



# TARGET PRELIMS 2024

## BOOKLET-37; S&T-11

### BIOLOGY BASICS-2

### CLASSIFICATION OF LIFE

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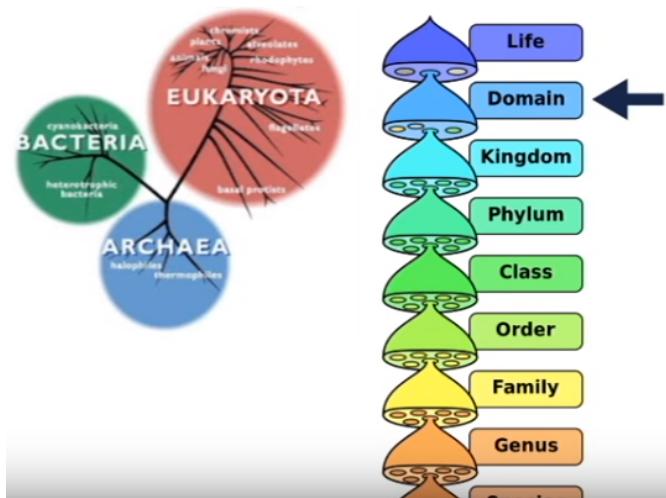
## 2. DIVERSITY IN LIVING ORGANISMS

### 1) INTRODUCTION

- Attempts at classifying living things into groups have been made since time immemorial.
  - Greek thinker **Aristotle** classified animals according to whether they lived on land, in water or in the air. This was a simple way of looking at life but misleading too.
- **Classification and Evolution**
  - Classification of life forms is closely related to the evolution. The living organisms which have evolved from same ancestor would tend to fall in the same group during classification.

### 2) THE HIERARCHY OF CLASSIFICATION GROUPS

- Various biologists have tried to classify all living organisms into broad categories, called the **Kingdoms**.
  - The classification Robert Whittaker (1969) proposed is widely used and has **five kingdoms**
    - Monera
    - Protista
    - Fungi
    - Plantae
    - Animalia
  - The number of Kingdoms were **expanded to 7 in 2015 by Ruggerio**. These are Monera, Archaea, Protozoa, Chromista, Fungi, Plants and Animals.
    - This classification also has **two super kingdoms** (Prokaryota and Eukaryota)
  - In 1990, a **three-domain system** (Archaea, Bacteria and Eukaryota) of biological classification was introduced by Carl Woese.
  - **More About Archaea** (or archaea bacteria)
    - Almost 10% of the life is found in the form of archaea. They are found almost everywhere (human gut, gut of a cow, extreme environment etc.)
    - **Key features**
      - They are prokaryotes (no nucleus or cell organelles)
      - **Cell wall present** (like bacteria)
      - **Membranes**

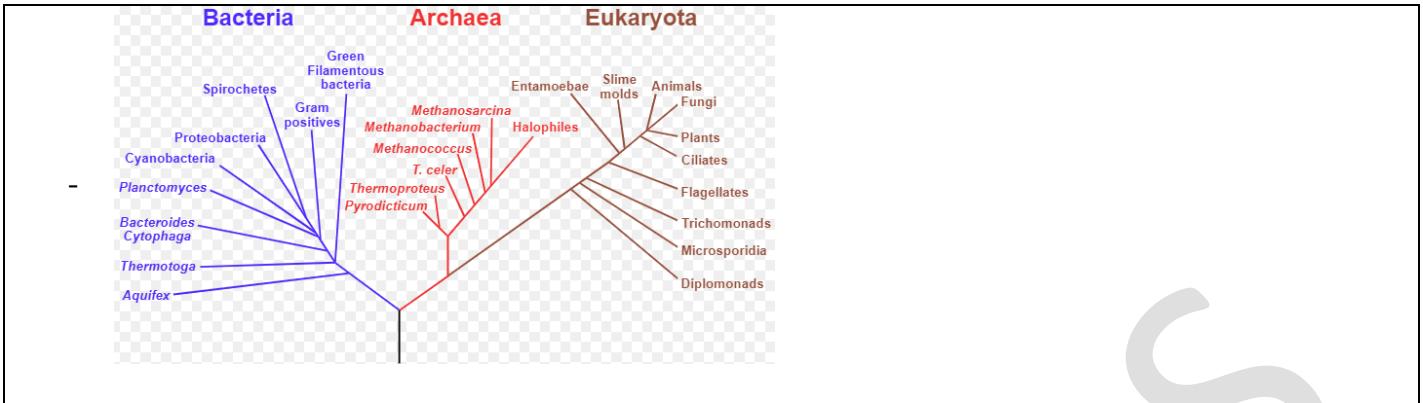


- **Metabolism** -> Phototrophs (e.g. halobacterium), Lithotroph (e.g. methanogen), Organotrophs (e.g. sulfolobus)
- **Many of these Archaea** are **extremophiles** (organisms that can thrive in extreme environments where most other forms of life can't live). This include glaciers, acid mine drainage and deep sea hydrothermal vents. Some categories of extremophiles are thermophiles, Psyhcrophiles, radio-resistant microbes, halophiles etc.
- The above groups have been formed based on the cell structure, mode and source of nutrition and body organization.
- **Further classification is done by naming the sub-groups at various levels** as given in the following scheme:
  - **Kingdom**
    - **Phylum** (For animals) / **Division** (for plants)
      - Class
      - Order
      - Family
      - Genus
      - Species
  - Humans
    - Kingdom: Animalia
    - Phylum: Chordata
    - Class: Mammalia
    - Order: Primates
    - Family: Hominidae
    - Genus: Homo
    - Species: Homo Sapiens
  - Thus, by separating organisms on the basis of a hierarchy of characteristics into smaller and smaller groups, we arrive at a basic unit of classification, which is a **species**.
    - Broadly, a species includes all organisms that are similar enough to breed and perpetuate.

In some recent classification mechanism **Domain** is considered the highest classification of life. The concept of domain was only introduced in 1990s, before which Kingdom held the highest rank of classification.

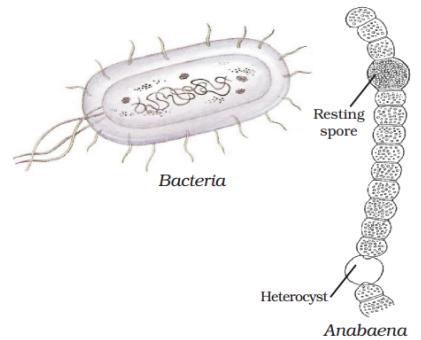
#### **Need of this classification:**

- Earlier all living organisms were divided into Prokaryotes (bacteria) and Eukaryotes (everything else).
- But, later it was found that some of the organisms which were earlier classified as bacteria, were from a completely different lineage. Though they were prokaryotes, they were not bacteria.
- This led to creation of three domains: **Eukarya, Bacteria and Archaea**.
- The domains highlight the enormous evolutionary differences among organisms. It was **Carol Woese** who separated Monera into bacteria and archaea and proposed a **three domain system**.
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## 1) MONERA (MONERA AND ARCHAEA)

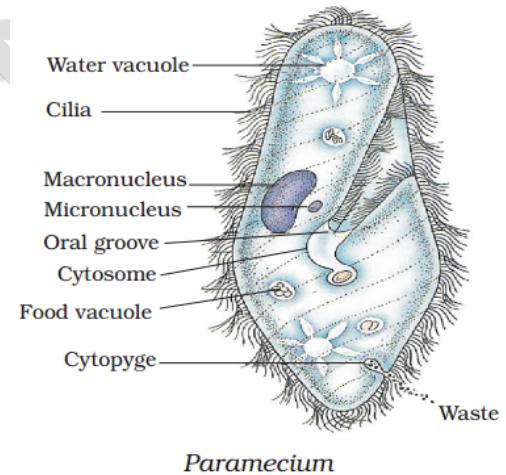
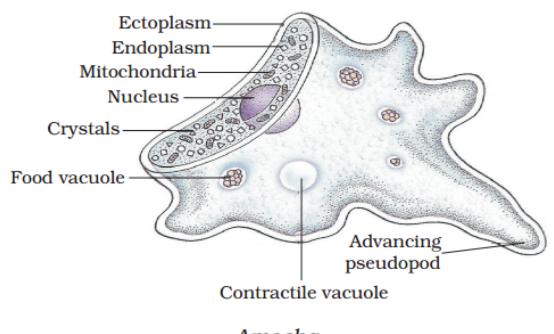
- All Prokaryotes are found in this Kingdom. Don't have a defined nucleus or organelles. Don't show multicellular body design.
  - Note: All Kingdoms except Monera have Eukaryotes
  - Show diversity based on other characteristics
    - Cells walls - some have some not.
    - Autotrophic or heterotrophic
  - E.g.: **bacteria**, blue green algae or cyanobacteria (it is considered a bacterium, and the term algae is reserved for Eukaryotic organisms only, it is autotrophic), mycoplasma (lacks a cell wall around their cell membrane), Anabaena (a genus of filamentous cyanobacteria, that exists as plankton)
  - **Spirulina: A wonder Food Supplement**
    - Spirulina is a blue green alga (family: Monera) that was earlier classified as a plant (algae) because of its richness in plant pigments as well as its ability to photosynthesize.
    - New understanding of its genetics, physiology and biochemical properties caused scientists to move it to the Bacteria Kingdom and the Cyanobacterium Phylum.
    - It is a free floating filamentous micro-algae that grow generally in oceans and salty lakes in subtropical climate.
    - It is cultivated worldwide and has been consumed for centuries for its high nutritional content and health benefits.
    - The nutritional value of Spirulina is well-recognized with its unusual high protein content (60-70% by dry weight) and its richness in vitamins (particularly B12) minerals, essential fatty acids, and other nutrients.
    - It is consumed in the form of capsules, tablets, flakes, syrups, or powder.
    - However, there is still not enough evidence to determine if spirulina supplements are safe. Medical studies are currently underway to verify spirulina as a dietary supplement and its potential health effects.
    - **Composition of Spirulina**
- |         |        |
|---------|--------|
| Protein | 60-70% |
|---------|--------|



Carbohydrate	16-20%
Lipid	5-7%
Mineral	6-9%
Moisture	2.5%-6%

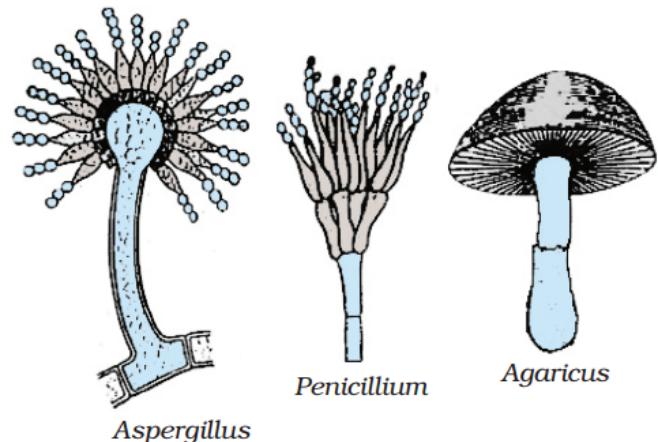
## 2) PROTISTA (OR PROTOZOA)

- Protista is a diverse group of Eukaryotic organisms that are not plants, animals, or fungi (It's a **hodgepodge category**, and eukaryotes that don't fit in plants, animals, and fungi are included in this category)
- They can be unicellular, multicellular or colonial. They can also be found in almost every habitat on earth.
- They can be autotrophic, heterotrophic, or mixotrophic and can produce both sexually and asexually.
- There are several major groups of Protists including:
  - i. **Algae:** Photosynthetic protists that range from single celled organisms to large multi-cellular seaweeds (it lacks cellular characteristics of plants and hence not classified as plants). They can be found in freshwater or marine ecosystems and are very important primary producers of aquatic ecosystem.
  - ii. **Protozoa:** They are heterotrophic protists and are typically unicellular and motile. They can be free living or parasitic. They play a significant role in nutrient cycling and as prey for other organisms. Some protozoa can cause diseases in humans and animals such as Malaria (Plasmodium falciparum) and sleeping sickness.
  - iii. **Slime Molds:** Protists that can exist as single cells or as large, multicellular aggregates. They are important decomposers in forest ecosystem.
  - iv. **Water Molds:** They are mostly parasitic and can cause diseases in plants and animals.
- They have significant economic and ecological importance (for e.g. algae are used as food sources for animals and humans. Others play significant role in health and biotechnology sector. Some of these organisms use appendage, such as hair like cilia or whip like flagella for moving around.



### 3) FUNGI

- These are heterotrophic, Eukaryotic organisms.
- They use decaying organic material as food and are therefore called **saprophytes**.
- Many of them have the capacity to become multicellular organism at some stage of life.
- They have cell walls made of tough complex sugar called chitin.
- **E.g.**
  - i. Yeast, Mushrooms, molds etc.
- Some fungal species live in permanent mutually dependent relationship with blue-green algae (or cyanobacteria). Such relationships are called Symbiotic. These symbiosis life forms are called **lichens**.
  - i. We have all seen lichens as slow-growing dark coloured patches on the bark of trees.



#### ▫ Recent Development

##### i. **Kirajadi / Yarsagambu / Yartsa gunbu**

- Scientific Name: Ophiocordyceps Sinesis (O. Sinesis)
- It is classified as medicinal mushroom.
- It is an entomopathogenic fungus (a fungus that grows on insects) found in mountainous regions of India, Nepal and Tibet
- It parasites larva of ghost moths and produces a fruiting body which is valued as an herbal remedy.
- The fungus germinates in the living larva, and kills and mummifies it, and then a dark brown stalk-like fruiting body which is a few centimetres long emerges from the corpse and stands upright.
- **Uses**
  - Used in traditional Asian medicines in countries such as Nepal, China, Bhutan etc.
  - In 2012, BBC magazine reported how it is transforming local economies in Himalayas.
- **Endangered in China**
  - Overharvesting and overexploitation has led to the classification of the specie as endangered in China.
- **Other names**
  - Caterpillar fungus, Yartsa Gunbu, etc.



### 4) PLANTAE

- **Autotrophic, Eukaryotic, mostly Multicellular with cell walls.**
  - They use chlorophyll for photosynthesis.

- Thus, all plants are included in this group.
- They all have cell walls made of cellulose.
- **Note:** Algae are classified under Protista, but some biologists classify multi-cellular algae under Plantae
- **Note:** Three of the five kingdoms have cell walls.
  1. **The Plant Kingdom:** All Plants have cell walls made up of cellulose.
  2. **The Fungi Kingdom:** Most fungi have cell walls made of Chitin, a complex carbohydrate that provides structural support and protection
  3. **The Monera Kingdom:** Bacteria and Cyanobacterium (also known as blue green algae) in Monera kingdom have cell walls made of peptidoglycan, a polymer made of sugars and amino acids that provides support and protection.

## 5) ANIMALIA

- Organisms which are multicellular eukaryotes without cell walls.
- They are all Heterotrophic.

**Note:** **Viruses** are not classified in any kingdom yet because they are not really alive. They only show signs of life

## 2) ANIMAL KINGDOM: ANIMALIA

- These are organisms which are Eukaryotic, multicellular, and heterotrophic.  
The Animal Kingdom is classified into several phyla, each with distinct characteristics and traits. The following are the major phyla of the Animal Kingdom:
  1. **Porifera (Sponges)**
  2. **Cnidaria**
  3. **Platyhelminthes (Flatworms):** These are bilaterally symmetrical animals with flattened bodies and primitive nervous systems.
  4. **Nematoda (Roundworms):** These are unsegmented, cylindrical animals with a complete digestive system.
  5. **Annelida (Segmented Worms):** These are bilaterally symmetrical animals with a segmented body and a closed circulatory system.
  6. **Mollusca (Snails, clams, octopuses):** These are soft-bodied animals with a muscular foot and a mantle that secretes a shell in some species.
  7. **Arthropoda (Insects, spiders, crustaceans):** These are segmented animals with jointed legs and an exoskeleton made of chitin.
  8. **Echinodermata (Starfish, sea urchins):** These are radially symmetrical animals with a spiny exoskeleton and a water vascular system.
  9. **Chordata:** These are animals with a notochord, a dorsal nerve cord, and pharyngeal gill slits at some point in their development. Chordates include vertebrates and non-vertebrates like tunicates and

lancelets. Chordates are divided into three subphyla: Urochordata or Tunicata, Cephalochordata and Vertebrata.

### Chordata:

Chordates are a major phylum within the Animal Kingdom that includes animals that have a number of shared characteristics, including:

- 1) **Notochord:** It is a flexible rod-like structure that runs along the dorsal (back) side of the body, providing support and allowing for movement.
  - In vertebrate subgroup of chordates, the notochord develops into spine, and in wholly aquatic species this helps the animal swim by flexing its tail.
- 2) **Dorsal Nerve Chord:** A nerve cord that runs along the back of the body, and in some cases develops into spinal cord in vertebrates.
- 3) **Phryngeal Gill Slits:** Pouches in the pharynx region of the body that are used for respiration in aquatic species and may be modified for other functions in terrestrial species.
- 4) **Post-Anal Tail:** A tail that extends beyond the anus, present at some point in the life cycle of many chordates.
  - **Note:** In humans and apes, the tail is reduced to a tiny tailbone called 'Coccyx'.

- They can be broadly classified as **Vertebrates and Invertebrates**.
- **Vertebrates** are animals with backbones and spinal columns i.e. these animals have a **true vertebral column and internal skeleton**, allowing for a completely different distribution of muscle attachment points to be used for movement.
  - Vertebrates are bilaterally symmetrical, triploblastic (derived from three embryonic cell layers – ectoderm, mesoderm and endoderm), coelomic and segmented, with complex differentiation of body tissues and organs.
  - All chordates (Phylum) possess the following features
    1. Have a notochord
    2. Have a dorsal nerve cord
    3. Are triploblastic
    4. Have paired gill pouches
    5. Are coelomate
  - Vertebrates are the most advanced organisms on Earth. Although they represent a very small percentage of all animals, their size and mobility often allow them to dominate their environment. Vertebrates can further be classified into following **5 groups**
    - Fishes
    - Amphibians
    - Reptiles
    - Birds
    - Mammals



## 2) IN-VERTEBRATES

- Invertebrates are animals without backbones. More than 98% animal species in the world are invertebrates. Invertebrates **don't have internal skeleton made of bone**.
  - Many invertebrates have a **fluid-filled, hydrostatic skeleton**, like the jelly fish or worm.
  - Others have a **hard-outer shell**, like insects and crustaceans.
- **Invertebrates can be classified as:**

### PORIFERA:

- The word porifera means organisms with holes.
- These are non-motile animals attached to some solid support.
- There are holes or pores all over the body. These lead to canal system that helps in circulating water throughout the body to bring food and oxygen.
- These animals are covered with hard outside layers or skeleton.
- **The body design** involves very minimal differentiation and division into tissues. They are commonly called sponges and are mainly found in marine habitats.
- They are considered one of the simplest forms of multicellular animals and are found in both fresh water and marine environments.
- They are important aquatic animals – They provide habitat for other organisms and help filter water. They are also used in various industrial applications such as cleaning and polishing.

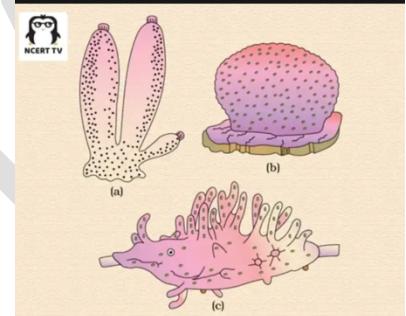
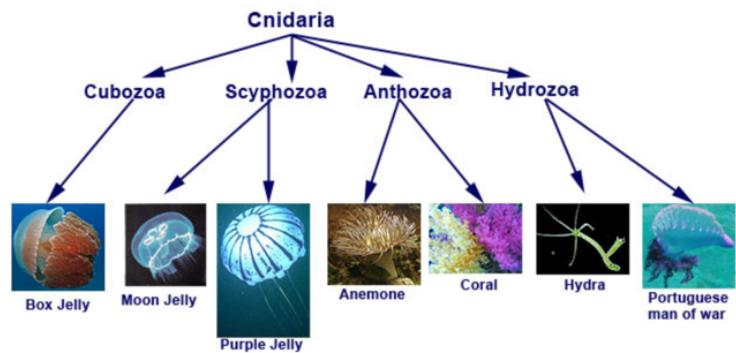


Figure 4.5 Examples of Porifera : (a) Sycon (b) Euspongia (c) Spongilla

### B) COELENTERATE (CNIDARIA)

- It is the phylum of organisms that include corals, anemones, hydroids and jelly fish.
- They were the first animals to move, sense and hunt.
  - They are characterized by tentacles. These tentacles allow organisms to move around and sense the surrounding environment. The cells on tentacles are called Cnidocytes. They are used to inject venom and paralyze the prey. It is due to the presence of Cnidocytes that the phylum is called Cnidaria.
- They are aquatic and mostly live in marine water and some in fresh water (e.g. Hydra).
- Some of these Cnidarias live attached life and are called Polyp (Greek word for attached).
- Other Cnidarians like jelly fish can move around.
- Their body is radially symmetrical.
- They show more body design differentiation.

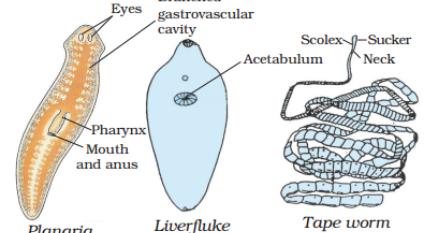
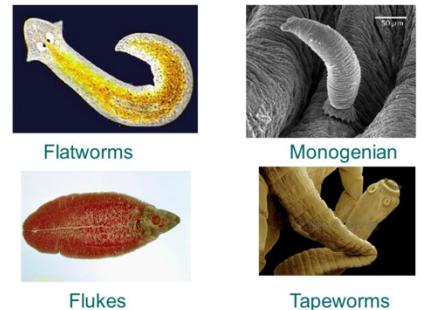


- They are **diploblastic organisms** as their embryonic body is made up of **two layers** of cells (outer Ectoderm and Inner Endoderm). One makes up the **cells on the outside of the body**, and the other **makes the inner lining of the body**.
- They have **tissue level organization** and were first animals to develop this. These animals also show **gastrovascular cavity** and **primitive nervous system**. The gastrovascular cavity has a **single opening**. Because of the presence of cavity, they are also called **Coelenterate** (Coel -> Cavity; and Enteron -> Intestine).
- Some of these species live in **colonies (Corals)**, while others have a **solitary lifespan (Hydra)**.

### C) PLATYHELMINTHES (PLATY -> FLAT AND HELMINTH-> WORM)

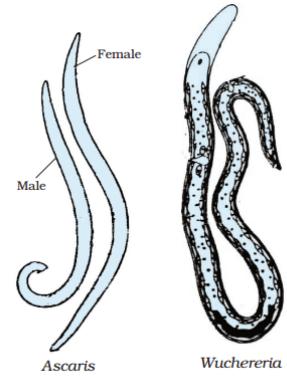
- **More complex** than Porifera and Coelenterate.
- The body is **bilaterally symmetrical**, meaning that the left and the right half of the body has the same design.
- There are **three layers of cells** (Ectoderm, Mesoderm and Endoderm) from which **differentiated tissues can be made**, which is why such animals are called **triploblastic**.
- This **allows outside and inside body linings** as well as some organs to be made. There is thus **some degree of tissue formation**.
- However, there is **not true internal body cavity** or **Coelom**, in which well-developed organs can be accommodated.
  - **Note:** Flat worms are the **only triploblastic organism**, which **don't have Coelom**.
  - Some flatworms have **rudimentary organs**.
- The body is **flattened dorsiventrally** (like ribbon), meaning from top to bottom, which is why these animals are called **flatworms**.
- **Either free living or parasitic**.
- Some of the members of this phylum are **harmful and can cause diseases**. They live like **endo-parasites** in humans or other organisms.
  - E.g. **Tape worm (Taenia solium)**, Liverflukes (*Fasciola*) -> infects liver
- Some of them can be useful as well **for e.g. Planaria** is used to feed on mosquito larvae and can be used to control mosquitoes.
- Some flatworms are **very long** (upto 90 feet)

### Phylum Platyhelminthes



### D) NEMATODA (ASHCHELMINTHES)

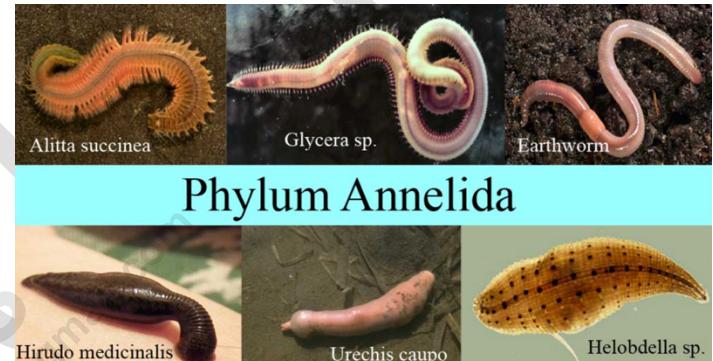
- The nematode body is also bilaterally symmetrical and triploblastic.
- However, the body is cylindrical rather than flattened. Thus, it is this phylum which saw the beginning of Coelom, but coelom is not truly developed and thus it is the only phylum which has false coelom or pseudo coelom.
- There are tissues, but no real organs, although a sort of body cavity or a pseudo-coelom, is present.
- These are very familiar as parasitic worms causing diseases, such as the worms causing elephantiasis (filarial worms) or the worms in the intestines (roundworms or pinworms).



**Fig. 7.15:** Nematodes (Aschelminthes)

### E) ANNELIDS

- They are defined as triploblastic, bilaterally symmetrical, metamerically segmented, a coelomate worm with a thin flexible cuticle around the body.
- They show a very important step in animal evolution -> Segmentation. Segments on annelids are usually ring like (Annulus is the Greek word of ring and hence the name Annelida)
- They are mostly aquatic; marine or fresh water; some are terrestrial, burrowing.
- Body organization is that of an organ system level.
- E.g.
  - **Earthworms** -> which help in ploughing of the land
  - **Leech** -> It sticks to the animal body to suck blood.



**Phylum Annelida**

### E) ARTHROPODS (ARTHRO -> JOINTED; PODS -> APPENDAGES)

- Probably the largest group of animals. They make upto 75% - 80% of the world's animal species and thus are most abundant.
- 
- These animals are bilaterally symmetrical and segmented.
- They have jointed legs (the word arthropods mean jointed legs).

<b>Segmentation</b> (Head, Thorax and Abdomen): This segmentation helps an organism to travel and protect its sensitive organs. Each segment has a pair of legs attached for smooth locomotion.	<p>A diagram of a beetle with labels for its segments: 'Head' at the front, 'Thorax' in the middle, and 'Abdomen' at the rear. The thorax is divided into three segments, each with a pair of legs attached.</p>
---	--

- They are triploblastic, and Coelomic (i.e., they possess true coelom or body cavity). There is an open circulatory system so the blood doesn't flow in well-defined blood vessels. The coelomic cavity is blood filled (therefore there Coelom is also called **Haemocoel**).

- They also have **an exoskeleton** which is hard, external skeleton made up of **Chitin**.
- They include cockroaches, crabs, butterflies, beetles, scorpions, shrimp, spider, lobster, lice, ticks, termites, potato bugs, and sea monkeys.
- Reproduction:**
  - Most of them are oviparous (egg laying) (e.g., butterfly)
  - Some are viviparous (give birth to young ones) (e.g., scorpions)

<p><b>Indirect Development:</b> In most arthropods, young ones are <u>totally different from adults</u> (these young ones are called Larvae) [E.g. Butterfly].</p> <p>The process of development of Larvae into an adult is called <u>Metamorphosis</u>.</p>	
<p><b>Direct Development:</b> Here larval stage is not included</p>	<p>E.g. Scorpions</p>

- Arthropods include animals such as **insects, crustaceans and arachnids**. Largest group of arthropods are the insects. The next largest group are crustaceans, including lobsters and crabs. The arachnids include spiders and ticks.
- **Insects** are the largest group of arthropods. Very adaptable, living almost everywhere in world. Exoskeleton that covers their entire body. Insects body consists of **three parts**: the head, thorax and abdomen.
  - e.g. Beetle, butterfly, moth, dragonfly, bee etc.
- **Crustaceans** live mostly in ocean or other waters. **Hard external shell** which protects their body.
  - E.g. Crab, lobsters and barnacle.
- **Arachnids: Spiders, Ticks and Scorpions**
  - Like other arthropods, the arachnids have a hard exoskeleton and joint appendage for walking. Most have four pairs of legs. Unlike other arthropods, arachnids do not have antenna.
  - E.g. spider, scorpion etc

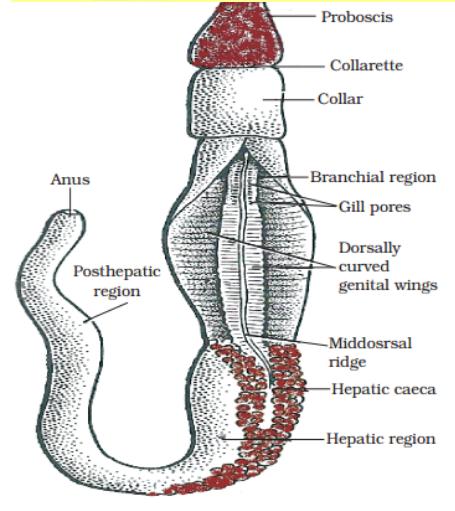
## F) MOLLUSCA

- This is the second largest phylum of the animal kingdom.
- In the animals of this group, there is bilateral symmetry (they can be asymmetric also)
- The coelomic cavity is reduced.
- Little segmentation
- There is an open circulatory system and kidney like organ for excretion.
- There is a foot that is used to move around.
- Most mollusks have a soft, skin like organ covered with a hard-outside shell.
- Some live on land such as snail or slug.
- Other mollusks live in water, such as the oyster, mussel, clam, squid octopus etc.



## G) ECHINODERMS (ECHINA -> SPINY; DERM -> SKIN)

- **Exclusively free-living marine animals** (All echinoderms are exclusively marine) [i.e. there are no freshwater or terrestrial echinoderms known yet]
- They are **triploblastic** and have a **coelomic cavity**.
- **Most have arms that radiate from the centre of their body.** Centre body contains **organs** and mouth for feeding.



## H) PROTOCHORDATES

- They are **informal category of animals**, named mainly for convenience to **describe invertebrate animals that are closely related to vertebrates**.
- These animals are **bilaterally symmetrical**, **triploblastic** and have a **coelom**.
- In addition, they show **a new feature of body design**, namely a **notochord**, atleast at some stages during their lives.
- The notochord is a **long-rod like support structure** (chord= string) that runs along the back of animal separating the nervous tissues from the gut. It provides **a place for muscle to attach for ease of movement**.
- Protochordates may not have a proper notochord present at all stages in their lives or for entire length of the animal.
- They are **marine animals**
- e.g. *Balanoglossus*, *Herdmania* and *Amphioxus*.

## 3) VERTEBRATES

Phylum Vertebrata can be divided into five classes (Fishes, Amphibians, Reptiles, Bird and Mammals)

### A) FISHES (PISCES)

- **Exclusively aquatic** (live in water)
- **Breathe in water using gills**, not lungs

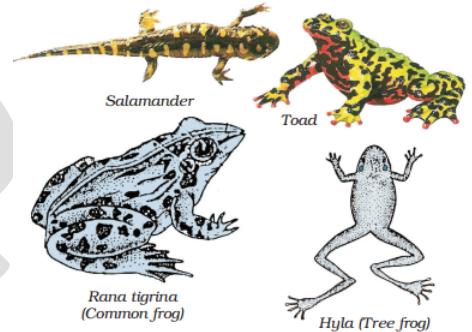
- **Cold blooded** (there body temperature change with change in environmental temperature)
- Have scales and fins
- **Lay many eggs.**
- **2 chambered heart**
- Body is streamlined, and a muscular tail is used for movement.
- **Many kinds of fish**
  - Some with skeletons made entirely of cartilage, such as sharks
  - Some with skeleton made of both bone and cartilage, such as tuna or rohu.

**Note:** Sometimes fish are divided into two different classes (based on the presence and absence of jaws; **Cyclostomes** -> Jawless fishes, they have sucker mouth e.g. Hag fish; **Pisces** -> Jawed fishes)

**Other differences:** Cyclostomes are only found in marine water. They don't have scales or paired fins.

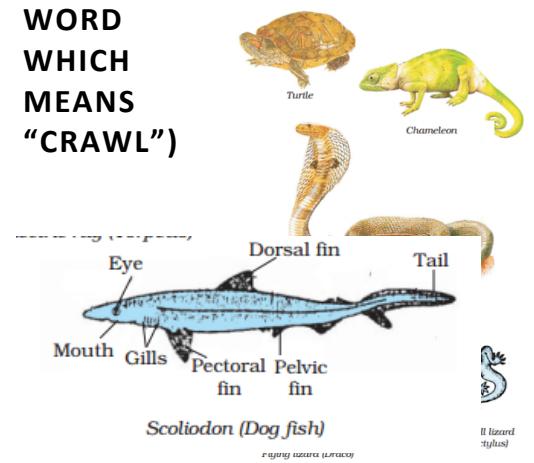
## B) AMPHIBIANS (AMPHI – DUAL; BIO - LIFE)

- **Differ from fish in lack of scale** and have a 3-chambered heart.
- Have Mucus glands on Skin -> Moist smooth skin
- **Cold blooded**
- Live on land & water
- Webbed feet
- Breathe with lungs and gills
- Four legs (sometimes none)
- **Lay many eggs**
  - These eggs are laid in water to avoid dehydration. Thus, the larvae initially have gills to breathe in water. These gills will be replaced by lungs in adult stage.
- **3 chambered hearts:** (Note: larvae has 2 chambers and adults have 3 chambers)
- E.g.
  1. Frogs, toads, and salamanders are some examples



## C) REPTILES (REPT IS A LATIN WORD WHICH MEANS "CRAWL")

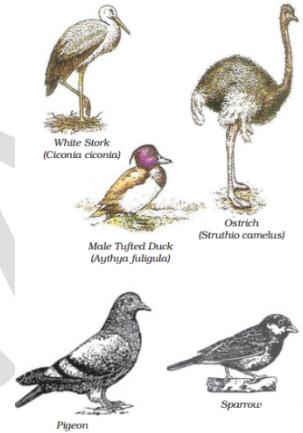
- These were the first terrestrial vertebrates.
- **Cold Blooded**
- Have scales (to protect them from sun and from abrasions while moving on ground)
- Have dry skin
- Usually lay eggs with tough coverings
  - Don't need to lay eggs in water, unlike amphibians.
- **Ear holes instead of ears**
- 4 legs or no legs.



- **Heart:** Most reptiles have **a three chambered heart**. Crocodilians have 4 chambered hearts, turtles have a three-chambered heart but with an incomplete wall in a single ventricle, so their heart is functionally four chambered.
- **E.g**
  - Snakes, turtles, lizards, and crocodiles are some examples

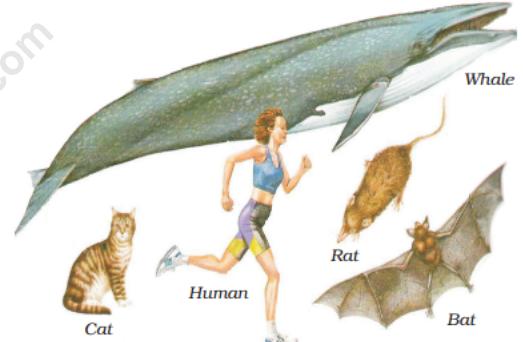
#### D) AVES

- **Have feathers:** Feathers are actually modification of scales from their ancestor reptiles. The older scales can still be spotted on the legs of birds. Feathers help in insulation and keep them warm.
- **Warm blooded:** Feathers allow birds to keep themselves at constant temperature. This warm blooded nature allow birds to face their environmental nature.
- **Wings:** In birds, the fore limbs are modified into wings. This helps birds to fly. They have hollow bones which reduce their body weight and allow them to fly easily.
- Lay eggs
- Have 2 legs
- Earholes instead of ears
- Breathe through lungs.
- **Four chambered heart** (all birds) -> to provide them continuous supply of large quantity of oxygen.



#### E) MAMMALS

- **Warm blooded**
- Have hairs or fur
- Skin has hairs as well as sweat and oil glands.
- Most give birth to live young mostly
  - **However**, a few of them, like the platypus and echidnas lays eggs and some like Kangaroos give birth to very poorly developed young ones.
- **Mammary glands:** Mammal mother's nurse the young ones with milk i.e. mammals have glands to give milk
- Breath with lungs
- Mammals live on all sorts of environment including the ocean, underground and on land.
- **Ears that stick out** (external ears evolved for the first time in Mammals)
- **Heart: 4 chambered heart (all mammals)**
- Blue whale is also mammal, so is bat.



**Fig. 7.25: Mammalia**

**Note:** Amphibians, Reptiles, Birds and Mammals are together called **Tetrapods**. They have two forelimbs and two hindlimbs.

Adult snakes don't have limbs, but extremely young snake embryos do). Ancestors of today's snakes once sported full-fledged arms and legs, but genetic mutations caused the reptiles to lose all four of their limbs about 150 million years ago.

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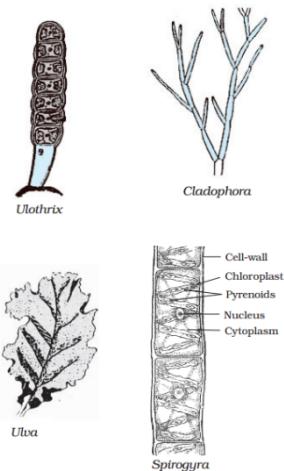
## 4) FLORAL DIVERSITY: PLANT KINGDOM

- **General Features:**
  - » Eukaryotic
  - » Multicellular
  - » Non-motile (Sedentary)
  - » Cell walls (Cellulose)
    - Thus, the most abundant sugar on earth is cellulose.
  - » Autotrophic
- In terms of **plant diversity**, India ranks tenth in the world and fourth in Asia. India represents nearly 11% of the world's known floral diversity.
- **Plant Kingdom** is classified in various sub-categories on the basis of following features:
  - » Extent of Differentiation of plants parts like stem, roots, leaves etc.
  - » Presence of special tissues (Xylem and Phloem)
  - » Ability to bear seeds
  - » Naked Seeds and Fruits enclosed seeds
  - » Ability to produce **flowers**
- **On the above grounds**, plants have been classified into five divisions:



### THALLOPHYTA (DERIVED FROM UNDIFFERENTIATED PLANT BODY)

- Plants that **don't have well differentiated body design** fall in this group. They are not differentiated between roots, stems and leaves. The plants in this group are commonly called algae. The plants are predominantly aquatic.
  - Please note: In Protista we have unicellular algae, and generally all multicellular algae are put in Plantae Kingdom.
- **Features:** Eukaryotic, Multicellular, non-motile, cell walls made of cellulose, autotrophic.
- E.g. Spirogyra, Ulothrix, Cladophora, Ulva, Chara etc.
- **Usefulness of Thallophyta in our life:**
  - Seaweeds can be used for food purpose (soup made of sea weeds is popular in Korea and Japan)
  - Production of Biofuels



- Anti-biotics development
  - Gellies that we get in icecreams and other sweets are extracted from an organism called Gelatin which is a Thallophyta.
- **Harmful Algae's:**
- **Karenia Brevis** is an alga which produces toxin and is harmful for aquatic life.
  - **Eutrophication (algal bloom)**

### BRYOPHYTES (BRYON -> MOSS; PHYTON -> PLANT)

- They are part of Bryophyta division of Kingdom Plantae.
- Have **well differentiated body parts** like stems and leaves.
- However, no specialized tissue for conduction of waters and other substances from one part of the plant body to another.
- **Reproduction through Spores** (not seeds). All Bryophytes reproduce through spores and not seeds.
- E.g. Moss (Funaria), Marchantia, Liverworts, Hornworts, Mosses)

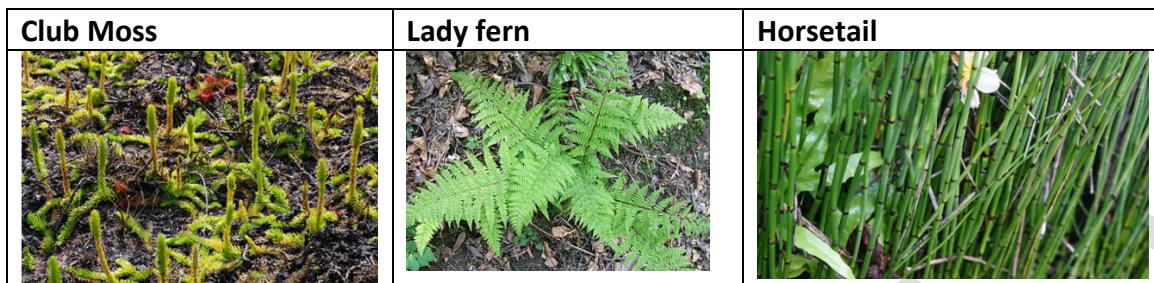
Mosses	Liver Worts
	

- They cannot circulate rainwater through their stems and leaves but must absorb it from environment that surrounds them. Therefore, they would be found in moist environments and not dry conditions. The plant body is differentiated into a small stem and simple leaves, but true roots are absent.
- **Note:** Ally Bryophytes reproduce through spores and not seeds.
- Bryophytes are the second largest group of green plants in India distributed largely in Eastern Himalaya, North-Eastern India, Western Himalaya and the Western Ghats.
- Mosses consist of the major component of Indian bryo flora followed by liverworts and hornworts.

### C) PTERIDOPHYTE (PTERIS -> FERNS; PHYTONS -> PLANT)

- They are the most basic vascular plants – having simple reproductive system lacking flowers and seeds.
  - **Vascular Plants:** Have specialized tissues for conduction of water and other substances from one part of the plant body to another. (Xylem and phloem).
- **Well Differentiated body parts:** Well differentiated plant body into **roots, stem and leaves**.
- **Reproduction through Spores.** Produce **neither flowers nor seeds**, so they are referred to as **Cryptogams**.

- Most of them are terrestrial plants flourishing well in moist and shady places (thus avoiding sunlight), and some of them are aquatic. This group include vascular cryptogams like club-mosses, horse-tails and ferns which are universally distributed all over the world.



- Note:** About 1/3<sup>rd</sup> of the Pteridophytes are epiphytes (i.e., they grow on other plants)
- Note:** **Thallophyte, Bryophytes and Pteridophytes** are called Cryptogams. This is because they have hidden (Crypto) reproductive organs. These plants are flowerless and seedless.
- In India,** the north-eastern region (including eastern Himalaya) is rich in pteridophytes diversity, followed by south India (including eastern and western Ghats) and north India (including western Himalayas)

## SPERMATOPHYTES (DISPERSED BY SEEDS)

### A) GYMNOSPERMS (SEEDS NOT ENCLOSED) E.G., CONIFERS

- Group of seed producing plants that include conifers, cycads, Ginkgo and Gnetales. (Origin of word: Greek, gymnos: naked, sperma: seed). This is named so after the unenclosed condition of their seeds. The naked condition of seeds of gymnosperm stands in contrast to the seeds and ovules of flowering plants (angiosperms), which are enclosed within an ovary. In Gymnosperms ovules are present on the surface of the megasporophylls and are directly pollinated by the pollen grains. There is nothing like ovary, style, and stigma, and naturally there is no fruit.
- E.g., Pines, Deodar, Cycads (look like palm tree, but they are not. Palms are angiosperms)



### B) ANGIOSPERMS (SEED ENCLOSED) E.G. FLOWERING PLANTS

- The word is made from two Greek words: angio means covered, and sperma - means seed.
- Angiosperms, the flowering plants are the most diverse group of land plants. Angiosperms are the seed producing plants like the gymnosperms and can be distinguished from the gymnosperms by characteristics including flowers, endosperm within the seeds, and the production of fruits that contain the seed.
- These are the most highly developed plants which bear flowers having conspicuous accessory and essential whorls.
- Carpels have the ovary, style and stigma. With the stimulus of fertilization the ovary generally develops into fruit and the ovules in seeds. Thus, the seed remains within the fruit.

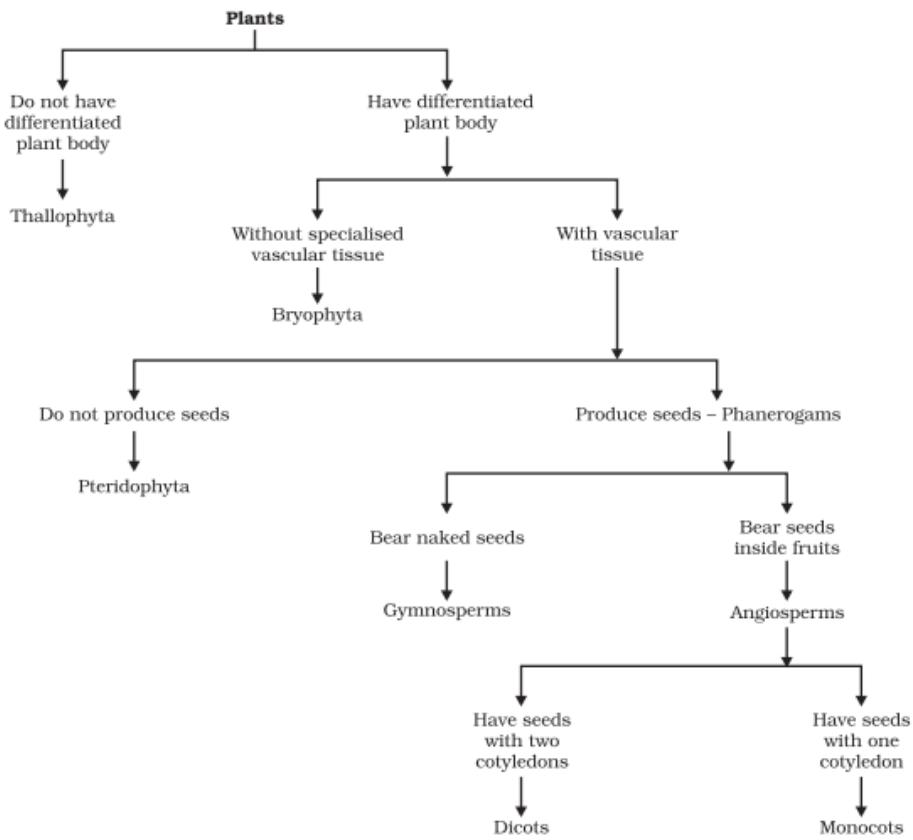
- Plant embryos in seeds have structure called **cotyledons**. Cotyledons are called 'seed leaves' because in many instances they emerge and become green when the seed germinates.
  - Thus, cotyledons represent a bit of pre-designed plant in the seed.
- The angiosperms are divided into **two groups on the basis of number of cotyledons** present in the seed.
  - **Monocotyledons/ monocots:** Plants with seeds having a single cotyledon (embryonic leaf). They are generally grass and grass-like flowering plants. (E.g. wheat, rice maize etc are a monocotyledons). Other economically important monocotyledons include Palms, Bananas, gingers, turmeric, onion, garlic etc.
  - **Dicots:** Plants with seeds having two cotyledons are called dicots.



Monocots				
Embryos	Leaf venation	Stems	Roots	Flowers
One cotyledon	Veins usually parallel	Vascular bundles usually complexly arranged	Fibrous root system	Floral parts usually in multiples of three
Dicots				
Two cotyledons	Veins usually netlike	Vascular bundles usually arranged in ring	Taproot usually present	Floral parts usually in multiples of four or five

- India has more than 7% of the world's known flowering plants

### 3. SUMMARY CHART: CLASSIFICATION OF PLANTS





# TARGET PRELIMS 2024

## BOOKLET-38; S&T-12

### CA UPDATES ON S&T

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## 1. SPACE

### 1) GSLV-F14/INSAT-3DS MISSION (FEB 2024)

- GSLV-F14 (**GSLV-MK-II**) was the 16<sup>th</sup> mission of GSLV, and it deployed the INSAT-3DS meteorological satellite in GTO. This mission is fully funded by Ministry of Earth Science.
- **INSAT-3DS:** It is a follow-on mission of Third Generation Meteorological Satellite for Geostationary Orbit. It is designed for enhanced meteorological observations and monitoring of land and ocean surfaces for weather forecasting and disaster warning.
- The satellite will augment the Meteorological services along with the presently operational INSAT-3D and INSAT-3DR satellites.
- **Note:** GSLV MK-II is nicknamed '**Naughty Boy**'. It is because it has had a rather patchy track record.
  - » So far (including GSLV F14), GSLV has had 16 launches so far, and four of them have been failures.
  - » **What is the core issue?**
    - The main problem is the Cryogenic engine that powers the third and final stage. GSLV-MK-II uses a cryogenic engine which is a reverse-engineered version of a Russian technology.
    - **Why?** Russia couldn't supply technology to India due to MTCR restrictions. But it supplied a few of the engines. Initially India used these engines and later tried to reverse engineer the same.
    - **Note:** Now India has its own cryogenic engine as well, a result of decades of R&D. This engine has entirely Indian design, developed within ISRO, and uses a different process to burn fuel. It is closer to the designs of the Arianne rockets that were used by ISRO till a few years ago to launch its heavier rockets. This engine is being used in LVM-3.

### 2) CARTOSAT-2 BROUGHT DOWN (FEB 2024)

- **Background:** The satellite was launched in 2007 in SSPO. Until 2019, the satellite equipped with over 12,000 coupled charged devices used its “panchromatic and multi-spectral cameras” to generate high resolution images that were extensively used for urban planning, monitoring of road networks, and water distribution, creation of land use maps, among others.
- 17 years after its launch, Cartosat-2, the first of India's second generation of high-resolution imaging satellites primarily used in urban planning has been deorbited.
- With a descent into earth's atmosphere, all of its components would be disintegrated. It has led to reduction of collision risk and safe end-of-life disposal of the satellite.

### 3) GAGANYAAN

- **Introduction**
  - **Gaganyaan project** envisages demonstration of human spaceflight capability by launching crew of 3 members to an orbit of 400 km for a 3-day mission and bring them back safely to earth, by landing in India sea waters.
  - Assuming two important test flights (unmanned) in 2024 and 2025 are successful, the first crewed flight of the mission is scheduled for 2025.
  - The GSLV MK-III launch vehicle will be used to launch the Gaganyaan mission.
  - **Technically, it is a demonstration mission:** It will test various technologies required for human spaceflight, which remains the most complicated form of spaceflight, and demonstrate India's familiarity with their production, qualification and use.
- **Significance/ Need of HSP**
  - **First step towards future space programs** like having India's own space station and sending humans to moon and on other interplanetary mission. PM Modi has set the target of having a space station by 2035 and landing an Indian on Moon by 2040.
  - **More R&D in space** – ISRO will be able to conduct micro-gravity experiment.
  - **Advances in Science and Technology**
  - **Strengthen India's Soft power:** So far, only three countries USA, Russia and China have executed Human Spaceflight at their own.
  - **Technological spin-offs will benefit other sectors.**
  - **Improvements in Higher Education** in the field of aeronautical engineering, aerospace engineering and physics.
  - **Employment Opportunities**
  - **Symbolism: Great power status** – Achievements in outer space are a marker of great power status.
- **Key components of Human Space Program (HSP)**
  - **Human Space Flight Centre (HSFC)** – A body set up by ISRO as a coordinating body for Gaganyaan called the Human Space Flight Centre (HSFC).

- Development of **Human rated launch vehicles** for carrying crew safely to space.
  - All systems in LVM3 launch vehicles are-reconfigured to meet human rating requirements and christened **Human Rated LVM3** (HLVM3). It will be capable of launching the orbital module to an intended LEO of 400 km.
  - HLVM3 also consist of **Crew Escape System (CES)** powered by a set of quick acting, high burn rate solid motors which ensure that Crew module along with crew is taken to safe distance in case of emergency either at launch pad or during ascent phase.
- **Orbital Module:** It is the object that LVM-3 rocket will launch and place in LEO. It will be orbiting earth and comprises of **Crew Module (CM)** and **Service Module (SM)**. It is fit with adequate redundancy considering human safety.
  - CM is the habitable space with Earth like environment in space for the crew. It can house upto three astronauts for a week.
    - **Technical details of crew module:**
      - It is of double walled construction consisting of pressurized metallic Inner Structure and unpressurised External Structure with Thermal Protection System (TPS).
      - It houses the crew interfaces, human centric products, life support system, avionics and deceleration systems.
      - It is also designed for re-entry to ensure safety of the crew during descent till touchdown. It includes parachutes to slow its descent to the ground once it descends from orbit.
      - It also include a gynoid (feminine robot) named '**Vyomamitra**' fit with sensors to track the effects of radiation and weightlessness, monitor capsule conditions, and sound alarms in the event of an impending emergency, aside from being able to perform some task.
    - SM will be used for providing necessary support to CM while in orbit. It is an unpressurized structure containing thermal system, propulsion system, power systems, avionics systems and deployment mechanisms.
  - **Life Support System (Habitable Modules)** to provide an earth-like environment to crew in space.
    - Building a habitable module in which astronauts will live and work. Such environmental control systems are being developed.
    - **Other life support systems** – Space suits etc.



- **Precursor Missions** for demonstrating the technology preparedness levels before carrying out the actual mission. This includes Integrated Air Drop Test (IADT), Pad Abort Test (PAT), and Test Vehicle (TV) flights.
  
- **Crew Training Facility established** in Bengaluru caters to Classroom training, Physical Fitness Training, Simulator Training and Flight suit training.
  - **Training Modules** cover academic courses, Gaganyaan Flight Systems, Micro-Gravity familiarization through parabolic Flights, Recovery & Survival training etc. **Aero medical training**, Periodical Flying Practice and Yoga are also included as part of the training.
  - **Note:** A shortlist of candidates was sent to Russia for advanced training.
  
- **Astronaut Training** – to live in a gravity less environment.
- **Capabilities for recovering astronauts safely**.
  
- **Other Steps taken so far:**
  - **Space Borne Assistance and Knowledge Hub for Crew Interaction (SAKHI):** A multipurpose app developed by Vikram Sarabhai Space Centre that will help astronauts on Gaganyaan space flight mission carry out a range of tasks such as looking up vital technical information or communicating with one another. It will also monitor the health of astronauts, alert them about their dietary schedule etc. It will also help them stay connected with Earth. It will keep the crew connected with the onboard computer and ground-based stations, guaranteeing a seamless communication link.
  
  - **Pilots have been selected** and the identities of the four astronaut-designates, all IAF test pilots, were revealed in Feb 2024. The final crew for the mission will be chosen from among the four. **Prashanth Balakrishnan Nair, Ajit Krishnan, Angad Pratap and Shubhanshu Shukla** – are all airforce pilot.
  
  - In 2018, the Union Cabinet had allocated Rs 10,000 crore for the program.

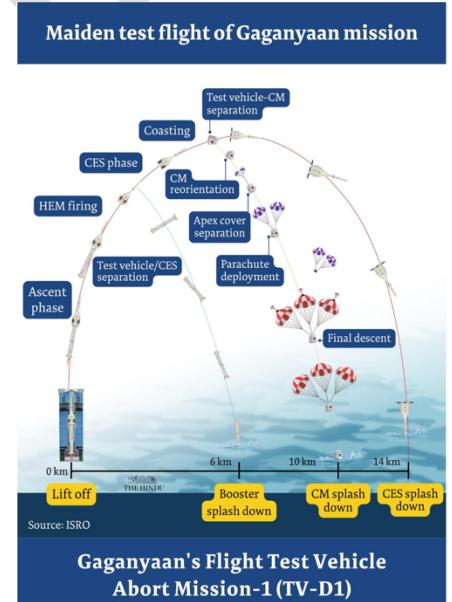
#### **A) CE-20 CRYOGENIC ENGINE IS NOW HUMAN RATED (FEB 2024)**

- **Human rating** refers to rating a system that is capable of safely transporting humans.

- ISRO has achieved a major milestone in the human rating of its CE20 cryogenic engine which powers the cryogenic stage of the human rated LVM3 launch vehicle for Gaganyaan missions, with completion of the final round of ground qualification tests.
- The final test was carried out on Feb 13, 2024. It was the seventh in the series of vacuum ignition test carried out at High Altitude Test Facility at ISRO propulsion Complex, Mahendragiri, to simulate flight conditions.
- According to ISRO, the ground qualification tests for the human rating of the CE20 engine involved life demonstration tests, endurance tests and performance assessment under nominal operating conditions as well as off-nominal conditions w.r.t thrust, mixture ratio, and propellant tank pressure.
- **All the ground qualification test** of the CE20 engine for the Gaganyaan programme have been successfully completed.

## B) GAGANYAAN FIRST FLIGHT TEST VEHICLE ABORT MISSION-1 (TV D-1) WAS SUCCESSFULLY ACCOMPLISHED (OCT 2023)

- The purpose of the TV-D1 mission was to demonstrate the Crew Escape System for the Gaganyaan program through a test vehicle demonstration in which the vehicle went up to a Mach number, which is slightly above the speed of sound, and initiated an abort condition for the Crew Escape System to function.
- **Outcome:** TV-D1 Mission was fully achieved and that the Crew Escape System (CES) performed as intended.



## 4) SHIVA SHAKTI

- **What happened?**
  - The IAU working group for Planetary System Nomenclature has approved the name '**Station Shiva Shakti**' for the landing site of **Chandrayaan-3's Vikram lander**. The approval was given on 19<sup>th</sup> March 2023.
- **About International Astronomical Union:**

- The International Astronomical Union (IAU) was founded in 1919. It's an **NGO** with mission to promote and safeguard the science of astronomy in all its aspects, including research, communication, education and development, through international cooperation.
- The IAU consists of **Individual members**, who include both **professional astronomers and junior scientists**, and **national members**, such as professional associations, national societies, or academic institutions.
- Its **individual members** – structured into Divisions, Commissions, and Working Groups – are **professional astronomers from all over the world**, at the Ph.D. level and beyond, who are active in professional research, education and outreach in astronomy. It also has **junior members**.
- Among other tasks of the IAU are the **definition of fundamental astronomical and physical constants**, **unambiguous nomenclature** and **informal discussions on the possibilities for future international large-scale facilities**.
- Further, the **IAU serves as international authority for assigning designations** to celestial bodies and **surface features** on them. This authority was also **recognized by the United Nations** in 1982 in **UN Resolution 13 on Extraterrestrial features names**.
- The IAU also work **to promote research, education, and public outreach activities** in astronomy for the public.

- **How astronomical sites are named?**

- **Why naming?**
  - According to the **Gazetteer of Planetary Nomenclature**, planetary nomenclature, like terrestrial nomenclature, is used to uniquely identify a feature on the surface of a planet or **satellite** so that it can be **easily located, described, and discussed**.
  - This gazetteer **contains detailed information about all names of topographic and albedo features on planets and satellites** (and some planetary ring- and ring-shaped systems) that the **IAU has named from its founding in 1919 through the present time**.
- **IAU Rule 4 states:** "**Solar system nomenclature** should be **international in its choice of names**. Recommendations submitted to the **IAU national committees** will be considered, but **final selection of the names is the responsibility of the International Astronomical Union**. Where appropriate, the [working group] **strongly supports an equitable selection of names from ethnic groups, countries, and gender on each map**; however, **a higher percentage of names from the country planning a landing is allowed on landing site maps**.
- **IAU's Rule 9 states:** "No names having political, military or religious significance may be used, except for names of political figures prior to the 19th century."
- **Note:** The **Astrogeology Science Centre of the U.S. Geological Survey** maintains the **Gazetteer of Planetary Nomenclature** on behalf of the IAU with funding from NASA.

- **About Station Shiv-Shakti:**

- In Aug 2023, **PM Modi announced that the point where the moon lander of Chandrayaan-3 touched** will be **called 'Shiv Shakti'**.
- IAU has accepted this name.

- The citation for the name in the **Gazetteers** reads: “Compound word from Indian mythology that depicts the masculine (“Shiva”) and feminine (“Shakti”) duality of nature; Landing site of Chandrayaan-3’s Vikram Lander”.

## 5) SKYROOT SUCCESSFULLY TEST FIRES STAGE-2 OF VIKRAM-1 SPACE LAUNCH VEHICLE (MARCH 2024)

- **About Skyroot Aerospace:**
  - » It is an Indian, private sector, space enterprise based in Hyderabad, Telangana, India. In 2020, when GoI announced opening up of the space sector, it became the first startup to sign an MoU with ISRO to launch a rocket.
- **Rockets being Developed by Skyroot:**
  - » It is producing a series of Vikram Rockets named after Dr. Vikram Sarabhai. The goal is to launch small satellites using this rocket.
  - » **Vikram-S:** In 2022, Skyroot created history by launching India's first privately developed rocket Vikram-S.
    - It is a single stage sub-orbital rocket. It is India's first privately developed cryogenic hypergolic liquid and solid fuel-based rocket engine. It was developed using advanced composite and 3-D printing technologies.
    - In its first flight, in Nov 2022, it carried three customer payloads in a sub-orbital flight. It was launched from the sounding rocket complex of the ISRO's Satish Dhawan Space Centre in Sriharikota, Andhra Pradesh. It achieved a peak altitude of 89.5 kms and has met all flight parameters. This mission was called Prarambh Mission.
  - » **Vikram-1** is being developed to carry 480 kg payload to Low inclination Orbit.
    - In March 2024, Skyroot has successfully test fired the Stage-2 of Vikram-1 space launch vehicle, called Kalam-250, at the propulsion test bed of the ISRO, at its SDSC, in Sriharikota, Andhra Pradesh.
    - Stage-2 is a critical stage for space launch vehicles as it carries the launch vehicle from atmospheric phase to the deep vacuum of outer-space.
    - **KALAM-250** is a high strength carbon composite rocket motor, which uses solid fuel and a high-performance Ethylene-Propylene-Diene terpolymers (EPDM) Thermal Protection System (TPS). It also houses a carbon ablative flex nozzle along with high-precision mechanical actuators for thrust vector control of the vehicle, which helps the rocket achieve the desired trajectory.
      - **Note:** EPDM is a durable material made to withstand the toughest conditions. It can withstand high temperature and abrasive chemicals.
    - The test also had an important contribution from Vikram Sarabhai Space Center (VSSC), which supplied its proprietary head-mounted safe arm (HMSA) for the test, used for the safe operation of the rocket stage.

- The Solid propellant in Kalam-250 was processed by Solar Industries at their Nagpur facility.
  - The test lasted for 85 seconds and recorded a peak sea-level thrust of 186 KN.
  - **Note:** Skyroot have already tested the stage-3 of Vikram-1 called Kalam-100 in June 2021.
  - **Note:** Vikram-1 is the first private orbital rocket launch.
  - **Testing of Stage-2** is a milestone for Indian Space Industry, marking the successful test of the largest propulsion system ever designed and developed by the Indian private sector so far.
  - **Skyroot** team expects to reach its maiden orbital launch of the Vikram-1 by 2024.
- » **Vikram-2** which will follow Vikram-1, will carry 595 kg to low inclination orbit.
- » **Vikram-3** will carry 815 kg to Low inclination orbit.
- Skyrocket also says that the rockets will be able to undertake multi-orbit insertion and inter-planetary missions as well as offer “customized, dedicated and ride share options covering a wide spectrum of small satellite customer's needs”.
  - **Significance of these initiatives**
    - » Step towards privatization in space sector. This will bring innovation and youthful energy in the sector and is also expected to increase investment.
    - » Huge future potential as the demand for launching small satellites is growing.
    - » Scope to increase India's share in space sector. India's current share in the space economy is only 2%. PM Modi has been calling it to be increased to 10%.

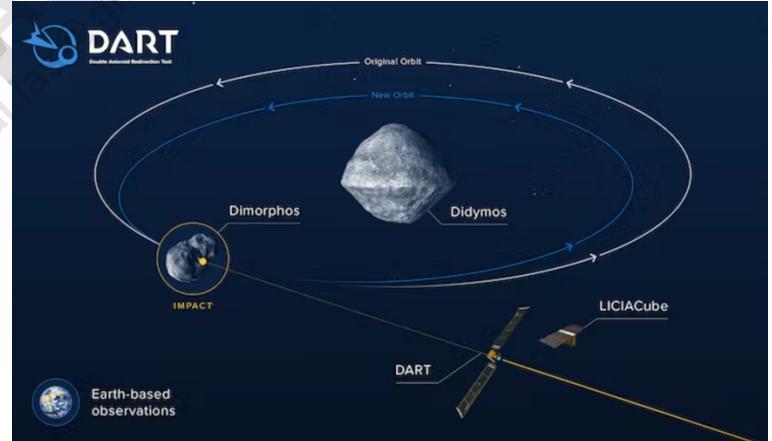
## 6) INTUITIVE MACHINE – 1 (IM-1) (ODYSSEUS): USA'S PRIVATE SPACECRAFT ODYSSEUS LAND ON MOON (FEB 2024)

- **Why in news?**
  - » US achieves first moon landing in 50 years with private spacecraft Odysseus (Feb 2024)
- **The Intuitive Machines 1 (IM-1, TO2-IM) mission objective was to place a NOVA-C lander, called Odysseus, at Crater Malapert A near the south pole of the Moon.**
  - » **Rocket:** The uncrewed mission was sent on its way to the moon atop Falcon 9 rocket launched by Elon Musk's company SpaceX from NASA's Kennedy Space Center in Cape Canaveral, Florida.
- **Success:**
  - » **Spacecraft Odysseus** built and flown by Texas-based company Intuitive Machines landed near the south pole of the moon. This is the first US touchdown on lunar surface in more than 50 years. Before this a US Spacecraft to land on Moon was Apollo 17 in 1972, when NASA's last crewed moon mission landed there with astronauts Gene Cernan, and Harrison Schmitt.

- » This is the first ever achieved entirely by private sector.
- » This is also the first landing under NASA's Artemis lunar program. A host of small landers like Odysseus are expected to pave the way under NASA's Commercial Lunar Payload Services (CLPS) program, designed to deliver instruments and hardware to the moon at lower costs than the US Space Agency's traditional method of building and launching those vehicles itself.
- » The robotic lander is dubbed Odysseus and consists of six legs. It landed at a crater named Malapert A near the moon's south pole.
- **Payloads:** The vehicle is carrying a suite of scientific instruments and technology demonstration for NASA and several commercial customers designed to operate for seven days on solar energy before the sun sets over the polar landing sites.
- **Note:** So far, spacecrafts from only five countries have landed on Moon – USA, USSR, China, India and Japan.

## 7) DART MISSION CHANGED THE SHAPE OF DIMORPHOUS (MARCH 2024)

- **Why in news?**
  - Collision with NASA spacecraft altered shape of asteroid Dimorphos (March 2024: Source: TH)
- **Introduction**
  - DART is a planetary defense-driven test of technologies for preventing an impact of Earth by a hazardous asteroid.
  - Under this NASA launched a mission in Nov 2021, aboard Space X Falcon 9 rocket. It sent a space capsule of the size of a fridge towards an asteroid to shoot it off course. The target asteroids were 11 million kms away from Earth and DART mission reached here after 11 months of journey.
  - **Target Asteroid:**
    - DART's test target was an asteroid (Dimorphos/Didymos B) that passed the earth in 2022 and will come back two years later.
    - Its primary body (Didymos A) is approx. 780 meters across, its secondary body (or "moonlet") – Dimorphos/ Didymos B is about 160 meter in size, which is more typical of the size of asteroids that could pose the most likely significant threat to Earth.
    - NOTE: DART's target asteroid was **NOT** a threat to earth, and it is only a test mission.
    - In Sep 2022, this space capsule was crashed into Dimorphous/Didymos-B.
    - It used autonomous targeting, using images of the asteroids it acquires as it approaches. DART needed to recognize the asteroid itself, automatically lock onto Dimorphous, and adjust its trajectory to hit it. This is while it was moving at a speed of 24,000 km per hour.



- **Aim of the project:** Prepare to save earth from future threat of asteroids.
- **Technology**
  - » DART is the first mission to demonstrate the **Kinetic Impactor Technique** - striking the asteroid to shift its orbit - to defend against potential future asteroid impact.
- **Aim of this test:** Evaluate whether Kinetic Impactor technique can be used to deflect an object (Dimorphous/Didymos B) from its orbit.
- **Why Didymos system was chosen?**
  - Because it is a binary pair, it will be possible for astronomers on Earth to **assess the results of the impact**.
  - These asteroids pose **no risk to Earth** and have been chosen as the target for partly due to that fact.
- **How observations were made:**
  - Measurements from telescopes on Earth.
  - **LICIACube:** It is an Italian Space Agency CubeSat (a small type of satellite) that was deployed from a spring-loaded box aboard the craft on 11<sup>th</sup> Sep. LICIACube followed along and photographed the collision and its aftermath.
- **Outcome:**
  - For the **first time**, humans have demonstrated that it was possible to change celestial object's trajectory, if needed, to protect earth. The impact shortened Dimorphos' orbit time by 32 minutes.
    - » **Proof:** The test was a proof of concept for many technologies, that NASA has invested over the last few years.
  - **Collision** has also changed asteroid's shape.
    - » Before the DART encounter, the Asteroid was a bit plump in the waist, now appears to be shaped more like a watermelon – or, technically, a triaxial ellipsoid.
    - » Scientists say that the **shape change was so dramatic** because of its rubble-pile composition.
  - **DART** has also given some fascinating data about both asteroid properties and the effectiveness of a kinetic impactor as a planetary defence technology.

## 8) JAPAN'S SLIM (SMART LANDER FOR INVESTIGATING MOON)

- **Japan** has become the fifth country to land on Moon when its spacecraft SLIM landed on the Lunar surface in Jan 2024. Before this, USA, USSR, China and India had reached moon.
- **SLIM** (nicknamed **Moon Sniper**) is a lightweight spacecraft about the size of a passenger vehicle.
- It aimed for a pinpoint target. While most previous probes have used landing zones about 10 kms wide, **SLIM was aiming at a target of just 100 meters** (330 feet). It was a product of 2 decades of work on precision technology by Japan Aerospace Exploration Agency, JAXA.

- **Successful:** Japan has confirmed that its moon lander successfully achieved its pin-point landing on the moon on 19<sup>th</sup> Jan 2024

## 9) COSMIC MICROWAVE BACKGROUND RADIATION (CMBR)

- Cosmic Microwave Background (CMB) is a cooled remnant of the first light that could ever travel freely throughout the universe. This fossil radiation is the 'furthest that any telescope can see' and was released soon after the 'Big Bang'.
- CMBR is electromagnetic radiation as a remnant from an early stage of the Universe in Big Bang Cosmology. It is an all-pervasive, but weak, electromagnetic radiation from early universe, when matter was still to be formed.
- **This radiation doesn't come from any of the object that we see in the universe around us** (like stars and galaxies). It is coming from the time when these things were still to be formed. Thus, they are relic from an early universe when matter and radiation were in Thermodynamic Equilibrium.
- It was first discovered in 1964 and since then has emerged as an important source of information on the early universe.
- **Spectrum of CMBR**
  - Spectrum produced by CMB is very smooth. It does, however, contains some wiggles, or deformities, in its shape.
  - These wiggles encode information about specific events that can be expected to be found from in the CMB spectrum in different scenarios.
  - It is believed that the neutral hydrogen pervading the cosmos during dark ages absorbed some of the CMB radiation to produce an extremely small dip in the frequency of spreading radio waves.
  - **Thus far** theory and actual observations of CMB spectrum have matched perfectly.
- **Key things that scientists have learned from CMBR.**
  - From CMBR, scientists have inferred that the early Universe was filled with hot, dense and extremely uniform gas, mostly hydrogen and that the first stars were formed when these blobs of gases came together. That is when visible light also made its first appearance. Scientists refer this phase as **cosmic dawn**.
  - It also gives evidence that Universe expanded from an initial violent explosion. Cosmic Microwave radiation have become less energetic due to the redshift which also gives evidence of expanding universe.

## 10) SOME TELESCOPES PLANNED ON THE FAR SIDE OF THE MOON TO STUDY COSMIC MICROWAVE BACKGROUND (CMB) RADIATION (APRL 2024)

- **Need:** Terrestrial telescopes can't properly detect the frequency drop in the CMB radiation.
- **Advantages of placing telescopes on the far side of the moon (rather than on earth)**
  - » **No atmosphere:** On earth, the telescope has to peer through layers of atmosphere.
  - » **No pollution or artificial lighting:** On earth, it is becoming difficult for telescope to see through pollution or artificial lighting.
  - » **Long night of Moon:** On moon, one night lasts 14 days thus ensuring dark skies for observation for longer period.
  - » **Earth's ionosphere** also blocks radio waves from reaching earth. And an orbiting telescope also receive radio noise from the whole planet along with signals from outer space.
- **Therefore, scientists are seriously considering an idea they have toyed with since the 1950s:** Placing optical and radio-telescopes on the far side of the moon, which always faces away from earth.
- **Different agencies working towards sending satellite on far side of the moon:**
  - » **NASA-Berklee Joint Project – LuSEE Night** (Lunar surface electromagnetic Experiment): It is scheduled for launch in Dec 2025 and will launch on the far side of the moon and almost exactly opposite from the earth. This location is useful because it best shields radio frequency noise coming from the earth.
  - » **NASA's Long Baseline Optical Imaging Interferometer** is scheduled to be launched in parts before this decade is out.
  - » **China** also plans to send a moon orbiting radio telescope scheduled for launch by 2026.
  - » India's **PRATUSH** (Probing ReionizATion of the Universe Using Signal from Hydrogen) plans to orbit the moon and study the background radiation when it is on the far side of the moon. The telescope is being built by Raman Research Institute (RRI) in Bengaluru with active collaboration from ISRO.
    - Initially, ISRO will be put around earth. After some fine-tuning, the space agency will launch it moonward. It will carry a wideband frequency-independent antenna, a self-calibrating analog receiver and a digital correlator to catch radio noise in the all-important signal from the Dark ages.

## 11) MOONS IN SOLAR SYSTEM

- **How Many Moons are there in our Solar System**
  - » According to the latest data by NASA, planets together have 293 confirmed moons now.
    - **Saturn (146) and Jupiter (95)**, with total 241 account for more than 80% of these.
    - **Uranus (28)** and **Neptune (16)** are other planets with a greater number of Moons.
    - **Mars (2)** and **Earth (1)** are other planets with Moon in the solar system.
    - **Pluto** (It is a dwarf planet and not planet) also have five moons.
  - » **Why this kind of distribution?**

- » **Mercury** is too close to sun and its gravity will not be able to hold on its own moon. The moon there would crash into Mercury or start orbiting around Sun.
- » Scientists are **not yet sure about why Venus doesn't have a moon.**
- » **Moons are classified into two separate categories.**
  - » **Regular Moons:** Moons which have prograde orbits (they orbit in the direction of the planet rotation) and lie close to plain of their equators.
  - » **Irregular Moons** can have pro or retrograde orbits and often lie at extreme angles to the planet's equators. Irregular moons are probably minor planets that have been captured from surrounding space. Most irregular moons are less than 10 kms in diameter.
- **Important Moons**
  - » Largest: **Ganymede** (Jupiter), Titan (Saturn), Callisto (Jupiter) etc.
  - » **Note:** Ganymede (though a moon) is bigger than Mercury and Pluto.
- **Number of Moons by dwarf planets:**

Dwarf Planet	Number of Moons
Ceres	0
Pluto	5
Haumea	2
Make make	0
Eris	1

## A) GANYMEDE

- **About Ganymede:**
  - » It is the largest moon of our solar system, larger than planet Mercury and dwarf Planet Pluto.
  - » It is the only natural moon in the solar system with a known magnetic field. The magnetic field causes auroras.
  - » It's an ice-covered world that may hold more water than all the earth's water combined. But unlike Earth, Ganymede's oceans are below its 100-mile-thick icy crust.
- **Details of Water Vapor at Ganymede:**
  - » Astronomers using archival data from NASA's Hubble Space Telescope found evidence of water vapor in the thin atmosphere of Jupiter's Moon Ganymede. This water vapor may have come from sublimation of ice occurring on the surface of the moon.

## B) CALLISTO

- **Why in news?**

- » An international team of scientists, including from India, has discovered strong evidence indicating the presence of ozone on Jupiter's Moon Callisto. (March 2024)
- **About CALLISTO:** Callisto is the 2<sup>nd</sup> largest moon of Jupiter (3<sup>rd</sup> largest of the solar system). More than its size, it is distinguished by its composition. Despite being as big as planet mercury, it is half as much mass. It is primarily composed of water ice, rocky materials, sulphur dioxide, and some organic compounds. These substances make moon a potential candidate for supporting life in the Solar System beyond the earth.
- **A study was published in March 2024** issue of the journal Icarus. It outlines the researchers' investigation into the chemical evolution of "SO<sub>2</sub> astrochemical ice", which is ice primarily composed of SO<sub>2</sub> in the presence of ultraviolet irradiation. This shed light on the chemical process and composition on the surface of Callisto. By analyzing the data of the UV absorption spectra of the irradiation ice samples, the team was able to identify a distinct signature indicating the formation of ozone.
- **Significance of Ozone:** the presence of ozone is crucial for life to exist. In the absence of ozone layers, UV-B and UB-C radiation reaching the surface will make the possibility of life less probable.
  - » The discovery of ozone also suggests presence of oxygen, which in turn is a fundamental ingredient required for the formation of complex molecules, required for life (as we know it), such as amino acids, raising question about moon's habitability. This extends to other icy moons in our Solar System, potentially informing our understanding of habitable conditions beyond Earth.

## 12) BINARY STARS EATING THEIR OWN PLANTS

- **Why in news?**
  - » A study of 91 pairs of stars finds that about 8%, or 1/12, swallowed up a planet at some point in their lives (March 2024)
- **Understanding Twin Stars (Or Binary Stars):**
  - » A binary star or binary star system is a system of two stars that are gravitationally bound to and in orbit around each other. Binary stars in the night sky that are seen as a single object to the naked eye are often resolved using a telescope as separate stars, in which case they are called visual binaries.
  - » Stars in binary system don't necessarily have the same mass, size or brightness. The larger star of a binary couple is called the primary star, while the smaller one is known as the secondary star or the companion star.
  - » **Note: Binary stars are not rare.**
  - » It is estimated that around 85% of stars exist in binary star systems or systems with three or more stars. Single stars account for just 15% of all stars.

- **Twin Stars** born at the same time should have a virtually identical composition, as they are both born from the same parent cloud of gas and dust.
  - » Any major chemical differences between these so-called “co-natal” stars may thus be a sign that one devoured a world.
- **A new study** by researchers used the European Space Agency’s Gaia satellite to identify 91 pairs of stars.
- **How is composition of a star understood?**
  - » Within each travelling pair, the stars sit relatively close to one another – less than a million astronomical unit apart – and are likely co-natal. Scientists analyzed lights coming from distant stars. When molecules are heated, they give off unique spectrum of light wavelengths corresponding to the element’s they are made up of. Scientists analyzing light coming from distant stars can therefore deduce the stars’ elemental composition as stellar molecules are exposed to very high temperatures.
  - » The scientists utilized the European Southern Observatory’s Very Large Telescope in Chile, the Magellan Telescope, also found in Chile, and the Keck Telescope in Hawaii to analyze the light from these co-natal stars. They found that about 8% of these pairs – about one in 12 – had one star that displayed signs it had engulfed a planet. In other words, its chemical makeup differed from its twin.
  - » **Note:** The study was analyzing stars in their prime phase engulfing the planets (not the Red-Giant phase) engulfing the planet.
- **Significant Understanding:** Stable Planetary Systems like our own solar system might not be a norm.

### 13) HIGH ALTITUDE PSEUDO SATELLITES (HAPS)

- **Why in news?**  
Why India wants to develop high-altitude pseudo-satellite vehicles, powered by the Sun (Feb 2024)
- **In Feb 2024**, the Bengaluru based **National Aerospace Laboratories (NAL)** successfully flew a prototype of new generation unmanned aerial vehicle (UAV). It is being seen as a huge breakthrough as it can fly at Great Heights, about 20 km above ground and runs entirely on Solar Energy. It can also remain in the air for months on end. Such UAV belong to the class of flying objects called HAPS, or High-Altitude Pseudo Satellite Vehicles, or ‘**HALE**’ High Altitude Long-endurance vehicles.
- **Uses of HALES/HAPS:**
  - Surveillance and Monitoring
  - Disaster Management
- **Advantages of HAPS over UAVs and Satellites.**

- **UAVs** are battery powered and thus can't stay in air for long duration.
- **Drones** fly at relatively low height, and thus their vision is restricted to small areas.
- **Satellites** in LEO move very fast and thus can't continuously watch the same point and Satellites in Geo stationary orbit are too expensive for these purposes and are very far to give a clear picture of ground.
- **HAPS** will overcome these challenges.
- **HAPS technology** is still under development. Several countries, and companies, have developed and flown such vehicles with encouraging success, but none has mastered the technology yet. The world record for a vehicle of this class is held by the **Airbus-manufactured Zephyr**, which flew for continuously 64 days in 2022 before crashing.
- **What about prototype tested by NAL?**
  - It flew for 8.5 hours. Next time, NAL wants to go for 24 hours. The full-scale machine that NAL is planning to build by 2027, would be aiming to remain in the air for 90 days at a stretch.
- **HAPS** is another technology where India is entering the race at a relatively early stage.

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# TARGET PRELIMS 2024

## BOOKLET-39; S&T-13

### NANO-TECHNOLOGY, ROBOTICS

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## 1. NANOTECHNOLOGY

- Nanotechnology is science, engineering, technology, conducted at the nanoscale which is 1 to 100 nanometers. Nanotechnology and Nanoscience involve the ability to see and to control individual atoms and molecules. In other words, nanotechnology is the engineering of the functional system at molecular scale.
- Richard Feynman, the father of nanotechnology, in his 1959 talk described nanotechnology as a field which can manipulate and control things on the scale of a nanometer. He expected that matter will have surprising properties at Nano level and thus provide for enormous number of applications.

### 1) APPLICATIONS OF NANOTECHNOLOGY

- **Carbon Nanotubes** are used in various products ranging from paints and textiles to medical diagnostics tools and components of future quantum computers because of remarkable properties such as very high elastic strength alongside low mass density or very high current densities with no heat loss.
- **Electronics**
  - **Graphene** is used in transparent electrodes for solar cells, LCD, robust non-volatile atomic switches, chemical and biological sensors and in spintronic devices.
  - **Semiconducting nanowires** are highly versatile optoelectronic components, for a wide variety of applications such as nano-LEDs and nano-Lasers, solar cells, and biomedical sensors.
- **Health**
  - **Nanoparticles of silver** embedded into fibers have anti-microbial action. It is used in food packaging, clothing, disinfectants and household appliances. Bandages are being infused with silver nanoparticles to heal cuts faster.
  - **Gold Nanoparticles** have anti-bacterial properties
  - **Nanomedicines – Diagnosis and Treatment** (see details separately)
  - **Water Purification: Special Filters using nanomaterials** can remove objects as tiny as viruses from water.
- **Nanotechnology in Agriculture** – Better fertilizers, pesticides, insecticides, feeds, better treatment for domesticated animals.
  - **Nano-Fibre based Agriculture Inputs:** For e.g., **FIB-SOL** provides a five-gram fiber that is soluble in water and can be applied on field using conventional or modern irrigation practices. The product addresses the demand for live bacteria that could rejuvenate the soil. It could also increase the nutrient utilization efficiency, allowing plants to assimilate nutrients in a better way.
- **Environmental Applications:**
  - **Iron nanoparticles** can be used to effectively clean-up organic solvents that are polluting the ground water. The nanoparticles disperse throughout the water and decompose the organic solvents in place.
  - Adding a **little boron to Carbon** while creating nanotubes produce solid, spongy, reusable blocks that can absorb large quantities of oil spilled in water.

- **Nanotechnology based smart windows** have energy saving, easy cleaning, UV controlling and photovoltaic properties.
- **Renewable Energy Generation**
  - New and Cheap Solar Cells use nanoparticles of **Titanium oxide** coated with dye molecules to capture the energy of visible light and convert it into electricity.
  - A **novel catalytic nanosheet** from of a nickel molybdenum-nitride, a thousand time cheaper than traditional platinum, is the new model for harvesting hydrogen from water for use as fuel.
- **Structural Engineering Applications**
  - **Nano-enhanced Cement** contained by addition of nanoparticles like nano silica (silica fume), nanostructured metals, CNTs and carbon nanofibers give stronger, more durable, self-healing, air purifying, fire resistant, easy to clean quick compacting structure.
  - **Nano-enhanced Construction Ceramics** such as floor and wall tiles and sanitary ware have self-cleaning, anti-bacterial, hygienic and scratch resistant features.
  - **Nano-enhanced paints** can reduce emission of Nitrogen-di-oxide, hydrocarbons, and carbon monoxide in the atmosphere. It can also make paint scratch proof, easy cleaning, air purifying, UV resistant, water repellent, flame resistant, and anti-bacterial.
  - **Nanotechnology based smart windows** have energy-saving, easy cleaning, UN controlling and photovoltaic properties.
  - **Fire resistant glasses** are produced by addition of fumed silica nanoparticles in glasses.
- Nanotechnology can promote **different forms of insulation solutions** like coatings, vacuum insulations glazing and nanofoams.
- **Nano whiskers** on clothes create a cushion of air around the fabric so that liquids can't stain them.
- **Cosmetics:** Nanoparticles like Zinc oxides and titanium oxides are used in sunscreen and related products. They provide protection from UVA rays.

## 2) FUTURE POTENTIAL APPLICATIONS

- Advancements like **nano-machines** will lead to development in the field of nano-medicines, more advanced electronics circuitry, quantum computing etc.

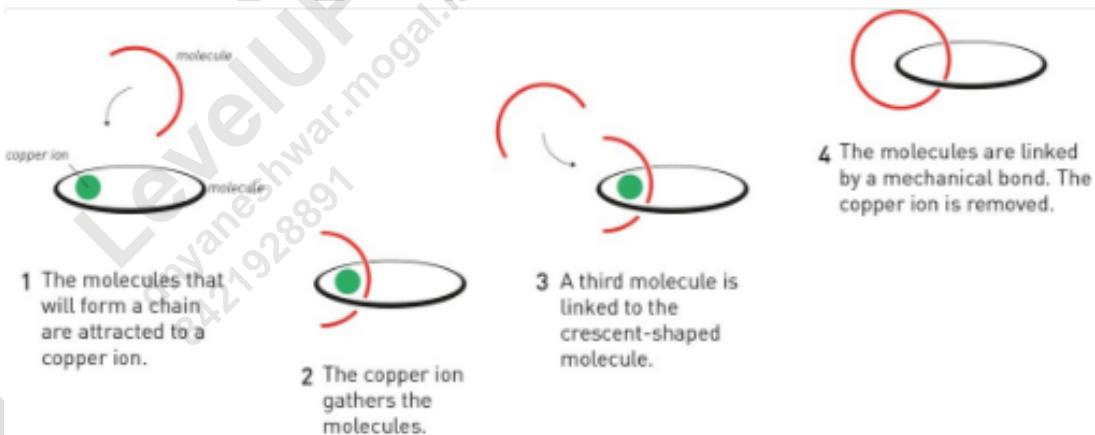
## 3) CONCERNS AND LIMITATIONS

- Due to their extremely small dimensions, large surface area and high reactivity, they have the **potential ability to penetrate living cells** quite readily. As a result, their unique nano-features may also make them potentially hazardous for human health and environmental safety.
- **Health**
  - Inhaling airborne nanoparticles and nanofibers may lead to a number of pulmonary diseases, e.g. fibrosis. Some form of carbon nanotubes could be as harmful as asbestos if inhaled in sufficient quantities.
  - Experiments with rats have also shown impact on skin (ageing) and brain.
- **Toxicity**
  - Lack of investment on nanotoxicology research

- **Environmental impact**
  - **Lack of research on potential harmful impact:** Lack of study on Impact of nanomaterial on non-human species, on ecosystem or the global environment.
  - e.g. bacteriostatic silver nanoparticles used in socks to reduce foot odor are being released in the wash. These particles are then flushed into the wastewater stream and may destroy bacteria which are critical component of natural ecosystem, farms and wastewater treatment processes.
- **More dangerous Weapons**
  - As a general-purpose technology, it will be **dual use**, meaning it will have many commercial uses and it also will have military uses - making for more powerful weapons and tools of surveillance.
  - A technology this powerful could easily be misused. The rapid development cycle and massive manufacturing capability may lead to an unstable arms race between competing powers.
- **Other Concerns**
  - May lead to loss of jobs in traditional farming and manufacturing sector
  - May bring about crash in certain markets due to lowering of oil and diamonds due to possibility of developing alternative source of energy that are more efficient and won't require use of fossil fuels. Also, because people would be able to develop products at molecular level, diamond will lose its significance.
  - Atomic weapons may become more accessible and more powerful and more destructive.

#### 4) MOLECULAR MACHINES OR NANO MACHINES

- Molecular Machine, or nano-machine, is any discrete number of molecular components that produce quasi-mechanical movements (output) in response to specific stimuli.
- **The 2016 Nobel Prize for Chemistry was awarded to 'Molecular Machine' trio:**
  - For the **design and synthesis of molecular machines**
  - **Details about their contributions**
    - » Sauvage in 1983 took the first step by linking two ring shaped molecule to form a chain



» Stoddart in 1991 developed a rotaxane, a dumbbell-shaped molecular structure that enabled him to build molecular lift, a molecular muscle and a molecule based computer chip

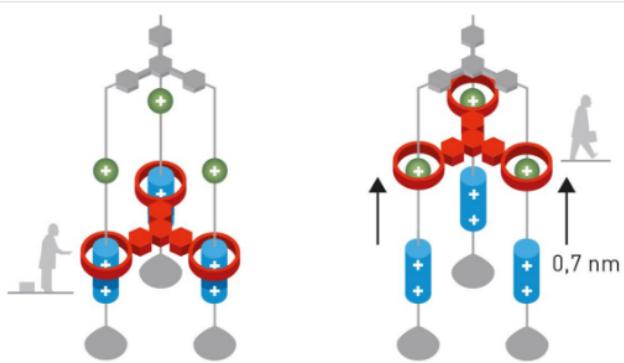


Illustration: ©Johan Jarnestad/The Royal Swedish Academy of Sciences

- » Feringa in 1999 was the first person to develop a molecular motor and in 2011 designed a four-wheeled nano-car

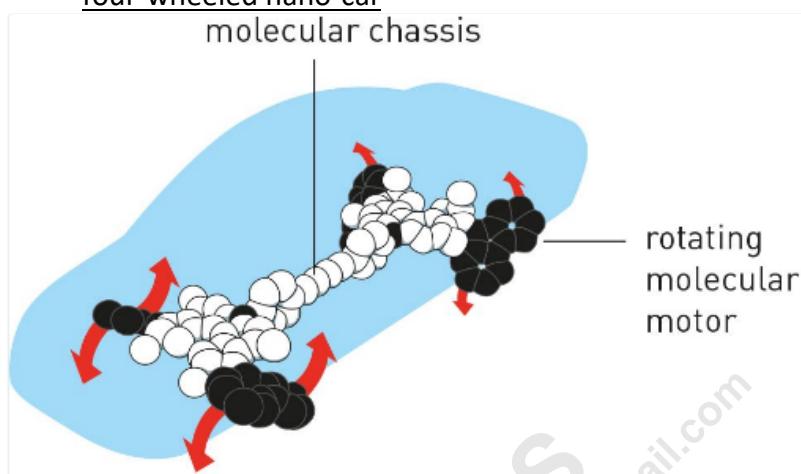


Illustration: ©Johan Jarnestad/The Royal Swedish Academy of Sciences

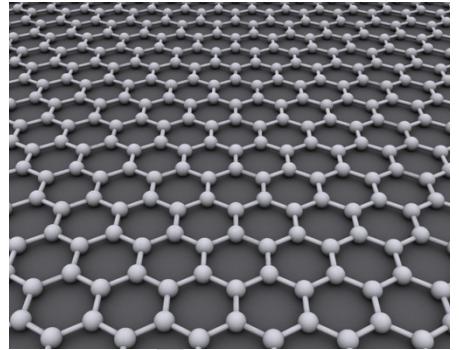
- **Significance of those nano-machines**
  - These tiny machines that we can't even see have enormous potential.
  - » **Medicine and treatment**
    - Molecular technology could lead to development of machines that are so small they could be swallowed or implanted into human bodies with little negative effect.
    - They could be used to fight disease in the body, to repair damaged tissues, and even to probe DNA structure.
    - Such precise drug delivery will **minimize adverse side-effects**.
  - » **Smart materials** able to adapt to their environment, small sensors that can be controlled remotely, and drugs that are activated on command
  - » **Efficient energy storage devices**

## 5) EXAMPLES OF SOME MATERIAL

### A) SCHWARZITE – NEW FORM OF CARBON CREATED – CLASS DISCUSSION

### B) GRAPHENE

- It is an **allotrope of carbon** which is a one-atom thick layer of pure carbon. Carbon atoms are bounded together in a hexagonal honeycomb lattice.



- How is it produced?**

- By separating a single atom layer film from graphite.

- Properties: Physical**

- 2D** – world's first 2D material
- Graphene is **harder** than diamond, **more elastic** than rubber, **tougher** than steel and yet **lighter than aluminum**.
  - In fact, it is 200 times stronger than steel (100 times stronger than the strongest steel).
- Thickness:** 1 million times thinner than a human hair
- Stretchable as well as transparent, flexible and impermeable.
- It can also act as **perfect barrier** – not even helium can pass through it.

- Properties: Thermal, Electrical and Magnetic Properties**

- Highest electronic conductivity** of any material in the world.
- Best Heat conductivity** of any material in the world
- Shows a **large and nonlinear diamagnetism**.

- Applications:** Graphene's unique combination of extraordinary properties offer a fascinating material platform for the development of next-generation technologies in many areas.

- Energy Harvesting and Storage:** It can be used for better rechargeable batteries; superior capacitors; newer methods of making solar cells etc. Further, proton transfer in graphene shows promise for artificially mimicking photosynthesis.
- Electronics:** Very high electron conductivity allows graphene to be used for low-cost printable electronics, high performance transistors; thermal management and heat dissipation in nano-electronic devices.
  - The optical properties** of graphene can also be controlled by doping and make it well suited for optoelectronic devices.
- Composites and Coatings:** Its low mass and low loading requirements make graphene standout as a reinforcing agent in composites. It can be used for making lubricants with enhanced anti-wearing capabilities; radiation shielding and lighting strike protection; superhydrophobic coating; transparent, flexible and conductive thin films etc.
- Membranes** – It can improve the quality of filters used in desalination or other water purifying instruments. Graphene oxide is used for the purpose.
  - It can also act as gas barrier for e.g., in food packaging.
  - It can be used for separation of organic solvent with water.
- Biomedical Technologies:** Very high surface area, electron mobility etc. is paving the way for novel biomedical technologies. Graphene bioelectronics (transistors and electrode arrays) has become a ground-breaking field that offers existing opportunities for developing new

- kinds of biosensors. Key **applications include** Thermal ablation of highly resistant cancer cells; Bioelectronics (bionics); Electronic interface to living cells and nerve tissues; etc.
- **Sensors:** Since every atom of graphene is exposed, it is an ideal material for biological, gas and chemical sensors. It can be used for explosive detection; detecting biomarkers for Parkinson's disease; selective gas sensing; self-healable, multifunctional electronic sensor tattoos; environment monitoring etc.
  - Wearable technologies
  - Light weight cars, planes etc.

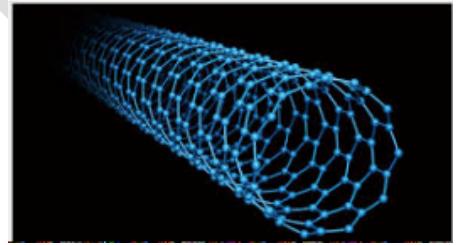
- **Health Risks:** Extensively debated.

- Toxicity depends on several factors such as shape, size, purity, post-production processing steps, oxidative state etc.

### C) CARBON NANOTUBES (CNT)

- **Intro**

- » Carbon nanotubes are allotropes of carbon with a cylindrical nanostructure. These cylindrical carbon molecules have unusual properties, which are valuable for nanotechnology, electronics, optics and other fields of material science and technology.



- **Properties**

- » Strength: One of the most tensile and elastic material discovered yet.

- **Wettability**

- » Exhibits a super hydrophobic property.
- » By applying a low voltage as low as 1.3 V, the extreme water repellants surface can be switched into super hydrophilic.

- **Electrical Properties**

- » CNT are either metallic or semiconducting along the tubular axis.

- **Thermal Properties**

- » All nanotubes are expected to be very good thermal conductors along the tube, exhibiting a property known as "ballistic conduction", but good insulators lateral to the tube axis.

- **Application**

- » **Current uses and application** of nanotubes has mostly been limited to the use of bulk nanotubes, which is a mass of rather unorganized fragments of nanotubes.
- » Used as composite fibers in polymers to improve the mechanical, thermal and electrical properties of the bulk product.
- » Tips for atomic force microscope probes
- » In tissue engineering, carbon nanotubes can act as scaffolding for bone growth.

- **Concerns:** Toxicity, health risk not clear yet.

## 6) ELABORATING ON SOME NANOTECHNOLOGICAL APPLICATIONS

### A) NANOTECHNOLOGY IN HEALTH:

- **Medical Applications:**
  - » **Prevention of disease:**
    - **Nanoparticles of silver** embedded into fibers have anti-microbial action. It is used in food packaging, clothing, disinfectants, and household appliances. Bandages are being infused with silver nanoparticles to heal cuts faster.
    - **Gold Nanoparticles** have anti-bacterial properties.
    - **Water Purification: Special Filters using nanomaterials** can remove objects as tiny as viruses from water.
  - » **Diagnostics**
    - **By** studying and identifying individual molecules, it is possible to diagnose disease in time to improve the prognosis for the patient.
  - » **Improved Treatment**
    - Indian Institute of Nano Science and Technology (INST) is developing **Magnetic Hyperthermia mediated cancer therapy** - delivery and localization of magnetic material within the targeted tumour site followed by subsequent application of an alternating Magnetic Field (AMF), thereby generating heat at the tumour site.
    - E.g: **Scientist** are using gold **nanoparticles to target prostate cancer**. Here the nanoparticles or nano shells are made of small layers of Silica glass formed into a sphere and wrapped in a thin layer of gold. This is made to reach the tumour site and then harnessed to cause the tumorous tissue to pulse with extreme temperature when light is applied through a laser specifically designed to excite the particles
    - A team of scientists from IISc Bengaluru have developed nano robots to be used in dental procedure (like root canal therapy).
    - With more advancement in **Nanomachines** – complex surgical procedures would become less intrusive and less complicated.

### USING NANOROBOTS FOR DENTAL PROCEDURE

- **Background/Need**
  - A significant percentage of root canal treatments fail, because the procedure leaves out some bacteria that are located deep within the dentinal tubules.
- **The new method:**
  - Scientists have developed **Spiral Silica robots** measuring 300 nanometers to travel through dentinal tubules and target bacteria.

### MAGNETIC HYPERTERMIA-MEDIATED CANCER THERAPY (MHCT)

### B) ENVIRONMENTAL NANOTECHNOLOGY

▪ **Key areas where nano-material researchers are working:**

- i. **Ensuring Potable Drinking Water** – Use of Graphene based water filters are expected to increase the accessibility of clean drinking water in coming future
- ii. **Removing pollutants from water**
  - **Cleaning up organic chemicals polluting ground water**
    - Iron nanoparticles can be used to effectively clean-up organic solvents that are polluting the ground water. The nanoparticles disperse throughout the water and decompose the organic solvents in place. This method is more effective and costs significantly less than treatment methods that require the water to be pumped out of ground.
  - **Cleaning up of oil spills**
    - Using photocatalytic cooper tungsten oxide nanoparticles to break down oil into bio-degradable compounds.
- iii. **Generating Less pollution during manufacturing of materials**
  - E.g. Use of silver nano particles as catalysts can significantly reduce the polluting by products in the process used to manufacture propylene oxide.
    - Propylene oxide is used to produce common materials such as plastics, paint, detergents and brake fluid.
- iv. **Producing solar cells that generate electricity at competitive cost**
  - E.g. Silicon nanowires embedded in a polymer result in low cost but high efficiency solar cells.
- v. **Increasing the electricity generated by windmills**
  - E.g. use of carbon nanotubes in windmill blades results in stronger and lower weight windmill blades. This helps in more amount of electricity generated by each windmill.
- vi. **Reducing cost of fuel cells**
  - Changing the spacing of platinum atom in fuel cells increases the catalytic ability of the platinum. This allows the fuel cells to function with 80% less platinum, significantly reducing the cost of the fuel cells.

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## C) NANOTECHNOLOGY IN AGRICULTURE

### i. Nano-Fertilizers

#### - **Introduction:**

- India has become the first country in the world to have developed and roll out nano-fertilizers.
  - » So far, it has launched nano-versions of two fertilizers – Urea and Diammonium Phosphate (DAMP).
  - » While nano-Urea has been made available to farmers since late 2021, nano-DAP was launched in April 2023.

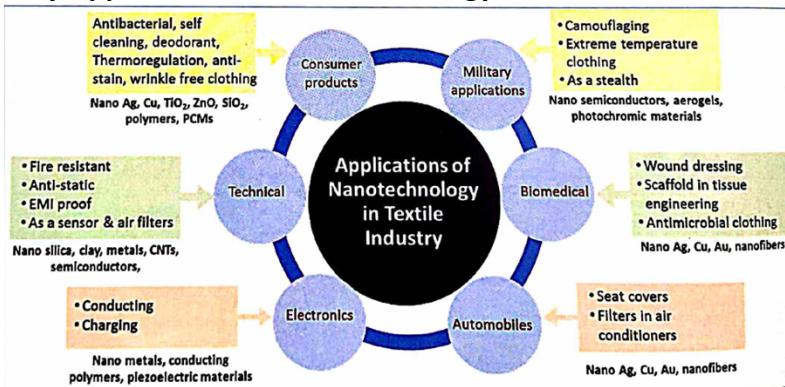
- The Indian Farmers Fertilizer Cooperative Limited (IFFCO), which had developed the variants using propriety technology, claims that Nano-UREA and Nano-DAP have several advantages over their conventional granular counterparts.
- **More Details:**
  - Both Nano-Urea and Nano-DAP come in liquid form.
  - IFFCO claims that a 500 ml bottle of nano-urea can replace at least a 45 kg bag of granular urea and a bottle of 500 ml nano-DAP can replace a 50 kg bag of granular DAP.
- **Advantages:** The Parliamentary Standing Committee on Chemicals and Fertilizers (2022-23), headed by Shashi Tharoor have enumerated several advantages of nano-fertilizers in its March 2023 report:
  - **Soil Health:** Nano-UREA can address the imbalanced and excessive use of conventional urea in the country, which accounts for around 82% of nitrogenous fertilizers applied to majority of the crops.
  - It costs less than subsidized conventional fertilizer thus reducing the cost for farmers.
  - They also result in better productivity and higher income for farmers.
    - » The PSC report notes that it has average 8% higher crop yield.
  - Experts also believe that these nano-fertilizers will lead to reduced import dependency of fertilizers and save forex reserves.
  - It will also contribute to reduced fiscal burden of government because of reduced fertilizer subsidy cost.

- |  |
|--|
| <ul style="list-style-type: none"> <li>- <b>What is NANO UREA</b> <ul style="list-style-type: none"> <li>▫ Fertilizer Minister, Mansukh Mandaviya has claimed that <u>by 2025, India's domestic urea production as well as that of nano-Urea</u> would together mean India would be "<u>self-sufficient</u>", in the manufacture of Urea and wouldn't require 90 lakh tonnes that it imported every year and <u>would save the country close to Rs 40,000 crore</u>.</li> </ul> </li> <li>- <b>When is Urea used in agriculture and when can it be replaced by Nano Urea?</b> <ul style="list-style-type: none"> <li>▫ Urea is used on <u>two occasions</u> – at the time of sowing (or transplantation); and the second is done <u>when the plant has sprouted a canopy of leaves</u> and is approaching the reproductive phase of plant growth.</li> <li>▫ It is to be noted that <u>traditional Urea is still necessary during the initial stage</u>, as basal nitrogen, of crop development. The <u>nano Urea</u> could be useful once the plant grew after which the product could be sprayed on its leaves.</li> </ul> </li> </ul> |
|--|

- **Limitations:**
  - **Doubts about Yield gain:** DTE has reported interviews of several farmers who had to resort back to traditional fertilizers after, nano-fertilizers didn't give good results.
  - **Labour cost for spraying fertilizer** is increasing the overall input cost for farmers.
  - **Complaints** about farmers being forced to buy Nano-Urea.
  - **Issue of Evaluation/Trial:** ICAR has given results of field trial based on a year (two seasons) of experiments in its affiliated labs. This was an exception as ICAR normally tests a new fertilizer for 2 years (or three seasons) before giving go ahead to a new fertilizer.

## D) NANOTECHNOLOGY IN TEXTILES

### Key Applications of Nanotechnology in textile sector



## 7) NANOTECHNOLOGY IN INDIA

### - Policies/Schemes/Programs

#### a. Mission on Nano Science and Technology (Nano Mission)

##### ▪ Introduction

- It is an umbrella program of GoI for overall development in the field of Nanotechnology.
- It was launched in 2007 with an allocation of Rs 1,000 crore which was further extended during the 12<sup>th</sup> five-year plan.
- It is structured in a fashion to **achieve synergy** between the national research efforts of various agencies in Nano Science and Technology and launch new programs in a concerted fashion.
- Department of Science and Technology is the nodal agency for the mission.

##### ▪ Objectives of the Nano-Mission

- **Basic Research Promotion** – funding of basic research by individual scientists or groups of scientists and creation of centre of excellence for pursuing this research.
- **Infrastructure Development** for Nano Science and Technology Research -> development of a chain of facilities across the country.
- **Human Resource Development** – Providing effective education and training to researchers and professionals in diversified fields. Launching of M.Sc./M.Tech programmes, create national and overseas post-doctoral fellowships, chairs in universities etc.
- **International Collaborations** – Exploratory visits of scientists, organization of joint workshops, conferences and joint research projects, facilitate access to sophisticated research facilities abroad, forge academia-industry partnership.
- Development of **product and processes for national development**
  - Especially in areas of national relevance like
    - Safe Drinking Water
    - Materials Development
    - Sensors Development
    - Drug Delivery

- **Achievements of the Mission**

- The mission has resulted into more than 5,000 research papers and some useful products like nano-hydrogel based eye drops, pesticide removal technology for drinking water, water filters for arsenic and fluoride removal and nano-silver based on anti-microbial textile coating.
- India has moved from the fourth to the third position in the world in terms of scientific publications in nano-science and technology.
- **Institute of Nanoscience and Technology (INST):** It is an autonomous institute of the Department of Science and technology, Gol.

## 2. ROBOTICS

### 1) LAWS OF ROBOTICS:

- Isaac Asimov gave the three laws of robotics as:
  - A robot must not harm a human being, or, through inaction, allow a human being to come to harm
  - A robot must always obey the human beings unless it is in conflict with the first law.
  - A robot must protect itself from harm unless it is in conflict with the first and/or second law.

### 1) WHERE ARE ROBOTS BEING USED CURRENTLY AND AREAS WHERE THERE IS A POTENTIAL TO USE ROBOTS

- Robotics is being used across a range of sectors such as:
- **Warehouse Automation**
- **Automotive manufacturing**
  - » They add precision, tirelessness and continuity in the manufacturing process.
- **Search and Rescue after Disaster**
  - » From collapsing building (due to faulty construction) to earthquake to flooding.
  - » IIT Hyderabad is working on a search-and-rescue robot called **SARP (Snake like articulated platform)**. The engineering institute is applying several technologies in building **SARP**: navigation, camera, infrared, haptic feedback (to identify survivors) and collaboration (multiple snake robots can communicate with one another)
- **Defence & National Security**
  - » Whether it is with Pakistan or China, our borders are unsafe for border forces and human lives are getting lost whenever there is firing or illegal movement of people at LoCs.
  - » Government is looking at DRDO to develop next generation of robotic soldiers.
  - » **Other dangerous security tasks** like **bomb disposal, reconnaissance** etc can be performed by Robots.
  - » For e.g. **Daksha** is one of India's current military robots. It is used to locate, handle, destroy, risky objects safely and even can climb stairs.
- **Hazardous Industries**
  - » BARC is using robots to clean radioactive water tanks.
- **Mining and Mineral Extraction**
- **Marine Engineering**
  - » **Amogh** is an autonomous underwater vehicle. It is designated to inspect and repair bridges, pipelines and hulls of ships at the depth of upto 15 meters. The robot has an endurance capacity of upto 3 hours.
- **Space**
  - » Robots are used for exploration when humans can't be used.
  - » E.g., Fedor of Russia, Vyomamitra of India etc.
- **Health Sector**
  - » Robots are being used in operation theatres and rehabilitation centres to augment the quality of life.

- » Robots can also assist **surgical procedures** like removing gallbladders, performing hysterectomies and repairing knee ligaments.
- **Agri-Robots**
  - » Can replace costly human labor and add precision in agriculture.
- They can be used anywhere to improve productivity.

## 2) ADVANTAGES OF USING ROBOTS

Accuracy

Untiring nature of robots

Non-complaining

Safety in hostile environments

Reducing cost of production

Industries facing global competition can't survive without robots

For e.g. the automobile industry can't actually survive without use of robotics

# GS FOUNDATION 2025

01

## GS CLASSES

800 hours

CSAT Module

ESSAY Module

02

## CURRENT AFFAIRS CLASSES

300 hours

## FEE

Offline ₹ 1,00,000

₹ 70,000/-

Online ₹ 90,000

₹ 63,000/-

**Valid till**

05<sup>th</sup> Apr 2024

03

## TESTS / ASSESSMENTS

Weekly Test / Monthly / Quarterly / Half yearly

Prelims Test Series

Mains Test Series

04

## MENTORSHIP & PERSONAL GUIDANCE



# TARGET PRELIMS 2024

## BOOKLET-40; S&T-14

### CA UPDATES ON S&T-2

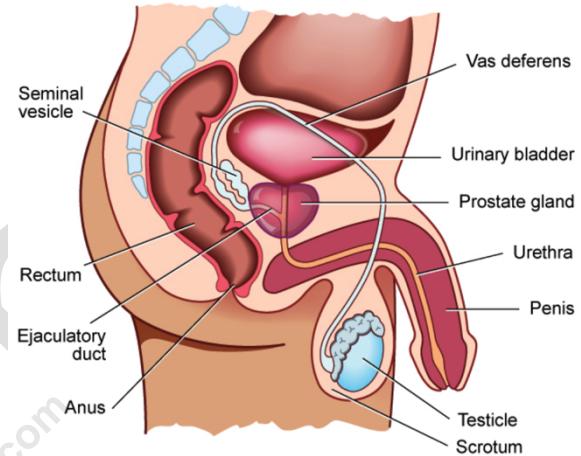
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# 1. HEALTH

## 1) PROSTATE CANCER

- **What is Prostate?**
  - » Prostate is a gland which is part of male reproductive system.
  - » **What is the function of Prostate?**
    - Prostate contributes additional fluid to your semen (ejaculate). Ejaculate is a whitish grey fluid that release from your penis when you get orgasm. It contains enzymes, zinc and citric acid, which help nourish sperm cells and lubricate your urethra.
    - Prostate muscle also helps push semen into and through your urethra when you orgasm.
  - » **Location:** Prostate gland is located below the bladder and in front of your rectum. The urethra runs through the centre of the prostate.
  - » **Note:** Women doesn't have prostate gland. Women and people Assigned Female at Birth (AFAB) have Skene's gland. However, some people refer to Skene's gland as the female prostate gland.
  - » **Note:** Sperm is produced by Testes and not in Prostate.
  - » **Urethra:** It is the tube through which ejaculate and pee flow out of your body.
- **Prostate Cancer:** It is the one of the most common type of cancer that affects men and people assigned male at birth (AMAB).
- **Lancet Report (April 2024)**
  - » **Situation in India:**
    - » **Prostate cancer** accounts for 3% of all cancers in India, with an estimated 32K to 42K new cases diagnosed annually.
    - » Large proportion of cases are diagnosed in advanced stage which means that the cancer has spread at the time of diagnosis. Therefore, 65% of the patients die of the disease.
    - » **Prostate Cancer cases in India will double to 71,000 new cases per year by 2040.**
      - **Why?**
        - Ageing population and increasing life expectancy means there will be higher number of older men in the coming years.
        - The main risk factors are age and genetics, which, according to him, are aggravated by additional factors like smoking, obesity, a poor diet and lifestyle.
  - » **Global Scenario:**
    - » Globally cases are expected to double from 1.4 million per year in 2020 to 2.9 million per year by 2040 with low and middle income countries predicted to see the highest increase.
  - » **Recommendations:**



- » Early testing in men over 60 as prostate cancer account for 3% of high risk cancers in India. This will pickup cancer at treatable stage.

## 2) H5N1 (BIRD FLU)

- Since 2020, a highly pathogenic version of bird flu, H5N1, has been spreading across the globe. It is becoming an existential threat to birds and wildlife.
- The virus has infected birds in more than 80 countries (as of Dec 2023) and resulted in culling of millions of chickens and turkeys at commercial poultry farm. It also struck numerous species of wild birds, such as gulls and terns, killing them by thousands.
- The flu is also spreading to mammals. Tens of thousands of seals and sea lions in different parts of the world have died due to the disease.
- The infection has also infiltrated mainland Antarctica for the first time in history.
- Factor behind large scale spread: Largely unknown. Climate change could be one of the reasons. Soaring global temperature impact the behavior of birds in such a way that it exacerbates the spread of flu. These birds are forced to move to new territories and mix with species that they usually don't interact with, which possibly boosts the chances for the virus to spread even further.

## 3) INDIA TB REPORT, 2024: RELEASED BY MOH&FW IN MARCH 2024

- Decline in 16% in TB incidence (new cases emerging each year) since 2015.
  - » The incidence rate has fallen from 23.7 lakh population in 2015 to 19.9 million per lakh in 2022.
- Decline in mortality due to TB by 18% since 2015.
  - » Mortality rate has declined from 28 per lakh population in 2015 to 23 per lakh population in 2022, according to the India TB report 2024.
- The gap between estimated number and actual cases of TB is closing.
  - » There were only 2.3 lakh missing cases in 2023, as compared to 3.2 lakh the year before.
  - » This gap has been reducing over the years, specially with the government's Ni-Kshay portal tracking all TB patients.
- Notification from Private sector: Of all the TB cases notified in 2023, nearly 32% of notification came from the private health care sector which is an increase of 17% from the previous year.
- Key Initiatives:

- » After the COVID-19 pandemic, the National TB Elimination Program (NTEP) embarked on a journey towards accelerating TB elimination, guided by the National Strategic Plan (NSP) 2017-25.
- » **NTEP:** It continued providing free diagnostic services, conducting approx. 1.89 crore sputum smear test and 68.3 lakh nucleic acid amplification tests (NAAT) in 2023.
- » **DBT under the Nishay Poshan Yojana** continued to provide financial support to TB patients, with approx. Rs 2,781 crore disbursed to approximately one crore beneficiaries. It added that more than 1.5 lakh Nikshay Mitras have come forward and committed support persons affected with TB.

## 2. DEFENCE

### 1) AGNI-P (OR AGNI-PRIME)

- **Why in news?**
  - » New Generation Ballistic Missile Agni-Prime successfully flight tested by Strategic Force Command & DRDO (April 2024: Source - PIB)
- **Details**
  - » Agni P is a new generation advanced variant of Agni class of missiles. It is a two stage, surface to surface, solid fueled, canisterized missile with range capability between 1,000 and 2,000 kms. It is being developed by DRDO and will be successor of Agni-1 and Agni-2 missiles.
  - » It is the sixth missile in the Agni Series of **ballistic missile**. Since it is canisterized, it can be transported on train or stored in canister.
  - » It is also lighter than earlier Agni Missiles.
- **April 2024 Test:** Strategic Force Command (SFC), along with DRDO, conducted the successful flight-test of the New Generation Ballistic Missile Agni-Prime from Dr APJ Abdul Kalam Off the coast of Odisha. The test met all the trial objectives validating its reliable performance.
  - » Note: The missile was first tested in June 2021. Then in June 2023, the first pre-induction night launch was conducted by the users after three successful development trials of the missile, validating the accuracy and reliability of the system.
- **Background:**
  - » Agni class of missiles are the mainstay of India's nuclear launch capability which also includes the Prithvi short range ballistic missiles, submarine launched ballistic missiles and fighter aircraft. The longest of the Agni series, Agni-V, an Inter-Continental Ballistic Missile (ICBM) with a range of over 5,000 km, has already been tested several times and validated for induction.

### 2) AKASHTEER SYSTEM

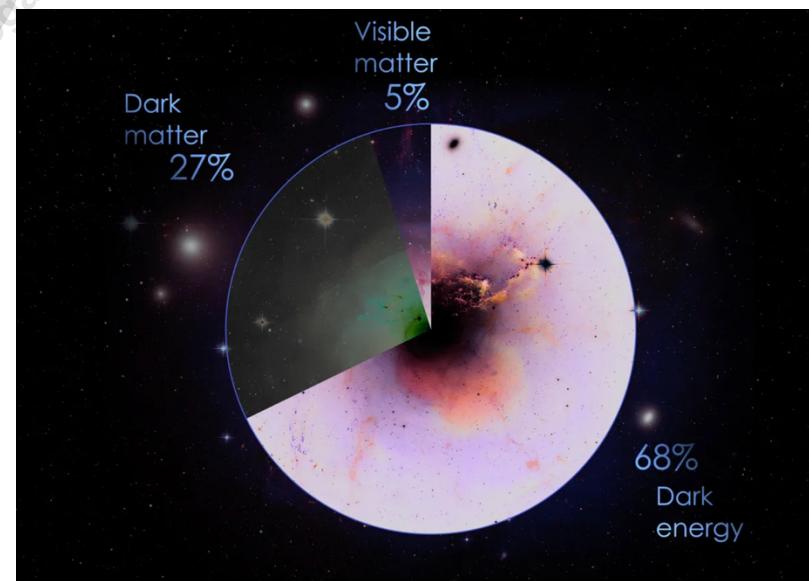
- **Why in news?**
  - » Army inducts indigenous AkashTeer system (April 2024)

- **About Akashteer:**
  - » The Automated Air Defence Control & Reporting System 'Project Akashteer' is an initiative to automated air defence control and reporting processes by digitizing the entire process.
  - » It will empower the Air Defence Unit of Indian Army with an indigenous, state of art capability, to effectively operate in an integrate manner. It will enhance the operational efficiency and integration of the Army's air defence mechanisms.
  - » It will enable monitoring of low-level airspace over the battle areas of Indian army and effectively control the Ground Based Air Defence Weapon Systems.
- In April 2024, Army started induction of control and reporting systems under 'Project Akashteer' to bolster its air defence capabilities.
- Earlier in May 2023, Ministry of Defence had signed a contract with Bharat Electronics Limited (BEL) for procurement of Automated Air Defence Control and Reporting System 'Project Akashteer' worth Rs 1,982 crore for the Indian Army.

### 3. SPACE

#### 1) BUILDING BLOCK OF THE UNIVERSE: NORMAL MATTER, DARK MATTER AND DARK ENERGY

- **Introduction:** Everything that we can observe in the universe is made of matter. **Matter** is defined as any substance that has mass and occupies space. But there is more to the universe than the matter we can see. **Dark Matter** and **Dark Energy** are mysterious substances that affect and shape the cosmos, and scientists are still trying to figure them out.
- **Normal Matter:** It makes up everything that we can observe. This matter can be seen by us in visible light with our own eyes or through a telescope that can detect light we can't see, like ultraviolet or infrared. It can exist as a gas, liquid, or plasma of charged particles. While normal matter is everywhere in our daily lives, it composes less than 5% of the total universe.
- **Dark Matter:** Like ordinary matter, dark matter takes up space and holds mass. But it doesn't reflect, absorb, or radiate light – at least not enough for us to detect yet. While scientists have measured that dark matter makes up about 27% of the cosmos, they're not sure what it is. **Theories** include several kinds of as-yet unidentified types of particles that rarely interact with normal matter.



- » **How was Dark matter first understood:** In the 1930s, Swiss astronomer Fritz Zwicky coined the term while studying the Coma galaxy cluster. It contains more than 1,000 galaxies. The speed at which galaxies within a galaxy cluster move depends on the cluster's total mass and size. Zwicky noticed that galaxies in the Coma Cluster were moving faster than could be explained by the amount of matter astronomers could see.
- **Dark Energy:** It may be comprising roughly 68% of the universe, but scientists know even less about it than they do about dark matter. But something like dark energy must exist to explain the universe's accelerating expansion.
- Since the late 1920s, astronomers have known that the universe is expanding. In the 1990s, observations of distant star explosions, called supernova, showed that the universe expanded more slowly in the past than it does now. The reason for this remains unclear, but the leading explanation is that the universe contains something that has a repulsive gravitational effect – it pushes the universe apart instead of pulling it back together. This phenomenon is called dark energy.

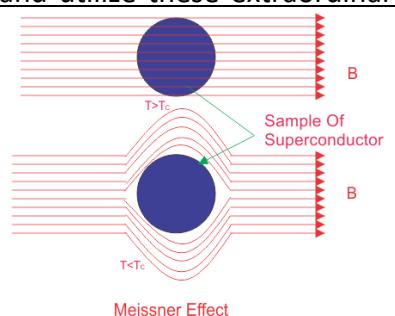
### 1) DARK ENERGY SPECTROSCOPIC INSTRUMENT (DESI)

- An international team of scientists has released the most comprehensive “three dimensional” map of the Universe, which, scientists hope, could reveal some clues about dark energy, the mysterious force that is believed to be causing the universe to expand uncontrollably.
- The researchers, including a team from India's TIFR, has published its findings from the first year of observation by the Dark Energy Spectroscopic instrument, or DESI.
  - » DESI is a unique piece of equipment that, once fitted over a telescope, can capture light from 5,000 galaxies at the same time.
  - » DESI is measuring the effect of dark energy on the expansion of the Universe. It is obtaining optical spectra for 10s of millions of galaxies and quasars, constructing a 3D map spanning the nearby universe to 11 billion light years.
  - » **The survey** is being conducted on the Mayall 4-meter telescope at Kitt peak national observatory, Arizona, USA.
- **The key thing** is that scientists have been able to measure the distance between these galaxies with a very high degree of accuracy. This is why scientists are calling it a 3-D Map. Knowing the precise distances of the galaxies is crucial because that allows us to calculate the expansion rate of the Universe. This can offer first clues into the mystery of dark energy.
- **Some important information provided by DESI:**
- The DESI collaboration has measured that the expansion rate of the Universe was increasing by 68.5 km/s after every 3.26 million light year of distance, a unit astronomers define as megaparsec. This expansion rate can give first clue into the behavior of dark energy.
- **Future:** So far scientists have analyzed only 1 year of observational data from DESI. On 31<sup>st</sup> March 2024, DESI has been collected data for 3 years and it is scheduled to run for five years.

## 4. PHYSICS: MISCELLANEOUS TOPICS

### 1) SUPERCONDUCTIVITY

- **Why in news?**
  - » In Aug 2023, two South Korean researchers posted two related papers on the internet, not yet peer-reviewed, claiming that a lead based compound they had developed had shown superconducting properties at room temperature, under normal pressure conditions. (Aug 2023)
- **Definition**
  - » Some materials when they are cooled below certain temperatures ( $T_{critical}$ ), they lose all electrical resistivity. This is called superconductivity.
    - It is one of the nature's most intriguing quantum phenomenon and was first discovered more than 100 years ago in mercury cooled to temperature of liquid helium (-270 degree C) by Heike Kamerlingh-Onnes in 1911. He received 1913 physics Nobel Prize.
    - **How many elements show superconductivity.**
      - Almost half of the elements in the periodic table display low temperature superconductivity, but applications of superconductivity often employ easier to use or less expensive alloys. For e.g., MRI machines use an alloy of niobium and titanium.
  - » **At what temperature superconductivity is achieved:** The first material to have been discovered to show superconductivity was mercury. Most of the other materials commonly used as superconductors - Lead, Aluminium, Tin, Niobium, and several others also become superconducting at comparable temperatures, called **Critical temperature**.
  - » **In some cases**, superconductivity is achieved at slightly higher temperature but that is under increased pressure conditions.
  - » Even the materials that are classified as '**high temperature superconductors**', as of now, show superconductivity properties only well below -150 degree C.
  - » The temperature at which the metals change from normal conducting state to superconducting state is called **Critical/Transition** temperature.
    - For e.g. below 4-degree Kelvin the metal mercury becomes a superconductor, therefore critical temperature for mercury is 4 K.
  - The transition from normal conducting stage to superconducting stage is reversible.
  - The super conducting material shows **some extra ordinary properties** which make them very important for modern technology. The research is still going on to understand and utilize these extraordinary properties of superconductors in various fields of technology.
    - **Infinite conductivity** (zero electric resistance)
      - » **Persistent current**
    - **Meissner Effect:** a superconductor, expel the magnetic field and doesn't allow the magnetic field to penetrate inside it. This phenomenon in superconductors is called Meissner effect.
    - **Critical temperature**
    - **Critical magnetic field**



- Critical Current
- Applications of Superconductivity
  - » **Medical Sector:** Used in magnetic resonance imaging, Magnetic Source imaging etc.
  - » **Electric Engineering:** For generation of high performing generators, motors, transformers, relays, superconducting magnets etc.
  - » **Electronics:** **Quantum Computing**, high quality sensors, filters, circuitry radar etc.
  - » **Transportation:** Magnetically levitated trains, Marine propulsion motors etc.
  - » **Fundamental Physics:** Particle accelerators, Magnets, Plasma / fusion research etc.
- Superconductivity at Room Temperature???
  - » The holy grail of superconductivity today is to find or create materials that can transfer energy between each other in a non-pressurized container.
    - If an efficient superconductor becomes possible at room temperature, it would revolutionize power transmission system for industry, commerce, and transportation.
  - » **Several Wrong Claims and Skepticism:** In recent years several claims of achieving superconductivity at room temperature has been found to be wrong. This has made scientific community a bit skeptic about any such new claim.
    - For e.g. in July 2023 only a research paper published in Physical Review Letters in 2021, by a US-based researcher making a similar claim had to be retracted.
    - Scientists at IISc Bengaluru had made similar claims in 2018, only to be sent for more reviews. The case is still unresolved.
  - » **In July 2023**, the South Korean researchers have posted two related papers on internet, not yet peer reviewed, claiming that a lead-based compound that they had developed had shown superconducting properties at room temperature, under normal pressure conditions. They are calling this material to be LK-99.

## 2) QUANTUM MECHANICS

- Introduction
  - » Quantum mechanics is the science of very small. Quantum mechanics explains the behaviour of matter and its interaction with energy on the scale of atoms and subatomic particles.
  - » **Three revolutionary principles**
    - **Quantized Property**
      - » Some properties, such as position, speed and color, can sometimes only occur in specific set amounts.
    - **Particles of Light**
      - » Light can sometimes behave as particles.
    - **Waves of Matter**
      - » Matter can also behave like wave.
  - » **Differences between Classical Mechanics and Quantum Mechanics**

Concept	Classical Mechanics	Quantum Mechanics
	<b>Continuous</b> , everything is allowed	<b>Discrete</b> , discontinuous, not all allowed

	All wavelength available in light	Each element is unique, not every wavelength is possible
	Something is wave or particle	Both - everything is wave and particle
Heisenberg's uncertainty principle	Know position and velocity precisely	Know either position or velocity precisely. We can't know both accurately

#### » Uses

- Since the breakthrough of renormalization, QFT has served as the foundation for developing quantum theories about four fundamental forces of nature
  - » Electromagnetism
  - » The weak nuclear force
  - » The strong nuclear force
  - » Gravity

#### » Uses for real life.

- **Ultra-Precise Clocks**
  - » Atomic clocks, are able to use principle of quantum theory to measure time
- **Uncrackable codes: Quantum Cryptography**
- **Superpower Computers**
  - » Quantum computers supercharge processing power because they use quantum bits, or qubits, which exist in a superposition of states - until they are measured, qubits can be both 1 or 0 at the same time.
- **Improved Microscopes**
  - » This type of microscopes fires two beams of photons at a substance and measures the interference pattern created by the reflected beam - pattern change based on whether they hit flat or uneven surface.
- **Biological Compass**
  - » A light sensitive protein called cryptochrome, which may contain entangled electrons.

### 3) ATOMIC CLOCK

- An atomic clock is a clock device that uses an electronic transition frequency in the microwave, optical, or ultraviolet regions of the electromagnetic spectrum of atoms as a frequency standard for its timekeeping element.
- They are the most accurate time and frequency standards known and are used as primary standards for international time distribution services, to control the wave frequency of television broadcasts, and in global navigation satellite systems such as GPS.
- **Principle**
  - » Based on atomic physics. It uses the microwave signal that electrons in atoms emit when they change energy levels.
  - » When exposed to certain frequencies of radiation, such as radio waves, the subatomic particles called electrons that orbit an atom's nucleus will "jump" back and forth between energy states.

Clocks based on this jumping within atoms can therefore provide an extremely precise way to count seconds.

- » Currently the most accurate atomic clocks first cool the atoms to near absolute zero temperature by slowing them with lasers and probing them in atomic fountains in a micro-wave filled cavity.
- » Since 1967, the official definition of a second is 9,192,631,770 cycles of the radiation that gets an atom of the element called cesium to vibrate between two energy states.
  - Inside a cesium atomic clock, cesium atoms are funneled down a tube where they pass through radio waves. If this frequency is just right 9,192,631,770 cycles per second, then the cesium atoms "resonate" and change their energy state.
- » **Accuracy**
  - The NIST-F1 cesium clock can produce a frequency so precise that its time error per day is about 0.03 nanoseconds, which means that the clock would lose one second in 100 million years.

- **Where is atomic clock used -> Wherever accurate timings are required:**

- » Satellite navigation services
  - E.g. GPS
- » CERN lab for precisely timing the collision.
- » Standard organization (to provide accurate time)

#### 4) NOBEL PRIZE IN CHEMISTRY: QUANTUM DOTS

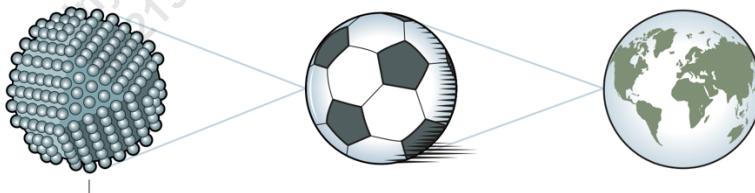
- **Quick Summary:**

- » The Royal Swedish Academy of Sciences has decided to award the Nobel Prize in Chemistry, 2023 to:
  - a. **Moungi G. Bawendi** (MIT, USA)
  - b. **Louis E. Brus** (Columbia University, USA)
  - c. **Alexei I. Ekimov** (Nanocrystals Technology Inc., New York, NY, USA)

"**For the discovery and synthesis of "Quantum Dots".**

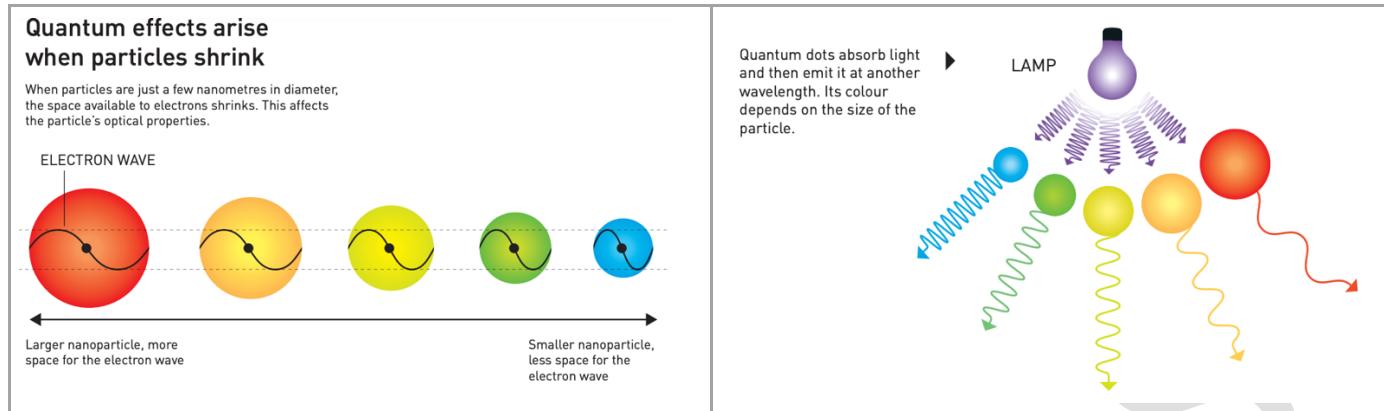
- **Details:**

- » **Quantum Dots** are nanoparticles so tiny that their size determines their properties.
  - **Understanding Size of Quantum Dots:**



A quantum dot is a crystal that often consists of just a few thousand atoms. In terms of size, it has the same relationship to a football as a football has to the size of the Earth.

- **Understanding Properties:** They have many fascinating and unusual properties. Importantly, they have different colors depending on their size.



- **For decades**, Quantum phenomena in the nanoworld were just a prediction.
- **Contributions:**
  - » **In the early 1980s**, Alexie Ekimov and Louis Brus succeeded in creating - independently of each other - quantum dots, which are nano-particles so tiny that quantum effects determine their characteristics.
    - **Alexie Ekimov**, in early 1980s, succeeded in creating size-dependent quantum effects in colored glasses.
      - The color came from nanoparticles of copper chloride and Ekimov demonstrated that the particle size affected the color of the glass via quantum effects.
      - This was the first time someone had succeeded in deliberately producing quantum dots - nanoparticles that cause size-dependent quantum effects.
    - **Louis Brus**, a few years later, was the first scientist in the world to prove size-dependent quantum effects in particles floating freely in a fluid.
  - » **Moungi Bawendi**, in 1993, revolutionized the chemical production of quantum dots, resulting in almost perfect particles. This high quality was necessary for them to be utilized in applications.  
  - **Applications:**
    - » Researchers have primarily utilized quantum dots to create colored light.
      - The luminous property of quantum dots are utilized in computer and television screens based on QLED technology, where the Q stands for quantum dot.
      - In these screens blue light is produced using the energy-efficient diodes that were recognized with the Nobel Prize in Physics 2014. Quantum dots are used to change the color of some of the blue light, transforming it into red or green. This makes it possible to produce three primary colors of light needed in a television screen.
    - » **LED Lamps**: Quantum dots are used in LED lamps to adjust the cold light of the diodes. The light can then become as energizing as daylight or as calming as the warm glow from a dimmed bulb.
    - » **Biochemistry and Biomedicine**: Biochemists attach quantum dots to biomolecules to map cell and organs. Doctors are also investigating the potential use of quantum dots to track tumour tissue in the body. Chemists instead use the catalytic properties of quantum dots to drive chemical reactions.
    - » **Health Sector**: These can guide surgeons when they remove tumour tissues, among many other things.
    - » **Future Applications**: Researchers believe that in the future they could contribute to flexible electronics, tiny sensors, thinner solar cells, and quantum cryptography.

## 5) THE NOBEL PRIZE IN PHYSICS 2023: ATTOSECOND PHYSICS

- **Quick Summary:**
  - » Anne L'Huillier, Pierre Agostini and Ferenc Krausz have been awarded Nobel Prize in Physics, 2023.
  - » **What did they do?**
    - Through their experiments, they have created flashes of light that are short enough to take snapshots of electrons' extremely rapid movements.
    - Anne L'Huillier discovered a new effect from laser light's interaction with atoms in a gas.
    - Pierre Agostini and Ferenc Krausz demonstrated that this effect can be used to create shorter pulses of light than were previously possible.
- **Background: Understanding the Problem:**
  - » Human eyes cannot clearly see hummingbird's beating its wings which can be around 80 times per second. We are only able to perceive this as a whirring sound and blurred movement. It is because extremely short events are impossible to observe by human eyes.
  - » **High Speed photography** can capture detailed images of fleeting (short) phenomena. **A highly focused photograph of a hummingbird in flight requires an exposure time that is much shorter than a single wingbeat**.
  - » **The faster the event, the faster the picture needs to be taken if it is to capture the instant.**
  - » Atom's natural timescale is that of femtoseconds ( $10^{-15}$  sec). These movements can be studied with the very shortest pulses that can be produced with a laser.
    - A **femtosecond** was, in the 1980s, regarded as the limit for the flashes of light it was possible to produce.

<b>Explanation:</b>	Light consists of waves – vibrations in electrical and magnetic fields – that move through a vacuum faster than anything else. These have different wavelengths, equivalent to different colours. For example, <u>red light has a wavelength of about 700 nanometres</u> ( $4.29 \times 10^{14}$ Hz), one hundredth the width of a hair, and it cycles at about <u>four hundred and thirty thousand billion times per second</u> . We can think of the <u>shortest possible pulse of light as the length of a single period in the light wave</u> , the cycle <u>where it swings up to a peak, down to a trough, and back to its starting point</u> . In this case, the wavelengths used in ordinary laser systems are never able to get below a femtosecond, so in the <u>1980s this was regarded as a hard limit for the shortest possible bursts of light</u>
---------------------	--

- But, electrons natural timescale is further lower in attoseconds ( $10^{-18}$  sec) i.e. in the world of electrons, positions and energies change at speeds of between one and a few hundred attoseconds. Therefore, flashes of light produced at femtosecond was not enough to see processes occurring on the timescale of electrons.
- **Development of Attosecond Pulses:**
  - » The mathematics that describes waves demonstrate that any wave form can be built if enough waves of the right sizes, wavelengths, and amplitudes (distance between peaks and troughs) are

used. The **trick to attosecond pulses** is that it is possible to make shorter pulses by combining more and shorter wavelengths.

- » In 1987, **Anne L' Huillier and her colleagues** at a French laboratory passed an infrared laser beam through a noble gas. The beam's interaction with atoms in the gas produced **overtones** (overtones are waves of light whose wavelength was an integer fraction of the beam. For e.g, if the beam had a wavelength of 100, the overtones would have wavelength of 10, 25, 50 etc.)
  - By finetuning the setup used to produce the overtones, scientists realized that it should be possible to create intense pulses of light each a few attosecond long.
- » In 2001, **Pierre Agostini** and his research group in France successfully produced and investigated a series of 250-attosecond light pulses, or a pulse train.
- » At the same time, **Ferenc Krausz** and his team in Australia developed a technique to separate an individual 650 second pulse from a pulse train.
  - Using this researcher were able to measure the energy of some electrons released by some krypton atoms.

- **Applications of attosecond physics:**

- » It allows scientists to capture images of activities that happen in incredible short spans. This can be used for exploring short-lived atomic and molecular processes implicated in fields like material, science, electronics, and catalysis.
- » In **medical diagnostics**, attosecond pulses can be used to check for the presence of certain molecules based on their fleeting signatures.
- » These pulses could also be used to develop faster electronic devices, and better telecommunication, imaging and spectroscopy.

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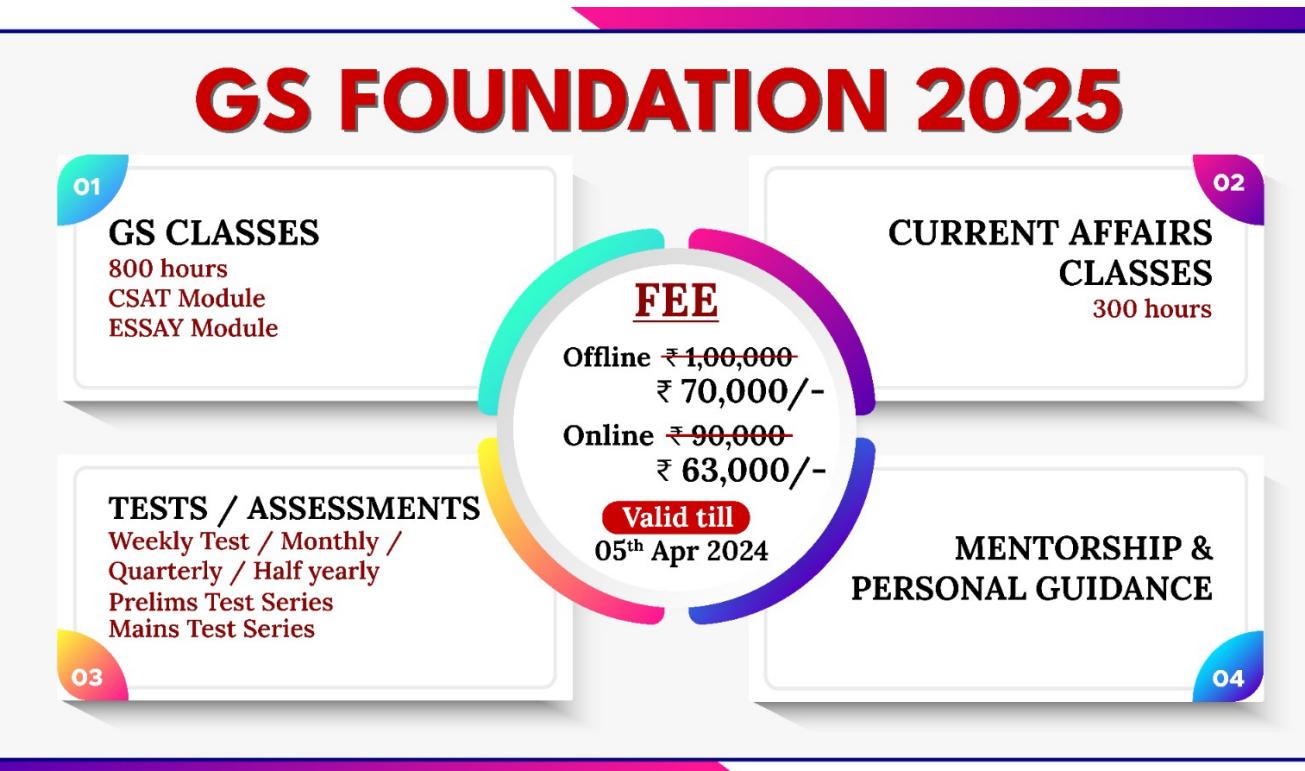
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# TARGET PRELIMS 2024

## BOOKLET-41; EB&CC-10

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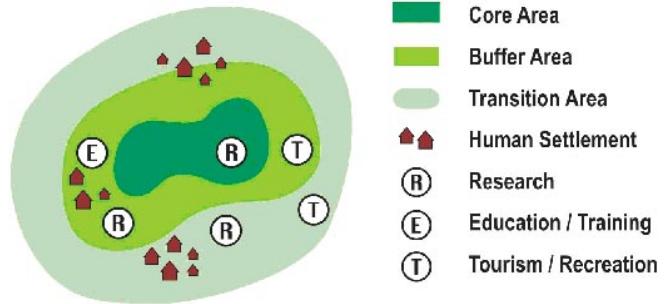
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## 2. UNESCO'S MAN AND BIOSPHERE PROGRAM (MAB)

- **Introduction**
  - » MAB Program is a **major effort in biodiversity conservation**, launched in 1971.
  - » It is an **inter-governmental scientific program** that aims to establish a scientific basis for improvement of relationships between people and their environments.
  - » MAB **combines natural and social sciences, economics and education** to improve human livelihood, and the equitable sharing of benefits.
- **Implementation of the MAB program**
  - » For implementation of its inter-disciplinary work on ground, MAB relies on the World Network of Biosphere Reserves (WNBR) and partnership for knowledge sharing, research and monitoring, education and training, and participatory decision making.
- **Characteristics of Biosphere Reserves**
  - » The characteristics feature of biosphere reserves are
    - **People are integral component**
    - **Remain under national jurisdiction** but share their experience and ideas nationally, regionally and internationally within the WNBR.
    - **Achieve three inter-connected functions:** Conservation, development and logistic support
    - **Zonation Scheme**
    - **Multi-stakeholder approach** with particular emphasis on the involvement of local communities in management.
    - **Integrating cultural and biological diversity**, especially the role of traditional knowledge in ecosystem management.
    - **Fostering dialogue** for conflict resolution in natural resource use.
- **Details about Zonation Scheme**
  - » While countries maintain flexibility at the national levels with regard to the definition of zones, **the zonation needs to ensure that biosphere reserves effectively combine conservation, sustainable use of resources, and knowledge generation through integrated zonation and collaborative management**.
  - » **Each biosphere reserve includes three zones: (Core, Buffer and Transition)**
    - i. **The Core Zone**

- Generally the strict nature reserves and wilderness portions are designated as core area in a BR.
- It should be kept absolutely undisturbed (or minimally disturbed).
- Non-destructive research and low impact uses (e.g. education) allowed.
- **Key functions of Core Area:**
  - **Conservation** function
  - **Range of ecosystem services:**
  - Employment opportunities can also complement conservation goals (e.g. environmental education, research, environmental rehabilitation and conservation measures, recreation and eco-tourism).

**Structure of a model biosphere reserve.**



ii. **The Buffer Zone** usually surrounds or adjoins the core area.

- It is used for cooperative activities compatible with sound ecological practices including, environmental education, recreation, ecotourism, and applied and basic research.
- They can also have important connectivity function in a larger spatial context as they connect biodiversity components within the core areas with those in transition areas.
- Human activities, if natural within BR, are likely to be permitted to continue if these don't affect the ecological diversity.

iii. **Transition Zone**

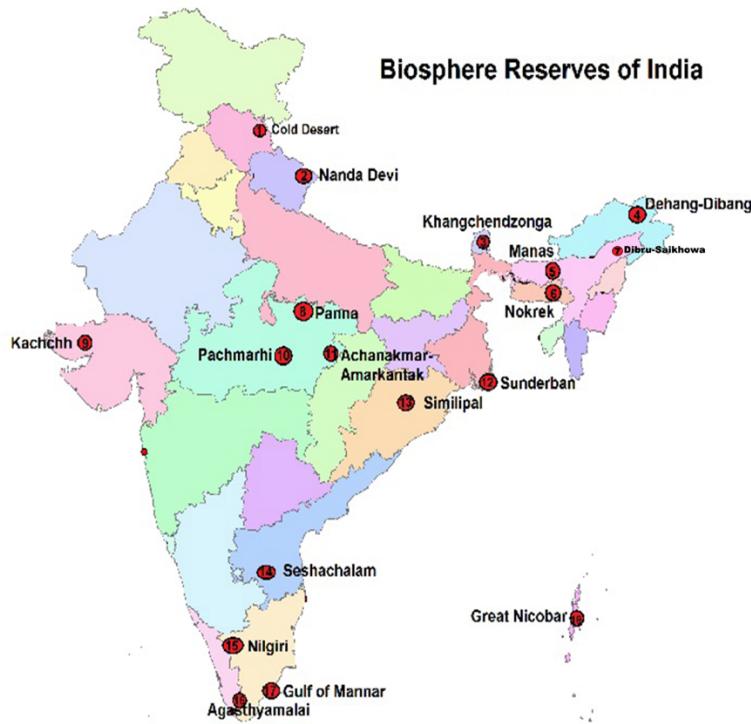
- Outermost part of biosphere reserve
- It has a central function in sustainable development which may contain a variety of agricultural activities, settlements, and other uses and in which local communities, management agencies, scientists and non-governmental organizations, cultural groups, economic interests, and other stakeholders work together to manage and sustainably develop the area's resource.
- Usually not delimited

- **Designation of Biosphere Reserves:** International Coordination Council (ICC) of the MAB program, UNESCO takes the final decision on the nomination for designation.
- **Relation between Biosphere Reserves and other protected areas (NP, WLS etc)**
  - BRs don't replace other PAs but it further strengthens the protected area network.
  - Existing PAs can become part of BR without any change in their legal status.
  - Inclusion of such PA in BR will enhance their national value
  - It doesn't mean the BR are to be established only around National Parks and WLS.
  - **Key differences**
    - » Conservation of overall biodiversity rather than a some specific flagship species.

- » **Increases broad-basing of stakeholders**, especially local people's participation and their training, compared to the features of scheme on WLS and NPs.
- » BRs are **internationally recognized** within the framework of UNESCO's MAB programme, after receiving consent from the participating countries.

- **Biosphere Reserves in India**

- The Indian government has established **18 biosphere reserves in India**, (categories roughly corresponding to IUCN Category 5 protected areas).
- A **scheme called Biosphere Reserve** is being implemented by GoI since 1986, in which financial assistance is given to states for maintenance, improvement and development of certain items. (60:40 general states, 90:10 - Northeastern and 3 Himalayan states)
- **The Indian National Man and Biosphere Committee** constituted by the Central govt identifies new sites, advises on policies and programmes, lays down guidelines, reviews progress and guidelines in the light of evaluation studies and feedback.
- **Management** of the biosphere reserves is the responsibility of concerned state/UT with necessary financing assistance, guidelines for management and technical expertise provided by the central government.
- **World Network of Biosphere reserves**
  - » **12** of the 18 biosphere reserves are a part of the World Network of Biosphere Reserves, based on the UNESCO Man and Biosphere (MAB) programme list.



Name	States	Key Fauna	Type	Year
------	--------	-----------	------	------

<b>Great Nicobar Biosphere Reserves</b>	Andaman and Nicobar Islands	Saltwater Crocodile	Islands	2013
<b>Gulf of Mannar Biosphere Reserve</b>	Tamil Nadu	Dugong or Sea cow	Coastal	2001
<b>Agasthyamalai Biosphere Reserve</b>	Kerala, Tamil Nadu	Nilgiri Tahr, Elephants	Western Ghats	<b>2016</b>
<b>Nilgiri Biosphere Reserve</b>	Tamil Nadu, Kerala, Karnataka	Nilgiri Tahr, Lion-tailed macaque	Western Ghats	2000
<b>Simlipal Biosphere Reserve</b>	Odisha	Gaur, Royal Bengal Tiger, Wild Elephant	Deccan Peninsula	2009
<b>Achanakmar-Amarkantak Biosphere Reserve</b>	Chhattisgarh, Madhya Pradesh	-	Maikala Hills	2012
<b>Panna</b>	Madhya Pradesh	Tiger, Chital, Chinkara, Sāmbhar, Sloth Bear	Ken River	2020
<b>Panchmarhi Biosphere Reserve</b>	Madhya Pradesh	Giant Squirrel, Flying Squirrel	Semi-Arid	2009
<b>Sunderbans Biosphere Reserve</b>	West Bengal	Royal Bengal Tiger	Gangetic Delta	2001
<b>Nokrek Biosphere Reserve</b>	Meghalaya	Red Panda	Tura Range, Meghalaya Plateau	2009
<b>Khangchendzonga National Park</b>	Sikkim		Himalayas	<b>2018</b>
<b>Nanda Devi Biosphere Reserve</b>	Uttarakhand	-	Western Himalayas	2004

- Other Biosphere reserves, not part of MAB include the following:

Name	States	Key Fauna	Type	Year
<b>Seshachalam Hills</b>	Andhra Pradesh ( Eastern Ghats)		Eastern Ghats	2010
<b>Little Rann of Kutch</b>	Gujarat	Indian Wild Ass	Desert	2008
<b>Manas</b>	Assam	Golden Langur, Red Panda	Eastern Himalayas	1989
<b>Dibru Saikhowa</b>	Assam	Golden Langur	East Himalayas	1997
<b>Dihang-Dibang</b>	Arunachal Pradesh		Eastern Himalayas	1998

Cold Desert	Himachal Pradesh	Snow Leopard	Western Himalayas	2009
-------------	------------------	--------------	-------------------	------

## 1) PANNA BIOSPHERE RESERVE

- In 2020, UNESCO included Panna National Park/ TR in the list of UNESCO's World Network of Biosphere Reserves. Thus, Panna becomes the third biosphere reserve in MP after Panchmarhi and Amarkantak. MoEF&CC had declared Panna a Biosphere reserve in 2011 itself.
- **Details of Panna**
  - » It is a "Critical Tiger Habitat" in the state of Madhya Pradesh. It is also home to World Heritage Site of Khajuraho.
  - » It is characterized by forest and marshy vegetation, with an abundance of rare medicinal plants.
  - » **Ken river** flows through the reserve and the Ken-Betwa project will also be located in it.

### CRITICAL TIGER HABITATS:

- Critical Tiger Habitat (CTH) refers to the areas within the tiger reserve that are considered to be the most important for the conservation of tigers.
- These areas are critical for:
  - i. Maintaining the breeding population and their prey species, as well as
  - ii. Providing connectivity to other habitats for long term survival of the tiger population.
- Certain areas under the Tiger Reserves are designated Critical Tiger Reserves under the Wildlife Protection Act, 1972. These areas are given highest level of protection under the law, and any development or human activity within these areas is strictly regulated to prevent any disturbance to the tiger population.
- The designation of Critical Tiger Habitats has played a significant role in conservation of tigers in India. As of March 2023, there are 54 tiger reserves in India, and each reserve has its own Critical Tiger Habitat area.

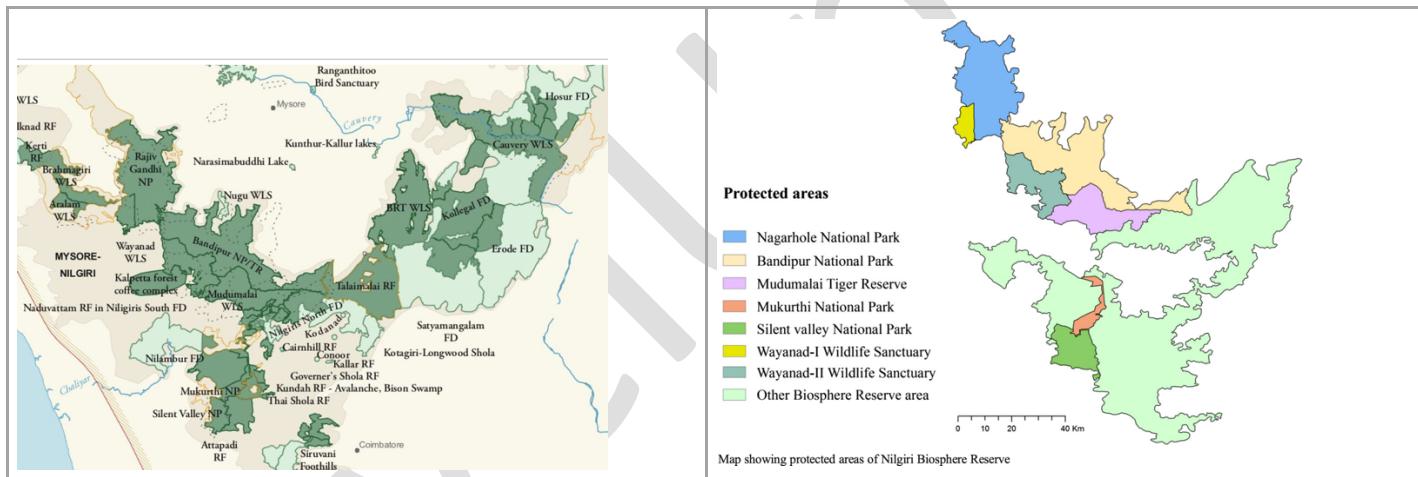
## 2) KANCHENJUNGA BIOSPHERE RESERVE

- **About Kanchenjunga Biosphere Reserve -**
  - » It is one of the highest ecosystems in the world. It falls within the Himalayan global biodiversity hotspots.
  - » **The core zone** alone has over 150 glaciers and 73 glacial lakes. **Zemu glacier** is one of the famous ones.
  - » 86% of the core lies in Alpine zone and the remaining portions are in the Himalayan Wet temperate and sub-tropical moist deciduous forest.
  - » It is also home to many threatened species including **musk deer, snow leopard, red panda, and Himalayan Tahr**.
  - » It is also home to many ethnic communities including **Lepcha, Nepalese, and Bhutia**.
- **Significance**
  - » The inclusion in the list will **boost the unique ecosystem of Sikkim** on two counts: Collaborative research and tourism.
    - It will boost the international research collaboration relating to flora and fauna and ecosystem of KBR.

- Further, this will help Sikkim get **more tourists**.

### 3) NILGIRI BIOSPHERE RESERVE

- The Nilgiri Biosphere Reserve was the first BR in India established in the year 1986. It is located in the Western Ghats and includes 2 of the 10 biogeographical provinces of India.
- Location and Area:** The reserve encompasses 5,520 km<sup>2</sup>, in the state of Tamil Nadu (2537.6 Km<sup>2</sup>), Karnataka (1527.4 Km<sup>2</sup>) and Kerala (1455 km<sup>2</sup>). It forms an almost complete ring around the Nilgiri Plateau.
- Protected Area in Nilgiri BR include:**
  - Nagarhole NP**
  - Bandipur National Park**
  - Wayanad WLS**
  - Mudumalai WLS**
  - Sathyamangalam WLS**
  - Mukurthi NP**
  - Silent Valley NP**



- Vegetation type of Nilgiri BR**

### Vegetational Types of the Nilgiri Biosphere Reserve

S.No	Forest type	Nature of Vegetation	Area of occurrence
1	Moist evergreen	Dense, moist and multi storeyed forest with gigantic trees	In the narrow valleys of Silent Valley
2	Semi evergreen	Moist, deciduous	Nilambur and Palghat division
3	Thorn	Dense	North east part of the Nilgiri district
4	Savannah woodland	Trees scattered amid woodland	Mudumalai and Bandipur
5	Sholas & grasslands	High elevated evergreen with grasslands	South and western catchment area, Mukurthi national park

- **The People:**

- » A variety of human cultural diversity can be found in the Nilgiri Biosphere Reserve.
- » Tribal groups like the Todas, Kotas, Irullas, Kurumbas, Paniyas, Adiyans, Edanadan Chettis, Cholanaickens, Allar, Malayan, etc., are native to the reserve. Except for Cholanaickens who live exclusively on food gathering, hunting and fishing, all the other tribal groups are involved in their traditional occupation of agriculture.

#### 4) 3<sup>RD</sup> NOV: INTERNATIONAL DAY FOR BIOSPHERE RESERVE

- In the year 2022, at the 41st session of UNESCO's general conference, it was decided that Nov 3 would be celebrated worldwide as the International Day of Biosphere Reserve.
- This international day by UNESCO aims to:
  - i. Conserve nature, protecting biodiversity and cultural diversity.
  - ii. Promote scientific research, underpinning development through research monitoring, education and training.
  - iii. Promote socio-culturally and environmentally sustainable economic development.
  - iv. To foster the growth of local economies.

#### 5) GLOBAL SITUATION OF BIOSPHERE RESERVES UNDER MAB NETWORK

- As of Nov 2023, there are 738 properties in 134 countries, including 12 in India, four in Sri Lanka and three in Maldives

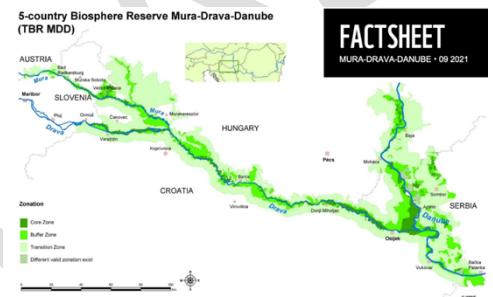
#### 6) TRANSBOUNDARY BIOSPHERE RESERVES

- A TBR is first and foremost a cooperation between established Biosphere reserves. UNESCO formally designates it as a TBR if certain conditions are met:

- » A political agreement between the states concerned.
  - » A Common zoning that promotes the spatialization of conservation and development issues
  - » Identification of local and national partners and the establishment.
- TBR is an international recognition of a political will to cooperate in the conservation and sustainable use, through common management, of a shared ecosystem.

## 7) IN 2021 UNESCO DECLARED WORLD'S FIRST 5 COUNTRY BIOSPHERE RESERVE IN AMAZON OF EUROPE

- In Sep 2021, UNESCO designated **Mura-Drava-Danube** (MDD) as the world's first 'five country biosphere reserve'.
- **Unique Features:**
  - » It is Central Europe's largest near natural free-flowing river system without any dams across five countries.
  - » It is the first biosphere reserve in the world which is commonly shared and managed by five countries.
  - » With, 930,000 ha along 700 km of Mura, Drava and Danube Rivers Europe's largest river protected area.
  - » Flagship project for international understanding and regional cooperation.
- The reserve covers 700 kms of the Mura, Drava and Danube rivers and stretches across **Austria, Slovenia, Croatia, Hungary, and Serbia**.
- It is home to floodplain forests, gravel, and sand banks, river islands, oxbows, and meadows.
- It is home to continental Europe's highest density of breeding white-tailed eagle (more than 150 pairs), as well as endangered species such as the little tern, black stork, otters, beavers, and sturgeons.
- It is also an important annual resting and feeding place for more than 250,000 migratory birds, according to WWF. Almost, 900,000 people live in the biosphere reserve.
- The total area of the reserve - a million hectares - in the so called 'Amazon of Europe', makes it the largest riverine protected area on the continent.
- The new reserve represented an important contribution to the European Green Deal and contributes to the implementation of the EU Biodiversity Strategy in the Mura-Drava-Danube region.
  - » The strategy aims to revitalize 25,000 km of rivers and protect 30% of the EU's land area by 2030.



LevelupIAS

### 3. UNESCO WORLD HERITAGE CONVENTION

- In 1972, UNESCO adopted the Convention Concerning the Protection of the World Cultural and Natural Heritage.
  - » This convention seeks to encourage the identification, protection, and preservation of cultural and natural heritage around the world, considered to be of outstanding value to humanity.
- **Strategic Objectives** (the "Five Cs")
  - » Credibility
  - » Conservation
  - » Capacity Building
  - » Communication
  - » Communities
- **What does the convention contain?**
  - » The Convention sets out the duties of state parties in identifying potential sites and their role in protecting and preserving them.
    - By signing the Convention, each country pledges to conserve not only the World Heritage sites situated on its territory, but also to protect its national heritage.
  - » It explains how the World Heritage Fund is to be used and managed and under what conditions international financial assistance may be provided.
  - » The Convention obligates States Parties to report regularly to the World Heritage Committee on the state of conservation of their World Heritage properties.
  - » It also encourages States Parties to strengthen the appreciation of the public for World Heritage properties and to enhance their protection through educational and information programmes.
- **World Heritage Site**
  - » A world heritage site is a landmark which has been officially recognized by the UN, specifically by UNESCO.
  - » Sites are selected on the basis of cultural, historical, scientific or some other form of significance and they are legally protected by international treaties. UNESCO regards these sites as being important to the collective interests of humanity.
  - » The list is maintained by the International World Heritage Program administered by the UNESCO World Heritage Committee, composed of 21 UNESCO member states which are elected by General Assembly.
  - » While each World Heritage site remains part of legal territory of state wherein the site is located, UNESCO considers it in the interest of the International Community to preserve each site.
- **How UNESCO grants World Heritage Site tag?**
  - » Step 1: Inclusion in tentative list

- A tentative list is an "inventory" of properties a country believes deserves to be a World Heritage Site.

» **Step 2: Nomination File**

- After UNESCO includes a property in the Tentative List, the country has to prepare a nomination document.
- The Nomination file is evaluated by the International Council for Monuments and Sites and the World Conservation Union. These bodies then make recommendations to the World Heritage Committee.

» **Step 3: Consideration by UNESCO World Heritage Committee**

- The country meets once a year to determine whether or not to inscribe each nominated property on the World Heritage List and sometimes defer the decision to request more information from the country which nominated the sites.
- There are 10 selection criteria - a site must meet at least one.

- **10 Criteria**

- » Up to 2004 there were six criteria for cultural heritage site and four criteria for the natural heritage site.
- » In 2005 this was modified so that, now only one set of ten criteria.
- » Nominated sites must be of "outstanding universal value" and meet atleast one of the ten criteria.

## 1) WORLD HERITAGE SITES IN INDIA

As of Jan 2024, India has 42 World Heritage sites (34 Cultural, 7 Natural and 1 Mixed)

Cultural Heritage Sites in India	Year of Entry	State
#1 Agra Fort	1983	Uttar Pradesh
#2 Ajanta Caves	1983	Maharashtra
#3 Ellora Caves	1983	Maharashtra
#4 Taj Mahal	1983	Uttar Pradesh
#5 Group of Monuments at Mahabalipuram	1984	Tamil Nadu
#6 Sun Temple, Konark	1984	Odisha
#7 Churches and Convents of Goa	1984	Goa
#8 Fatehpur Sikri	1986	Uttar Pradesh
#9 Group of Monuments at Hampi	1986	Karnataka
#10 Khajuraho Group of Monuments	1986	Madhya Pradesh
#11 Elephanta Caves	1987	Maharashtra
#12 Great Living Chola Temples	1987	Tamil Nadu

#13 Group of Monuments at Pattadakal	1987	Karnataka
#14 Buddhist Monuments at Sanchi	1989	Madhya Pradesh
#15 Mountain Railways of India	1999	West Bengal, Tamil Nadu, Himachal Pradesh
#16 Humayun's Tomb, Delhi	1993	Delhi
#17 Qutub Minar and Monuments, Delhi	1993	Delhi
#18 Mahabodhi Temple Complex at Bodh Gaya	2002	Bihar
#19 Rock Shelters of Bhimbetka	2003	Madhya Pradesh
#20 Champaner-Pavagadh Archaeological Park	2004	Gujarat
#21 Chhatrapati Shivaji Terminus (formerly Victoria Terminus)	2004	Maharashtra
#22 Red Fort Complex	2007	Delhi
#23 Jantar Mantar	2010	Jaipur
#24 Hill Forts of Rajasthan	2013	Rajasthan
#25 Rani Ki Vav (The Queen's Stepwell)	2014	Gujarat
#26 Archaeological Site of Nalanda Mahavira at Nalanda	2016	Bihar
#27 The Architectural Work of Le Corbusier, an Outstanding Contribution to the Modern Movement	2016	Chandigarh
#28 Historic City of Ahmedabad	2017	Gujarat
#29 Victorian Gothic and Art Deco Ensembles of Mumbai	2018	Maharashtra
#30 Jaipur City	2019	Rajasthan
#31 Kakatiya Rudreshwara (Ramappa) Temple	2021	Telangana
#32 Dholavira, a Harappan City	2021	Gujarat
#33 Santiniketan	2023	West Bengal
#34 Sacred Ensembles of the Hoysala	2023	Karnataka

Natural Heritage Site in India	Year of Entry	State
#1 Sundarbans National Park	1987	West Bengal

#2 Western Ghats	2012	Kerala, Tamil Nadu, Karnataka, Goa, Maharashtra, and Gujarat
#3 Nanda Devi and Valley of Flowers National Parks	1988	Uttarakhand
#4 Manas Wildlife Sanctuary	1985	Assam
#5 Great Himalayan National Park	2014	Himachal Pradesh
#6 Keoladeo National Park	1985	Rajasthan
#7 Kaziranga National Park	1985	Assam

Mixed Heritage Site in India	Year of Entry	State
#1 Khangchendzonga National Park	2016	Sikkim

## 2) ADVANTAGE OF GETTING WORLD HERITAGE TAG

- **Identity:** the recognized site gets a new identity world over. The status itself confirms that the outstanding and exceptional features of the listed site.
- **Funding:** the site gets fund from World Heritage Fund for its protection
- **Tourism:** International recognition attracts attention of both domestic and global tourists.
- **Protection during Wartime:** The site becomes protected under Geneva convention against destruction or misuse during war.
- **National governments also become more responsible** in the protection of the site.
- **Access to global project management resources**, as they are now more willing to participate with the project.

### **“MARATHA MILITARY LANDSCAPES OF INDIA” WILL BE INDIA’S NOMINATION FOR RECOGNITION AS UNESCO WORLD HERITAGE LIST FOR THE YEAR 2024-25 (JAN 2024)**

- It was developed between 17th and 19th centuries, and represent an extraordinary fortification and military system envisioned by the Maratha rulers
- The **twelve component parts of this nomination** are, Salher Fort, Shivneri Fort, Lohgad, Khanderi fort, Raigad, Rajgad, Pratapgad, Suvarnadurg, Panhala fort, Vijay durg, Sindhudurg in Maharashtra and Gingee Fort in Tamil Nadu.
- The Maratha Military Landscapes of India is nominated under **criterion (iii): To bear a unique or at least exceptional testimony to a cultural tradition or to a civilization that in living or which has disappeared**, **criterion (iv): to be an outstanding example of a type of building, architectural or technological ensemble, or landscape that illustrates significant stage(s) in human history** and **Criterion**

(vi): To be directly or tangibly associated with events or living traditions, with ideas or with beliefs, with artistic and literary works of outstanding universal significance.

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## UNESCO INSCRIBES KARNATAKA'S SACRED ENSEMBLE OF HOYSALAS IN WORLD HERITAGE LIST (SEP 2023)

- The ancient site was part of UNESCO's tentative list since 2014 and now the global body has decided to inscribe **Sacred Ensembles of the Hoysalas in the World Heritage List**.
  - » The serial property encompasses the **three most representative examples of Hoysalas-style temple complexes in Southern India** dating from 12th to 13th century.
  - » The Hoysala style was created through a careful selection of **contemporary temple features** and those from the past to create a different identity from neighbouring kingdoms.
    - The shrines are characterized by hyper real sculptures and stone carving that cover the entire architectural surface, a circumambulatory platform, a large-scale sculpture gallery, a multi-tiered frieze, and Sculpture of the Sala legend.
  - » Chennakesava Temple was constructed by King Vishnuvardhana of the Hoysala dynasty in the 12th century to commemorate his victory over Cholas.
    - Other temples which are part of the Sacred Ensemble of Hoysala at Belur are Kappe Chennigaraya temple, Veeranarayan Temple, and Ranganayaki Temple which are relatively smaller in size than Chennakesava Temple but are famous for their architectural marvel.
  - » **Sacred Ensembles of Hoysala at Halebid:**
    - Intricate carving, finely detailed sculptures, and star shaped architectural plans are the prime features of sacred ensembles of Hoysala at Halebid.
    - The main Hoysaleswara temple was built in the 12th century during the reign of the King Vishnuvardhana and is dedicated to Lord Shiva.
    - Kedareshwara temple showcases remarkable Hoysala architecture and stone carvings.

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## SANTINIKETAN: NEW INDIAN SITE IN THE UNESCO'S WORLD HERITAGE LIST (SEP 2023)

- Santiniketan, West Bengal has been inscribed on the UNESCO's list of World Heritage sites during the ongoing 45th session of the UNESCO World Heritage Committee in Riyadh, Kingdom of Saudi Arabia.
  - » It is **India's 41st UNESCO World Heritage site**.
    - Established in Rural West Bengal in 1901, Santiniketan was founded by Rabindranath Tagore, a renowned poet and philosopher.
    - It is an ensemble of historic buildings, landscapes, and gardens, pavilions, artworks, and continuing educational and cultural traditions that together express its outstanding Universal value.
    - The built and open spaces of Santiniketan constitute an exceptional global testimony to ideas of environmental art and educational reform where progressive education and visual art intertwined with architecture and landscape, with the Ashram, Uttarayan, and Kala Bhavan areas forming the prime sites of these practices.

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## 4. CONVENTION ON BIOLOGICAL DIVERSITY (CBD)

- **Introduction :**
  - The CBD is a multilateral treaty which was approved in 1992 at the Earth Summit in Rio and came into force on 29 Dec, 1993.
    - » NOTE: Other two convention finalized at Rio summit included UNFCCC and UNCCD.
  - It has **3 main objectives:**
    - » The conservation of Biodiversity.
    - » The sustainable use of the component of biodiversity.
    - » The fair and equitable sharing of benefits arising out of the utilization of genetic resources.
  - **Membership**
    - » As of Feb **2022**, 196 countries were parties to convention.
      - India ratified CBD in 1994.
      - USA - signed the convention in 1993, but has not ratified it.
- **Key provisions**
  - » The Convention requires governments to undertake to conserve and sustainably use biodiversity. They are required to **develop national biodiversity strategies and action plans** and to integrate these into broader national laws for environment and development
  - » **Key treaty commitments include**
    1. Identifying and monitoring important components of biological diversity.
    2. Establishing protected areas to conserve biodiversity while promoting environmentally sound development around the area.
    3. **Rehabilitating degraded ecosystems** and promoting recovery of threatened species in collaboration with local residents
    4. Respecting, preserving and maintaining traditional knowledge of the sustainable use of biodiversity with the involvement of indigenous people and local communities.
    5. **Preventing** introduction of, controlling and eradicating alien species that could threaten ecosystems, habitats or species.
    6. Controlling the risks posed by GM Organisms.
    7. Promoting **public participation**, educating people and raising awareness regarding the significance of biodiversity.
    8. **Reporting** on how countries are meeting biodiversity goals.



## 1) CARTAGENA PROTOCOL ON BIOSAFETY TO THE CONVENTION ON BIOLOGICAL DIVERSITY

- **Introduction**

- It is an international agreement which aims to ensure the **safe handling, transport and use of living modified organisms (LMOs) resulting from modern biotechnology** that may have adverse effects on biological diversity, taking also into account risks to human health.
- The protocol makes it clear that **products from new technologies** must be based on the **precautionary principle** and allow developing nations to balance public health against economic benefits.
- It was the **first international regulatory framework** on safer transfer, handling and use of LMOs.
- It was adopted in 2000 and entered into force on 11th Sep 2003.
- The protocol **promotes biosafety by establishing rules and procedures** for the safe transfer, handling, and use of LMOs.

- **Advanced Information Agreement**

- The Cartagena Protocol provides for **Advanced information agreement (AIA)** procedure for ensuring that countries are provided with the information necessary to make decisions before agreeing to the import of such organisms into their territory.
- **Biosafety Clearing House** is established by the protocol to facilitate the exchange of information on LMOs and to assist countries in the implementation of the Protocol.

## 2) NAGOYA-KUALA LUMPUR SUPPLEMENTARY PROTOCOL ON LIABILITY AND REDRESS TO THE CARTAGENA PROTOCOL ON BIOSAFETY

- Liability and redress in the context of Cartagena Protocol concerns the question of what would happen if the trans-boundary movement of LMO has caused damage.
- It provides international rules and procedures on liability and redress for damage to biodiversity resulting from LMOs.
- India ratified in 2014

## 3) NAGOYA PROTOCOL TO CBD

- **What is Nagoya Protocol and what is its objective?**

- The Nagoya Protocol on **Access to Genetic Resources and the Fair and Equitable Sharing of Benefits** Arising from their utilization (ABS) to the CBD is a supplementary agreement to the CBD.
- It provides a transparent legal framework for the effective implementation of one of the three objectives of the CBD: the fair and equitable sharing of benefits arising out of the utilization of genetic resources.
- The Nagoya Protocol on ABS was adopted on 29 October 2010 in Nagoya, Japan and entered into force on 12 October 2014

- **Significance of Nagoya Protocol**

- Creates greater legal certainty and transparency for both providers and users of genetic resources by:
  - » Establishing more predictable conditions for access to genetic resources

- » Helping to ensure benefit sharing when genetic resource leave the country providing the genetic resources.
- **What is covered by NP?**
  - Genetic resources that are covered by CBD and benefits arising from their utilization.
    - » It also covers traditional knowledge (TK) associated with genetic resources that are covered by CBD and the benefits arising from its utilization.
- **Core Obligations of Nagoya Protocol wrt Genetic Resources**
  - **Access Obligation**
    - » Parties have to take domestic level access measures
  - **Benefit Sharing Obligation**
    - » Domestic level benefit sharing measures are to provide for the fair and equitable sharing of benefits arising from the utilization of genetic resources with the contracting party providing genetic resources
  - **Compliance Obligation**
    - » Specific obligations to support compliance with the domestic legislation or regulatory requirements of contracting party providing genetic resources , compliance with mutually agreed terms
- **What is the Access and Benefit-sharing Clearing House?**
  - The ABS clearing house is a platform for exchanging information on access and benefit sharing established by Article 14 of the Protocol, as part of the clearing house of the Convention.
  - It is one of the key tool in facilitating implementation of the Nagoya Protocol, by enhancing legal certainty and transparency on procedures for access and benefit-sharing and for monitoring the utilization of genetic resources along the value chain, including through internationally recognized certificates of compliance

#### 4) CBD-COP15: KUNMING-MONTREAL BIODIVERSITY FRAMEWORK (DEC 2022)

- After multiple delays due to COVID-19, nearly 200 countries at the UN Biodiversity Conference (COP15) in Montreal sealed a landmark deal - ***The Kunming-Montreal Global Biodiversity Framework (GBF)***, with four goals and 23 action oriented targets.
- **Some Facts about COP15:**
  - COP15 was held in Montreal, Canada. It was chaired by China and hosted by Canada.
  - It resulted in the adoption of ***The Kunming-Montreal Global Biodiversity Framework (GBF)*** which replaces the Aichi Biodiversity targets set in 2010.
- **Key Features:**
  - **Four Goals and 23 action-oriented targets** were adopted.
  - **Four Goals:**

#### GOAL A

- The integrity, connectivity and resilience of all ecosystems are maintained, enhanced, or restored, substantially increasing the area of natural ecosystems by 2050;
- Human induced extinction of known threatened species is halted, and, by 2050, extinction rate and risk of all species are reduced tenfold, and the abundance of native wild species is increased to healthy and resilient levels;
- The genetic diversity within populations of wild and domesticated species, is maintained, safeguarding their adaptive potential.

#### **GOAL B**

- **Biodiversity is sustainably used and managed** and nature's contributions to people, including ecosystem functions and services, are valued, maintained and enhanced, with those currently in decline being restored, supporting the achievement of sustainable development, for the benefit of present and future generations by 2050.

#### **GOAL C**

- **The monetary and non-monetary benefits from the utilization of genetic resources**, and digital sequence information on genetic resources, and of traditional knowledge associated with genetic resources, as applicable, are shared fairly and equitably, including, as appropriate with indigenous peoples and local communities, and substantially increased by 2050, while ensuring traditional knowledge associated with genetic resources is appropriately protected, thereby contributing to the conservation and sustainable use of biodiversity, in accordance with internationally agreed access and benefit-sharing instruments.

#### **GOAL D**

- Adequate means of implementation, including financial resources, capacity-building, technical and scientific cooperation, and access to and transfer of technology to fully implement the Kunming-Montreal global biodiversity framework are secured and equitably accessible to all Parties, especially developing countries, in particular the least developed countries and small island developing States, as well as countries with economies in transition, progressively closing the biodiversity finance gap of \$700 billion per year, and aligning financial flows with the Kunming-Montreal Global Biodiversity Framework and the 2050 Vision for Biodiversity.

#### ▪ **23 Targets:**

- **TARGET 1:** Bring the loss of areas of high biodiversity importance, including ecosystems of high ecological integrity, close to zero by 2030, while respecting the rights of indigenous peoples and local communities.
- **TARGET 2:** Ensure that by 2030 at least 30 per cent of areas of degraded terrestrial, inland water, and coastal and marine ecosystems are under effective restoration,
- **TARGET 3** (commonly called **30X30**): Ensure and enable that by 2030 at least 30 per cent of terrestrial, inland water, and of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures.
  - **Note:** Currently, 17% of terrestrial and 10% of marine areas are protected.

- **Note:** Countries are not individually required to attain the 30X30 target.
- 
- **TARGET 4:** Ensure urgent management actions, to halt human induced extinction of known threatened species and for the recovery and conservation of species, in particular threatened species,
- **TARGET 5:** Ensure that the use, harvesting and trade of wild species is sustainable, safe and legal,
- **TARGET 6:** Eliminate, minimize, reduce and or mitigate the impacts of invasive alien species on biodiversity and ecosystem services; reducing the rates of introduction and establishment of other known or potential invasive alien species by at least 50 percent, by 2030, eradicating or controlling invasive alien species especially in priority sites, such as islands.
- **TARGET 7:** Reduce pollution risks and the negative impact of pollution from all sources, by 2030, to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects.
- **TARGET 8:** Minimize the impact of climate change and ocean acidification on biodiversity and increase its resilience through mitigation, adaptation, and disaster risk reduction actions,
- **TARGET 9:** Ensure that the management and use of wild species are sustainable, thereby providing social, economic and environmental benefits for people, especially those in vulnerable situations and those most dependent on biodiversity,
- **TARGET 10:** Ensure that areas under agriculture, aquaculture, fisheries and forestry are managed sustainably,
- **TARGET 11:** Restore, maintain and enhance nature's contributions to people, including ecosystem functions and services,
- **TARGET 12:** Significantly increase the area and quality and connectivity of, access to, and benefits from green and blue spaces in urban and densely populated areas sustainably
- **TARGET 13:** Take effective legal, policy, administrative and capacity-building measures at all levels, as appropriate, to ensure the fair and equitable sharing of benefits that arise from the utilization of genetic resources and from digital sequence information on genetic resources, as well as traditional knowledge associated with genetic resources, and facilitating appropriate access to genetic resources, and by 2030 facilitating a significant increase of the benefits shared, in accordance with applicable international access and benefit-sharing instruments.
- **TARGET 14:** Ensure the full integration of biodiversity and its multiple values into policies, regulations, planning and development processes, poverty eradication strategies, strategic environmental assessments, environmental impact assessments and, as appropriate, national accounting, within and across all levels of government and across all sectors, in particular those with significant impacts on biodiversity, progressively aligning all relevant public and private activities, fiscal and financial flows with the goals and targets of this framework.
- **TARGET 15:** Take legal, administrative or policy measures to encourage and enable business, and in particular to ensure that large and transnational companies and financial institutions:
  - (a) Regularly monitor, assess, and transparently disclose their risks, dependencies and impacts on biodiversity including with requirements for all large as well as transnational companies and financial institutions along their operations, supply and value chains and portfolios;

- (b) Provide information needed to consumers to promote sustainable consumption patterns;
- (c) Report on compliance with access and benefit-sharing regulations and measures, as applicable;
- in order to progressively reduce negative impacts on biodiversity, increase positive impacts, reduce biodiversity-related risks to business and financial institutions, and promote actions to ensure sustainable patterns of production.
- **TARGET 16:** Ensure that people are encouraged and enabled to make sustainable consumption choices including by establishing supportive policy, legislative or regulatory frameworks, improving education and access to relevant and accurate information and alternatives, and **by 2030, reduce the global footprint of consumption in an equitable manner, halve global food waste.**
  - **TARGET 17:** Establish, strengthen capacity for, and implement in all countries in biosafety measures as set out in Article 8(g) of the Convention on Biological Diversity and measures for the handling of biotechnology and distribution of its benefits as set out in Article 19 of the Convention.
  - **TARGET 18:** Identify by 2025, and eliminate, phase out or reform incentives, including subsidies harmful for biodiversity, in a proportionate, just, fair, effective, and equitable way, while substantially and progressively reducing them by at least 500 billion US\$ per year by 2030, starting with the most harmful incentives, and scale up positive incentives for the conservation and sustainable use of biodiversity.
  - **TARGET 19:** Substantially and progressively increase the level of financial resources from all sources, in an effective, timely and easily accessible manner, including domestic, international, public and private resources, in accordance with Article 20 of the Convention, to implement national biodiversity strategies and action plans, by 2030 mobilizing at least 200 billion United States dollars per year.
    - **Financial Package to poor countries:** The agreement asks for increasing to at least \$20 billion annually by 2025 the money that goes to poor countries. That number would be increased to \$30 billion each year by 2030.
  - **TARGET 20:** Strengthen capacity-building and development, access to and transfer of technology, and promote development of and access to innovation and technical and scientific cooperation, including through South-South, North-South and triangular cooperation,
  - **TARGET 21:** Ensure that the best available data, information and knowledge, are accessible to decision makers, practitioners and the public
  - **TARGET 22:** Ensure the full, equitable, inclusive, effective and gender-responsive representation and participation in decision-making, and access to justice and information related to biodiversity by indigenous peoples and local communities, respecting their cultures and their rights over lands, territories, resources, and traditional knowledge, as well as by women and girls, children and youth, and persons with disabilities and ensure the full protection of environmental human rights defenders.
  - **TARGET 23:** Ensure gender equality in the implementation of the framework

## 5) COMMEMORATIVE PERIODS

### A) 2010: INTERNATIONAL YEAR OF BIODIVERSITY

### B) 2011-2020: UN DECADE OF BIODIVERSITY

- This was announced on recommendation of the CBD signatories during COP10 at Nagoya in October, 2010.

### C) INTERNATIONAL DAY FOR BIOLOGICAL DIVERSITY: 22ND MAY

- The UN has proclaimed May 22 as the International Day for Biological Diversity (IDB) to increase understanding and awareness of biodiversity issues.
- This day was chosen as **Convention on Biological Diversity was adopted by UN Conference** on this day.

## 6) REPORT: GLOBAL BIODIVERSITY OUTLOOK

- The report provides a summary of the status of biological diversity and an analysis of the steps being taken by the global community to ensure that biodiversity is conserved and used sustainably, and that benefits arising from the use of genetic resources are shared equitably.
- **The fifth edition (GBO-5)** is the final report card on progress against 20 global biodiversity targets agreed in 2010 with a 2020 deadline, and offers lessons learned and best practices for getting on track.
- None of the 20 targets have been fully achieved, though six targets have been partially achieved (Targets 9, 11, 16, 17, 19 and 20)

## 5. POLLINATORS AND ASSOCIATED ISSUES

- There are more than 20,000 species of wild bees alone, plus many species of butterflies, flies, moths, wasps, beetles, birds, bats, and other animals that contribute to pollination. Pollinated crops include those that provide fruit, vegetables, seeds, nuts, and oils. Many of these are important dietary sources of vitamins and minerals, without which the risks of malnutrition might be expected to increase. Several crops also represent an important source of income in developing countries from, for example, the production of coffee and cocoa

### 1) IPBES GLOBAL ASSESSMENT OF POLLINATORS

- This assessment, titled **Thematic Assessment of Pollinators, Pollination and Food Production** is the first ever assessment of pollinators issued by IPBES.
- **Key Highlights**
  - **Significance of Pollinators:**
    - » **75% of world's food crops** depend at least in part on pollination.
    - » **90% of the wild flowering plants** depend on pollinators
    - » **Volume of agri-production dependent on pollinators** has increased by 300% during the past 50 years.
  - **A number of pollinator species worldwide** are being driven towards **extinction**. This is threatening millions of livelihoods and 100s of billions of dollars' worth of food supply.
  - **Key factors affecting pollinators**
    - » Changes in land use
    - » Intensive agri production
    - » Pesticides (including neonicotinoid insecticides)
    - » Alien invasive species
    - » Diseases and pests are specially problematic for managed bees.
    - » Climate change
  - **Way forward** - Sustainable Agriculture, reducing chemical pesticides, Improved managed bee husbandry

### 2) ABOUT INTERGOVERNMENTAL SCIENCE POLICY PLATFORM ON BIODIVERSITY AND ECOSYSTEM SERVICES (IPBES)

- It is an **independent inter-governmental body** established by states to strengthen the science policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long term human well-being, and sustainable development.
- It was **established in 2012** at Panama city.
- It is **not an UN body**. However, at the request of the IPBES plenary and authorization of UNEP Governing Council, the **UNEP provides secretariat services to IPBES**.
- It currently has 134 member states. Many NGOs, organizations, conventions and civil society groupings also participate in the formal IPBES process as observers, with several thousand individual stakeholders,

ranging from scientific experts to representatives of academic and research institutions, local communities and the private sector, contributing to and benefiting from our work

- **The work of IPBES can be categorized in four complementary areas:**

1. **Assessments:** e.g., the Assessment of Pollinators
2. **Policy Support:** Identifying policy-relevant tools and methodologies, facilitating their use, and catalysing their further development.
3. **Building Capacity and Knowledge**
4. **Communication and Outreach**

### 3) ABOUT "THE GLOBAL COALITION OF THE WILLING ON POLLINATORS)

- The coalition was formed in 2016 to follow up on the findings of IPBES Assessment on Pollinators, Pollination and Food Production.
- The coalition has 28 signatories including 17 European countries, five from Latin America and the Caribbean and four from Africa.
- **Members are supposed to do the following:**
  - Taking action to protect pollinators and their habitats by developing and implementing national pollinator strategies
  - Sharing experience and lessons learnt in developing and implementing national pollinator strategies, especially knowledge on new approaches, innovations, and best practices
  - Reaching out to seek collaboration with a broad spectrum of stakeholders—countries as well as businesses, NGOs, farmers, and local communities
  - Developing research on pollinator conservation

### 4) WORLD BEE DAY: 20<sup>TH</sup> MAY

- The World observes Bee Day on May 20 to raise awareness about the importance of pollinators and how they contribute to our sustainable developments. The day has been designated by the UN.

## 6. CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES (CITES) ON WILD FLORA AND FAUNA

- **About Convention**

- » Convention also known as **Washington convention** is a multilateral treaty to protect endangered plants and animals.
- » It was drafted as a result of resolution adopted in 1963 at a meeting of members of the IUCN (International Union for Conservation of Nature).
- » It came into force in 1975 and now has **184 parties** (as of Nov 2022). Almost every country in the world has signed up + the European Union.

- The convention is **binding on Parties** in the sense that they are committed to implementing it; however, it doesn't take the place of national laws.
- **Aim:** It's aim is to ensure that **international trade** in specimens of wild animals and plants **does not threaten the survival of the species in wild**, and it accords varying degree of protection to more than 35,000 (>5000 plants, and > 30 thousand animals) species of plants and animals.
  - » In essence, **CITES ban hunting, capturing, and selling of endangered or threatened species.**
- **Categorization of Species covered by CITES according to degree of protection they need:**
  - » **Appendix I:**
    - The appendix includes those species which are **threatened with extinction** and where trade is a current or potential threat to their continued existence.
    - **Any international movement of these species** - or products made from them - **requires permits from both the exporting and importing country.**
    - **International trade for commercial purpose** is **generally not allowed** and is permitted **only in exceptional circumstances.**
    - The appendix currently has **over 1,000 species.**
  - » **Appendix II:**
    - Species included in this appendix are **not necessarily threatened with extinction**, but their **trade must be controlled** in order to avoid utilization incompatible with their **survival.**
    - **In practice**, the appendix includes many highly endangered species.
    - This is the **biggest appendix** and has around 40,000 species.
    - **International Trade** in the species is allowed but **requires a permission from exporting countries**, after determining that the export will not harm the survival of the species and that the specimen has been **obtained legally.**
  - » **Appendix III:**
    - This appendix is used when a country wants to regulate trade in a given species. Here, a **country can get a species listed unilaterally.**
    - **Export permits are then required** for that species be exported from the country.
    - **Note:** Additions to Appendix 1 and Appendix 2, **require the agreement of two-third of the COP.**
- **Significance**
  - » Even though **enforcement is difficult**, CITES has helped reduce trade in many threatened species including elephants, crocodiles, and chimpanzees.

#### A) COP OF CITES

- » CoP of CITES meet **every three years**. The **18th CITES was held in Geneva in 2019** and the **COP-19 was held in Panama in Nov 2022.**

## 7. CONVENTION ON CONSERVATION OF MIGRATORY SPECIES OF WILD ANIMALS (BONN CONVENTION – CMS)

- **Introduction:**
  - **Migratory species** are those animals that move from one habitat to another during different times of the year, due to various factors such as food, sunlight, temperature, climate, etc. The movement between habitats, can sometimes exceed thousands of miles/kilometres for some migratory birds and mammals. A migratory route can involve nesting and requires the availability of habitats before and after each migration.
  - To protect the migratory species throughout their range countries, a **Convention on Conservation of Migratory Species (CMS)**, has been in force, under the aegis of United Nations Environment Programme.
    - » Also referred to as the **Bonn Convention**, it provides a global platform for the conservation and sustainable use of migratory animals and their habitats and brings together the States through which migratory animals pass, the Range States, and lays the legal foundation for internationally coordinated conservation measures throughout a migratory range.
  - It is only global convention specializing in the conservation of migratory species, their habitat and migration routes.
- **Appendix I and Appendix 2**
  - **Migratory species threatened with extinction** are listed on **Appendix I** of the Convention.
    - » CMS Parties strive towards strictly protecting these animals, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them.
    - » Besides establishing obligations for each State joining the Convention, CMS promotes concerted action among the Range States of many of these species.
  - Migratory species that need or would significantly benefit from international co-operation are listed in **Appendix II** of the Convention.
    - » For this reason, the Convention encourages the Range States to conclude global or regional agreements.
- **Members**
  - Currently there are 132 members to the convention.
  - **India** has been party to the CMS since **1983**.
- **COP** is the decision making body of CMS.
- **Key Highlights: 13th COP Summit, Gandhinagar Gujarat**
  - i. **Gandhinagar Declaration** sends strong message on importance of migratory species for new global biodiversity strategy.

- iii. **The First Ever Report on the Status of Migratory Species**, presented to CMS COP13, shows that despite some success stories, the **populations of most migratory species covered by CMS are declining.**
  - iv. **Great Indian Bustard, Asian Elephant, and Bengal Florican** have been classified as "Endangered Migratory Species" ( Appendix 1 ) by CMS as per Indian proposal.
  - v. **Animal Culture Linked to Conservation for the first time at UN Wildlife Conference in India**
  - vi. **Seven Migratory Species Champions** were recognized during the conference.
    - Under the Champion program, Germany, India, Italy, Monaco, Norway, the European Commission, and the Environmental Agency - Abu Dhabi were acknowledged for their **generous contributions to the CMS initiatives.**
- **India also has non-legally binding MoUs with CMS** on the conservation and management of **Siberian Crane** (1998), **Marine Turtles** (2007), **Dugongs** (2008) and **Raptors** (2016).
  - India is temporary home to **several migratory animals and birds**. The important among these include Amur Falcons, Bar headed Geese, Black necked cranes, Marine turtles, Dugongs, Humpbacked Whales, etc.

## 8. TRAFFIC

- **TRAFFIC** is a wildlife **trade monitoring network**. Its **mission** is to ensure that **trade in wild plant and animals is not a threat to the conservation of nature**. It plays a pivotal role in **tackling illegal wildlife trade** through research and analysis, advocacy, and awareness work and by supporting remedial action against illegal wildlife trade.
  - It **specializes** in **investigating and analyzing wildlife trade trends, impacts and drivers; informing and supporting governments** to enforce effective policies and laws; **advising private sector** on mechanism for sustainable sourcing of wildlife etc.
- It was established **in 1976 as a strategic alliance of IUCN and WWF.**
- **TRAFFIC and CITES**
  - **One of the TRAFFIC priorities** is to **promote international cooperation to address wildlife trade issues, with particular emphasis on CITES.**
  - It provides **information and assistance** to help the **decision making process of CITES**, supporting efforts to ensure that international wildlife trade is at sustainable levels and doesn't pose a threat to the conservation of species.
  - In 1999, **CITES and TRAFFIC** signed an MoU to undertake **joint activities for capacity building.**

## 9. BIRDLIFE INTERNATIONAL

- It is a **global partnership of conservation organizations (NGOs)** which work towards **conservation of birds, their habitats, and global biodiversity.**
  - Its priorities include **preventing extinction of bird species, identifying, and safeguarding important sites of birds**, maintaining, and restoring key bird habitats, and empowering conservationists worldwide.
- It is the **world's largest partnership** of conservation organizations, with over **121 NGO partner organizations.**
  - For e.g., in India, the partner organization is **Bombay Natural History Society (BNHS)**

- Birdlife International has so far identified more than 7,500 important bird areas.

## 10. IMPORTANT BIRD AND BIODIVERSITY AREAS (IBAS)

### - Introduction

- An Important Bird and Biodiversity Area (IBA) is an area identified using an internationally agreed set of criteria as being globally important for the conservation of bird population. The program was developed and sites are identified by Bird Life International.
- Since the late 1970s, the **Bird Life Partnership** has been working collectively to identify, document and protect all places on earth of greatest significance for the conservation of the world's birds.
- As a result, over 13,000 Important Bird and Biodiversity Areas (IBAs) have been identified. All of these sites are also (Key Biodiversity Areas) KBAs for birds at the global or regional level.

### - Significance

- IBA recognition enhance the conservation attention of the bird species of the region.
- Some of the region also get statutory protection.

### - Criteria to be identified as IBAs

#### i. Globally Threatened Species

- The site qualifies if it is known, estimated, or thought to hold a population of a species categorized by the IUCN Red List as Critically Endangered, or Endangered or Vulnerable.
  - Presence of CR or EN -> sufficient for qualification
  - Presence of Vul -> presence of more than a threshold is necessary to trigger selection.

#### ii. Restricted Range Species

- The sites form one of a set selected to ensure that all restricted-range species of an Endemic Bird Area (EBA) or a Secondary Bird Area (SA) are present in significant numbers in at least one site and preferably more.

#### iii. Biome Restricted Species

#### iv. Congregations

### - How do Birdlife International work to protect these habitats?

- Each of the **Birdlife Partners** has responsibility for their national network of Important Bird & Biodiversity Areas (IBAs).
- The Birdlife Secretariat takes the lead on all international aspects as well as in some priority countries where BirdLife is not present and in the High Seas

### - Other Important sub-programs

#### ▫ IBAs in Danger

- These are IBAs under threat from damaging development - the majority of which appears to be poorly planned and doesn't take environmental values into account.
- The IBAs in Danger initiative provides an essential focus for governments, development agencies, the international environmental and conservation conventions, business and

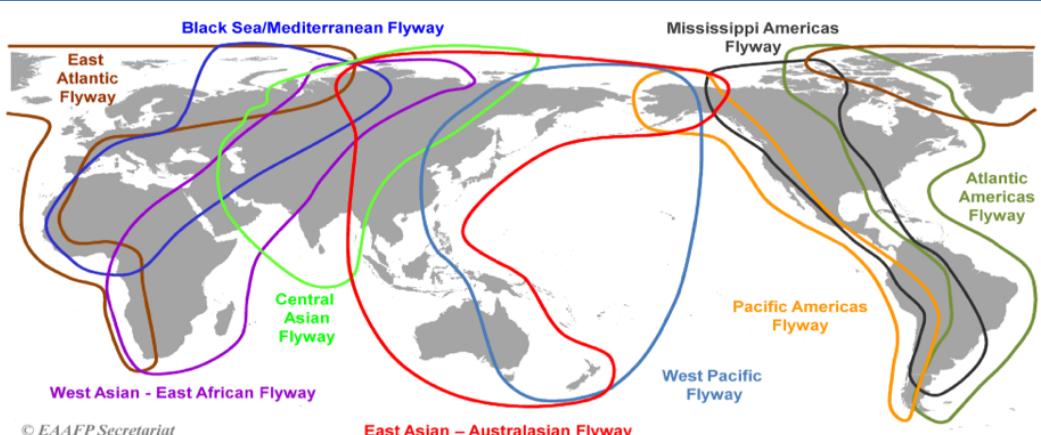
wider civil society to act to prevent the further damage or loss of the sites crucial to the survival of the world's birds.

## 11. MIGRATORY BIRDS AND FLYWAYS

- Bird migration is one of the great wonders of the natural world. A huge variety of birds, millions of them, make the journey: the tiny Rufous

### Hummingbird

migrates up and down the North



American continent, while the Arctic Tern, BirdLife's emblem, migrates from pole to pole. In fact, roughly one in five bird species migrate.

- **Flyways**

- Flyways are **migratory path taken by birds every year between their summer breeding grounds and their wintering grounds**.
- While taking the migratory routes, **birds don't change path at random**. They follow set routes which **include habitats where they can rest and refuel along the way**.
- Many different **species share broadly similar routes**, which have **been loosely split into 9** (some sources mention 8) **major flyways**. They are like **bird super-highways across the sky**.

- **Flyways and India**

- **Major Bird Flyway Network through India**
  - » **370 species of birds visit India through three flyways:**
    - Central Asian Flyway (CAF)
    - East Asian - Australasian Flyway
    - Asian - East African Flyway
  - » **Over 80% of migratory birds through India comes through CAF** among which 87 species are of high conservation concern including two critically endangered, five endangered and 13 vulnerable species.
- **India has also launched the National Action Plan for conservation of migratory species under the Central Asian Flyway.**

- **Birdlife International's Flyway Program** focuses on **protecting birds across all major flyways**.

- Key aims of the BI's Flyway Program:
  - » **Save the threatened migratory species from extinction** by addressing main threats and conserve key sites and habitats which will be beneficial to a wider set of migratory species.
  - » **Address landscape-scale barriers** especially **illegal and unsustainable killings of birds** and **proliferation of poorly planned energy and power transmission infrastructure**.

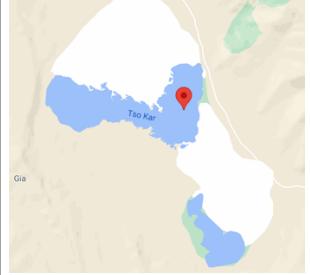
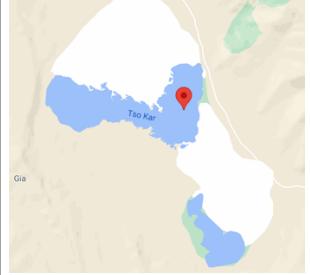
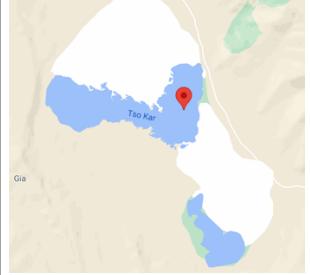
- » **Conserve network of critical stopover sites** through action on the ground by BI's local conservation groups.
- » **Strengthen local and national capacity** in the stop-over sites by strengthening the collaboration between BirdLife Partners.

## 12. RAMSAR CONVENTION ON WETLANDS

- **What is a Wetland?**
  - A Wetland is a **transitional land between terrestrial and aquatic ecosystem**. It is an ecosystem that is flooded either permanently or seasonally.
    - **UN Ramsar Convention** defines wetlands as '*areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh brackish or salt, including areas of marine water the depth of which at low tide doesn't exceed six meters*'.
- **Significance of Wetlands:** Wetlands provide a wide range of important resources and ecosystem services such as:
  - **Food:** Rice cultivation, fishery etc.
  - **Water storage and ground water recharge**
  - **Water purification, flood moderation and erosion control**
  - **Climate regulation**
  - **Tourism** is another area where Wetlands such as large lakes have played crucial role.
  - **Biodiversity** -> wetlands are transition zones between two different ecosystems and thus are highly productive.
  - **Coastal Protection** is ensured by Wetlands as they act as buffer zones.
- **Ramsar Convention**
  - **Introduction**
    - The **Convention on Wetlands of International Importance, called the Ramsar Convention**, is the intergovernmental treaty that provides the framework for the **conservation** and **wise use** of wetlands and their resources. It is the only global treaty that focuses on a single ecosystem (Wetlands).
    - The convention was adopted in the Iranian city of Ramsar in 1971 and came into force in 1975. Since then almost 90% of UN member states, from all the world's geographic regions, have accepted and become contracting parties.
    - **Headquartered** in Geneva
  - **The aim** of the Ramsar list is "to develop and maintain an international network of wetlands which are important for the conservation of global biological diversity and for sustaining human life through the maintenance of their ecosystem components, processes and benefits".
  - **Concept of 'Wise use'** is at the centre of Ramsar Convention.
    - Through this, the convention continues to emphasize that **human use on sustainable basis is entirely compatible with Ramsar principles and wetland conservation in general**. Application of "wise use" concept is crucial to ensure that wetlands continue to support biological diversity as well as human well-being.

- The wise use guidelines emphasize on:
  1. Adoption of national wetland policies, involving review of local legislation and institutional arrangements to deal with wetland matters.
  2. Development of programs of wetland inventory, monitoring, research, training, education etc.
  3. Take action at wetland sites, involving the development of integrated management plans covering every aspect of the wetlands and their relationships.
- The concept applies to all wetlands and water resources in contracting parties territories (not just to Wetlands of International Importance)

## 1) LIST OF RAMSAR SITES IN INDIA: WETLANDS OF INTERNATIONAL IMPORTANCE

#	Name of the Site	State	Other Speciality				
1	Tso Kar Wetland Complex	Ladakh	<p>Tso Kar Wetland Complex was included in the Ramsar list in Dec 2020.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; padding: 5px;">Location</th> <th style="text-align: center; padding: 5px;">Two Lakes</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; padding: 10px;">  </td><td style="text-align: center; padding: 10px;">  </td></tr> </tbody> </table> <p>The complex is a notable example of two connected lakes, the freshwater Startsapuk Tso &amp; the hypersaline Tso Kar. They are situated in Changthang region of Ladakh.</p> <p>Tso Kar means white lake, because of the white salt efflorescence found on the margins due to the evaporation of highly saline water.</p> <p>The Tso Kar Basin is also an A1 category Important Bird Area (IBA) as per Bird Life International and a key staging site in the Central Asian Flyway.</p> <p>The site is also amongst the most important breeding areas of the Black-necked Crane (<i>Grus nigricollis</i>) in India.</p>	Location	Two Lakes		
Location	Two Lakes						
							

			This IBA is also the <u>major breeding area of Great Crested Grebe</u> ( <u><i>Podiceps cristatus</i></u> ), <u>Bar-headed Geese</u> ( <u><i>Anser indicus</i></u> ), Ruddy Shelduck, Brown headed Gull, Lesser Sand-Plover, and many other species.
<b>2</b>	Tso Moriri Lake	Ladakh	
<b>3</b>	Wular Lake	J&K	
<b>4</b>	Surinsar-Mansar Lakes	J&K	
<b>5</b>	Hokera Wetland	J&K	
<b>6</b>	Hygam Wetland Conservation Reserve	J&K	<p>It falls <u>within Jhelum River Basin</u> and plays an <u>significant role as a flood absorption basin, biodiversity conservation site, eco tourism site, and livelihood security of the local community.</u></p> <p>It is located in the <u>Baramulla district</u>. It serves as an <u>abode to many residents and migratory bird species</u>. It is also <u>recognized as an IBA</u>.</p> <p><b>High rate of siltation</b> is leading to <u>wetland characteristics being changed to landmass in several areas</u>.</p>
<b>7</b>	Shallbugh Wetland Conservation Reserve	J&K	It is located in <u>Srinagar district</u> . It is an abode to <u>more than 4 lakh resident and migratory birds of at least 21 species</u> .
<b>8</b>	Harike Lake	Punjab	
<b>9</b>	Kanjli Lake	Punjab	
<b>10</b>	Ropar Lake	Punjab	
<b>11</b>	<b>Keshopur-Miani Community Reserve</b>	<b>Punjab</b>	
<b>12</b>	<b>Beas Conservation Reserve</b>	<b>Punjab</b>	
<b>13</b>	<b>Nangal WIS</b>	<b>Punjab</b>	
<b>14</b>	Chandertal Wetland	Himachal Pradesh	
<b>15</b>	Pong Dam Lake	Himachal Pradesh	
<b>16</b>	Renuka Wetland	Himachal Pradesh	<b>Smallest of all Ramsar site in India.</b>

17	Asan Conservation Reserve	UK	Became Ramsar Site in Oct 2020 It is a <u>444 hectare stretch of the Asan river</u> running down to its confluence with <u>Yamuna river</u> in <u>Dehradun</u> district of UK. The river was <u>dammed by the Asan Barrage</u> in 1967 and it resulted in <u>siltation above the dam wall</u> which created <u>suitable habitat for birds</u> . This supports, <u>330 species of birds</u> including the critically endangered vultures - (red headed vulture and white-rumped vulture) and <u>Baer's Pochard</u> . It is also a <u>significant ground for migratory birds</u> . It is strategically located <u>within the Central Asian Flyways</u> .  This was <u>declared conservation reserve</u> in 2005 under <u>Section 36A of Wildlife Protection Act, 1972</u> .
18	Sultanpur	Haryana	<u>Sultanpur National Park from Haryana</u> supports more than <u>220 species</u> of resident, winter migratory and local migratory waterbirds at critical stages of their life cycles. More than ten of these are globally threatened, including the <u>critically endangered sociable lapwing</u> , and the <u>endangered Egyptian Vulture, Saker Falcon, Pallas's Fish Eagle and Black-bellied Tern</u>
19	Bhindwas	Haryana	Bhindwas Wildlife Sanctuary, <u>the largest wetland in Haryana</u> is a human-made freshwater wetland. Over 250 bird species use the sanctuary throughout the year as a resting and roosting site. The site supports more than ten globally threatened species including the endangered Egyptian Vulture, Steppe Eagle, Pallas's Fish Eagle, and Black-bellied Tern.
20	Keoldeo Ghana NP	Rajasthan	
21	Sambhar Lake	Rajasthan	
22	Upper Ganga River (Brijghat to Narora Stretch)	Uttar Pradesh	
23	Nawab Ganj	Uttar Pradesh	
24	Parvati Agra	Uttar Pradesh	
25	Saman	Uttar Pradesh	
26	Samaspur	Uttar Pradesh	
27	Sandi	Uttar Pradesh	
28	Sarsai	Uttar Pradesh	

29	Sur Sarovar Lake (Keetham lake), Agra	Uttar Pradesh	<p>It is a <u>human made lake</u> that was created to <u>supply water to the city of Agra</u>. The wetland soon became an <u>important and rich ecosystem</u>. It now provides <u>refuge to resident and migratory birds</u>, and more than <u>60 species of fish</u>. It is located on <u>Delhi-Mathura Highway</u> in Agra district.</p> <p>It was <u>declared a bird sanctuary in 1991</u>.</p> <p>It is also listed as an <u>Important Bird Area</u>.</p> <p>Sur Sarovar also has the <u>biggest Bear Rescue Center</u> for rescued dancing bears.</p>
30	Bakhira WLS	Uttar Pradesh	
31	Haiderpur Wetland	Uttar Pradesh	<p>Haiderpur is one of the <u>largest human-made wetlands</u> that was <u>formed in 1984</u> after the construction of <u>Madhya Ganga Barrage</u> at the <u>confluence of Saloni and Ganga rivers</u>. It is a part of <u>Hastinapur WLS</u>.</p> <p>It covers an <u>area of 6,908 hectares</u> and is <u>situated on the Muzaffarnagar-Bijnor border</u>.</p> <p><b>Significance:</b> <b>Source of fresh water and ground water recharge</b> <b>Biodiversity Protection:</b> It hosts, <u>more than 30 species of plants</u>, <u>over 300 species of birds</u> including <u>102 waterbirds</u> and <u>more than 40 fish and 10 mammals species</u>. It has <u>CR Gharials</u>; <u>EN Hog Deer</u>, <u>Swamp Deer</u>, <u>Black bellied Tern</u>, <u>Steppe Eagle</u>, etc.</p>
32	Kebartal Wetland (Kanwar Lake)	Bihar	<p><b>Kabartal (Kanwar Jheel ) Wetland, Bihar</b> Became Ramsar site in Oct 2020</p> <p>This is <u>Bihar's first Ramsar site</u>. It is located in Bihar's Begusarai district. It covers <u>2,620 hectares</u> of the Indo-Genetic plains in Northern Bihar. It is a <u>residual oxbow lake</u>, formed during the <u>meandering of Gandak river</u>, a tributary of Ganga in the geological past.</p> <p>It is an <u>important stopover along the Central Asian Flyway</u>, with <u>58 bird species</u> using it to rest and refuel.</p> <p>Some <u>critically endangered birds</u> of the site include <u>red-headed vulture</u>, <u>white rumped vulture</u>, <u>Indian Vulture</u>, <u>Baer's pochard</u>, and the <u>Sociable Lapwing</u>.</p> <p><b>Note:</b> Kabartal is <b>Asia's largest freshwater oxbow lake</b></p>

33	Deepor Beel	Assam	<p>It is a <u>lake located to the South West of Guwahati city</u> in Assam. It is a <u>permanent freshwater lake</u>, in a <u>former channel of Brahmaputra river</u>, to the south of the main river.</p> <p>It is also an <u>Important Bird Area</u>. It is <u>the only Ramsar site of Assam</u>.</p>  <p>The Deepor Bil WLS measures <u>4.1 sq km</u> within this wetland</p>
34	Loktak Lake	Manipur	
35	Pala Wetland	Mizoram	
36	Rudrasagar Lake	Tripura	
37	Nalsarovar Sanctuary	Bird	Gujarat
38	Thol Lake	Gujarat	Thol Lake Wildlife Sanctuary from Gujarat lies on the Central Asian Flyway and more than 320 bird species can be found here. The wetland supports more than 30 threatened waterbird species, such as the critically endangered White-rumped Vulture and Sociable Lapwing, and the vulnerable Sarus Crane, Common Pochard and Lesser White-fronted Goose
39	Wadhwan Lake	Gujarat	Wadhvana Wetland from Gujarat is internationally important for its birdlife as it provides wintering ground to migratory waterbirds, including over 80 species that migrate on the Central Asian Flyway. They include some threatened or near-threatened species such as the endangered Pallas's fish-Eagle, the vulnerable Common Pochard, and the near-threatened Dalmatian Pelican, Grey-headed Fish-eagle and Ferruginous Duck
40	Khijadia WLS	Gujarat	
41	Bhoj Wetlands	Madhya Pradesh	

42	Sakhya Sagar	Madhya Pradesh	
43	Sirpur Sagar	Madhya Pradesh	
44	Yashwant Sagar	Madhya Pradesh	<p>It is <u>one of the two Important Bird Areas (IBA) in the Indore region</u> as well as one of the <u>most important birding sites in Malwa region of Madhya Pradesh</u>.</p> <p>Presently it is being used for <u>water supply</u> to the city of Indore and is being also used for <u>fish culture on a commercial basis</u>.</p>
45	<b>Sundarban Wetlands</b>	West Bengal	<p><b>Largest Ramsar site in India Sundarbans</b></p> <ul style="list-style-type: none"> <li>It comprises of <u>hundreds of islands</u> and a <u>network of rivers, tributaries and creeks</u> in the <b>delta of the Ganga and the Brahmaputra</b> at the mouth of Bay of Bengal in India and Bangladesh.</li> <li><b>Indian Sundarban</b> consists of <b>60% of the country's total mangrove forest area</b>.</li> </ul> <p><b>Sundarbans Reserve Forest (SRF)</b></p> <ul style="list-style-type: none"> <li>It is the <u>largest mangrove</u> in the world and is now a wetland of international importance. So, it has now become the <b>largest protected wetland (4,23,000 hectare)</b> in the country.</li> </ul>
46	East Wetlands	Calcutta WB	<p>It comprises of <u>a larger number of waterbodies distributed east of city of Kolkata</u> across the districts of South and North 24 Parganas. It is spread <u>over 125 km<sup>2</sup></u>.</p> <p>Along with the wetlands, it also <u>has 254 sewage-fed fisheries</u>, agricultural and solid waste farms and some built up areas.</p> <p>It was included in <b>the Ramasar List</b> in Aug 2002.</p> <p>The hydrology of this wetland is unique. It <b>doesn't have a catchment area of its own</b>. <u>Approximately 250 million gallons of sewage flows into it everyday</u>.</p> <ul style="list-style-type: none"> <li>The sewage is then <u>drawn by the local fishery owners</u> into fish ponds or <b>bheris</b> directly from the tributary wastewater canals. .</li> </ul>

			<ul style="list-style-type: none"> <li>• Sunlight is enough to <u>promote high growth of dense plankton and algae</u> which serves as food for the fish population which thrive on the nutrient rich plankton.</li> <li>• Organic pollution in the wastewater is <u>thus reduced by 80% and the coliform bacteria in the wastewater is reduced by 99.9 %</u> in these ponds.</li> </ul> <p>The <b>Kolkata Municipal Corporation</b> saves <u>Rs 5,000 - 7,000 crores every year</u> - the cost of sewage treatment plant for treating so much water.</p> <ul style="list-style-type: none"> <li>• <u>Channels drain out the effluents and slurry from the treated wastewater</u>, that is then used <u>to grow rice and vegetables</u>.</li> <li>• <u>Around 25% of Kolkata's fish and vegetables are grown with the help of this water</u>. This wetland thus support livelihood of more than a lakh population.</li> </ul> <p>It acts <b>as kidney of Kolkata</b> as <u>the wastewater from the city</u> is converted into food and used in fisheries and agriculture across this wetland.</p> <p><b>Bheris</b> are a unique feature of the Kolkata wetlands, and are shallow fishponds fed by naturally treated wastewater rich in algae, which allows for low-cost fish cultivation.</p> <p><b>Safety of Fish/Vegetables:</b> Some experts have raised the issue of <u>heavy metal contamination</u> from this kind of fishery and vegetable cultivation.</p>
47	Bhitarkanika Mangroves	Odisha	<p>Bhitarkanika is also the <u>second largest mangrove ecosystem</u> in the country (after Sundarbans).</p> <ul style="list-style-type: none"> <li>• Freshwater mixed with seawater near the lower end of the <u>Brahmani and Kharasota river</u> to produce brackish water ideal for mangroves.</li> </ul> <p><b>Key threats:</b></p> <ul style="list-style-type: none"> <li>• <b>Diversion of water from Brahmani river basin:</b> The Talcher-Angul coal mines, steel and power generating units as well as the Kalinga Steel and power hub in Jajpur district were <u>drawing enormous quantities of freshwater from the Brahmani river</u>.</li> </ul>
48	Chilka Lake	Odisha	
49	Satkosia Gorge	Odisha	

50	Tampara Lake	Odisha	<p>It is the <u>most prominent fresh water Lake</u> situated in the state of Odisha (Ganjam district). <u>The depression in the ground gradually filled with rainwater from catchment flow and was called "Tamp"</u> by the British and subsequently termed "<b>Tampara</b>" by the locals. It supports varied biodiversity including that of birds, fishes, phytoplanktons, and more than seven species of terrestrial plants and macrophytes. It is important habitat for <u>vulnerable species</u> such as <u><i>Cyprinus carpio</i></u>, <u>common pochard</u> (<i>Aythya ferina</i>), and river tern (<i>Sterna aurantia</i>).</p> <p>With large fish yield, it is an <u>important source of livelihood for the local communities</u>.</p>
51	Hirakud Reservoir	Odisha	<p>It is the <u>largest earthen dam</u> in Odisha which <u>started operating in 1957</u>.</p>
52	Ansupa Lake	Odisha	<p>It is the <u>largest freshwater lake of Odisha</u> situated in the <u>Banki</u> sub-division of Cuttack district and has its fame from time immemorial for its scenic beauty.</p> <p>It is an <u>oxbow lake</u> formed by <u>River Mahanadi</u> and is spread over 231 ha. It is home to several species of birds, fishes, mammals and macrophytes. It provides a safe habitat for <u>at least three threatened bird species</u> - <u><i>Rynchops albicollis</i> (EN)</u>, <u><i>Sterna acuticauda</i> (EN)</u> and <u><i>Sterna aurantia</i></u> and <u>three threatened fish species</u> - <u><i>Clarias magur</i> (Clariidae) (EN)</u>, <u><i>Cyprinus carpio</i> (Cyprinidae) (VU)</u>, and <u><i>Wallago attu</i> (VU)</u>.</p> <p>The lake also <u>sustains fresh water demand of the surrounding area</u> and supports <u>livelihood of local communities through fisheries and agriculture</u>.</p> <p>It is a <u>famous wintering ground for migratory birds</u> and is also <u>known for its scenic beauty</u>.</p>
53	Nandur Madhameshwar	MHA	
54	Lonar Lake	MHA	<p>It is an <u>ancient circular crater lake</u> created by <u>Meteorite strike</u> in Maharashtra</p> <p>It got <u>National geo-heritage tag in 1979</u>.</p> <p>It is <u>relatively young geo-logically</u>, just about 50,000 years <u>old</u>.</p> <p>A meteorite <u>estimated to weigh two-million-tonnes slammed into the Earth</u>, creating a 1.83-km diameter crater where the lake formed. It is distinguished by a <u>near-perfect</u>,</p>

			<p><u>circular ejecta blanket</u>, which refers to earth thrown up during the collision, around it.</p> <p>It is an <u>endorheic</u> (i.e., no outflow) basin, almost circular in shape.</p> <p>The lake is <u>high in salinity and alkalinity</u>, as the lack of outflow leads to a concentration of minerals as the lake water evaporates.</p> <p><u>Outside the lake</u>, there is a <u>considerable diversity of plant and animal life</u>, as springs which help feed the lake provide a source of fresh water.</p>
55	<b>Thane Creek</b>	Maharashtra	<p>It is located in <u>Maharashtra India</u>. <b>Thane Creek</b> is an <u>inlet in the shoreline of the Arabian Sea</u> that <u>isolates the city of Mumbai from the Konkan region of the Indian Mainland</u>. There are <u>several source of fresh water to the Creek</u>, the <u>largest being the Ulhas River</u>. It has been declared as <u>Thane Creek Flamingo sanctuary</u>.</p> <p>Thane creek is <u>fringed by Mangroves on both banks &amp; comprise around 20% of the total Indian mangrove species</u>.</p> <p>The mangrove serves as a nursery for several fishes &amp; sustains the local fishery. The area is an <u>important part of the wetland complex of the Central Asian Flyway of the birds</u> and has been categorized as IBA.</p> <p><b>Thane Creek Flamingo Sanctuary:</b> The Western bank of the Thane Creek has been declared the "<u>Thane Creek Flamingo Sanctuary</u>".</p> 
56	Kolleru Lake	AP	
57	Nanda Lake	Goa	

58	Ranganathittu Bird Sanctuary	Karnataka	
59	Magadi Kere Conservation Reserve	KAR	Artificial Lake One of the <u>largest nesting ground for bar headed goose</u> in southern India
60	Ankasamudra Bird Conservation Reserve	KAR	Artificial Lake Home to 210 species of plants, 8 species of mammals, 25 species of birds, and 41 species of fish
61	Aghanashini Estuary	KAR	The site is an estuary where the <u>Aghanashini River</u> flows into the <u>Arabian Sea</u> in Karnataka state. It addition to its <u>estuarine and shallow marine waters</u> , it features <u>rocky and pebble shores</u> , intertidal mudflats and some aquaculture ponds and rice fields. These diverse environments provide <u>habitat to more than 80 fish, 115 birds</u> and 45 mangroves species.
62	Karaivetti Bird Sanctuary	TN	It is <u>one of the most important fresh water feeding grounds for migratory water birds</u> in the state of TN. It is also an important nesting site for threatened species like the <u>spotted eagle</u> and the <u>tawny eagle</u> .
63	Longwood Shola Reserve Forest	TN	It is among the <u>last vestiges of urban shola forest</u> , where everything <u>else has been lost to tea cultivation</u> and other land use changes.
64	Point Calimere	TN	
65	Karikili Bird Sanctuary	TN	
66	Pallikaranai Marsh Reserve Forest	TN	
67	Pichavaram Mangrove	TN	
68	Gulf of Mannar Marine Biosphere Reserve	TN	
69	Konthankulam Bird Sanctuary	TN	
70	Udhayamarthandapuram Bird Sanctuary	TN	
71	Vedanthangal Bird Sanctuary	TN	

72	Vellode Sanctuary	Bird	TN	
73	Vembannur Wetland Complex		TN	
75	Chitrangudi Sanctuary	Bird	TN	<p>Chitrangudi Bird Sanctuary, locally known as "Chitrangudi Kanmoli" is located in <u>Ramnathapuram district of TN</u>. Notable waterbirds spotted from the site are <u>spot billed Pelican</u>, <u>little egret</u>, <u>grey heron</u>, <u>large egret</u>, <u>Open billed stork</u>, <u>Purple</u>, and <u>pond herons</u>.</p>
75	Suchindram Theroor Wetland Complex		TN	<p>It is part of the <u>Suchindram-Theroor Manakudi Conservation Reserve</u>. It is an <u>important bird area</u> and <u>lies at the southern tip of the Central Asian Flyway</u> of migratory birds.</p> <p>It was <u>formed for birds' nesting purposes</u> and it attracts <u>thousands of birds</u> every year.</p>
76	Vaduvur Sanctuary	Bird	TN	<p>It is a <u>large human made irrigation tank</u> and <u>shelter for migratory birds</u> as it <u>provides a suitable environment for food, shelter, and breeding ground</u>.</p> <p>While these irrigation tanks have <u>socio-economic and cultural significance</u>, very little is known of their ecological importance.</p> <p>These tanks have the potential to harbor good populations of resident and wintering water birds but no studies have been done to confirm this.</p>
77	Kanjirankulam Sanctuary	Bird	TN	<p>It is a protected area <u>near Mudukulathur Ramanathapuram District, TN</u>. It is <u>notable nesting site for several migratory heron species</u> that roost in the prominent growth of babul trees here.</p> <p>The breeding population of migratory waterbirds arrive here between October and February and include: Painted stork, white ibis, black ibis, little egret, great egret.</p>
78	Ashtamudi Lake		Kerala	
79	Sashthamkotta Lake		Kerala	
80	Vembanad Wetland	Kol	Kerala	

- **Note1:** Globally, there are around 2500 wetlands in Ramsar list. India with 80 Ramsar Sites have the highest number of wetlands in South Asia.

## 2) HOW A SITE IS DESIGNATED AS RAMSAR SITE

- According to Ramsar convention "**Each contracting party shall designate** suitable wetlands within its territory for inclusion in a List of Wetlands of International Importance".
- The wetlands are selected on account of their international significance in terms of ecology, botany, zoology, limnology, or hydrology. Accordingly any wetland which meets **at least one of the criterion of identifying Wetlands of International Importance (9 criteria)** can be designated by the appropriate national authority to be added in the Ramsar list.
- The **Ramsar secretariat ensures that data and map meet the standards set by the Conference of parties**, before publishing the information on the site of the **Ramsar Sites Information System**.
- The **nine criteria for identifying Wetlands of International Importance**:
- **Group A of the Criteria:** Sites containing representative, rare or unique wetland types
  - **Criterion 1:**
    - A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.
- **Group B of the Criteria.** Sites of international importance for **conserving biological diversity Criteria based on species and ecological communities**
  - **Criterion 2:** It supports vulnerable, endangered, or critically endangered species or threatened ecological communities.
  - **Criterion 3:** It supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.
  - **Criterion 4:** It supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.
- **Specific criteria based on water birds**
  - **Criterion 5:** It regularly supports 20,000 or more water birds.
  - **Criterion 6:** It regularly supports 1% of the individuals in a population of one species or subspecies of water bird.
- **Specific criteria based on fish**
  - **Criterion 7:** It supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.
  - **Criterion 8:** It is an **important source of food for fishes, spawning ground, nursery and/or migration path** on which fish stocks, either within the wetland or elsewhere, depend.
- **Specific criteria based on other taxa**

- Criterion 9: It regularly supports 1% of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species

### 3) MONTREUX RECORD

- It is the principle tool of the Ramsar Convention for highlighting those sites, where an adverse change in ecological character:
  - Has occurred
  - Is occurring
  - Is likely to occur as the result of technological developments, pollution or other human interference and which are therefore, in need of priority conservation attention.
- If such changes are brought to the notice of the Convention Secretariat (by Government or by NGOs), the site is then placed under Montreux Record.
  - This is a **means to drawing attention** to such sites, and it is subject to continuous review.
  - Convention Secretariat, will help the country in taking conservation measures, and if they succeed, the site may be removed from the Montreux Record after a review, and at the request of the country.
- **Indian Ramsar Sites in Montreux Record:**
  - Keoladeo National Park
  - Loktak Lake
    - Chilka lake was once placed on the record. Later, when conservation measures were implemented and succeeded, it was removed from the record.

### 4) THREATS FACED BY WETLANDS IN INDIA

- **Water Pollution**
- **Noise Pollution** caused by rapid urbanization around the wetlands continues to be an irritant and is putting migratory visitors away.
- **Dumping of Wastes** (Municipal solid waste, construct waste) etc is leading to loss of Wetlands.
- **Very less focus** on small non-notified wetlands.
  - Absence of any inventory related to wetlands.
- **Lack of resources with local bodies** to ensure proper care and protection of the wetlands.

### 5) WORLD WETLAND DAY: 2<sup>ND</sup> FEBRUARY

- World wetland day is celebrated every year on 2nd February. The date marks the day of adoption of Ramsar Convention on Wetlands on 2nd February 1971, in the Iranian city of Ramsar on the shores of the Caspian sea.
- **Theme for 2023:** "Wetland Restoration"
  - It highlights the urgent need to prioritize wetland restoration.
- **Why Wetland is significant for Biodiversity?**

- It is stressed by the recently released global **IPBES assessment** which identifies wetlands as the most threatened ecosystem. This impacts **40% of the world's plants and animals** that live or breed on wetlands.

## 6) WETLAND (CONSERVATION AND MANAGEMENT) RULES, 2017

- It was notified by MoEF&CC replacing the 2010 rules.
- **Key Highlights**
  - **Decentralization** -> empowers states and Uts to identify and manage their wetlands.
  - **State Wetland authorities** to be established in each state and UT
    - Headed by State environment minister.
  - **National Wetland Committee:** It will replace Central wetland regulatory authority and will be responsible for monitoring the implementation of these rules
    - Headed by Secretary, MoEF&CC.
    - It will also advise the central government on appropriate policies and action programmes.
  - **Banned activities** like dumping solid waste, electronic etc.
  - **Applicability**
    - Wetland classified under RAMSAR
    - Wetland notified by Central, state or UTs.

## 13. WORLD WILDLIFE DAY: 3<sup>RD</sup> MARCH

- It is celebrated on 3rd March
- **UNGA** in 2013 had passed a resolution for choosing 3rd of March as the WWD. This day was chosen as on March 3, 1973, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was adopted.

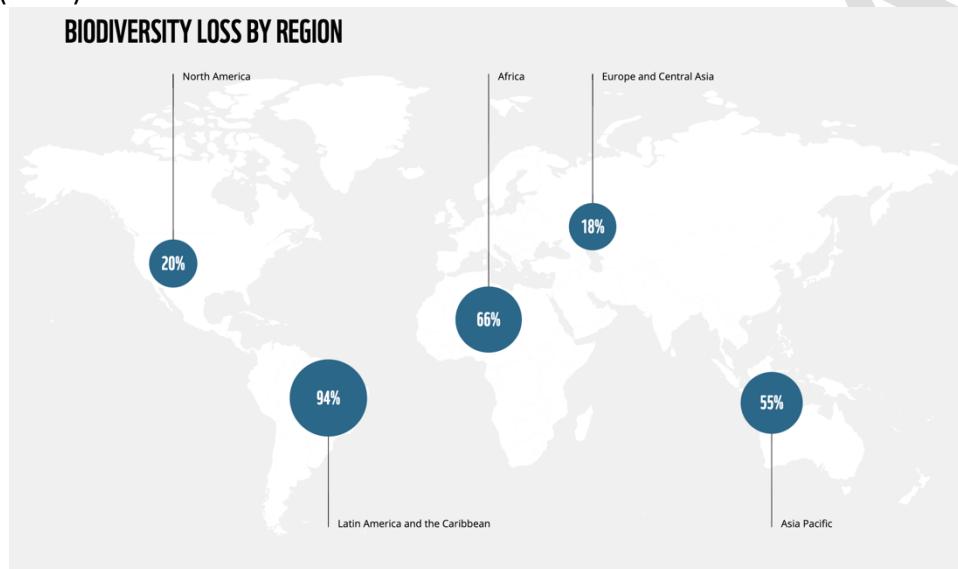
## 14. WORLD WILDLIFE FUND FOR NATURE (WWF)

### 1) ABOUT WWF

- The World Wildlife Fund for Nature is an international NGO founded in 1961, working in the field of wilderness preservation, and the reduction of human impact on the environment.
- It is considered the world's largest privately financed conservation organization, with over 5 million supporters worldwide working in more than 100 countries and on more than 3,000 projects.
- **Important Reports:** The Living Planet Report has been published every two years since 1998
- **Important Campaigns by WWF**
  - **Earth Hour** - Encourages everyone to switch off non-essential electric lights, for one hour, from 8:30 - 9:30, on a specific day towards the end of March.
    - Earth hour 2020 was held on 28th March.
  - **Debt for Nature Swaps** are financial transactions in which a portion of a developing countries foreign debt is forgiven in exchange for local investments in environmental conservation measures.

## 2) REPORT: LIVING PLANET REPORT

- The Living Planet Report comprehensive study of trends in global biodiversity and the health of the planet.
- A Living Planet Index (LPI), featuring about 32,000 populations of 5,230 species across the world, showed that vertebrates wildlife populations are plummeting at a particularly staggering rate in tropical regions of the world.
- In last 50 years, there has been 69% decline in the wildlife populations of mammals, birds, amphibians, reptiles and fish.
- **Region with highest decline** -> Latin America and the Caribbean region (-94%); followed by Africa (-66%) and Asia Pacific (-55%)



- **Freshwater species** populations has globally reduced by 83%, confirming that the planet is experiencing a "biodiversity and climate crisis."
  - Habitat loss and barriers to migration routes were responsible for about half of the threats to monitored migratory fish species.
- **WWF has identified six key threats to biodiversity:**
  - Agriculture; Hunting; Logging; Pollution; Invasive Species and Climate Change
- **Recommendations/Suggestions:**
  - Biodiversity crisis and Climate Change has to be dealt with together - instead of two different issues, as they are intertwined.

## 15. INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT OF SHIP'S BALLAST WATER AND SEDIMENTS (ALSO KNOWN AS "BALLAST WATER MANAGEMENT CONVENTION")

- Convention was **adopted in Feb 2004 by 74 countries** (now 86 countries are signatories).
  - It **came into force in Sep 2017**.
- It is a maritime treaty which **requires signatory states to ensure** that ships flagged by them comply with standards and procedures for the management and control of ship's ballast water and sediments.
- **Objective**
  - Prevent, minimize, and ultimately eliminate the transfer of harmful aquatic organisms and pathogens through the control, and management of ship's ballast water and sediments.

- **Main Provisions**
  - **General Abilities:** Ships must have facilities to treat the ballast water before releasing it in foreign waters.
  - **Reception Facilities:** Under Article 5 Sediment Reception Facilities Parties undertake to ensure that ports and terminals where cleaning or repair of ballast tanks occurs, have adequate reception facilities for the reception of sediments.
  - **Research and Monitoring**
    - » Article 6 calls for parties individually or jointly to promote and facilitate scientific and technical research on ballast water management; and monitor the effects of ballast water management in waters under their jurisdiction.
- **Note:** India is **not participating** in the convention.

## 16. INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE (ITPGR)

- **Why in news?**
  - India hosted the 9th session of the Governing Body (GB9) of the ITPGR (Sep 2022)
- **Introduction**
  - This is a treaty which is aimed at:
    - » **Conservation and sustainable use of all plant genetic resources for food and agriculture and;**
    - » **The fair and equitable sharing of the benefits** arising out of their use, in harmony with the CBD, for sustaining agriculture and food security.
      - **Recognizing the contribution of farmers** to the diversity of crops that feed the world.
      - Ensuring that the recipients share the benefits they derive from the use of genetic materials with the countries where they have been originated.
    - » Establishing **a global system to provide farmers, plant breeders and scientists with access to plant genetic material.**
- It was adopted by the **31st session of the Conference of Food and Agriculture Organization (FAO) of the UN on Nov 3, 2001.**
- **Main Provisions**
  - 1. Multilateral System**
    - It is the treaty's innovative solution to access benefit sharing.
    - It puts **64 of the world's most important crops** - crops that together account for 80% of the food we derive from plants - into an easily accessible global pool of genetic resources that is freely available to potential users in the Treaty's ratifying nations for some uses.
  - 2. Access and Benefit Sharing**
    - Ratifying nations are provided facilities to access the genetic material for the 64 crops in the Multilateral System for research, breeding and training for food and agriculture.
    - Prevent the recipient of genetic resources from claiming IPR over those resources in the form in which they received them.

- Those who access genetic materials through the multilateral system agree to share the benefits from their use through the benefit sharing mechanisms established by the treaty.

### 3. Farmer's right

- The treaty calls for protecting the traditional knowledge of these farmers, increasing their participation in national decision-making process, and ensuring that they share in the benefits from the use of these resources.

### 4. Sustainable Use

- Most of the world's food comes from four main crops - Rice, Wheat, Maize and Potatoes.
- However, local crops, not among the main four, are a major food source for hundreds of millions of people and has potential to provide nutrition to countless others.
- The treaty helps maximize the use and breeding of all crops and promotes development and maintenance of diverse farming systems.

- The Ninth session of the Governing Body (GB9) of the International Treaty on Plant Genetic Resources of Food and Agriculture (ITPGRFA) was held in New Delhi (Sep 2022)

- Key Highlights:

- In a historical first, Federation of Seed Industry of India (FSII) contributed Rs 20 lakhs (USD 25,000) to the Benefit Sharing Fund (BSF) as the first collective contribution from Indian seed sector, during the GB-9 meeting.
  - The BSF is the funding mechanism of the treaty used for support of capacity building, Conservation and sustainable use projects among the Contracting parties of the Treaty.
- India appointed as the co-chair of the Working Group on "Enhancement of MLS (Multilateral System)"
- Consensus on Implementation of Farmers Rights Reached after extensive negotiation at GB9
- India flags issue regarding genebank funding

## 17. WORLD SEED VAULTS

- Introduction:

- Seed vaults are places where seeds of various plants are stored to ensure protection of genetic resources and diversity.
  - » They are stored at very low temperatures (at around -18 degree C).
  - » Even at this temperature, seeds have a shelf life and thus seed vaults are regularly updated with fresh, viable samples.

- Svalbard's Vaults, at Spitsbergen, Norway

- It stores crop seeds.
- It is built inside a mountain on the remote Arctic Archipelago of Svalbard. It was opened in 2008 with the intention of being politically neutral and safe location to protect the world's crop diversity. It is designed to survive nuclear war and world war.

- Samples sent here are the duplicates from seed and gene banks, research facilities, and communities around the world, ranging from large institutions like ICARDA, to the Cherokee Nation, who in 2020, became the first tribe in the U.S. to send important heirloom seeds to Svalbard.
- During the **Syrian war**, scientists uplicated and safely transported genetic resources from International Center for Agriculture Research in the Dry Areas facility in Tal Hadia.
- **Millennium Seed Bank** at the Royal Botanic Gardens, Kew, UK is the world's largest wild seed conservation project.
  - It has recently completed 20 years of its formation.
  - Its vault has been built to withstand bombs, radiation, and floods. It holds **2.4 billion seeds** from 39,681 species, coming from 190 countries and territories.
  - The facility claims that they have contributed to protecting 16% of the world's seed-bearing plants.
  - **After the recent massive bushfire in Australia**, the seed bank sent backup seeds of **clover glycine (Glycine latrobeana)**, a rare, wild pea, to its partners in Australia so that the plant could be cultivated and used to restore the ecosystem.
- **Other important seed banks**
  - **The Australian Grains Genebank (AGG)**
  - **Vavilov Institute of Plant Industry**, Russia

## 18. ANTARCTIC TREATY SYSTEM

- a. **Antarctic Treaty:**
  - It is a treaty that was negotiated during the middle of the Cold War by 12 countries with Antarctic interests. It acts as a foundation for rule based international order for a continent without a permanent population. It remains the only example of a single treaty that governs a whole continent.
  - It is a **remarkably short treaty** and contains only 14 articles. Key provisions include promotion of Freedom of Scientific Research, the use of continent only for peaceful purposes, and the prohibition of military activities, nuclear tests, and the disposal of radioactive waste.
    - The **most important provision** of the treaty is **Article IV**, which effectively seeks to neutralize territorial sovereignty in Antarctica. This means that a limit was placed on making any new claim or enlargement of an existing claim. Further, **no formal recognition** was given to any of the **seven territorial claims** on the continent, by Argentina, Australia, Chile, France, New Zealand, Norway, and the United Kingdom.
    - **Russia, USA, and China** - who are signatory to the conventions but have not made any formal territorial claims - are also bound by the limitations of Article IV.
  - **How has the treaty expanded for 60 years?**
    - Though the compact was held for 60 years, there have been tensions from time to time. For e.g. between UK and Argentina.
    - A key reason because of which the treaty has survived is that it has kept on evolving through a series of additional conventions and other legal protocols.
      - Various disputes have been addressed through the expansion of the treaty framework with new agreements. This framework is now referred to as the "**Antarctic Treaty System**".

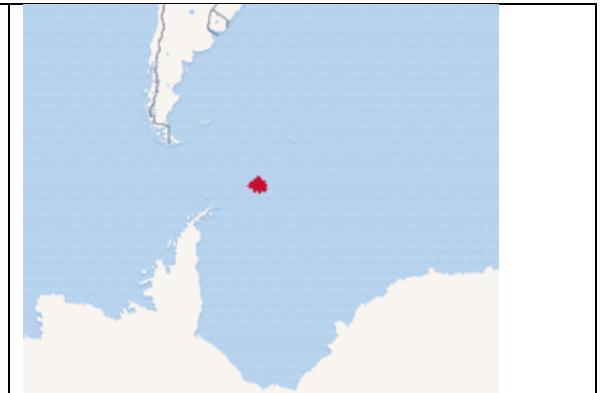
- These measures have been a great success, but tensions have arisen in recent years over the promotion of Southern Ocean Marine Reserves. In 2016, agreement was reached on Ross Sea Marine Protected Area, and momentum is building for a broader network of Southern Ocean Marine Protected Areas. China and Russia have resisted these initiatives.
- By, 2020 the treaty has 54 signatories.
- **Changing Circumstances between 1950s to 2020s**
  - Though the treaty has been successful in responding to various challenges so far, the circumstances are radically different now. Antarctic is much more accessible both due to climate change and technological improvement. More countries now have substantive interest in the region when compared to only 12 in the beginning.

## 19. CONVENTION FOR THE CONSERVATION OF ANTARCTIC MARINE LIVING RESOURCES (CCAMLR)

- **About the CCAMLR**
  - It is part of Antarctic Treaty System. It was entered into force on 7th April 1982 and is headquartered in Hobart City of Tasmania State, Australia.
    - The immediate reason for the convention was the concerns related to increased krill catches in the Southern Ocean which could have had a serious impact on populations of other marine life which are dependent upon krill for food.
  - It is aimed at preserving marine life and the environmental integrity in and near Antarctica. It thus wants to ensure sustainable utilization of resources of Southern Ocean and regulates the use of resources in the region.
  - The commission has 26 members (25 countries + European Union) presently.
  - Note:** India is a member state.
- **Marine Protected Areas**
  - In 2009, the commission by consensus decided to create a network of Marine Protected Areas (MPAs).
    - It was the first international body to do this on the recommendations from the United Nations World Summit on Sustainable Development.
- **Designated or Proposed Marine Protected Areas**

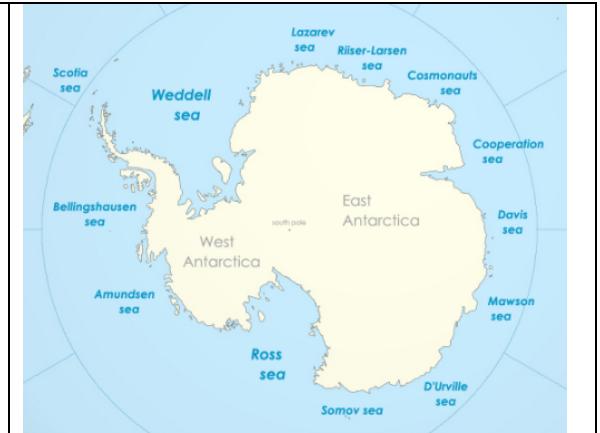
### South Orkneys MPA - Designated

Designated in 2009, around South Orkneys Island in the Southern Ocean



## Ross Sea MPA - Designated

Designated in 2016



- **East Antarctica, Weddell Sea and Antarctic Peninsula** are the three others proposed MPAs yet to be approved by the commission.
- **East Antarctica** (proposed MPA) will protect blocks of oceans and ocean floor along the East Antarctica, an area rich in cold water corals that provide foraging ground for penguins.
  - It has been proposed by Australia, France, and European Union. It will protect one million square kms of ocean but has been repeatedly been struck down at the meetings of CCAMLR since 2010.
  - Members like **China** and **Russia** have opposed it due to economic and political reasons.
  - **All 26 members** must consent for the creation of Marine Park.
  - **What will be the impact of creation of MPA in East Antarctica?**
    - Ban on fishing in a vast area of the Weddell Sea and parts of Antarctic Peninsula. It will lead to safeguarding of species including penguins, killer whales, leopard seals, and blue whales.
    - It would also play an important role in fighting climate change as the seas around Antarctic are very important sink for Carbon dioxide.
- **Weddell Sea** - lies adjacent to Antarctic Peninsula. It made an MVA, it would become the largest nature reserve anywhere in the world.
- **Antarctica Peninsula** (the area to the west of Antarctic Peninsula) is particularly vulnerable to tourism impacts, fishing activities and global warming. About 75% of the Antarctic Krill is located here.
- In Sep 2021, India announced that it is considering to co-sponsor an MPA proposal at the CCAMLR and getting aligned with countries such as Argentina, Brazil, Chile, Korea, New Zealand, South Africa and USA, which are also proactively supporting the MPA proposals.

### A) KRILL FISHERY AND ASSOCIATED ISSUES:

- Krill is the most abundant species in the world, with a biomass of 400 million tons in the Antarctic.
- **Significance:**
  - **Main Source of food for ocean wildlife** including whales, penguins and seals, any disruption to krill populations will ripple across the ecosystem.
  - **Note:** Krill is not a fish, it's a **Crustacean** (a type of arthropod).
- **Fighting Climate Change:** Krill are integral in influencing atmospheric carbon levels, and have the capacity to remove upto 12 billion tonnes of carbon every year from the Earth's atmosphere.
- **Competition for krills is increasing** as the human demand for krill products increase.

- Useful Video: <https://youtu.be/4euvH0K3lsQ>
  - Antarctic Krill Fishery: [Krilling for Oil | Oceans. Inc](#)

## 20. 6<sup>TH</sup> MASS EXTINCTION/ HOLOCENE EXTINCTION/ ANTHROPOCENE EXTINCTION

- **Background: Earth's previous five extinction:** Earth is the only known planet to support life. Various kinds of life forms have survived here for at least 3.5 billion years. But it's hospitality doesn't show consistency. In fact, **within the last 500 million years, the natural disasters have caused at least 5 mass extinctions** which wiped out **50-90% of all species on the planet** at the time.

### 1. End-Ordovician, 443 million years ago

- A severe ice age led to sea level falling drastically upto 100 meters, which wiped out 60-70% of all species which were prominently ocean dwellers.
- Then soon after the ice melted leaving the oceans starved of oxygen.

### 2. Late Devonian, 360 million years ago

- A messy prolonged climate change event, hit the life in shallow seas very hard, killing 70% of the species including almost all corals.

### 3. Permian-Triassic, 250 million years ago

- It has been the biggest and worst mass extinction in last 500 million years. More than 90% of the species perished, including trilobites and giant insects - strongly linked to massive volcanic eruptions in Siberia that caused a savage episode of global warming.

### 4. Triassic-Jurassic, C 200 million years ago

- 75% of species were lost, again most likely due to another huge outburst of volcanism. It left earth clear for dinosaurs to flourish.

### 5. Cretaceous - Tertiary, 65 million years ago

- A giant asteroid impact on Mexico, just after large volcanic eruptions in India saw the end of 60% of the species that populated the planet including dinosaurs.
- Mammals, and eventually humans took advantage.

- **6th Mass Extinctions** refers to ongoing extinction of various plants and animal species mostly as **a result of human activity**. Scientists believe that billions of population of mammals, birds, reptiles and amphibians have been lost all over the planet, leading them to say a sixth mass extinction has already progressed further than was thought.

- According to a research published in the journal proceedings of the National Academy of Sciences of the United States of America (PNAS), **the ongoing sixth mass extinction** may be one of the most serious environmental threats to the persistence of civilization.

- » This extinction is human caused and is more immediate than climate destruction.
- » The study found that 515 species of terrestrial vertebrates are near extinction.
  - Most of these species are from South America (30%), followed by Oceania (21%), Asia (21%), and Africa (16%) among others.
- » The current loss of species has been occurring since 1800s.

- A study published by University of Hawaii (Jan 2022)
  - » The current mass extinction has been going on since 16th century. Since then earth has lost 1,50,000 to 260,000 species (around 7.5 to 13 percent of its two million species)
  - » It also said that the Red List is biased and leaves out most invertebrates - a group that has seen a dramatic loss and is the majority of diversity on Earth.
- Some other scientists believe that sixth mass extinction is not already under way, but we are on the edge.
- Scientists blame the following factors for this:
  - » Human Over-population and over-exploitation of resources
    - Habitat loss and fragmentation represent primary threat for 85% of all species on the IUCN Red list.
    - It includes deforestation for farming, logging and settlement.
  - » Poaching in case of large animals prized for their body parts (tiger, elephant, lion etc)
  - » Pollution is pervasive in many species, from chemicals like mercury that accumulate in fish to the plastic debris that slowly kill sea turtles, sea birds and cetaceans.
  - » Introduction of Invasive species
    - It threatens a variety of native plants and animals around the world by killing them directly or by outcompeting them for food and nest sites.
  - » Climate Change has also negatively impacted entire ecosystems
    - An economy based on fossil fuels (that pollute the atmosphere) and are producing global warming with dire consequence for ecosystem.
    - An example of the impact of climate change can be seen in case of Corals. The warming of the water and acidification of oceans (due to high CO<sub>2</sub> in the atmosphere) are the principle reason for corals dying.
- This mass extinction will have serious ecological, economic and social consequences
  - » Human civilization is completely reliant on healthy ecosystem for food, water and other resources.

## 21. IMPORTANT DAYS

### 1) UN WORLD WATER DAY: 22<sup>ND</sup> MARCH

- The day is used to advocate for the sustainable management of freshwater resources.
- The **UN World Water Development Report** is released around World Water Day by **UN-Water** every year.

### 2) WORLD ENVIRONMENT DAY: 5<sup>TH</sup> JUNE

- The United Nations has designated 5th June as the World Environment Day. The UNEP annually organizes events for World Environment Day, which encourages worldwide awareness and action for the protection of the environment. Since 1974, it has been celebrated every year engaging governments, businesses, celebrities, and citizens to focus their efforts.

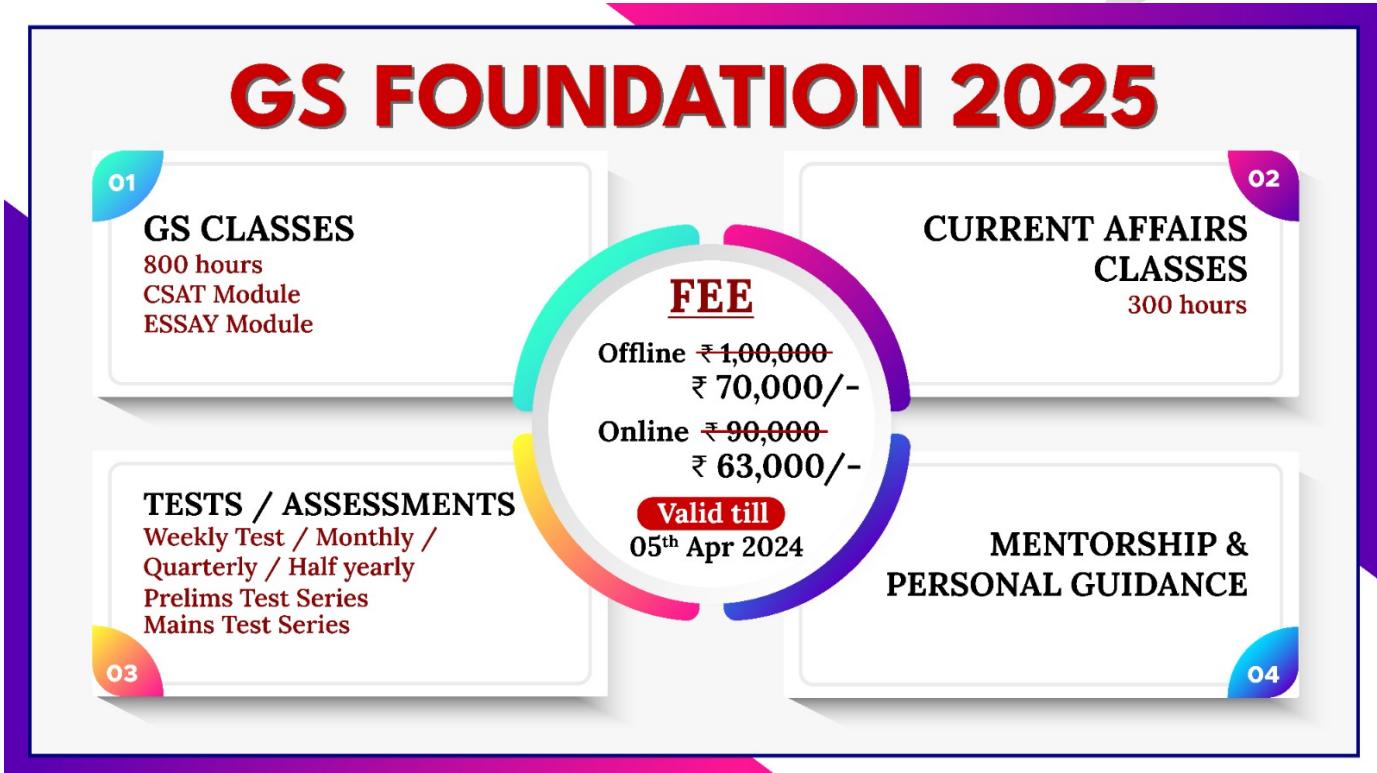
### 3) WORLD OCEAN DAY: 8<sup>TH</sup> JUNE

- June 8 is the World Ocean Day, the UN day for celebrating the role of oceans in our everyday life and inspiring actions to protect ocean and sustainably use marine resources.
  - » Many countries have been celebrating this day since 1992, following the UN conference on Environment and Development, held in Rio de Janeiro.

» UNGA officially decided this in 2018.

#### 4) EARTH DAY: 22<sup>ND</sup> APRIL

- The day is celebrated world-wide to demonstrate support for environment protection.
- The day was first proposed in UNESCO conference in 1969 and the first Earth Day Celebrations took place in 1970.



# TARGET PRELIMS 2024

## BOOKLET-42; EB&CC-11

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## 2. LAWS DEALING WITH BIODIVERSITY PROTECTION

### 1) BIOLOGICAL DIVERSITY ACT, 2002

- **Introduction**
  - In order to help it realize the objectives of CBD, India has enacted an umbrella legislation called the Biological Diversity Act 2002. India was the first country, to pass a law to uphold the CBD nationally.
  - The objective of the act are conservation, sustainable utilization, and fair and equitable sharing of benefits arising out of use of biological resources and associated knowledge.
  - The act extends to whole of India.
- The act works towards biodiversity protection in the following ways:
  - » **Regulation of extraction to biological resources**
  - » **Protection of Biodiversity Heritage Sites**
  - » **Biodiversity Management Committees** play a crucial role in promoting conservation and sustainable use of biological resources within their respective areas and facilitate people's participation in biodiversity conservation.
  - » **Conservation of Endangered species:** The act prohibits the transfer of any endangered species, parts, or products without the permission of the State Biodiversity Board (SBB) or the NBA.
- **Conservation of Traditional Knowledge** – the act recognizes the importance of traditional knowledge associated with biodiversity conservation and ensures its protection and preservation.
- **The act recognizes the contributions of Indigenous local communities in conservation of biodiversity** and a company using these resources is required to share 0.5% of the sales post tax to these ILCs. Only those companies whose turnover is more than 3 crore are required to make this payment.
- **Institutional Framework for the implementation of the law**
  - The act is being implemented through three tiered institutional structure
    - i. National Biodiversity Authority (at central level)
    - ii. State Biodiversity Boards (at state level)
    - iii. Biodiversity Management Committees (at local level)

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#### A) NATIONAL BIODIVERSITY AUTHORITY (NBA)

- The central government has established the NBA in exercise of powers conferred by sub-section (1)(4) of Section 8 of BDA, 2002.
- The NBA is Autonomous body and that performs **facilitative, regulatory and advisory function** for Government of India on issue of Conservation, sustainable use of biological resource and fair equitable sharing of benefits of use.

## B) BIODIVERSITY MANAGEMENT COMMITTEE (BMC)

- Under section 41(1) of the Act, every local body of the state shall constitute a Biodiversity Management Committee within areas of its jurisdiction for the purpose of promoting conservation, sustainable use and documentation of biological diversity including preservation of habitats, conservation of land races, folk varieties & cultivars, domestic stock and breeds of animals and micro-organisms and chronic knowledge relating to biological diversity.
- The main function of the BMC is to prepare People's Biodiversity Register (PBR) in consultation with local people. This register shall contain comprehensive information on availability and knowledge of local biological resources, their medicinal or any other use or any other traditional knowledge associated with it.
- They shall also be responsible for:
  - » Conservation, Sustainable use and access to benefit sharing of biological resources
  - » Eco-restoration of the local biodiversity
  - » Feedback/Information to the Board, and the NBA in matters of IPRs, traditional knowledge etc.
  - » Management of Biodiversity Heritage sites including Heritage trees, animals, micro-organisms, and Sacred Groves.
  - » Conservation of traditional varieties/breeds of economically important plant species
  - » Biodiversity Education and Awareness building

## C) ISSUE OF FAIR AND EQUITABLE SHARING OF BENEFITS ARISING OUT OF USE OF BIOLOGICAL RESOURCES AND ASSOCIATED KNOWLEDGE

- **Introduction**
  - » The Biological Diversity Act, 2002 regulates the extraction of biological resources through the state Biodiversity Boards and the National Biodiversity Authority.
    - Broadly, all foreign entities (companies, institutions and individuals) are within the jurisdiction of NBA while all Indian entities are the subject matter of the state board.
  - » **Biological resources** include plants, animals and micro-organisms but exclude those which are normally traded as commodities.
  - » **What does the law say about sharing of Benefits?**
    - Before a commercial entity extracts biological resources, it must make prior approval of the state board or the NBA and also undertake to share benefits arising out of the use of such biological entities within the local community, which has conserved and protected these biological resources. **The benefits** can be in the form of monetary compensation as well as 'joint ownership of IPRs' and/or 'transfer of technology'.
- **Divya Pharmacy vs Union of India case:** Landmark Judgment by Uttarakhand High Court on Dec 28, 2018
  - » **Core Issue:** Whether the State Biodiversity Board could impose 'Fair and Equitable Benefit Sharing' as one of the regulatory functions on the Indian entities using Biological Resources.

» **Key Highlights of the Judgment:**

- » Indian companies which are extracting biological resources are liable to seek prior approval as well as share part of their revenue with the local communities that are responsible for conserving and protecting such resources.
  - The court also referred to international conventions and treaties such as Nagoya Protocol on Access to Genetic Resources and Fair and Equitable Sharing of Benefits arising from their utilization to the Convention on Biological Diversity.
- » The court held that rights of indigenous and local communities have to be protected, equally from outside as well as from within.
- » The court finally ordered that the State Biodiversity Board does have jurisdiction to demand "fair and equitable sharing of benefits" from Divya Pharmacy and, by implication, from all Indian companies.

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#### D) THE BIOLOGICAL DIVERSITY (AMENDMENT) ACT, 2023

- It was introduced in LS by MoEF&CC in Dec 2021 and was finally passed in the house in July 2023 and Rajya Sabha in Aug 2023.
- The amendment intends to encourage the Indian system of medicine; facilitate fast-tracking of research, patent application process; attract more foreign investment in the preservation and commercial utilization of India's biological resources; and decriminalizes all the offences under the act.
- **Key Highlights:**
  - i. Simplify compliance requirements for domestic companies
  - ii. Exempts AYUSH practitioners, local people, and communities of the area, including growers and cultivators of biodiversity, from giving prior intimation to State Biodiversity Boards for accessing biological resources for commercial utilization.
  - iii. Users of codified traditional knowledge and AYUSH practitioners will be exempted from sharing benefits with local communities
    - Issue/Criticism: The term Codified Traditional Knowledge hasn't been defined by the bill or by CBD. A broad interpretation might exempt all local traditional knowledge from benefit sharing requirements.
    - Legal experts also feel that exemption to Ayush practitioners would be detrimental to ecology and go against the principle of sharing commercial benefits with indigenous communities.
  - iv. Removes research and bio-survey from the purview of benefit sharing.
  - v. Benefit sharing will be based on terms agreed between the user and the local management committee represented by the National Authority
    - Issue/Criticism: The bill removes direct role of local communities in determining the benefit sharing provisions.

- vi. Companies registered in India and controlled by Indians are now treated as Indian companies, even if they have foreign equity or partnership, thereby reducing the restrictions on them.
- vii. **Simplifying the IPR Process:**
  - The act specifies that approval of NBA is required before applying for IPR involving biological resources obtained from India, or (ii) sealing of patent.
  - The bill says that approval would be required before the approval of IPR instead of before the application itself.
    - It further differentiates between foreign and domestic entities.
    - Foreign entities will require approval from NBA whereas domestic entities will be required to register with NBA. However, at the time of commercialization of IPR, domestic entities will need approval from NBA.
- viii. The bill **decriminalizes all offences** under the act and provides for wide range on penalties. Further, it authorizes government officials to hold enquiries and determine penalties.
  - **Issue/Criticism:** Such discretion with government official may promote corruption/rent seeking.
- ix. The bill allows for foreign investment in research into biodiversity. However, this investment will necessarily have to be made through Indian companies involved in biodiversity research.
- x. A new section - 36(A) has been added emphasizing on the monitoring of the Biological Resources obtained from foreign countries for use in India as per the provisions of the Nagoya Protocol on access to benefit sharing.
- xi. Section 36(B) enables state government to develop strategies and plans for conservation and sustainable use of biological diversity.

## 2) BIODIVERSITY HERITAGE SITES (BHS)

- **About Biodiversity Heritage Sites**
  - They are well defined areas which have unique, ecologically fragile ecosystems - terrestrial, coastal, and inland waters and marine, having rich biodiversity comprising of any one or more of the following components:
    - i. Richness of wild as well as domesticated species or intra-specific categories
    - ii. High endemism
    - iii. Presence of rare and threatened species, keystone species, species of evolutionary significance, wild ancestors of domestic cultivated species, or their varieties
    - iv. Past pre-eminence of biological components represented by fossil beds and having significant cultural, ethical, or aesthetic values and are important for the maintenance of cultural diversity.
- Under Section 37 of the Biological Diversity Act, 2002 (BDA) the state government in consultation with local bodies may notify in the official gazette, areas of biodiversity importance as Biodiversity Heritage Sites (BHS).
- **Biodiversity Heritage Sites of India (As of Jan 2024)**
  - i. Arittappatti Biodiversity Heritage Site, Madurai, TN
    - This is the first BHS of TN.

- It has rich biological and historical significance, with the presence of around 250 bird species including 3 flagship raptors species - Laggar Flacon, Shaheen Falcon, Bonelli's Eagle and wildlife like Indian Pangolin, Python, and Slender Loris.
- ii. **Asramam, Kerala, Kollam**
  - It hosts a unique diversity of Mangrove species with diverse flora and fauna.
  - It also has rare and endangered heritage trees of *Syzygium travancoricum* which is listed as CR in the IUCN list.
- iii. **Nallur Tamarind Grove** in Devanhalli, Bengaluru, Karnataka
  - The area has some of the oldest tamarind trees, recorded age of the oldest one being 410 years.
  - The BHS is spread over 54 acres and comprises of nearly 300 trees.
  - The significant component of this popular structure is a group of old plants standing like ageless sentinels. The area has some of the oldest tamarind trees, some more than 400 years old.
- iv. **Hogrekan in Chikmagalur, Karnataka**
  - The shola vegetation is home to many unique medicinal species.
  - It also serves as a "Wildlife Corridor" between Kudremukh and Bhadra WLS.
- v. **University of Agricultural Sciences, GKVK Campus in Bengaluru, Karnataka.**
  - Large biodiversity -> 13 species of mammals, 10 species of reptiles, 165 species of birds and an impressive 530 species of plants.
- vi. **Ambaraguda** in Shimoga, Karnataka
  - A patch of primitive shola forest, known for many unique and endemic plant species.
- vii. **Purvatali Rai, Bicholim, North Goa**
  - Sacred grove
- viii. **Ameenpur Lake**, Sangareddy, Telangana
  - First water body to be recognized BHS.
  - A man-made lake more than 300 years old.
  - Home to many resident and migratory birds, such as flamingos, egrets, herons, cormorants etc.
- ix. **Glory of Allapalli** in Gadchiroli, MHA
  - First BHS of MHA
  - A patch of dense original forests. Forest is pristine and so dense that hardly any sunlight reaches the forest floor.
  - The forests dates back 100s of years.
- x. **Bambarde Myristica Swamps**, Dodamarg, Maharashtra
- xi. **Ganeshkhind Garden**, Maharashtra

xii. **Landorkhori**, Jalgaon, Maharashtra

xiii. **Schistura Hiranyakeshi** in Amboli, Sindhudurg district

- A species of fish – Schistura Hiranyakeshi – endemic to Amboli was recently recorded for the first time in the western ghats in the local temple pond.



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xiv. **Mandasuru, Kandhamal, Odisha**

- Mandasaru gorge is an abode of 1563 species of plants, animals and fungi spread over an area of 528 ha.

xv. **Mahendragiri Hill, Gajapati, Odisha**

- It is situated at an elevation between 700-15001 m above mean sea level in Gajapati district of Odisha.
- With increase altitude, the hill complex demonstrates several micro climatic conditions like tropical shola, tropical semievergreen, tropical moist-deciduous & tropical dry deciduous.
- The diversified vegetation with rich floral diversity representing 40% of the reported flora of Odisha.
- The ancient temples of Kunti, Shima, Arjuna and Yudhishtira at Mahendragiri have been declared as protected monuments under the Ancient Monument and Archaeological sites and Remains Act 1958 by the State Government. These monuments provide a sacred and holy background for receiving about one lakh devotees annually every year to worship the deities of the hill.

xvi. **Gandhamardan Hill, Bargarh and Balangir district, Odisha (March 2023)**

- An area of more than 18000 hectares of Gandhamardan Hill (Gandhamardan Reserve Forest) (In Bargarh and Balangir district) has been notified as BHS.
- The hill has high floral diversity with more than 1,000 species of plants.

- One angiosperm, Ficus conccina var dasycarpa and one spider, *Peucetia harishankarensis* are endemic to the hill.
- It is considered a treasure trove of medicinal plants and thus an Ayurvedic paradise of Odisha.
- The hill is home to two important temples - Nrusinghanatha Temple located on northern slope and Harishankar temple located on southern slope.
- The place is famous for highly successful people's resistance against bauxite mining there.

xvii. **Naro Hills, Satna Madhya Pradesh**

- It is a unique and varied geology and it supports a large number of ecosystem and species of flora and fauna.

xviii. **Patlakot, Chhindwara, Madhya Pradesh**

- It has a terrain of 1700 feet deep valley and ecosystem of estimated age of 6 million years and species of rare flora and fauna including rare Bryophytes and Pteridophytes.

xix. **Amarkantak, Anuppur, Madhya Pradesh:**

- It is situated in the Maikal mountain ranges which link the Vindhya and Satpura mountain ranges. It has a unique terrain of a 1700 feet deep valley and an ecosystem of the estimated age of 6 million years and species of rare flora & fauna including rare bryophytes and Pteridophytes.
- Amarkantak ecological system is the origin of three major rivers - Narmada, Johila, and Sone

xx. **Tonglu BHS, Darjeeling Forest Division, WB**

- 230 hectare site is a medicinal plant conservation area.
- Unchecked foot traffic is a major concern for protection here as the BHS borders Nepal border.

xi. **Dhotrey BHS, Darjeeling Forest Division, WB**

- Right next to Tonglu
- Rich in medicinal plants
- Threatened by human encroachment

xxii. **Baneshwar Shiva Dighi, Coochbehar, WB**

- It offers refuge to black softshell turtle listed under CR by IUCN.

xxiii. **Chilkigarh Kanak Durga** in Jhargram, WB

- Chilkigarh Kanak Durga is a small patch of forest ripe with traditional beliefs of local habitats.
- The site is home to 25 species of animals and more than 380 species of plants, out of which many have medicinal properties.

xxiv. **Char Balidanga (Nadia), WB (2023)**

- It is an island spread across 115 acres. It has tropical riverine vegetation with tall grasses and trees, along with swampy flat land covered with algal mats, which are periodically inundated with tidal ebbs.
- It is home to almost 100 species of birds, apart from golden monitor lizard, and golden jackals.

xxv. **Namthing Pokhari** (Darjeeling) WB (2023)

- It is a natural Himalayan Wetlands. It is home to the Himalayan Salamander.

xxvi. **Amkhoi Wood Fossil Park** (Birbhum), WB (2023)

- It has unique geological and paleo-botanical features.

xxvii. **State Horticulture Research Development Station** (Nadia), WB (2023)

- It hosts indigenous horticulture germplasm of orchard trees.

xxviii. **Birampur - Baguran Jalpai**, Purba Medinipur, WB (2023)

- It is a habitat of red crabs and sand bubbler crabs which are fast disappearing from Bengal coastline due to human encroachment.
- The bushes along side the coast have golden jackals, jungle cats and golden monitor lizards.

xxix. **Haldi Char**, Purba Medinipur, WB (2023)

- It is a wetland which is home to Swarna Godhika (Yellow monitor lizard) - a schedule -1 endemic species. The wetland is most conducive for the species to thrive.
- Note: With this WB has 10 BHS (highest in the country)

xxx. **Gharial Rehabilitation Centre**, Lucknow, UP

- Located in Kukrail reserve forest of Lucknow.
- Established for conservation and rehabilitation of CR species of Gharial.

xxxi. **Sacred Grove at Sural Bhatori Monastery**, Pangi Village, Chamba, Himachal

xxxii. **High Altitude Meadows, Hudan Bhatori, Chamba** Himachal

- It is a 108 Bigha high altitude meadow at Muhal Dhar Shinkal in Hudan Bhatori panchayat of Pangi is at an altitude of 3,850m.
- Dominant plants are cranberry, honeysuckle, whitebeam, slender false brome, hairy brome etc.

xxxiii. **Birch-Pine forest patch, Nain Gahar**, in Lahaul's Udaipur

xxxiv. **Tunkyong Dho, Dzongu, Sikkim (2023)**

- It is notified as Sikkim's first biodiversity heritage site.
- It is believed to be one of the oldest natural dho (lake), directly related to the Hee-Youngmingmoo clan of Lepcha community in Dzongu.
- Dzongu valley is a specially protected area for aboriginal/indigenous primitive tribes considered to be the original inhabitant of Sikkim called as Lepchas.

xxxv. **Majuli Island, Assam**

- World's largest river island.
- BHS because of unique ecological and cultural heritage. Home to Assamese - neo-Vaishnavite culture.

xxxvi. **Hajong Tortoise Lake, Dima Hasao, Assam:**

- The lake is a natural habitat of CR freshwater lake 'Black Softshell Turtle" and Endangered "Indian Peacock Softshell Turtle". The site also harbors threatened species like CR Chinese Pangolins.

xxxvii. **Borjuli Wild Rice site, Sonitpur, Assam:**

- This BHS has a good population of wild species of rice - Oryza rufipogon.
- Oryza rufipogon is the progenitor of present day cultivated rice, O. Sativa.

xxxviii. **Khaw Kur Syiem Kmieing, Meghalaya**

- It is a mosaic of natural habitats along with significant diversity of life forms. It is also an old sacred grove with monolith and religious spots.

xxxix. **Dialong Village** in Tamenglong, Manipur

- Home to the rare and endangered citrus indica, or the Indian wild orange. It is the most primitive ancestor to all cultivated citrus fruits in the world.

xl. **Baramura Waterfall, Khowai, Tripura**

- This is the highest natural waterfall in Tripura.
- Critical habitat for rare wildlife, Rich in floristic diversity
- Habitat for many stream water favored fauna

xli. **Unakoti, Tripura**

xlii. **Silarchari Caves, Gomati, Tripura**

- Only natural cave of Tripura.
- Unique habitat for several threatened cave bat species in Tripura

xliii. **Debbari or Chabimura, Gomati, Tripura**

- Unique habitat for threatened plants of Tripura like Dhup tree and cane resources of India

xliv. **Betlingship & its surroundings, North District, Tripura**

- It is the highest peak of Tripura on Jampui Hills, which is famous for a wonderful orange festival.

### 3) INDIAN FOREST ACT, 1927

- The act was passed to consolidate the then existing laws relating to forest, the transit of forest products, and duties that can be levied on forest product.

- The act provides for three categories of forests:
  - i. **Reserved Forest**
    - » The reserved forests can be notified by states on any forest land or waste land to which government has ownership or right.
    - » They are strictly protected. Many activities are such as fresh clearings, tree felling, burning, grazing, quarrying, manufacturing, hunting, shooting etc are prohibited in reserved forests.
  - ii. **Protected Forest**
    - » Protected forests are also notified on forest lands or waste lands owned by Government.
    - » They are less strictly protected. The state government can declare any portion of the protected forest as closed for a term not exceeding 30 years during which the rights of private person can be suspended and several activities can be prohibited.
    - » **Note: The key difference between reserved forests and protected forests**
      - Rights to all activities like hunting, grazing etc. are banned in reserved forests unless specific orders are issued otherwise.
      - Rights to activities like hunting and grazing are sometimes given to communities living on the fringe of the forest, who sustain their livelihood partially or wholly from forest resources or products.
  - iii. **Village Forest**
    - The State Government may assign to any village-community the rights of Government to or over any land which has been constituted a reserved forest, and may cancel such assignment. All forests so assigned shall be called village-forests.
    - These forests are managed by village community with the assistance of the government.
      - State governments may make rules for regulating the management of village forests, prescribing the condition under which the village community may be provided timber or other forest produce or pasture and their duties for the protection and improvement of forest.
- The act also gives **power to central government** to regulate timber production and its transportation.
- It has been criticized over the years as a:
  - » Tool for Colonial overtake of India's forests for exploitation (specially timber)
  - » Exploitation, Harassment, eviction and loss of livelihood of tribals.
- After independence, the same act (with slight changes) continued and the forest dwellers kept getting harassed, evicted and exploited.

#### A) 2017 AMENDMENT: EXEMPTION TO BAMBOO GROWN IN NON-FOREST AREAS (CLASS DISCUSSION)

#### 4) FOREST CONSERVATION ACT, 1980 (2023 AMENDMENT)

- **Why in news?**
  - » MoEF&CC have published proposed amendments to the Forest Conservation Act, 1980 and have invited feedback from general public (Oct 2021)

- **Introduction**
  - » It was enacted to help conserve the country's forests.
  - » It strictly restricts and regulates de-reservation of forests or use of forest lands for non-forest purposes without the prior approval of central government.
    - In 1996, the **Supreme Court** in a verdict in **TN Godavarman Thirumulpad vs Union of India** had expanded the definition and scope of forest land to include all areas recorded as forest in government record, irrespective of ownership, recognition and classification. Before this, the act was primarily applicable to reserve forests and national parks.
    - The court also expanded the definition of forests to encompass the "dictionary meaning of forests", which would mean that a forested patch would automatically become a "deemed forest" even if it is not notified as protected, and irrespective of ownership. The order was also interpreted to presume that the act is applicable over plantations in non-forest land.
  - » The Act also covers
    - Requirement for declaring an area as a protected forest, Wildlife Sanctuary or a national park.
    - Maintenance of water supply in springs, rivers and tanks.
- **Forest Conservation Division**
  - » It is mandated to regulate the diversion of forest land for non-forestry purposes through effective implementation of Forest (Conservation) Act, 1980.

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#### **A) 1996 SUPREME COURT VERDICT AND EXPANSION OF THE CONSERVATION FUNCTION**

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#### **B) EXEMPTION PROVIDED BY THE SCHEDULED TRIBES AND OTHER FOREST DWELLERS (RECOGNITION OF FOREST RIGHTS ACT, 2006)**

- In this act, certain exemptions to forest clearance for the forest dwelling scheduled tribes and other forest dwelling communities have been provided.
  - Section 3 of the act provides that the Central government can provide diversion of forest and for providing certain facilities managed by the government such as for creation of schools, hospitals, anganwadis, fair price shops, roads, electric and telecommunication lines, tanks and other minor water bodies, minor irrigation canals etc.

- This clearance shall be subjected to the condition that the same is **recommended by Gram Sabha.**
- Thus, it can be understood that the 2006 Act brings in **a balance between conservation of forest rights and protection of rights of forest dwelling communities** and even this is achieved only by an elaborate procedure after seeking sanction of various communities.

### C) FOREST CONSERVATION (AMENDMENT) ACT, 2023

- Adding of a **preamble** to the act.
- Changing the name to **Van (Sanrakshan Evam Samvardhan) Adhiniyam**, i.e. **Forest (Conservation and Augmentation) Act.**
- The bill provides that **two types of land** will be **under the purview of the act:**
  - i. Land **declared/notified as a forest under Indian Forest Act, 1927 or under any other law, or**
    - Note: The land which has **not been notified** will not be included under the purview of the act.
  - ii. Land **notified as a forest on or after Oct 25, 1980** in a government record.
    - Note: Land which changed from forest use to non-forest use **before Dec 12, 1996** will not be included.
- **Exempted Category of Land:**
  - » Under the 1927 Act, decisions regarding diversion of forest land for non-forest purposes are taken by the **state government**. The **1980 act** requires **additional prior approval from central government**.
  - » The bill provides that **such approval will not be required** when forest land is **diverted for constructing**
    - i. **Strategic Linear Projects** (roads, railways) of national importance and concerning **national security within 100 km of India's border**.
    - ii. **Security related infrastructure** upto 10 hectares,
    - iii. **Defence related projects**, a camp for paramilitary forces, or public utility projects as specified by the central government, not exceeding five hectares in a left-wing extremism affected area.
  - » The bill also exempts **certain type of land** from the provisions of the act, such as **forest land along a rail line or a public road maintenance by the government providing access to a habitation, or to a rail, and roadside amenities upto a maximum size of 0.10 hectare.**
- **Assignment/Leasing of forest land:**
  - » The Original act **restricts the de-reservation of forests** for use of forest and **non-forest purposes**. Such restrictions can be lifted **only with the prior approval of central government**.
    - The act specifies **certain activities** that will be **excluded from non-forest purposes**, meaning that restrictions on the use of forest land for non-forest purposes will not apply. These activities include **works related to the conservation, management, and development of forest and wildlife** such as establishing check posts, fire lines, and wireless communication.

- » The **amendment adds** more activities to the list such as (i) zoos and safaris under WPA, 1972 owned by the government or any authority, in forest areas other than protected areas, (ii) ecotourism facilities, (iii) silviculture operations (enhancing forest growth), and (iv) any other purpose specified by central government.
- **Powers to issue directions:** The 2023 amendment adds that the central government may issue directions for the implementation of the act to any authority/organization under or recognized by Centre, State, or UT.
- **Significance:**
  - » **Increase Plantation in non-forest areas:** The environment ministry says that the application of the act on land covered under dictionary meaning of forests (or deemed forests) has resulted in a "declining tendency in plantations in non-forest lands owing to the apprehension among individuals, organizations, and authorities regarding such plantations being considered forests".
  - » **Removal of mandatory central government approval** for diversion of forests in certain cases is expected to reduce delays in the implementation of strategically important projects.
- **Criticism:**
  - » The amendment by providing blanket exemptions from the act for several types of lands and several types of projects is going contrary to the intent of the 1980 act which was enacted for prevention of de-reservation of forest lands and large scale deforestation.
  - » Such forest clearance activities will also violate rights of forest dwellers which were secured under the 2006 Act.
  - » The Apex Court in T.N. Godavarman Thirumulpad v. Union of India (UOI) and Ors (AIR 1997 SC 1228), has given a wider meaning to forest land to broaden the scope of their protection. However, the 2023 bill provides a much narrower interpretation to the term forest land by inserting section 1A to encompass only two types of land under its ambit.
  - » **Exemption near border area** would cover large parts of the north-eastern region, Uttarakhand and Himachal Pradesh and could lead to loss of biodiversity in biodiversity hotspots.
  - » **The purpose of allowing a zoo** inside a forest is not clear.
    - Even Supreme Court (2023) has remarked that they don't appreciate the necessity of having a zoo inside tiger reserves or national parks.
  - » There is also a lack of clarity on compensatory afforestation for this diverted land. Similarly, it doesn't provide for how rehabilitation/resettlement/livelihood opportunities etc. would be provided for tribals affected by this kind of diversion.

## 5) FOREST SITUATION AND KEY STEPS TAKEN TO PROTECT FORESTS

- **Current Situation of forests in India:** As per Indian State of Forest Report 2021, India's total forest cover is 7.13 lakh sq km (21.71% of India's total area). When compared to 2011, there has been an increase of 3.14% in the total area under forest.
- **Concerns:**

- » **Decline in Natural Forests:** Though very dense forests have increased by 501 sq km, but it pertains to protected and reserve forests with active conservation activities.
- » **Decline in North-East India:** Five states in Northeast - Arunachal Pradesh, Manipur, Meghalaya, Mizoram, and Nagaland have all shown loss in forest cover. It's important for protecting the forest cover of NE as it is natural forest and with only 7.98% of the geographical area, it contributes to 23.75% of India's total forest cover.
- **Reasons:**
  - A spate of natural calamities; particularly landslides and heavy rains
  - Anthropogenic factors: Shifting agriculture, pressure of development activities and felling of trees.
- » **Vulnerability to Forest Fire:** Around 35.46% of the forest cover in India is prone to forest fires.
  - Between Nov 2020 to June 2021, 3.4 lakh forest fire hotspots were recorded, which is the highest recorded forest fire cases ever.
- **Why forests are crucial? Why is it important to protect forests:**
  - » **Controlling Global Warming:** Forest restoration will play a huge role in achieving Net Zero climate target. A study in 2017 showed that land-based sinks (natural climate solutions which also includes forests) can provide upto 37% of emission reductions.
  - » **Protecting Biodiversity**
  - » **Preventing Desertification**
  - » **Ensuring Soil Health** (by preventing soil erosion, increasing organic content of soil etc.)
  - » **Protecting micro-climate** of an area
  - » **Livelihood** for crores of tribals and forest dwellers
  - » **Water Security:** Forest restoration is must for water security.
  - » **Medicinal plants** from forests can solve a number of health issues
- **Key Initiatives in India to Conserve Forests:**
  - » Forest Conservation Act, 1980
  - » Compensatory Afforestation Regime
  - » Various Protected Areas - NP, WLS, Tiger Reserves, Biosphere reserves etc.
  - » **Green India Mission** launched in 2010 with three objectives:
    - Double the area to be taken up for afforestation/ eco-restoration in India in the next 10 years.
    - Increase the green house removal by India's forests
    - Enhance the resilience of forests/ecosystem.
  - » **Nagar Van Scheme**
  - » **Forest Fire Prevention and Management Scheme**
  - » **India's International commitments:**
    - India has committed to restore 5 million hectares of degraded and deforested land between 2021 and 2030.
    - India also targets creation of 2.5 to 3 billion tonnes of carbon sink by 2030 as part of its INDC. This would require India to increase its tree cover by 12% over the next 10 years.
- **Key International Initiatives:**
  - » **REDD+** under UNFCCC framework:

- » **New York Declaration on Forests** (NYDF) in 2014 by United Nations Climate Summit: Target of restoring 350 million hectares of forests by 2030.
- » **The span 2021-2030** is the UN Decade on Ecosystem restoration. It emphasizes on efforts to restore degraded terrestrial ecosystems including forests.
- » **Bon Challenge** launched in 2011 focuses on global goal of restoring 150 million hectares of degraded and deforested landscapes by 2020 and 350 million hectares by 2030.
- » **UN** has proclaimed 21st March as the International Day of Forests in 2012 to celebrate and raise awareness of the importance of forests.
  - The year 2022 marks a decade of IDF.

#### D) SAROJINI FOREST (SAROJINI VAN)

Odisha has named a forest after a tribal women Sarojini Mohanta as a tribute to this homegrown changemaker.



Hired for a Daily wage of Rs 315 as a watcher, she has gone beyond the call of duty to create a forest on a denuded path of land in just two years.

When the Principal Chief Conservator of Forest (PCCF) came for an inspection to Bonai, he was left dazed that the women's dedication led to the survival of 95% of saplings planted in four acres of land.

The PCCF suggested to name the plantation area after her and thus the place was named 'Sarojini Vana'.

Every plant in the area sprawled over three acres of land appears to be at Sarojini's fingertips; she would know which plant would die if it wasn't watered

#### 6) THE WATER (PREVENTION AND CONTROL OF POLLUTION) ACT OF 1974

- It provides for the prevention and control of water pollution, and for the maintaining or restoring of wholesomeness of water in the country.
- The Act was amended in 1988.
- **The Water (Prevention and Control of Pollution) Cess Act** was enacted in 1977, to provide for the levy and collection of a cess on water consumed by persons operating and carrying on certain types of industrial activities.
  - This cess is collected with a view to augment the resources of the Central Board and the State Boards for the prevention and control of water pollution constituted under the Water (Prevention and Control of Pollution) Act, 1974. The Act was last amended in 2003.

#### 7) THE AIR (PREVENTION AND CONTROL OF POLLUTION) ACT OF 1981

- Main Objectives
  - To provide for the prevention, control and abatement of air pollution
  - To provide for the establishment of central and State Boards with a view to implement the Act
  - To confer on the Boards the powers to implement the provisions of the Act and assign to the Boards functions relating to pollution
- **Definitions**

- "Air Pollutants" means any solid, liquid or gaseous substance [(including noise)] present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or properties or environment.

### 3. ENVIRONMENT (PROTECTION) ACT, 1986

- Why in news?
  - » MoEF proposes amendments in EPA, 1986 to decriminalize provisions (July 2022)
- Details about the Act:
  - » EPA, 1986 was passed under Article 253 of the Constitution, which empowers the centre to enact laws to give effect to international agreements signed by the country.
  - » The Act establishes "the framework for studying, planning, and implementing long-term requirements of environmental safety and laying down a system of speedy and adequate response to situations threatening the environment"
  - » It is an enabling act and empowers the Central Government to establish authorities [under section 3(3)] charged with the mandate of preventing environmental pollution in all its forms and to tackle specific environmental problems that are peculiar to different parts of the country.
    - E.g. authorities created under EPA: Central Ground Water Authority (CGWA)
  - » The act defines terms such as environment, environment pollutant, and hazardous substances.
  - » It provides for imprisonment of upto 5 years and or fine of upto Rs 1 lakh for violator of the law.
  - » **Environment Protection Rules 1986**
    - The rules set the standards for emissions or discharge of environment pollutant.
    - Prohibitions and restrictions on the location of industries and the carrying on processes and operations in different areas.
    - Procedure of taking samples

### 4. WILDLIFE (PROTECTION) ACT, 1972

- Why in news?
  - » Wild Life (Protection) Amendment Act, 2022 came into force from 1st April 2023
- The Wildlife (Protection) Act, 1972 was enacted to provide for the protection of wild animals, birds and plants with a view to ensure the ecological and environmental security of the country.
  - » It defines wildlife to include any animals, bees, butterflies, crustaceans, fish, and moths; and aquatic or land vegetation, which form part of any habitat.
  - » The act, along with Wildlife Protection Rules, provides for the protection of wild birds, animals and plants and for all matters that are connected to it whether it be their habitat or the waterhole or the forest that sustain them.
- The Act provides for:

- » Prohibition of hunting
  - » Protection and management of wildlife habitats
  - » Establishment of protected areas and reserves such as national parks, wildlife sanctuaries, tiger reserves, conservation reserves, and community reserves.
  - » Management of zoos etc.
- It defines **five types of protected areas**
1. National Parks
  2. WLS
  3. Community Reserves
  4. Conservation Reserves
  5. Tiger Reserves
- It also provides for the formation of:
- » NTCA
  - » Central Zoo Authority
  - » National Board for Wildlife (NBW), an advisory body to help centre of policy decisions.
- **The six Schedules (Before the 2022 amendment)**
- » The act had **six schedules** with varied degree of protection to different kind of animals and plants.
    - **Schedule I and Part II of Schedule II** provided absolute protection and offences under these are prescribed the highest penalties.
    - The Penalties for Schedule III and Schedule IV were less and these animals are protected.
    - Schedule 5: Vermins includes animals which can be hunted.
      - Common crow, Fruits bats, mice and Rats only
    - Schedule 6 contains endemic plants, which are prohibited from cultivation and planting. The cultivation and trade of specified plants can only be carried out with prior permission of competent authorities. These plants are as follows:
      - Beddomes Cycad -> Medicinal, EN
      - Blue Vanda (Medicinal)
      - Kuth
      - Ladies Slippers Orchids
      - Pitcher Plant
      - Red Vanda
  - » **Permitted Hunting of Problematic Wild Animals**
    - Section 11(1)(a) of the WPA authorizes Chief Wildlife Warden to permit hunting of any problem wild animals only if it can't be captured, tranquilized or translocated.

#### **E) WILDLIFE PROTECTION (AMENDMENT) ACT, 2022**

- The amendment increases the number of species protected under the law and implement CITES effectively.
- » **Rationalizing Schedules:**
- Reduce the total number of schedules to four by:

- » **Schedule for Specially protected animal species:**
  - Schedule 1 (Species with highest level of protection);
    - It contains 600 species of vertebrates and hundreds of species of invertebrates.
  - Schedule 2 (Species with lesser level of protection);
    - It contains 2000 species (including 1,134 species of birds)
- » **Schedule for Plant Species:**
  - **Schedule 3 (Protected Plant Species);**
- » **Schedule for implementation of CITES:**
  - Schedule 4 (Specimen listed in the Appendices under CITES)
- » **Note:** There is no schedule for vermin species.

- **Implementing the obligations of CITES:** The central government will designate:
  - Management Authority, which grants export or import permits for trade of specimens
  - Scientific Authority, which gives advice on aspects related to impact on the survival of the specimen being traded.
- The amendment empowers central government to regulate or prohibit the import/trade/possession of invasive alien species.
- **Control of Sanctuaries: Increased role of centre.**
  - In the original act the sanctuaries are managed and controlled by Chief WildLife Warden who is appointed by the state government. But the amendment says that the action of the warden will be as per the management plans of the sanctuary which will be prepared as per the guidelines of the central government.
- **Sanctuaries in Special Areas:**
  - For sanctuaries falling under special areas (scheduled areas and areas where forest rights act is applicable), the management plan must be prepared after due consultation with concerned Gram Sabha.
- **Empowers central government to notify conservation reserve** (earlier only state government could do so).
- **Amends section 43 of the principal act** - To permit transfer or transport of a captive elephant for a religious or any other purpose by a person having a valid certificate of ownership.
- **New Section 42A has been added for surrender of captive animals:** Any person may voluntarily surrender any captive animals or animal products to the Chief Wild Life Warden. No Compensation will be paid for such items. The surrendered item becomes the property of state governments.
- **Increased fines and penalties** for violation of the law.

## F) WILDLIFE (PROTECTION) LICENSING (ADDITIONAL MATTERS FOR CONSIDERATION) RULES, 2024

- The revised notification came into effect on 16th Jan 2024, the first revision since 1983.
  - » The 1983 rules, prohibited issuing license to trade in a wild animal categorized under Schedule-1 or Part II of Schedule II under the WPA, 1972. The license was granted in exceptional circumstances with previous approval of central government.
  - » New Guidelines says that "no license shall be granted if it related to any wild animals specified in the Schedule-I to the Act, except with previous consultation of the central government.
    - It mentions additional matters to consider granting of licenses, the authorized officers must consider the capacity of the applicant to handle the business concerned in terms of the facilities, equipment and feasibility of premises for the business.
  - » **Note:** The new guidelines doesn't have licensing restrictions for species listed in Schedule-II of the WPA, 1972. It may imply that the license for trading in Schedule - II species can be granted without consulting central government which was required earlier.
- **Analysis:**
  - » **Exclusion of Schedule-II**

## 5. ZOOLOGICAL PARKS

### 1) CENTRAL ZOO AUTHORITY

- **About Central Zoo Authority (CZA)**
  - CZA is a statutory body formed under the Wildlife Protection Act, 1972. It is chaired by the environment Minister.
    - » The authority is responsible for regulation of zoos in the country.
    - » It prescribes various standards for the functioning of the zoo and evaluates and assesses the functioning of the zoo.
    - » It is also the authority to recognize or derecognize a zoo.
    - » It makes rules and guidelines for various issues associated with zoos like transfer of animals among zoos including international transfer among zoos.
    - » It consists of a **Chairperson** and **10 members** and a **member-secretary**.
      - Most of the members are officials in environment ministry.
      - Non-government experts are those who are wildlife conservationists or retired forest officers.
  - **Main Objective:** To complement the national effort in conservation of wildlife.
- **Reconstitution of Central Zoo Authority (July 2020)**
  - The environment ministry has reconstituted CZA to include an expert from the School of Planning and Architecture, Delhi, and a molecular biologist.

## 2) NATIONAL ZOOLOGICAL PARK

- Set up in 1959, as per the decision of Indian Board of Wild Life, 1952 (now a statutory body National Board of Wildlife under WPA, 1971)
- Till 2019, it was directly managed by MoEF&CC.
  - From Sep 2019, the Delhi Zoo (i.e. National Zoological Park) is being administered directly by Central Zoo Authority.
    - » **Criticism of the move:** CZA is a regulating body. So there is a conflict of interest in this case, where a regulating body is managing the zoo as well.
- It was originally known as Delhi Zoo but in the year 1982 it was given the status of the National Zoological park with the idea of it being the model zoo of the country.

## 3) RELIANCE INDUSTRIES LIMITED WILL BUILD WORLD'S LARGEST ZOO IN JAMNAGAR (DEC 2020)

It will come up in 280 acres of land near Reliance's refinery at Moti Khavdi near Jamnagar. It will house 100 different species of mammals, birds, reptiles, and amphibians.

## 4) VANDALUR ZOO (ARIGNAR ANNA ZOOLOGICAL PARK) (AAZP)

- **Why in news?**
  - » TN government order to set up museum, theatre at Vandalur Zoo (June 2023)
- **About Vandalur Zoo:**
  - » The zoo is located in Vandalur, to southwest of Chennai.
  - » It was established in 1855 and was the first public zoo in India.
  - » It is spread over 602 hectares and includes a rescue and rehabilitation centre. It is also the largest zoo of India.
  - » The zoo is situated 7 kms from Tambaram.
- **Details of news:**
  - » The TN government has issued an order to set up a museum and a theatre at a cost of Rs 4.3 crores at the AAZP.

## 5) NANDANKANAN ZOOLOGICAL PARK (NZP)

- It is a large zoo and botanical garden, situated 15 km from Bhubaneshwar. It has been built right inside a forest and set in a completely natural environment.
- **Uniqueness of the zoo**
  - It is the first zoo in India to breed a white tiger and Melanistic tiger.
  - It is the only conservation breeding center of Indian Pangolins in the world.
  - It is the only zoological park in India to become an institutional member of World Association of Zoos and Aquarium (WAZA).
  - A train 'Puri-New Delhi Express' has been named after Nandan Kanan zoo as Nandan Kanan express.

- It is the only zoo to have an open top leopard enclosure.

## 6. VARIOUS PROTECTED AREAS IN INDIA

- Protected areas are those in which human occupation or at least exploitation of resources is limited. There are several kinds of protected areas, which vary by level of protection depending on the enabling laws of each country or the regulations of the international organization involved.

### 1) VARIOUS PROTECTED AREAS

Type	Number	Total Area (km <sup>2</sup> )	Coverage of the country
National Parks	106	44,402	1.35%
Wildlife Sanctuaries	573	1,27,197	3.87%
Conservation Reserves	123	5585	0.17%
Community Reserves	220	1455	0.04%
<b>Protected Area Total</b>	<b>1022</b>	<b>1,78,640</b>	<b>5.43%</b>

- State with highest number of NP
  - Madhya Pradesh (11)

### 2) COMPARISON BETWEEN NP AND WLS

NP	WLS
They provide protection to <u>entire ecosystem</u> including fauna, flora, landscape and historical entities.	Known for <u>Wildlife conservation</u> . It focuses that population of wildlife and their habitats are maintained substantially
<b>Highly Restricted and Protected</b> <ul style="list-style-type: none"> <li>Commercial exploitation of forest produce not allowed</li> <li>Activities like hunting, grazing, human settlement etc are prohibited</li> <li>Visit requires <u>official permission</u> from relevant authorities. Limited activities are allowed that too after the permission of Wildlife Warden.</li> </ul>	<b>Relatively lower restriction and protection</b> <ul style="list-style-type: none"> <li>Commercial exploitation of forest produce not allowed</li> <li>Hunting is prohibited without permission in a sanctuary, <u>but Grazing and movement of cattle may be permitted</u></li> <li><u>No official permission</u> is required to visit a WLS</li> </ul>
<b>Boundaries</b> are <u>clearly specified</u> in case of a National Park	<b>Boundaries</b> may not be specified
It corresponds to <b>Category II</b> of the IUCN protected areas	It corresponds to the <b>Category IV</b> of protected areas.

## 7. NATIONAL PARKS

### 8. LADAKH

#### 1) HEMIS NATIONAL PARK

- It is a high altitude NP in the eastern Ladakh region.
- **Only NP of India north of Himalayas.**
- It is also the **largest notified protected area of India** (thus also the largest National Park). It is also the **largest NP in South Asia.**
- It is also the second largest contiguous protected area after the Nanda Devi Biosphere Reserve and the surrounding protected area.
- **Rivers**
  - Bound in the north by the banks of Indus river
  - Includes the catchment of Markha, Sumdah and Rumbak.
- **Fauna**
  - Best place to see snow leopard (VU) in the wild, it is believed to have **highest density of snow leopard in the world.**
  - Other famous species of animals include **Tibetan Wolf, Eurasian Brown bear (LC), and the red fox (LC).**
- **Flora**
  - The region lies in the **rain shadow area** of the Himalayas and doesn't receive much precipitation.
  - Hence, dry forests of Juniper, Populus-Salix forests, subalpine dry birch - fir are present at **lower altitudes.**



#### Cultural significance

The park houses numerous Tibetan Gompas and holy chortens within its boundary.

These include the famous 400 year old hemis monastery.

## 9. J&K – NPS

#### 1) DACHIGAM NATIONAL PARK

- **22 km from Srinagar district**
- **Main Fauna**

- **Hangul**: the park is supposed to contain last viable hangul population in the world.
- Leopard, Red fox, musk deer, black bear, brown bear, yellow throated marten, Himalayan weasel

## **2) SALIM ALI NATIONAL PARK (ALSO KNOWN AS CITY FOREST NATIONAL PARK - LOCATED IN SRINAGAR DISTRICT).**

- In honour of famous Indian ornithologist Salim Ali (some-times referred as bird man of India)
- Very small: 9 km<sup>2</sup>
- **Main Species**
  - Hangul, Musk deer, Himalayan black beer, leopard, Himalayan serow
  - Birds : Paradise flycatcher, Himalayan Monal, and Himalayan snowcock.

## **3) KISHTAWAR NATIONAL PARK**

- **Main species**
  - Snow leopard
  - Markhor
  - Musk deer
  - Brown bear
  - Himalayan black bear

## **4) KAZINAG (QAZINAG) NATIONAL PARK**

- It is a commissioned future national park in the Baramulla district in the Indian UT of J&K. It is part of a proposal for a Trans-Karakoram peace park with Pakistan.
  - It is located in the northern region of Kashmir and is located on the northern bank of Jhelum River.
- It was created after the Kargil War and based on the increasing pressure to protect the rare **Markhor** wild goat. The national park is being set up in J&K and is the fourth one in state.
- In India, Markhor is only found in J&K and Kazinag habitats the mammal's largest population.

## **10. HIMACHAL PRADESH NPS**

### **1) GREAT HIMALAYAN NATIONAL PARK**

It is a protected area located in Kullu region of Himachal Pradesh. It is spread over an area of 1,171 km square and an altitude between 15,00 and 6,000 meters.

In June 2014, GHNP was added to UNESCO's list of World Heritage Sites. The status was granted under the category of "outstanding significance of biodiversity conservation".

**Important Fauna** of the park includes some of the most exotic species of animals like snow leopard, blue sheep, Himalayan Brown Bear, Himalayan Tahr, musk deer, etc.



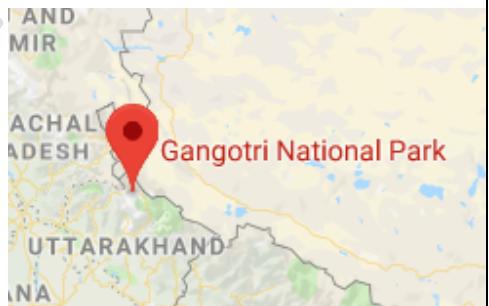
## 2) OTHER NATIONAL PARKS OF HIMACHAL

Inderkilla, Khirganga, Pin Valley and Col. Sherjung Simbalbara

### 11. UTTARAKHAND NPS

#### 1) GANGOTRI NATIONAL PARK

- GNP is a national park located in Uttarkashi district Garhwal range. This is the fourth largest NP in the country (after Hemis, Desert, and Simlipal) with total area of 2390 km<sup>2</sup>.
  - The Park provides majestic beauty of coniferous tree and grandeur of glacial world combined with lush green meadows.
  - The north-eastern boundary of the Gangotri National Park is along the international boundary with China.
  - **Important Fauna**
    - Snow leopard, ibex, tahr etc.



#### 2) VALLEY OF FLOWERS NATIONAL PARK

- It is a NP located in north Chamoli region of Uttarakhand. It is known for its meadows of endemic alpine flowers and the variety of flora.
- The area is also home to **fauna** such as **musk deer**, **snow leopard**, **Brown bear**, **blue sheep** etc.



### 3) NANDA DEVI NATIONAL PARK OR NANDA DEVI BIOSPHERE RESERVE

- It is a national park situated around the peak of Nanda Devi (7816 m) in the state of Uttarakhand.
  - It was declared World Heritage site by UNESCO in 1988. Later in 2005, the designation was enhanced to cover the Valley of Flowers too. So, the present UNESCO world heritage is **Nanda Devi and Valley of Flowers National Parks, 2005**.
  - **Both Parks** - Valley of Flowers and Nanda Devi are encompassed in the **Nanda Devi Biosphere** reserve.



### 4) RAJAJI NATIONAL PARK (TIGER RESERVE)

- Rajaji national park and tiger reserve is spread in **3 districts of UK: Haridwar, Dehradun and Pauri Garhwal**. It is nestled between the Shivalik ranges and the Indo-Gangetic plains.
- The Park has been named after **Rajagopalachari**, a prominent leader of the national freedom struggle and the second and last governor general of Independent India.
- In 2015, Rajaji became the second tiger reserve of UK.
- The Ganga and Song River flows through the park.
- Fauna: The Park is renowned for its elephants, sambar, barking deer, hog deer etc. Tigers and Leopards are prime predators of the park.

### 5) JIM CORBETT NP

- It is the oldest/first national Park in India and was established in 1936 as Hailey National Park to protect Bengal Tiger. It is in the Nainital district of Uttarakhand and has been named after Jim Corbett, a well-known hunter and naturalist. It was also the first park to come under Project Tiger initiative (i.e., declared a Tiger Reserve).
- It is also among the few tiger reserves in India which allows overnight stay in the lap of the National Park.



### 6) GOVIND PASHU VIHAR NATIONAL PARK

- Named after Gobind Ballabh Pant.
- Situated in Uttarkashi district and lies in higher reaches of Garhwal Himalayas.
- The **snow leopard project** started by Gol is being managed at this sanctuary.

## 12. HARYANA NPS

### 1) SULTANPUR NATIONAL PARK DETAILS

#### Details

- Sultanpur National Park (Formerly a bird sanctuary) is located at Sultanpur village (Gurgaon district) on Gurugram Jhajjar Highway, 15 kms from Gurgaon, Haryana.
- Sultanpur National Park is a major attraction for water birds and migratory birds.



### 2) KALESAR (YAMUNANAGAR DISTRICT)

- Kalesar National Park and the adjacent Kalesar WLS are protected areas in Yamunanagar district of Haryana state in India.
- It is located contiguous to Rajaji National Park in Uttarakhand.
  - » It is a popular destination for leopards, panthers, elephants, red jungle fowl and bird watching.
- Vegetation:** The forested area in the Shivalik foothills is covered primarily with Sal with smattering of Semul, Amaltas, and Bahera trees as well.



## 13. UTTAR PRADESH – NP

### 1) DUDHWA NATIONAL PARK (TIGER RESERVE)

- DTR is a protected area in Uttar Pradesh that stretches mainly across the Lakhimpur Kheri and Bagraich districts and comprises of **Dudhwa National Park, Kishanpur WLS, and Kataranighat WLS**.
- It's total area is more than 1,000 km<sup>2</sup>.
- It shares the north-eastern boundary with **Nepal**, which in large extent is defined by Mohana river.
- Fauna:** Tigers, leopards, bear, swamp deer, rhinoceros, elephant etc.



## 14. BIHAR – NP

### 1) VALMINKI NATIONAL PARK, TIGER RESERVE AND WLS

- It's located on **Indo-Nepal Border** in West Champaran district of Bihar, on the **bank of Gandak**. It is the **only National Park** in Bihar.
- Nepal's Chitwan National Park** borders the VNP.
- Gandak and its tributaries** are known to flood the Valmiki Tiger Reserve



## 15. JHARKHAND – NP

## 1) BETLA NATIONAL PARK (TIGER RESERVE)

- It is located on the Chota Nagpur Plateau in the Latehar district of Jharkhand, India.
- It consists of Palamau Tiger Reserve and Mahuadar Wolf Sanctuary.
- **Floor:** Sal and Bamboo are the major floral component of the park.
- **Fauna:** Elephants, Sloth bear, Panther, Wolf, Jack etc.



## 16. WEST BENGAL NPS

### 1) SUNDARBAN NP

- It is a **national park, tiger reserve, biosphere reserve** in west Bengal.
- It is part of Sundarbans in Ganga Delta and adjacent to Sundarbans Reserve Forest in BD. The Sundarban have also been added to the list of Ramsar Sites.
- **Flora**
  - Mangrove forests - Sundari trees (pneumatophore)
- **Fauna:** Bengal Tiger, Saltwater crocodiles; Fishing cats, leopard cats, wild boar, Pangolin, Chital are also found in Abundance
- **Threatened Species:** Royal Bengal Tiger, Saltwater crocodile, river terrapin, Olive Ridley Sea Turtle, Ganges River Dolphin, Hawksbill turtle and mangrove horseshoe crab.



### 2) GORUMARA NP

- **Location:** Northern West Bengal Jalpaiguri district, in the Terai region of Himalayan foothills.
- **Physical Features**
  - Medium-sized Park (80 square Kms) with grasslands and forests and is known as Dooars in West Bengal.
  - The Park is located on the flood plains of Murti River and Raidak river. The major river of the park is the Jaldhaka river, a tributary of the Brahmaputra River system.
- **Zoological Features:**
  - Primarily known for its population of Indian Rhinoceros.
  - Other animals found here include Gaur, Asian Elephant, sloth bear, chital and Sambar deer.
  - Lack of carnivores, only big cat being leopard. Tiger occasionally spotted.
  - **Submontane forest birds** like scarlet minivet, sunbird, Asian paradise suncatcher, and Indian Hornbill.
- **Conservation Focus**
  - Maintain a viable breeding community of Indian Rhinoceros



### 3) JALDAPARA NP

It is a NP in the foothills of Himalayas in the Northern Bengal and is on the banks of Torsa river.  
It has second largest rhino population (after Kaziranga (>2400 rhinos)

### 4) NEORA VALLEY NP

- Kalimpong district, West Bengal
- National Park, IBA site,
- **Fauna:** Red Panda; Civet; Black bear; Himalayan Flying Squirrel; Barking deer



### 5) SINGALILA NP

- Darjeeling district
- Located on the Singalila ridge at an altitude of 7,000 meters.
- **Flora**
  - Thick bamboo, oak, magnolia, and Rhododendron
- **Fauna:** Red Panda; Leopard Cat; Barking deer; Wild boar



### 6) BUXA NATIONAL PARK

- **Tiger reserve** located inside National Park.
- Notified as tiger reserve in 1983.
- Consists of moist deciduous and evergreen forests.
- **Other Species at Buxa**
  - Clouded leopard, jungle cats and fishing cats.
  - Elephants, gaurs, chital, sambar, barking deers and hog deer.



## 17. SIKKIM – NP

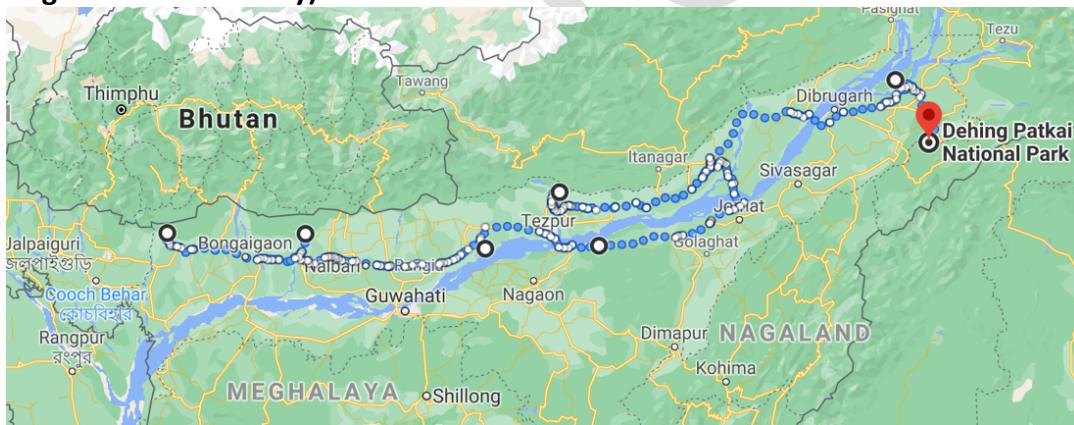
## 1) KHANGCHENDZONGA NATIONAL PARK (KHANGCHENDZONGA BIOSPHERE RESERVE)

- It is a national park and Biosphere reserve located in Sikkim, India. The total area of the park is 849.5 km<sup>2</sup>. It forms the core of the Biosphere Reserves.
- It includes a unique diversity of plains, valleys, lakes and glaciers and spectacular snow-capped mountains covered with forests including the world's **third highest peak, Mount Khangchendzonga**.
- The National Park falls in the **Himalayan Global Biodiversity Hotspots** and displays an unsurpassed range of sub-tropical to alpine system.
- It was also inscribed to the **UNESCO World Heritage Sites list in July 2016**, becoming the first mixed heritage site in India.
- It was **recently included in UNESCO's MAB program**.
- **Cultural Significance**
  - There are few lepcha tribal settlements inside the park.
  - The Park contains Tholung Monastery, a gompa located in the park's buffer zone.
- **Neighbouring Protected Area**
  - In the **north** it adjoins the **Qomolangma National Nature Preserve** in Tibet and in the **West** the **Kanchenjunga Conservation** area in Nepal.
- **Important Fauna:** Musk deer, snow leopard, Himalayan Tahr, red panda, Himalayan Black Bear, Himalayan Blue Sheep etc.



## 18. ASSAM – NP

National Parks in Assam - After addition of two national parks in June 2021, Assam now has **7 National Parks (2nd highest in the country)**



## 1) RAIMONA NATIONAL PARK

- **Details**
  - It is a national park in Assam, India located in Gossaigaon subdivision of Kokrajhar district. It is located within the Bodoland Territorial Region.
  - The area includes the northern part of the notified Ripu Reserve Forest, which forms the western buffer to the Manas National Park.
- **Boundaries:**
  - Raimona is bounded in the **West** by the **Sankosh river** (along the Assam-WB border) running southwards from the India-Bhutan border.
  - **Saralbhanga river** on the east forms the eastern boundary.
  - **Pekua river** defines the NP's southern boundary.
  - It also shares the contiguous forest patches of the Phipsoo WLS and the Jigme Singye Wangchuk National Park in Bhutan creating a transboundary conversion landscape.
- Such secured transboundary ecological landscape will ensure the long-term conversation of endemic species like the golden langur, the mascot of Bodoland Territorial Council and the endangered species such as the Asian Elephants, the Bengal Tiger etc.



## 2) MANASA NATIONAL PARK

- Situated in the **foothills of the Himalayas and extended to Bhutan**, Manas National Park is one of the most sought after tourist destination in entire North East.
- **History**
  - Declared a sanctuary in 1928
  - World Heritage Site by UNESCO in 1985
  - World Heritage Site in danger in 1992 - due to poaching and other instability
  - Tag of World Heritage Site in danger removed - 2010.
- **Important Wild life species**
  - One horned Rhino, Wild Buffaloes, little known white winged duck, and Manipur Bush Quail, among others.
- **Pygmy Hog Conservation Program (PHCP)**
  - The Pygmy Hog Conservation Program (PHCP) is a collaboration among Durrell Wildlife Conservation Trust of UK, Assam Forest Department, Wild Pig Specialist Group of International Union for Conservation of Nature and MoEF&CC.
  - It is currently being implemented by NGOs Aaranyak and EcoSystems India.
  - Under this initiative six Hogs (two males and 4 females) were captured from the Bansbari range of Manas National Park in 1996 for starting the breeding program.
  - **The reintroduction** began in 2008 with Sonai Rupai WLS (35 Hogs), Orang National Park (59) and Barnadi WLS (22).



- With the June 2021 release, the total number of releases in wild under the PHCP program reached **146**, which is more than their total original global population.
- Conservation of Pygmy Hog was initiated by noted naturalist Gerald Durrell and his trust in 1971. Pygmy Hog was brought back from near extinction by the partnership effort, and the efforts are being made towards establishment of a population across the entire range.
- By 2025**, the PHCP plans to release 60 Pygmy Hogs in Manas.

### 3) ORANG NATIONAL PARK

- It is located on the northern bank of Brahmaputra in the Darrang and Sonitpur districts of Assam.
- Famous Fauna:**
  - Great Indian one-horned Rhino; Pigmy Hog; Elephants, wild buffaloes and tigers
  - Birds: Bengal Florican (CR)** also called Bengal Bustard is one of the flagship species of the park with a population of 30-40
- It is the only stronghold of Rhino on the northern Bank of Brahmaputra.



### 4) NAMERI NATIONAL PARK

- Nameri is located in Sonitpur district of Assam.
- Shares border with Pakhui WLS of Arunachal Pradesh.



### 5) KAZIRANGA NATIONAL PARK

- » Situated in the Golaghat and Nagaon district of Assam.
- » It is a **World Heritage site, a tiger reserve, an IBA** and is most famous for its **one-horned Rhinos**.
- » **Fauna**
  - Great one-horned Rhino:** It hosts 2/3rd of the world's one-horned Rhino population.
  - Tigers:** It has one of the highest density of tigers among protected areas in the world.
  - Elephant**, wild water buffalo, swamp deer, Golden Langur
    - Eastern swamp deer (Barasinga) (**VU**)
- » **Geographical feature**
  - It is situated on the banks of Brahmaputra (The river lies to its north and west)



- » It is crisscrossed by 3 other rivers

## 6) DIBRU SAIKHOWA NATIONAL PARK AND BIOSPHERE RESERVE

- At Tinsukia and Dibrugarh districts of Assam
- Rivers
  - Bounded by Brahmaputra and Lohit rivers in the north and Dibru river in the South.
- Fauna
  - **White winged duck (EN)**
    - The park was created to protect the white winged duck.
  - Water buffalo
  - Black breasted parrotbill
  - Tiger and capped langur
- Flora: The Forest type of Dibru Saikhowa comprises of semi-evergreen forests, deciduous forests, littoral and swamp forests and patches of wet evergreen forests. It is the largest swamp forest in north-east India.



## 7) DIHING PATKAI NATIONAL PARK

- The national park is a contiguous stretch of forests, starting from **Upper Dihing Forests in the east (under Digboi division of the Tinsukia district)** upto the **Jeypore RF (under the Dibrugarh Division, Dibrugarh district)**.
- It comprises of Pristine forests along the Assam-Arunachal interstate boundary, classified as **Assam Valley Tropical Wet Evergreen Forests**.
  - Dehing-Patkai is sometimes also referred as '**Amazon of the East**'. It is the only rain forest in Assam and also spreads into Arunachal Pradesh.
  - Note: Dehing Patkai forms the largest stretch of the lowland forests in India.



- Being a **completely virgin forest**, the NP is **very rich in biodiversity**. Rare faunae include Chinese Pangolins, Flying Fox, Wild Pig, Sambar, Barking Deer, Gaur, Serow, and Malayan Giant squirrels.
- It is the **only sanctuary in India** which is home to **7 species of wild cats** - Tiger, Leopard, Clouded Leopard, Leopard Cat, Golden Cat, and Marbled Cat.
  - It is a part of Dehing Patkai Elephant reserve.

## 19. ARUNACHAL PRADESH NPS

### 1) NAMDAPHA NATIONAL PARK (TIGER RESERVE)

- About
  - It is a protected area in Changlang district of Arunachal Pradesh and is a **biodiversity hotspot** in eastern Himalayas.
  - It is crossed from east-to-west by the **Noa Dihing** river that originates in Chaukan pass, located on the Indo-Myanmar border.
- Fauna
  - **Namdapha Flying Squirrel** was first collected from the park and is described as **endemic** to the park. It is critically endangered and has been recorded only in a single valley within the park.
  - **Dhole, Red Panda, Red Fox** etc are other important mammals found here.
- Important Tribal Groups within the park include **Lisu, Chakma, Tangsa, and Singpho**.



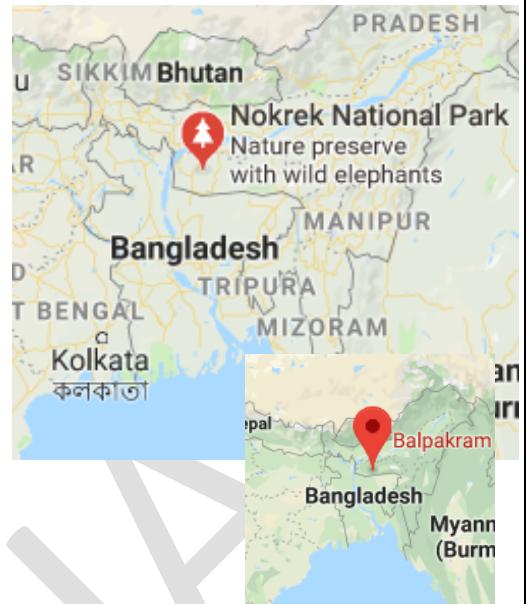
### 2) MOULING NP

- Spread primarily in upper Siang and East Siang districts
- The Mouling National Park and Dibang WLS are located fully or partly within **Dihang-Dibang Biosphere Reserve**.

## 20. MEGHALAYA

### 1) NOKREK NP, CHERRAPUNJI

- Nokrek National Park is the **core area of the Nokrek Biosphere Reserve** is located in West Garo Hills of Meghalaya, India.
- UNESCO added the NP to its list of BR in 2009.
- Along with Balphakram National Park it forms the hotspot of biodiversity in Meghalaya.
- **Important Fauna**
  - » Red Panda, Elephant etc.
- It is also an Important Bird Area.



## 2) BALPHAKRAM NATIONAL PARK

- It is NP near Garo Hills in Meghalaya. It is located at Extreme south of Garo Hills.
- **Fauna**
  - Red Panda, tiger, elephant etc.

## 21. MANIPUR NPS

### 1) KEIBUL LAMJAO NATIONAL PARK

- It is a NP in the Bishnupur district of the state of Manipur.
- Its area is 40 Km<sup>2</sup> and is perhaps the world's largest floating park.
- It is an integral component of the Loktak Lake. Loktak lake is also the largest freshwater lake of NE India.
- It has also been declared a **Ramsar wetland site.**
- **Important Fauna**
  - Brow Antlered Deer (flagship species), Hog Deer etc.



## 22. OTHER NPS OF NORTH EAST INDIA

Shiroi (Manipur), Murlen (Mizoram), Phawangpui (Blue Mountain) (Mizoram), Intanki (**Nagaland**), Clouded Leopard (Tripura), Bison (Tripura)

## 23. RAJASTHAN-NATIONAL PARKS

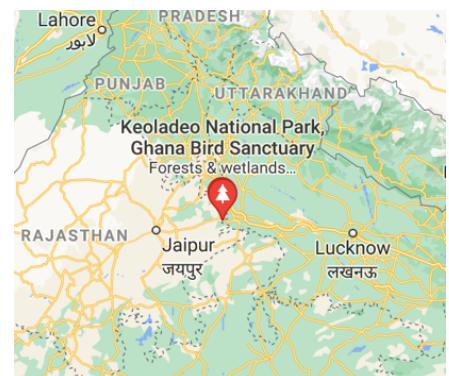
## 1) SARISKA NATIONAL PARK (TIGER RESERVE)

- **Location:** Sariska Tiger Reserve is located in the Aravalli Hills, 35 km from Alwar, 250 km SW of Delhi and 110 km NE of Jaipur. It lies in Alwar district of Rajasthan. It was declared as a Tiger reserve in 1978.
- It is a former hunting reserve of Maharaja of Alwar and is home to a variety of flora and fauna.
- The Park has population of tigers, leopards, Nilgai, Sambar, Chital etc.
- It is the **first globally successful reserve to relocate and rehabilitate the tigers.**
- **Other tourist attractions of the reserve**
  - The sanctuary is strewn with ruins of ancient temples dating back to the 10th and 11th centuries.
    - Some of the highlights are the ruins of the Kankwari Fort and the 10th century Neelkanth temples. The way to the temples is rough but the architecture and the Khajuraho-like carvings will simply leave the visitor in awe of the place.
    - Neelkanth Mahadeva, houses the ruins of over 300 Hindu and Jain temples constructed between the 8th and 12th Centuries.
    - Chand Baoli (step well) at Abhaneri is enormous with 3500 steep steps built by the Nikhumbha dynasty is one of the largest stepwells in the world.
    - Note: Alwar is a city dotted with heritage buildings, Forts, tombs and palaces. Some of the important sights not to be missed are Bala Qila, Vijai Mandir Lake Palaces, Fateh jung ki Gumbad, Moti Doongri etc.



## 2) KEOLADEO GHANA NATIONAL PARK (FORMERLY CALLED BHARATPUR BIRD SANCTUARY)

- **Introduction**
  - » KNP is spread over an area of 28.73 sq km and lies at the confluence of the Gambhir and Banganga rivers in Bharatpur district.
  - » This bird sanctuary hosts thousands of birds especially during winters.
  - » It is also a World Heritage Site.
  - » It is a man-made and man-managed wetland.
  - » Along with Loktak lake, Manipur, KNP is placed on the Montreux Record under Ramsar Convention.
- **Threats by Invasive Alien Species: Report published in Oct 2020**
  - » In a new study published in the journal Biodiversity and Conservation, researchers have categorized the site as facing 'high threat' from biological invasion.
  - » As many as 14 invasive alien species thrive in the park.
    - 9 plant species
    - 2 fish species (Common Carp and African Cat fish)
    - 2 Mammals (Bovine (Bos Taurus) and Rhesus Monkey (Macaca mulatta))
    - 1 moth species (Parapoynx diminutalis)



## 3) RANTHAMBORE NATIONAL PARK (TIGER RESERVE), SWAI MADHOPUR

- **Introduction**

- Ranthambore NP has an area of 392 km<sup>2</sup>. It was declared as NP in 1980. It is also a tiger reserve.
- In 1985, adjacent forests were declared the **Sawai Man Singh Sanctuary** and **Keladevi Sanctuary**.
- In 1991, tiger reserve was expanded to include Sawai Man Singh and Keladevi sanctuaries.



- **Fauna**

- Ranthambore is most well-known for its **Bengal tigers** and is one of the best places in India to see these animals in their natural habitat.
  - » **Overpopulation of Tigers** in Ranthambore has continuously led to conflicts between tigers.
- Other fauna includes Indian leopard, nilgai, wild boar, sambar, striped hyena, sloth bear, gray langur, rhesus macaque, mugger crocodile and chital.

- **Flora**

- The NP is famous for the **largest banyan tree in India**.

#### 4) DESERT NATIONAL PARK (DNP)

- Situated in Western Rajasthan near **Jaisalmer**. It is the second largest national park of India having an area of 3162 km<sup>2</sup>.
- Sand dunes form around 20% of the park. The major landforms consist of craggy rocks and compact Salt Lake bottoms, intermedial areas and fixed dunes.
- **Abundance of bird life**
  - The region is a haven for migratory and resident birds of the desert.
    - **Gadsisar Lake** is among the tourist places in Jaisalmer. Thousands of migratory birds come to this place every year.
  - Many eagles, harriers, falcons, and vultures are found here.
  - **The great Indian bustard** is also available in fair numbers.



#### 5) DARRAH NATIONAL PARK (MUKUNDARA NATIONAL PARK)/ TIGER RESERVE

- **Mukundra Hills** National Park is also known as **Darrah WLS**. It is located near the Kota town of Rajasthan. It consists of large tracts of forests formerly part of the Maharaja of Kota's hunting grounds.
- The national park is a **combination of 3 WLS**.
  - Darrah WLS
  - Chambal WLS
  - Jaswant Sagar WLS
- In 2013, it became the **third Tiger Reserve** of the Rajasthan.
- After the death of few tigers in 2020, the NP is left with only 1 tiger.



#### 24. GUJARAT NATIONAL PARK

## 1) BLACKBUCK NATIONAL PARK, VELAVADAR

- Blackbuck National Park, Velavadar, is situated in the Bhavnagar District of Gujarat state, India.



## 2) MARINE NATIONAL PARK

- It is situated on the southern shore of Gulf of Kutch in the Devbhumi Dwarka district of Gujarat.
- The national park has 42 islands on the Jamnagar coast. Most of these islands are surrounded by reefs. Out of which 33 islands have coral reef. Some of the best-known islands are **Pirotan, Karubhar, Narara, and Poshitra**.



## 3) GIR NATIONAL PARK

- Gir National Park and WLS located in the Saurashtra Peninsula of Gujarat, is the only natural habitat of world popular Asiatic Lions.
- **7 major perennial rivers** pass through Gir - Hiran, Saraswati, Datardi, Shingoda, Macchundri, Ghodavadi and Raval.
- **Kamleshwar Dam** is a large water body in the Gir Forest, which is good for marsh crocodile, reptiles and birds.



## 4) VANSDA (BANSDA) NATIONAL PARK

- It is a protected area located in Navsari district of the state of Gujarat.
- There has seen almost no felling of trees since 1952 which has ensured dense forest.
- It is nestled in Western Ghats.



## 25. MADHYA PRADESH NATIONAL PARKS

### 1) MADHAV NATIONAL PARK

- It is in the Shivpuri district of Gwalior in NW Madhya Pradesh, India. It is named after Madhav Rao Scindhia, the Maharaja of Gwalior.



### 2) KUNO NATIONAL PARK

- It was established in 1981 as a Wildlife Sanctuary also known as **Kuno-Palpur WLS**. In 2018, it was given the status of National Park.
- It is part of Kathiawar-Gir dry deciduous forests region.
- In **1990s**, it was being considered for the **Asiatic Lion Reintroduction Program**, which aimed at establishing second lion Population in India.
  - Place of African **Cheetah reintroduction in India**.



### 3) PANNA NATIONAL PARK (PANNA TIGER RESERVE)

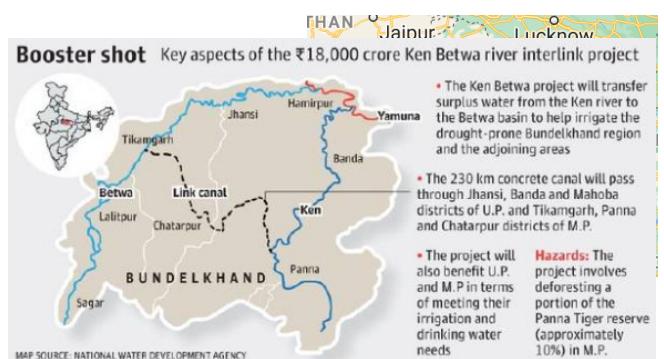
- **About Panna Tiger Reserve/National Park**
  - » It is a TR/NP located in the Panna and Chattarpur district of MP and has an area of 542 km<sup>2</sup>.
  - » **Ken River** flows from South to North through the Panna tiger reserve.
- **Successful Tiger Relocation**
  - » **Background:** Panna tiger reserve was the second tiger reserve in India after Sariska to lose all its native tigers. Though tigers were repopulated in Sariska before Panna, but Panna presently had 3 times the tiger numbers.
  - » **Beginning of Relocation** of tigers started in 2009 when the **T1 tigress** was brought from the Bandhavgarh. Over the years group of 7 founder tigers have mated and produced more than 80 cubs making it a one of the major success stories.
- **River inter-linking and Impact on Panna**
  - » The plan of Gol, and state of MP and UP to interlink **Ken and Betwa** involves construction of 283m long Daudhan Dam. This is expected to inundate 400 hectares of Panna Tiger Reserve and environmentalists have raised concerns regarding this.



Location in Madhya Pradesh, India

### 4) VAN VIHAR NATIONAL PARK

- It is located in **Bhopal**, the capital city of Madhya Pradesh. It is very small around 4.45 km<sup>2</sup>.
- It has a status of National Park, but it is managed as zoological park, following the guidelines of Central Zoo authority.
- Animals are kept in their natural habitats. Most animals are either orphaned or brought from other zoos. No animal is deliberately captured from the Wild.



## 5) SANJAY NATIONAL PARK (TIGER RESERVES)

- **About SNP**
  - Located in **Siddhi district** of Madhya Pradesh. The NP is part of Sanjay-Dubri tiger reserve.
- **Note:** Guru Ghasidas National Park is the part of Sanjay National Park which became part of Chhattisgarh on partition of MP. It was renamed to Guru Ghasidas National Park.



## 6) BANDHAVGARH NATIONAL PARK

- It is located in the Umaria district of MP.
- This park is known for its high tiger density (8 tigers / km<sup>2</sup>). It was declared a Tiger Reserve in 1993.



## 7) KANHA NATIONAL PARK (KANHA TIGER RESERVE)

- It is the largest NP of Madhya Pradesh and one of the important tiger reserves of India. Today it stretches over an area of 940 km<sup>2</sup> in two districts of Mandla and Balaghat.
  - Total Area: 1949 sq km.
  - Core Zone: 940 sq km
- It was declared a national park in 1955 by merging Hallon and Banjar WLS.
- **Important Fauna:** Tiger; Hard ground Barahsingha (*Cervus duvauceli branderi*); Gaurs
- **Major achievements**
  - Important national park for tiger tourism.
  - It is also the only natural habitat of highly endangered hard-ground Barasingha (*Cervus duvauceli branderi*)

## 8) SATPURA NATIONAL PARK (SATPURA TIGER RESERVE)

- Located in the Hoshangabad district of MP. Its name is derived from Satpura Ranges and its covers an area of 524 km<sup>2</sup>.
- **Adjoining WLS**
  - **Bori WLS**
  - **Pachmarhi WLS**
- SNP also with Bori and Panchmarhi WLS provides an unique central highland ecosystem.
- **Biodiversity rich NP**
  - Leopard, Sambar, Chital, Nilgai, four horned antelope, black buck, mouse deer, Indian giant squirrel etc.
  - **Previous years** have seen rare sightings of tigers, dholes, Indian gaur, Barahsingha etc.



## 9) PENCH NATIONAL PARK

- It is in Seoni and Chhindwara districts of MP and includes Pench Tiger Reserve.
- It derives its name from **Pench river** that flows through the park from north to South dividing park into almost equal western and eastern halves.

## 10) OTHER NATIONAL PARKS OF MP

- Dinasour Fossils
- Fossil

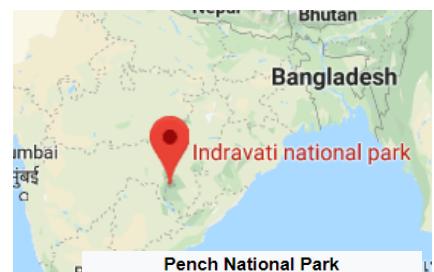
## 26. CHHATTISGARH NATIONAL PARKS

### 1) GURU GHASIDAS (SANJAY GANDHI) NATIONAL PARK

- This Park is the result of the carving of Chhattisgarh from Madhya Pradesh in the year of 2000. After Madhya Pradesh was divided in 2000, a large part of the then Sanjay National Park went to Chhattisgarh. Chhattisgarh government renamed this forest area, with an area of 1440.71 km<sup>2</sup> falling under its jurisdiction, as Guru Ghasidas National Park.
- **Tiger reserves in Chhattisgarh:** At present Chhattisgarh has three tiger reserves:
  - Achanakmar Tiger Reserve in Bilaspur
  - Udanti-Sitanadi Tiger Reserve in Gariaband
  - Indravati Tiger Reserve in Bijapur district
- State government is in the process of declaring Guru Ghasidas National Park into a tiger reserve.

### 2) INDRAVATI (KUTRU) NATIONAL PARK (TIGER RESERVE)

- » Indravati National Park is a national park situated in Bijapur district of Chhattisgarh state of India. It derives its name from the nearby Indravati River.
  - **Note1:** The Bijapur district is Maoist affected district.
  - **Note2:** The forests in the region are also affected by forest fires. Tribals set fire to forests as it makes it easier for them to collect mahua flowers during March-April.
- » **Fauna:** It is one of the last populations of **rare wild buffalo** (IUCN: EN)
- » **Flora:** Pre-dominance of sal, teak, bamboo, **Mahua** etc.



### 3) KANGER VALLEY NATIONAL PARK



## Why in news?

Bird watchers recorded 200 bird species in Chhattisgarh's Kanger Valley National Park (Dec 2022)

**Bird Species:** Bird watchers, and forest department officials counted 200 types of birds in Chhattisgarh's first ever inter-state bird survey conducted in the National park from 25th - 27th Nov 2022.

- The survey unveiled that the valley can potentially host species found in the Himalayas, the Northeast, the Eastern and Western Himalayas.

**About Bastar Hill Mynah:** It is a subspecies of the common hill mynah which is protected under Schedule 1(b) of the WPA.

It is endemic to the Kanger valley National Park.

The jet black colored bird mimics the human voice exceptionally well. For this reason, it is often found in cages and sold as pets in the market.



It is a national park in the Bastar region of Chhattisgarh.

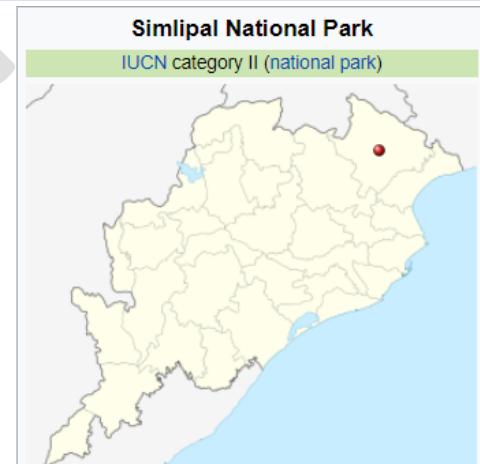
It is one of the densest national parks and is home to the **Bastar Hill Mynah**, the state bird of Chhattisgarh.

The park gets its name from **Kanger river** which flows along the length of the park

## 27. ODISHA NATIONAL PARKS

### 1) SIMLIPAL NATIONAL PARK (TIGER RESERVE)

- It is situated in Mayurbhanj district in the Indian state of Odisha. It is part of the Simlipal-Kuldiha-Hadgarh Elephant reserve popularly known as **Mayurbhanj Animal Reserve**, which includes three protected areas - Simlipal Tiger Reserve (2750 km<sup>2</sup>), Hadgarh Wildlife Sanctuary (191.06 km<sup>2</sup>) and Kuldiha Wildlife Sanctuary (272.75 km<sup>2</sup>).
  - Simlipal derives its name from** the abundance of Simul (red silk cotton trees) that bloom here.
  - It is **one of the largest** national parks in India.
  - It is also listed under **UNESCO World Network of Biosphere Reserve**.
  - Faunal Diversity:** Tigers, Elephants, Gaurs, Chousingha etc.
  - Issue of Non-declaration as full-fledged National Park**
    - Though the Simlipal has been accorded the status of National Park provisionally long back but is yet to be declared a full-fledged national.
    - Why not full fledged status?**
      - Families live close to the core area of the forest. Government haven't been able to shift them.



### 2) BHITARKANIKA NATIONAL PARK

- Introduction**

- It is a national park located in Kendrapara district of Odisha in eastern India.
- **Core area of 145 km<sup>2</sup>** of the Bhitarkanika WLS spread over 672 Km<sup>2</sup>, has been designated as a National Park.
- **Gahirmatha beach Marine Sanctuary** lies to the east, and separates swamp region cover with canopy of mangroves from the Bay of Bengal.
  - The sanctuary is the second largest mangrove ecosystem in the country.
- It is also a Ramsar convention site.
- **Fauna**
  - **1671 estuarine crocodiles** (saltwater crocodile) were counted living along the Bhitarkanika water bodies.
  - **Other Fauna**
    - White Crocodile, Olive Ridley Sea Turtles, Indian python, King Cobra, black ibis, darters etc.
- **Flora**
  - Mangroves - Sundari, thespia,
  - Grasses like Indigo, Bush etc.
- **Rivers**
  - The NP and WLS is inundated by a number of rivers - **Brahmani, Baitrani, Dhamra, Pathsala** and others
- **3 Protected Areas**
  - The Bhitarkanika National Park
  - The Bhitarkanika WLS
  - The Gahirmatha Marine Sanctuary
    - **Recent Development:**
      - » The Orissa High Court constituted a three-member committee on February 26, 2021 which will submit a report on the conservation of sea turtles in Gahirmatha marine sanctuary. This action followed media reports saying 800 Olive Ridley turtles have died since Jan 2021 due to negligence of state's forest and fisheries department.



## 28. MAHARASHTRA NATIONAL PARKS

### 1) GUGAMAL NATIONAL PARK

- Located in Amravati District of Maharashtra, it is part of Melghat Tiger Reserve.



### 2) PENCH NATIONAL PARK AND TIGER RESERVE

- Pench Tiger reserve is one of the premiere tiger reserves of India and the first one to straddle across two states - Madhya Pradesh and Maharashtra.

- The tiger reserve consist of **Indira Priyadarshini Pench National Park**, the **Pench Mowgli Sanctuary** and a buffer.
  - It is the same forest area portrayed in the famous 'Jungle Book' by Rudyard Kipling.
- The tiger reserve derives its name from the **Pench river** which is its lifeline.

### 3) NAVEGAON NATIONAL PARK

- It is a national park located in **Gondia district** of Maharashtra.
- It's role as **Bird Sanctuary** is very significant. It is home to **almost 60% bird species** found in whole of Maharashtra.
  - The beautiful **Navegaon lake** is known for its pollution free water and attraction of birds.
  - The area around the lake is known as **Dr. Salim Ali Bird Sanctuary.**



### 4) TADOOA NATIONAL PARK (TADOOA ANDHARI TIGER RESERVE)

- **Details**
  - It is Maharashtra's **oldest and largest National Park**. It is also one of the 54 tiger reserves in India. It is located in Chandrapur district of Maharashtra.
- The total area of the tiger reserve is 1,727 km<sup>2</sup>, which includes the Tadoba National Park, created in 1955.
  - The Andhari WLS was formed in 1986 and was amalgamated with the park in 1995 to establish the present **Tadoba Andheri Tiger reserve**. This is **most famous of MHA's six tiger reserves**.
- **Fauna**
  - **Keystone Species:** The Bengal tiger
  - Other Mammals: Indian leopards, sloth bears, gaur, nilgai , dhole, striped hyena, small Indian civet, jungle cats.
- **Vegetation of the park**
  - Southern tropical dry deciduous
  - Teak is the most common tree.
- **Two lakes and 1 river in the park**
  - Tadoba lake and Kolsa lake.
  - Tadoba river (also Andhari river (a minor river in Wainganga basin)) flows through the Andheri WLS)



### 5) SANJAY GANDHI NATIONAL PARK (SGNP) (BORIVALLI)

- It is located in Mumbai, Maharashtra. It is a rare example of a national park situated within a metropolitan and is also one of the most visited parks in the world.
- This is famous for the site of Ancient Kanheri caves.

### 6) CHANDOLI NATIONAL PARK

- It is a national park spread over Satara, Kolhapur, and Sangli district of Maharashtra. It was established in 2004.
- It is the southern portion of the **Sahyadri Tiger Reserve**.
- It is located near Chandoli dam. It lies between **Koyna WLS** and **Radhangiri WLS**.
  - Sahyadri Tiger Reserve**
    - It was created in 2007, by including all of **Chandoli Tiger Reserve** and **Koyna WLS**.
      - Chandoli Tiger Reserve** forms the southern portion of the reserve.
    - The tiger reserve is known for its population of Tigers and Leopards.



## 29. TELANGANA NATIONAL PARKS

### 1) KASU BRAHMANANDA REDDY NATIONAL PARK

- It is located in the Jubilee Hills and Banjara Hills of Hyderabad. It's a small park with a total area of 1.6 km<sup>2</sup>.
- The Park also houses the **famous Chiran palace**.
  - It was built in 1960. The entire palace complex is spread over an area of about 400 acres and was given to Prince Mukarram Jahan on his coronation by his Father Prince (Azam Jahan) in 1967.



### 2) MAHAVIR HARINA VANASTHALI NATIONAL PARK

- It is a deer national park located in Vanasthalipuram, Saheb Nagar, Hyderabad, Telangana.
- It is the largest green lung space in the city of Hyderabad.



### 3) MRUGVANI NATIONAL PARK

- Details:**
  - It is a small national park located in Hyderabad. Its total area is 3.6 sq km.



## 30. ANDRA PRADESH NATIONAL PARKS

### 1) PAPIKONDA NATIONAL PARK

- The WLS was upgraded to the National Park Status in 2008.
- The river **Godavari** flows through the park.
- Important Fauna** include Tigers, Leopards, Sloth bear, small Indian Civet, nilgai, four-horned antelope etc.
- It is located in Papi Hills in the East Godavari and the West Godavari districts.
- It is also an important bird area.



## 2) RAJEEV GANDHI (RAMESHWARAM) NATIONAL PARK

- It is located in Rameswaram of **Kadappa district** of Andhra Pradesh, India. It is a small national park of 2.4 sq km and lies on the bank of Penna River.
- **Note:**
  - Few other national parks in the country have been named after Rajeev Gandhi
  - Mukundara Hills National Park in Rajasthan, Nagarhole National Park in Karnataka etc.



## 3) SRI VENKATESWARA NATIONAL PARK (PART OF SESACHALLAM BIOSPHERE RESERVE)

- Located in eastern ghats and spread over Seshachallam Hills of Chittoor district.
- It receives most of its rainfall from north-eastern monsoon.
- **Vegetation:** Dry Deciduous mixed forests with patches of moist deciduous forests.



## 31. GOA – NATIONAL PARK

### 1) MOLLEM NATIONAL PARK AND BHAGWAN MAHAVEER WLS

- Located in Western Ghats, Goa, along the eastern border with Karnataka.
- It contains several important temples dating to the Kadambas of Goa, and home to waterfalls, such as **Dudhsagar Falls** and **Tambdi Falls**.
- The park is also home to **nomadic buffalo herders** known as **Dhangar**.

## 32. KARNATAKA – NATIONAL PARK

### 1) KALI TIGER RESERVE (ANSHI NATIONAL PARK)

- It is a tiger reserve situated in Uttar Kannada district of Karnataka.
- The park is habitat of Bengal Tiger, Black Panther and Indian Elephants.
- The **Kali river** flows through the Tiger reserve and is the lifeline of the ecosystem and hence the name. The tiger reserve is spread over an area of 13,00 sq km.



## 2) KUDREMUKH NATIONAL PARK

- Dakshin Kannada district of Karnataka.
- Located in Western Ghats.
- NP divided into four ranges
  - Kudremukh, Kerekatte, Kalasa, Shimoga.
- **Flora**
  - Plantation of eucalyptus, casuarinas etc.
- **Fauna**
  - Tiger, leopard, wild dog, Malabar giant squirrel, common langur, sloth bear, gaur, Porcupine sambar, barking deer etc.
  - **Birds' species**
    - » Malabar Trogon, Malabar Whistling thrush, great pied hornbill, and the imperial pigeon
- **Other attraction**
  - Kadambi waterfall



## 3) BANNERGHATTA NATIONAL PARK

- Near Bangalore, Karnataka  
In 2002, a portion of the park was made a **biological reserve**. It is a popular tourist destination with zoo, a pet corner, an animal rescue center, a butterfly enclosure, an aquarium etc

## 4) BANDIPUR NATIONAL PARK

- **About Bandipur Tiger Reserve**
  - Bandipur was established in 1974 as a tiger reserve under Project Tiger, is a national park located in Chamarajanagar and Mysore district of south Indian state of Karnataka. Bandipur is known for its wildlife and had many types of biomes, but dry deciduous forest is dominant.
  - It is about 80 km<sup>2</sup> from the city of Mysore on the route to a major tourist destination of Ooty. As a result, Bandipur sees a lot of **tourist traffic** and there are a lot of **wildlife fatalities** caused by speeding vehicles that are reported each year. There is a ban on traffic from the hours of dusk to dawn to help bring down deaths of wildlife.
- The national park spans an area of 874 sq km and protects several species of India's endangered species.
  - Together with adjoining Nagarhole National Park (KAR) (643 sq km), Mudumalai National Park (320 sq km), Wayanad WLS (344 sq km), it is part of Nilgiri Biosphere Reserve.
- **Dominant Flora:** Teak, Rosewood, Sandalwood etc.
- **Dominant Fauna:** Tiger, Elephant, Gaur, Sambar, Chital, Deer, Antelope, Wild Boars etc.



## 5) NAGARHOLE NATIONAL PARK (TIGER RESERVE) (ALSO KNOWN AS RAJIV GANDHI NATIONAL PARK)

- Located in Kodagu and Mysore district of Karnataka. It is located on the north-west of Bandipur National Park.
- It is also part of Nilgiri Biosphere Reserve.
- It is also recognized as **Important Bird Area (IBA)**
- **Important Biodiversity:** **Tigers**, Gaur, Elephants, Indian Leopard etc.
- **Tribes Commonly found in the forest**
  - **Jenu Kurubas** - primary inhabitants - slowly disappearing



## 33. KERALA – NATIONAL PARKS

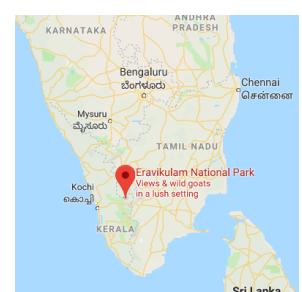
### 1) SILENT VALLEY NATIONAL PARK

- **Introduction**
  - It is the core of Nilgiri International Biosphere reserve and is part of Nilgiri Sub-Cluster (6000 km<sup>2</sup>), Western Ghat World Heritage Site recognized by UNESCO in 2007.
  - It consists of undisturbed tracts of Southwestern Ghats Mountain rain forests and tropical moist evergreen forests of India.
- **Location:** Nilgiri Hills, within the **Palakkad district of Kerala**, South India.
- **Important Water Bodies**
  - River **Kunthi** (Kunthipuzha) descends from the Nilgiri Hills above an altitude of 2000 m and traverses the entire length of the valley finally rushing down to the plains through a deep gorge.
    - It is a tributary of Thuthapuzha which in turn is tributary of Bharathapuzha river (second largest river of Kerala after Periyar River)
- **Important Animal Species**
  - Lion Tailed Macaque, Nilgiri Langur, Malabar Giant Squirrel, Nilgiri Tahr etc.
  - Silent valley Bush frog (Raorchestes silent valley), first described in 2016, is named after the park.



### 2) ERAVIKULAM NATIONAL PARK

- It is a 97 km<sup>2</sup> national park located along Western Ghats in the Idukki district of Kerala.
- It was the first National Park in Kerala (Now Kerala has 6 National Parks)
- It is a **UNESCO World Heritage Site**.
- It is the national park with **highest numbers of endangered Nilgiri Tahr**.
- **Other important species** found in Eravikulam National Park includes **Tiger, lion tailed macaque, gaur, leopard, Dhole** etc.
  - **Elephants** also make seasonal visit.



### 3) PAMPADUN SHOLA NATIONAL PARK

- Located in **Idukki** District, it is the **smallest National Park** of Kerala.
- The Park protects a moderate amount of montane evergreen forest that is associated with the wildlife rich Eravikulam National Park.
- **The keystone species** here are highly elusive and endangered, endemic small carnivore - the Nilgiri Marten, Leopards, and Indian Wild Dogs.



### 4) MATHIKETTAM SHOLA NATIONAL PARK

It is a small NP in Idukki district of Kerala state, South India.

### 5) ANAMUDI SHOLA NATIONAL PARK

It is a small NP in the Idukki District of Kerala.

It consists of Mannavan Shola, Idivara Shola, and Pullardi Shola, covering a total area of 7.5 km<sup>2</sup>.

### 6) PERIYAR NATIONAL PARK AND WLS

- Also, an **Elephant Reserve and Tiger Reserve**
- Protected area in districts of Idukki and Pathanamthitta in Kerala, India.
- Area of **925 Km<sup>2</sup>**, Core area of 305 Km<sup>2</sup> was declared as the Periyar National Park in 1982.
- The park forms the **major watershed of two important rivers**, the **Periyar and the Pamba**.
- It is often called the **Periyar Wildlife Sanctuary or Thekkady**. It is located in the Cardamom hills and Pandalam hills or the South Western Ghats along the border of Tamil Nadu.

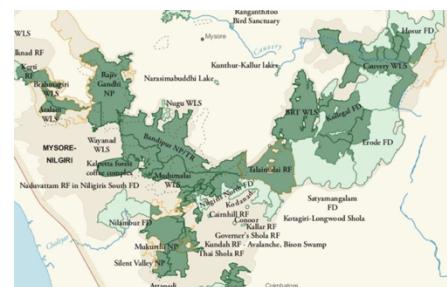
## 34. TAMIL NADU – NATIONAL PARKS

### 1) GUINDY NATIONAL PARK

- A very small national park (2.70 km<sup>2</sup>), located in **Chennai**.
- The park is an extension of the grounds surrounding Raj Bhavan, formerly known as the '**Guindy Lodge**' - the official residence of the Governor of TN.

### 2) MUDUMALAI NATIONAL PARK, WLS AND TIGER RESERVE

- It lies on the north-western side of the Nilgiri hills, **Nilgiri** district. It is located northwest of Coimbatore city in **TN**. It shares its boundaries with state of Karnataka (Bandipur) and Kerala (Wayanad WLS).
- It is part of the **Nilgiris Biosphere Reserve**
- The **Mysore Ooty Highway** runs through the park.
- **Moyer river** separates **Bandipur and Madumalai**. This river flows along the border of Kerala and TN.



- It is part of Nilgiri Biosphere reserves.

### 3) MUKURTHI NATIONAL PARK (EARLIER KNOWN AS NILGIRI TAHR NATIONAL PARK)

- It is a NP located in the western corner of the Nilgiri Plateau and north-western corner of TN.
- The Park was created to protect **its key stone species Nilgiri Tahr**.
  - Other important fauna of the park includes Tiger, Elephant etc.
  - Other threatened species of the park is Nilgiri Tahr, Nilgiri Marten, Nilgiri Langur etc.
- The park is characterized by **montane grasslands** and **shrublands** interspersed with Sholas in a high altitude area of high rainfall, near freezing temperature and high winds.
- Park is part of Nilgiri Biosphere Reserve and as part of **Western Ghats** it is also a UNESCO World Heritage site.
- **Culture**
  - **Toda tribe** of the region have harvested firewood from Shola and graze their hill buffaloes in the hill for centuries.



### 4) ANAMALAI TIGER RESERVE/ INDIRA GANDHI WLS AND NP

- Anamalai Tiger reserve, earlier known as Indira Gandhi WLS & NP is a protected area located in the Anaimalai hills of **Coimbatore district and Tiruppur district of Tamil Nadu**.
- **Important Mammals**
  - Bengal tiger, Indian Elephant, and Indian Leopard, Nilgiri Tahr and lion tailed macaque



### 5) GULF OF MANNAR NATIONAL PARK

- It is a NP which consists of 21 small islands and adjacent coral reefs in the Gulf of Mannar in the Indian Ocean.
- It is also the **core area of Gulf of Mannar BR** which also includes a 10 km buffer zone around the park, including the populated coastal area.

## 35. ANDAMAN AND NICOBAR ISLANDS

### 1) BASICS: UNDERSTANDING THE DISTRIBUTION OF ISLANDS IN A&N

- The **mains Islands** that come under the Andaman & Nicobar Islands are:
  - » **North Andaman, Middle Andaman, South Andaman, Little Andaman, Car Nicobar, Little Nicobar, and Great Nicobar.**
    - They are protruded parts of the oceanic fold mountains formed during tertiary epoch. Here are more than 350 islands of which only 38 are inhabited.
    - **Port Blair** - the capital of A&N Islands is situated in South Andaman.
    - **The Indira Point**, the southernmost point of India is the southern point of Great Nicobar Island.
    - **The Barren Island** which is India's only active volcano is situated in the east of Middle Island.
    - **Narcondam Island** (situated in north eastern part of North Andaman) is a volcanic island.
    - **10 degree channel** (10 degree N Latitude) separates Andaman and Nicobar Islands.
    - **Duncan Pass** is between South Andaman and Little Andaman.
    - **Coco Strait** - is between Coco Islands (Myanmar) and North Andaman.
    - **Saddle Peak** is the highest peak of A&N Islands (North Andaman, 738 m). It is followed by **Mt. Thullier** (Great Nicobar, 642 m)



## 2) MAHATMA GANDHI MARINE NATIONAL PARK

- It is national park on Andaman Island. It belongs to southern Andaman administrative district.
- **Two major island groups in the park:** Labyrinth Island and the Twin Island.

## 3) MOUNT HARRIET NATIONAL PARK

- **A national park in A&N islands**
  - **Mount Harriet** (383 m / 1,257 ft) is part of the park and is the third highest peak in the A&N archipelago next to saddle peak (in North Andaman - 732 m) and Mount Thullier (568 m in Great Nicobar).
  - **Important Faunal Species** are **Andaman Wild Pigs, Shrews** (Andaman and Jenkins), Saltwater Crocodile, turtles etc.
  - The park is also a butterfly hotspot.

## 4) OTHER IMPORTANT NATIONAL PARKS OF A&N ISLANDS

- Campbell Bay National Park
- Galathea Bay National Park
- Rani Jhansi National Park
- Saddle Peak National Park

## 36. WILDLIFE SANCTUARY

- The Wildlife (Protection) Act of 1972 provided for the declaration of certain areas by the state government as wildlife sanctuaries if the area was thought to be of adequate ecological, geomorphological and natural significance.
  - There are more than 500 WLS in India. Out of these Tiger reserves are governed by Project Tiger.
- In some cases central government can also declare an area to be WLS.
- **Human activities**
  - Some restricted human activities are allowed in WLS as specified in the Wildlife (Protection) Act of 1972.

### 1) CHANGTHANG WLS

The Changthang WLS (or the Changthang Cold desert WLS) is a high altitude WLS located in the Ladakhi adjunct of the Changthang plateau in the Leh district of the Union territory of Ladakh.

It is one of the few places in India with a population of Kiang or Tibetan Wild Ass, as well as the rare, Black-necked crane.

India's **first night sky reserve** is being developed here.



### 2) MAHARANA PRATAP SAGAR SANCTUARY

#### Introduction

- It is a lake sanctuary in the Kangra district of HP, spread over across 450 sq km.
- The sanctuary is locally known as Pong dam Lake and is located about 60 km southwest of Dharmshala.
- It is one of the **80** International Wetland sites declared in India by the **Ramsar Convention**.
- The reservoir is also leading source of fish in Himalayan states.
- **Birds**
  - The Lake is popular for the birds like Surkhabs, red necked grebes, terns etc.
  - Thousands of migratory ducks from Siberia come here every year.
- **Animal**
  - Barking deer, Sambar, wild boars, leopards and oriental small clawed otters.



### 3) NANDHAUR WLS

#### - About the WLS

- The sanctuary is located **near the Nandhaur river in Kumaon, UK** and spread over an area of **269.5 sq km**. It was created in 2012. The sanctuary is part of Terai Arc Landscape (TAL), a forest zone that stretches from Uttarakhand in India and extends in Nepal.
- **Flora**
  - » Primarily a **Sal** forest. Contain other 100 species of trees, over 30 species of shrubs etc. **Shisham, Bamboo, Teak and Chir pine** are important trees.
- **Fauna**
  - » Tiger, leopards, elephants, sloth bears etc.
- **Tiger Population in Nandhaur** is increasing and so is the demand for declaring Nandhaur as a **Tiger reserve**



#### 4) TAL CHAPPAR SANCTUARY

**Location:** Churu district of Northwestern Rajasthan in the Shekhawat Region.

**Important Features:**

- Known for **Blackbucks** and is also home to variety of birds.
- It has almost flat tract and interpersed shallow low-lying areas. It has open grassland with scattered Aracia and Proposis which gives it appearance of a typical Sawana.
- **Tal:** The rain water flows through shallow low lying areas and collect in small seasonal water ponds.
- **Fauna:** It is famous for **blackbucks** and is home to a variety of birds.



Location in Rajasthan, India

**Updates (Dec 2022):** The Sanctuary got protection from plan to reduce its size.

- The Rajasthan government had planned to reduce the size of ESZ around it.
- But, **the Rajasthan High Court**, has intervened through a suo motu PIL to protect the sanctuary. It took into cognizance of reports that its area was going to be reduced to three sq km under pressure from mine owners and stone crusher operator. The court ordered a "complete prohibition" on any action to reduce the WLS area.

#### 5) MAHANANDA WLS

- It is situated in the foothills of Himalayas between the **Tista and Mahananda River**, in the **Darjeeling district** of WB.

## 6) POBITARO WLS

- **Introduction :**
  - It is located in Morigaon district of Assam, 30 km east of Guwahati.
  - It is known for dense population of the Great-Indian one-horned Rhino and is also called **Mini-Kaziranga**.
    - » 102 rhinos in 16 km<sup>2</sup>. Pobitora has the world's densest population of one horned Rhino. The WLS has exceeded its Rhino bearing capacity.
    - » **Rhino Breeding program** is running successfully within the sanctuary under the Indian Rhino Vision 2020.
  - It covers flat flood plains and a hillock (Raja Mayong).
- **Boundaries**
  - Its boundary is made by GrangaBeel on South and the river Brahmaputra on North.
- **Biodiversity**
  - One-horned Rhino, leopard, wild boar, Barking deer, wild buffaloes etc.
  - Home to 200 migratory birds and various reptiles.
  - It is also an Important Bird Area.



## 7) TALLEY VALLEY WLS

- Talley valley WLS is located in Arunachal Pradesh. It is also a biodiversity hotspot.
- Talley is a plateau with a height of 24,00 meters. It is covered with dense forest of silver fir, pine etc.
- Rivers like Pange, Sipu, Karing, and Subansiri flows through the reserved forest and WLS.



## 8) PAKKE TIGER RESERVE (PAKHUI TIGER RESERVE/WLS)

Pakke tiger reserve/ Pakhui Tiger reserve is located in Pakke Kasang district of Arunachal Pradesh.

It had won the India Biodiversity Award 2016 in the category of 'Conservation of threatened species' for its **Hornbill Nest Adoption Programme**.

**Rivers:** It is bound by Kameng river in the west and Pakke river in the east.



**Adjoining Protected Areas:** The sanctuary adjoins Nameri National Park of Assam in the South. West of Kameng river lies Sessa Orchid Sanctuary and Eaglenest WLS.

- **Pakke Paga Hornfill Festival (PPHF)**

- 9th edition of the PPHF was held in Jan 2024 in the town of Seijosa in Arunachal Pradesh's Pakke Kessang district. It gave a call for protection and conservation of hornbills.
    - » Theme for 2024: 'Domutoh Domutoh, Paga hum Domutoh', translates to 'Let Our Hornbills Remain' in Nyishi, emphasizing the critical need to preserve the iconic birds.
    - » Note: Seijosa is located near the Pakke tiger reserve, which is home to four species of hornbills - Wreathed, Great Indian, Oriental Pied, and Rufous Necked.
      - The area is traditionally homeland to the **Nyishi people**, the largest tribal group of Arunachal Pradesh.
  - The first ever PPHF was held on Jan 16-18, 2015 with the aim to recognize the role played by the Nyishi in conserving the hornbills. The aim was to recognize the role played by the Nyishi in conserving hornbill in PTR.
    - » Note: The Nyishi had formerly hunted hornbills and used their bills to craft traditional headgear. They had later turned into hornbill conservationists.
  - PPHF was declared a state festival by the then-Arunachal Pradesh CM Prem Khandu in 2019

## 9) DAMPA TIGER RESERVES

- It is the largest WLS in Mizoram and was notified in 1985. It was declared a tiger reserve in 1994.
- **Location**
  - It is situated in the western part of Mizoram state, at the international border with Bangladesh.
- **Important Fauna**
  - It is natural home of leopards, Indian Bison, barking deer, sloth bear, gibbons, langur, slow lorises, etc.



## 10) NATIONAL CHAMBAL SANCTUARY (OR THE NATIONAL CHAMBAL GHARIAL WLS)

- **About National Chambal Sanctuary**

- It is a tri-state protected area in northern India for the protection of the Gharial (CR), the Red Crowned Roof Turtle (CR) and Ganges River Dolphin (EN).

- It is located on Chambal river on the tripoint of Rajasthan, Madhya Pradesh and Uttar Pradesh.
- It has sanctuary status under the WPA, 1972.
- All three states have separately notified this for territories in their states.
- **Declaration of area around the Chambal Sanctuary as Eco-sensitive zone (March 2020)**
  - Central government has notified an area to an extent of zero to two kms around the sanctuary as Eco-Sensitive Zone.

## 11) HAZARIBAGH WLS

- In Jharkhand
- **Biodiversity**
  - The sanctuary and its fringe forests have more than 400 deer, mainly the large sambar and the Sprightly and spotted Chital species that are protected under Wild Life Law.
  - The sanctuary is also home to Hyenas, sloth bears, black bears, Nilgai, several types of monkeys, snakes and 180 species of birds.

## 12) SATKOSIA TIGER RESERVE

- **About Satkosia Tiger Reserve**
  - It is a tiger reserve located in the Angul district of Orissa, India covering an area of 988 km<sup>2</sup>.
  - Satkosia Gorge WLS was created in 1976 with an area of 796 km<sup>2</sup>.
  - Satkosia Tiger Reserve was designated in 2007, and comprise the Satkosia WLS and the adjacent Baisipalli Wildlife Sanctuary.
- **River**
  - It's located where the Mahanadi River passes through a 22 km long gorge in the Eastern Ghats mountains.
- **Forest type**
  - Eastern Highlands moist deciduous forests ecoregion. The major plant community includes mixed deciduous forests including Sal and Riverine Forest.



## 13) NALABANDA BIRD SANCTUARY

- **About Nalabanda Bird Sanctuary**
  - The Nalabanda island is part of the Chilika Lake, India's largest brackish water lagoon. The island gets partially submerged during Monsoon. As the monsoon recedes in winter, water levels decrease, and the island is gradually exposed.
  - Birds flock to the island in large numbers to feed on its extensive mudflats. It is the largest wintering ground for migratory waterfowl found anywhere on the Indian sub-continent.
  - Some rare and endangered species listed in the IUCN Red List inhabit the lagoon for at least part of their life cycle.



- It was declared a bird sanctuary in 1973 under the **Wildlife Protection Act**.
- It is also core of the **Ramasar** designated wetlands of Chilika lake.
- **About Chilika Lake:**
  - » It is the largest brackish water lake and largest wintering ground for birds in India.
  - » As per the **bird status survey-2022** conducted in the Chilika, a total of 10,74,173 birds of the 107 water bird species and 37,953 individuals of 76 wetland dependent species were counted in the entire lagoon.
  - » **Last year**, the count in Chilika was over 12 lakhs.
  - » **Who conducted the census:** Chilika Development Authority and BNHS.
  - » Chilika lake is the largest wintering ground in Indian subcontinent.



#### 14) THANE CREEK FLAMINGO SANCTUARY

- In 2015, Thane Creek was declared as Flamingo Sanctuary by the Maharashtra government under Section 18 of the WPA 1972.
  - It was Maharashtra's second marine sanctuary after Malvan Sanctuary (Sindhudurg district).
  - By November, about 30,000 birds come to this sanctuary, 90% are lesser flamingos. They stay here till May, then migrate to Kutch in Gujarat.
  - **Other bird species**
    - » About 200, including the globally threatened species like the Greater Spotted Eagle (VU)

#### 15) MHADEI WLS

- **Why in news?**
  - The Goa bench of Bombay High Court has directed Goa government to notify the Mhadei WLS and other areas, referred to in National Tiger Conservation Authority communications and plans prepared by the Goa forest department, as a tiger reserve under the WPA within three months (July 2023: Source - IE)
  - It also said that the state government should take all the steps to prepare a tiger conservation plan and forward it to the NTCA within three months of notifying the reserve.

##### About Mhadei WLS:

It is a protected area in the Indian state of Goa in Western Ghats. It is located in North Goa district.

The sanctuary is an area of high biodiversity, and is being considered to become a Project Tiger's tiger reserve because of the presence of Bengal Tiger.

The NTCA has suggested on multiple occasions that a tiger reserve be carved out from the uninhabited core zone of Goa's protected area and has requested the state to speed up the process of notifying the Mhadei sanctuary and certain contiguous areas as a tiger reserve.



## **16) BHADRA WLS (TIGER RESERVE)**

- It is a protected area and a tiger reserve as part of Project Tiger. It is located in Chikkamangaluru town in Kar.

## **17) BUKKAPATNA CHINKARA WLS**

- Bukkapatna Chinkara WLS was notified recently in 2019 only. The proposal was approved by the State Board of Wildlife.
- **More Details**
  - Bukkapatna happens to be only the second protected habitat for the rare antelope in the state after Yedehalli in Bagalkot district.
  - Bukkapatna is larger than Yedehalli and it will also be the southernmost tip of the distribution range of Chinkara in India.

## **18) DANDELI WLS**

- It is in Uttara kannada district of Karnataka and covers an area of 866.14 Km<sup>2</sup>.

## **19) RANGANATHITTU BIRD SANCTUARY (PAKSHI KASHI OF KARNATAKA)**

- **About Ranganathittu Bird Sanctuary**
  - Ranganathittu Bird Sanctuary, also known as **Pakshi Kashi of Karnataka**, is a bird sanctuary located in Mandy district of Karnataka. It is located only 3 km away from the historic town of Srirangapatna.
- **Geography**
  - It is the largest bird sanctuary in the state (about 40 acres in area) and comprises of six islets on the banks of Kaveri river.
- **Bird Species**
  - The park is known for roughly 170 bird species including painted stork, Asian openbill stork, common spoonbill, Woolly necked stork, black headed ibis, lesser whistling duck etc.

## **20) THATTEKAD BIRD WLS**

- **About Thattekad WLS**
  - The Thattekad bird Sanctuary, with an area of 25 km<sup>2</sup> is a small bird sanctuary, located in Kothamangalam, Kerala.
  - It was the first bird sanctuary of Kerala and has been described by Salim Ali (one of the best known ornithologist of India) as the richest bird habitat on peninsular India.
  - It is an evergreen low-land forest located between the branches of Periyar River, the longest river in Kerala.

### **Key Species**

- The bird sanctuary is known for Sri Lankan Frogmouth and other bird endemic to the region. There are 330 bird species in the region, 300 of them endemic to the area.
- The important bird species include Orange headed thrush, large billed leaf barber, Jerdon's nightjar, Oriental Darter, Yellow browed bulbuls etc.

## 21) CAUVERY WLS

- **Location**
  - The Cauvery WLS is a protected area located in the Mandya, Chamaraja and Ramanagaram districts of Karnataka, India.
- **Physical features**
  - **Largest Protected area in Karnataka**. The sanctuary, is spread over more than 1000 km<sup>2</sup>. It's northern and southern boundary limited by Cauvery river, which drains from west to east.
  - It's eastern and north eastern borders are bounded by the TN state.
  - Cauvery river flows through it for a distance of 101 kilo meters
- **Biodiversity**
  - **Flora**
    - » The dominant species of trees found in the sanctuary are Terminalia arjuna and jambul.
  - **Fauna**
    - » Elephants, wild boar, leopard, dhole, spotted deer, barking deer, sambar, four horned antelope, black naped hare, Malabar giant squirrel, Grizzled giant squirrel which is under the highly endangered category in the state, smooth coated otter.
    - » **Reptiles**
      - Mugger crocodile, Indian mud turtle, Indian Rock Python, Cobra, Russel's viper etc.
  - **Birds**
    - » The sanctuary is listed as an Important Bird Area by Birdlife International.
    - » CR species of White rumped vulture and Indian vulture are found here.



## 22) WAYANAD WLS

- **Intro:**
  - It is an animal sanctuary in Wayanad Kerala, India.
  - It is an extent of 344.44 km<sup>2</sup> with four ranges namely Sulthan Bathery, Muthunga, Kurichiat and Tholpetty.
  - Second largest WLS in Kerala.
  - It is now an integral part of Nilgiri BR.
    - It is bounded by protected area network of Nagarhole and Bandipur in Karnataka in the north-east, and on the **South-east** by the Madumalai of Tamil Nadu.
  - **Note:** The sanctuary is separated into two disconnected parts known as the **North Wayanad WLS** and **South Wayanad WLS**. The area in between the two parts was originally a forest region, is now occupied majorly by plantation.



- **Wayanad WLS becomes a migratory destination** for animals from other NP and WLS in the region due to availability of water & fodder in the sanctuary.
  - Mammals such as gaurs migrate to sanctuary from the adjacent Bandipur and Nagarhole national parks in Karnataka and the Mudumalai NP in TN.
- **Proposal of Wayanad WLS as Tiger Reserve:**
  - The attempt of the Kerala forest department to push forward a proposal for notifying the sanctuary as the third tiger reserve in the state was **rejected by the State Wildlife Advisory Board** on account of the public resistance against the proposal.
  - **Arguments supporting the Tiger Reserve Status:**
    - » Highest number of tigers in the state
    - » Tiger reserve status will ensure better financial aid from the Centre and the NTCA which will also lead to better conservation and management of the tiger population and help generate more employment opportunities.
  - **Why the board rejected the demand?**
    - » **Public Protests:** Cattle lifting by the ailing tigers and their straying into human habitats had often triggered widespread public protests in the district.
    - » **Restriction on development activities** which will be brought by the notification have also become an issue.

## 23) IDUKKI WILD LIFE SANCTUARY

This sanctuary extends over the Thodupuzha and Udumpanchola taluks of Idukki district spreading over 105 Sq. Km. at 450 - 748m above sea level.



- The Idukki reservoir formed by three dams-Cheruthoni, Idukki and Kulamavu-extends to 33 sq km.
- **Common Animals**
  - Elephants, Porcupine, Sambar Deer, Wild Dogs, Jungle Cats, Malabar Giant Squirrel, Wild boar etc.
- **Common Birds**
  - Jungle fowl, Myna, Laughing thrush, Black bulbul, Peafowl, Woodpecker, Kingfisher etc.

## 24) CHINNAR WILDLIFE SANCTUARY

- **Location:** It is located 18 km north of Marayoor on SH 17, in the Idukki district of Kerala.
- It is under the jurisdiction of and contiguous with Eravikulam National Park to the South.
- Indira Gandhi Wildlife Sanctuary is to the north and Kodaikanal Wildlife Sanctuary is to the east.
- **Roads crossing:** The Munnar - Udumalpet road SH 17 passes through the sanctuary for 16 km and divides it into nearly equal parts.
- **Rivers:** Chinnar and Pambar rivers are the major perennial water resource in the sanctuary.
- **Settlements and crops:**

- 11 tribal settlements inside the Chinnar WLS, each is well demarcated by temporary stone walls
- The main inhabitants are Muthuvas and Pulayars.
- Cultivation of Maize, ragi and lemongrass is carried out
- Madhuvas carry out small scale ganza cultivation for their religious purposes.

## 25) SATHYAMANGALAM WLS (SATHYAMANGALAM TIGER RESERVE (STR))

- The core or critical tiger habitat in STR is 793.49 sq. km while the buffer or peripheral area is 614.91 sq km. It has a significant population of tiger, elephant, leopards, black buck, gaur, four horned antelope striped hyena, birds, reptiles, amphibians etc.
- It is the largest protected area of TN. It is in the eastern ghats in the Erode district of TN.
  - It acts as gateway to eastern ghats and acts as a significant ecosystem and a wildlife corridor in the Nilgiri Biosphere Reserve between Western Ghats and rest of the Eastern Ghats.
- Also, there are 9 tribal settlements and 18 tribal revenue settlements in STR which are not part of the tiger reserve.



## 26) SRIVILLIPUTHUR WLS AND MEGAMALAI WLS

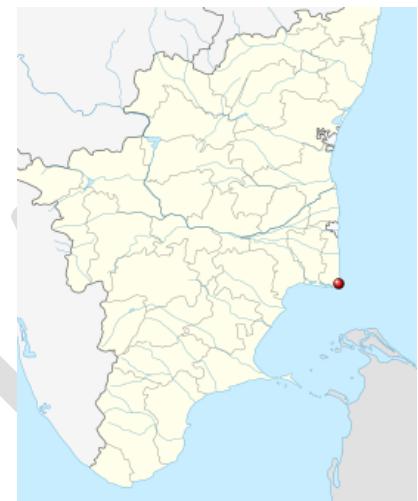
- **Why in news?**
  - In Feb 2021, the Srivilliputhur-Megamalai Tiger Reserve (SMTR), was jointly declared by the Central Government and Tamil Nadu Government.
- **Details**
  - The new tiger reserve (SMTR) is spread over 1016.57 sq km and it has been formed by clubbing Srivilliputhur WLS and Megamalai WLS.
  - Now, they would be eligible for funds from National Tiger Conservation Authority (NTCA).
- **Note:**
  - Megamalai region acts as a catchment for Vaigai river.
    - Vaigai river had faced a lot of problems in the past and it was revived when the water from Periyar river was brought to it after formation of the Periyar dam. Today, Vaigai gets around 80% of its water from Periyar dam. The remaining 20% is got from the watershed of the Megamalai region during the north-eastern Monsoon season.



## 27) POINT CALIMERE WILDLIFE AND BIRD SANCTUARY

- **About Point Calimere WBS**
  - **Geography**
    - It is a WLS located in Nagapattinam district of TN and is spread across an area of 30 sq m.
    - It comprises of sandy coastal, saline swamps, backwaters, and thorn scrub forests around the backwater.
    - It is located along the Palk Strait where it meets the Bay of Bengal at point Calimere at the south-eastern tip of Nagapattinam.
  - It is also a **Ramsar wetland site**.

- **Important Fauna**
  - **Black buck** (now LC) is the flagship specie of the WLS.
  - It is also famous for large congregation of waterbirds, especially **greater flamingo** (LC).
- **Key Problems faced by the Sanctuary**
  - **Pollution** from surrounding chemical companies.
    - **PH and salinity** of water have exceeded the permissible levels.
  - **Ecological disturbance** by fish farmers
  - **Climate change** has led to an increase in temperature which is negatively affecting the eggs during the pre-incubation period. The higher temperatures are providing better growth conditions for micro-organisms around eggs.
  - There are also high chances of antibiotic resistance among the coliform bacteria.
- **Decrease in number of migratory birds to the WLS**
  - From thousands of birds in the past, now, the numbers have gone down to a few hundred. The birds have started to avoid the sanctuary.



## 28) KALAKAD WLS AND MUNDANTHURAI WLS

- These were both established in 1962.
- In **1988**, **Kalakkad Mundanthurai Tiger Reserve** was created by combining the two sanctuaries.
  - It is located in the Southern Western Ghats in Tirunelveli district and Kanyakumari district in the southern state of TN.
  - It is the **second largest protected area in TN** (after the Sathyamangalam WLS) in Erode district.
  - It is part of the **Agasthyamalai Biosphere Reserve**.
  - It is also **India's southernmost tiger reserve**.
- The area acts as catchment of Thamiraparani river.



## 37. CONSERVATION RESERVES AND COMMUNITY RESERVES

- Conservation reserve and community reserves are the outcome of amendment to WPA in 2003.
- They are protected areas, which typically act as buffer zones or connectors and migration corridors to established NPs, WLS, and reserved and protected forests.
- It also provides mechanism to provide recognition and legal backing to the community initiated efforts in wildlife protection.
  - It provides for flexible methods wherein wildlife conservation is achieved without compromising the community needs.

## 1) CONSERVATION RESERVES

- The area is owned by state government.
- Managed by Conservation Reserve Management Committee.
- **Who declares an area as conservation reserve?**
  - » State government may, after having consultations with the local communities, declare any area owned by the government as conservation reserve.
- When area is marked as conservation reserve, it becomes mandatory for any development projects to get approval of the National Board for Wildlife, and State Board of Wildlife.

### A) TIRUPPADAIMARATHUR CONSERVATION RESERVE

- » It was the first conservation reserve established in India.
- » It is an IUCN Category V protected bird nesting area in the 2.84 hectares (7.0 hectares) compound of Siva temple, in Tiruppadaimarathur village, Tirunelveli District, TN.
- » On Feb 14, 2005 it became the first conservation reserve established in India.
- » The reserve is 10 kms from Kalakkad Mundanthurai Tiger Reserve.

**Over 400 little egrets, pond heron, and near threatened painted stork** nest in the grove of 20 huge, century old marutha, mahwa, neem and illuppai trees and feed in many agricultural fields, a few ponds and the Tamiraparani River adjacent to it



Painted stork



Little egret

### B) THREE NEW WILDLIFE CONSERVATION RESERVES IN RAJASTHAN (APRIL 2023)

- **Sorsan** in Baran, Khichan in Jodhpur, and Hamirgarh in Bhilwara
- **Sorsan in Baran:**
  - The grasslands of Sorsan in Baran is a safe home for the Great Indian Bustard, Blackbucks (the state animal of Rajasthan).
- **Khichan in Jodhpur:**

It hosts thousands of migratory Demoiselle cranes. It will be safe home for these birds and will be the first conservation reserve in India for Demoiselle cranes.



IUCN: LC

- With these three additions, there are 26 wildlife conservation reserves in Rajasthan.

## 2) COMMUNITY RESERVE

- The state government may notify any community land or private land as a community Reserve, provided that the members of the community or individual concerned are agreeable to offer such areas for protecting fauna and flora, as well as their traditions, cultures and practices.
- The reserve is managed through Community Reserve Management Committee.
- No change in the land use pattern shall be made within the community reserve, except in accordance with a resolution passed by the management committee and approval of the same by state government.

### A) SINGCHUNG BUGUN VILLAGE COMMUNITY RESERVE

- **Why in news?**
  - Arunachal Pradesh showcased its Singchung Bugun Village Community Reserve, a 17 sq km biodiversity hotspot during the Republic Day parade (Jan 2024)
- **Location:** The village is located in West Kameng district of Arunachal Pradesh and is located about 130 km from Tejpur in Assam. It lies adjacent to Eaglenest reserve.
- **What was the need of creating a community reserve?**
  - Environmentalists and forest department realized that area outside the eagle nest sanctuary was equally diverse and needed protection. This followed multiple rounds of discussions with the villagers over the years to explain what community reserve would mean and most importantly they would retain the land rights. In case the villagers needed to use some of the land for cultivation, they could get it de-reserved through the management committee.
  - Finally the villagers were convinced and they decided to make 17 sq. km of their land into community reserve. The **community reserve came into being in 2017** when the state government approved it.
- **In the short time since, the reserve has won the India Biodiversity Award** given jointly by the Centre and the UNDP.



- Reserve has also become a model, with new batches of IFS officers visiting Singchung every year to understand how the reserve was created.
- **Note:** The Buguns are an indigenous community with a population of about 2,000 people, spread across 12 villages that are dotted outside the forests of Eaglenest Wildlife Sanctuary.

### **B) GOGABEEL COMMUNITY RESERVE AND CONSERVATION RESERVE**

- Notified by State of Bihar in Aug 2019.
- **About Gogabeel:**
  - It is an ox-bow lake in Bihar's Katihar district. It is formed from the flow of rivers Mahananda and Kankhar in the north and the Ganga in the South and east. It is a permanent water body though it shrinks to some extent in the summer but never dries up.
  - It is the 15th protected area (PA) in Bihar.
  - It is an important Bird Area. More than 90 bird species have been recorded from this site, of which, about 30 are migratory.
    - » Among the threatened species, the Lesser Adjutant Stork is listed as Vulnerable by the IUCN while the Black Necked Stork, White Ibis and White-eyed Pochard are 'Near Threatened'.
  - The water body was notified as a 57 hectare Community Reserve and a 30 Hectare 'Conservation Reserve'. It is Bihar's first community reserve.
- It is a **big win for conservationists** who had been trying for long to convince both local residents as well as the authorities to declare the important birding site as a Protected Area

### **C) TILLARI CONSERVATION RESERVE**

- In June 2020, the Maharashtra government declared the Tillari Forest Area in the Dodamarg and Sawantwadi range in the coastal Sindhudurg district as a Conservation reserve area.
  - » The reserve covers 9 villages in the forest range and is known to serve as a corridor and even as a habitat for the population of tigers and elephants moving between the three states of Goa, Karnataka and Maharashtra.
- Tillari is the 7th Corridor in Maharashtra which has been declared as a 'Conservation Reserve'.
- **Note:**
  - » The 38 km-long Dodamarg wildlife corridor connects Radhanagri WLS in MHA to Bhimgad WLS in Karnataka. This corridor frequently witnesses elephant and tiger movement.

## **38. CONSTITUTIONAL PROVISIONS**

There are few provisions in Indian constitution which directly or indirectly call for biodiversity conservation.

### **1. Article 21 (Right to Life and Personal Liberty)**

- The Supreme Court on many occasion has interpreted this fundamental right to encompass within its ambit the protection and preservation of environment.

2. Article 48A directs the state to protect and improve the environment and to safeguard forests and wildlife (Article 48A)
  - This was added by 42nd Constitutional amendment in 1976.
3. Article 51A(g) makes it a duty of every citizen of India to **protect and improve the natural environment including forests, lakes, rivers and wildlife** and to have compassion for living creatures

## 39. INSTITUTIONS

### 1) NATIONAL GREEN TRIBUNAL (NGT)

- **National Green Tribunal Act, 2010**
  - An act to provide for the establishment of a National Green Tribunal for the effective and expeditious disposal of cases relating to environment protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incident thereto.
- It is expected to provide **speedy environmental justice** and help **reduce burden of litigation** in higher courts.
  - The tribunal is mandated to make and endeavour for **disposal of applications or appeals** finally **within 6 months** of filling of the same.
- **Other Facts Useful for Pre**
  - **Branches:** The Principle Bench of the NGT has been established in the National Capital - with **regional benches** in Pune, Bhopal, Chennai and Kolkata.
  - **Chairperson** of NGT is a retired judge of the SC.
  - **Other Judicial Members** are retired judge of the High Courts.
  - **Each Bench** -> At least 1 judicial member and one expert member
    - **Expert Members** should have a professional qualification and a minimum of 15 years of experience in the field of environment/forest conservation and related subjects.
- **Powers**
  - The NGT has the power to hear all civil cases relating to environmental issues and questions that are linked to the **implementation of laws listed in Schedule I of the NGT Act**. These include the following:
    - i. The Water (Prevention and Control of Pollution) Act, 1974;
    - ii. The Water (Prevention and Control of Pollution) Cess Act, 1977;
    - iii. The Forest (Conservation) Act, 1980;
    - iv. The Air (Prevention and Control of Pollution) Act, 1981;
    - v. The Environment (Protection) Act, 1986;
    - vi. The Public Liability Insurance Act, 1991;
    - vii. The Biological Diversity Act, 2002.
  - This means that any violations pertaining to these acts only, or any other decisions order taken by government under these laws can be challenged before NGT.

- **Important Note:** The NGT has not been vested with powers to hear any matter relating to the **Wildlife (Protection) Act, 1972**, the **Indian Forest Act, 1927** and various laws enacted by States relating to forests, tree preservation etc. Therefore, specific and substantial issues related to these laws **cannot be raised before the NGT**. You will have to approach the State High Court or the Supreme Court through a Writ Petition (PIL) or file an original suit before an appropriate civil judge of the Taluk.
- **Principles of Justice adopted by NGT**
  - The tribunal not guided by the Code of Civil Procedure, 1908, but shall be guided by **principal of natural justice**.
  - Further, the NGT is not bound by rules and evidence enshrined in the Indian Evidence Act, 1872.
    - » This ensures that it will be relatively easier for conservation groups to show facts and figures before the NGT.
- **Review Appeal** can be made to NGT
- If the review appeal fails, the **NGT order can be challenged** before the Supreme Court within ninety days.

## 40. COMPENSATORY AFFORESTATION

- **Introduction**
  - Forest land can be diverted for non-forest developmental activities like infrastructural project with approval of state and central government. For this diversion **afforestation must be done as compensation** for diversion of forest and is called compensatory afforestation.
  - Compensation must be paid for loss of forest, including for loss of ecosystem and biodiversity i.e., both tangible and intangible losses. The total valuation of this is called **Net Present Value**. This cost has to be borne by agency responsible for diversion of the state land.
  - In India, according to the Forest Conservation Act, 1980, and the rules and guidelines formed under it, in case of diversion of forest land for non-forestry purposes.
    - The equivalent non-forest land has to be identified for compensatory afforestation.
    - Funds for raising compulsory afforestation has to be imposed.
    - For certain activities additional conditions are imposed.
      - For e.g. in case forest land is being converted for mining purposes - additional conditions like maintaining a safety zone area, fencing and regeneration etc are stipulated.
- **MoEFCC is the nodal agency**
  - Application for clearance (land conversion) must be made to MoEF&CC through the concerned forest department of the state government.
    - The application/proposal should include details of non-forest/degraded forest identified for afforestation purposes, year wise phased targets, species to be planted and a suitability certificate from afforestation/ management point of view.
  - If clearance is given, the **compensation for the lost forest land** is also decided by Ministry and regulators.
- **Criteria for identifying non-forest land for compensatory afforestation.**
  - It should be identified contiguous to or in proximity of reserved forest or protected forest.

- In case the non-forest land is not available in the same district then it should be identified within the same state/UT.
  - If land is unavailable in entire state, funds for raising the CA in double the area in extent of forest land diverted need to be provided by the user agency. And this non-availability of the suitable non-forest land for CA in the state/UT would be accepted by central government only on the certificate of Chief Secretary to the state/UT.
- **Who implements afforestation and development work?**
    - After receipt of the money, State Forest department is to accomplish the afforestation for which money is deposited in the Compensatory afforestation fund within a period of one year or two growing seasons.
  - **How many saplings have to be planted?**
    - In Raghunath Jha vs Ministry of Urban Development Judgment, the National Green Tribunal said that permission to cut tree can be obtained only on the condition that "if any tree is fell or permitted to cut in place thereof **at least, 10 trees** shall be planted.
  - **Advantages of Compensatory afforestation**
    - Balances development with environmental requirements
    - Can help in increasing the tree cover as the compensatory forestation is larger than the fell tree

## 41. COMPENSATORY AFFORESTATION FUND ACT, 2016

### 1) BACKGROUND: FORMATION OF CAMPA (COMPENSATORY AFFORESTATION FUND MANAGEMENT AND PLANNING AUTHORITY)

- **Background**
  - In July 2009, the Supreme Court of India issued orders for the formation of **CAMPA** (Compensatory Afforestation Fun Management and Planning Authority) as National Advisory Council under the chairmanship of Union Minister of Environment and Forest for monitoring, technical assistance and evaluation of compensatory afforestation activities.
- **Objectives of CAMPA**
  - Promote afforestation and regeneration activities as a way of compensating for forest land diverted to non-forest uses.
  - National CAMPA Advisory Council has been established as per the orders of the Hon'ble Supreme Court with following mandates
    - » Lay down broad guidelines for state CAMPA
    - » Facilitate scientific, technological, and other assistance that may be required by state CAMPA
    - » Make recommendations to state CAMPA based on their plans and programmes
    - » Provide a mechanism to state CAMPA to resolve issues of an inter-state or Center-state character.

- **State CAMPA**
  - » Would receive the funds
  - » Administer the amount received from Adhoc CAMPA and utilize the funds collected for undertaking compensatory afforestation, assisted natural regeneration, conservation and protection of forests, infrastructural development, wildlife conservation and protection and other related activities.
  - » Would provide an integral framework for utilizing multiple sources of funding and activities relating to protection and management of forests and wildlife.
  - » **In sum, the prime task of State CAMPA would be regenerating natural forests and building up institution engaged in the task in the state forest department.**

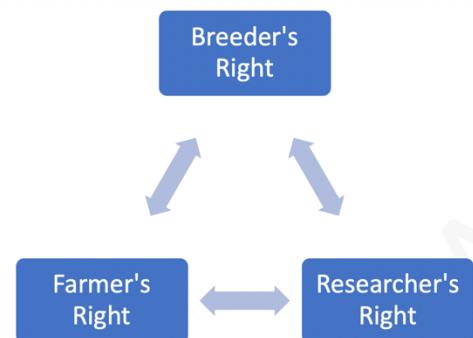
## 2) COMPENSATORY AFFORESTATION FUND ACT, 2016

- **Main Provisions of the Act**
  - **Statutory Backing to Funds and Authorities**
    - » The act provides legal backing to centre and state funds and regulate how this money will be utilized
    - » The funds would be created under Public Account of India and Public Account of State respectively
  - **What kind of payment would come into fund?**
    - » Payment for compensatory afforestation
    - » Payment for loss of forest ecosystem (Net present value)
    - » Payment for violation and diversion of forest land guidelines
    - » Additional payment for specific projects.
  - **How the funds will split between centre and state**
    - » The state would get bulk of the money (90%) and 10% would go to centre.
    - » The funds will go to Public account of State and Centre.
      - This will bring these funds within the overall oversight and control of parliament and state legislatures.
  - **How the money would be utilized**
    - » **State funds**
      - Compensatory afforestation
      - Regeneration of forests
      - Infrastructure development
      - Forest and wildlife protection
    - » **National Fund**
      - Monitoring purposes and approved schemes of forestry and wildlife
  - **How the fund will manage**
    - » **National CAMPA**
      - Core committee responsible for broader policy and day to day working
      - Specific group of experts from environment, science, economics and other fields responsible for monitoring
    - » **State CAMPAs**

- Responsible for managing state level funds
- **Auditing**
  - » The act also provides for annual audit of the account by CAG.
- **Expected Impact**
  - End of era of Ad Hocism
    - » The statutory authorities at centre and state levels.
  - Expedited Utilization
  - Employment Generation in backward and tribal areas:
  - Increase availability of timber and other forest products:
  - Improving quality of forest
- **MoEF&CC Modifies Compensatory Afforestation Rules for ease of business (May 2019)**
  - States with over 75% forest cover looking to divert forest land for non-forestry projects, can now carry out compensatory afforestation in other states.
    - It will promote ease of business and will give a push to projects stuck for want of non-forest land.

## 42. PROTECTION OF PLANT VARIETIES AND FARMERS RIGHTS ACT, 2001

- **Need of the law:**
  - Encourage plant breeding activities so that new varieties could be developed. Attract more investment in biotechnology.
  - Protect farmers' rights and interests.
  - Fulfilling the mandate of TRIPS:
    - Article 27.3(b) says that members may exclude plants from patentability - but requires protection for plant varieties in the form of an effective 'su-generis system' or through patents or both.
  - Fulfilling mandates of International Agreements like UPOV (International Union for Protection of Plant Varieties)
    - UPOV- International Union for the Protection of New Varieties of Plants
    - India has initiated the process of joining UPOV, but still not a member. India doesn't follow UPOV and has its own su-generis system.
  - Patent Act, 1970 excluded agriculture and horticulture methods of production from patentability.
- **About the Act**
  - The law was enacted in 2001 to grant IPRs to plant breeders, researchers and farmers who develop any new or extant plant varieties i.e., it has granted rights and protection to all three pillars of agriculture sector.



- **Objectives:**
  - » **Simulate investment for R&D** - both in public and private sector towards development of new plant varieties.
  - » **Facilitate growth of seed industry** in the country by making available high-quality seeds and planting material in the country.
  - » **Recognize the role of farmers** as cultivators and conservers and **contribution of traditional, rural, and urban tribal communities** to the country's agro-biodiversity by **rewarding them for their contribution** through benefit sharing and protecting the traditional right of the farmers.
  
- **Key Provisions**
  - » **Varieties which are open for registration** - Novel Variety, Extant Variety, Farmer's variety, essentially derived varieties.
  - » **Criterias to be satisfied for registration** - a variety should be **new, distinct, uniform, and stable**.
  - » The IPR granted is a **dual right** - one is for the variety and the other is for denomination assigned to it by the breeder.
  
  - » **Rights of Farmer's:**
    - Entitled to save, use, sow, re-sow, exchange or sell his farm produce.
      - But farmers can't sell the branded seed of the variety protected under the act.
    - **Farmer's right to register traditional varieties**
      - The act allows the registration of traditional or farmers' variety. Farmer can get Plant breeder rights and the act allows exclusive legal right to PBR-holding farmers.
      - Note: in case of registration of a traditional variety, it is important to involve all communities associated with its conservation. Similarly, in case of farmers' variety, it is important to recognize spousal contribution under joint ownership.
      - Exemption from Payment of fee either for registration or renewal of registration.
    - Farmers right for Reward and Recognition.
      - As per the act, a National Gene Fund is to be created to facilitate reward and recognition to eligible individual farmers and communities. This recognizes farmers who have been contributing in conservation of varietal wealth of crop plants.
    - **Farmers right of benefit sharing**
      - The act provides for equitable sharing of the benefit earned from the new variety with farming or tribal communities that had contributed varieties used as parameters. The benefit share may be reimbursed from the National Gene Fund.
      - **Farmer's right to get compensation for the loss suffered** from the registered varieties
      - **Farmer's right to receive Compensation for undisclosed use of traditional varieties**
        - If the breeder uses Farmers' variety as source material
    - **Farmer's right for the Seeds of Registered Varieties**
      - Seeds of registered varieties should be available to farmers **at affordable prices**. If this doesn't happen within three years of registration, the farmer can raise the matter with PPVFR -Authority.
    - **Protection against innocent infringement.**
      - This protection is only available for the first offence and the farmer is punishable for subsequent offences.

» **Rights of Breeders**

- Right for Production, Sale, Marketing, Distribution, Export and Import
- Penalties for infringement of Breeder's Right.

» **Rights of Researchers**

- Use of registered variety for conducting experiment, as initial source for creating new varieties.
- Free and complete access to protected materials for research use in developing new varieties of plant.
  - However, authorization of the breeder is required "whose repeated use of such variety as parental line is necessary for commercial production of such other newly developed variety".

- **UPOV and India's situation:** Other countries subscribe to the Union for the Protection of Plant Varieties (UPOV), an international agreement with several versions, which offers limited rights to farmers. India has been under constant pressure from the US to join UPOV, an inter-governmental organisation based in Geneva. Several international bodies have warned India against joining UPOV, as they feel it upholds only commercial interests. According to Gol, Indian law is in compliance with UPOV-1978.
- **Significance of the act**
  - » **Recognizes and protects the rights of farmers** in conserving, improving and making available plant genetic resources.
  - » **Enhances agri-growth** by promoting more R&D towards development of new plant varieties.
- **Problems with the law:**
  - » **Lack of proper enforcement:** Seed industry feels that there must be a mechanism to catch and punish those who illegally sell the variety.
    - Unique protection given to farmers can also act as a loophole as an aggregator may also own a small land and call herself a farmer.
  - » **Slow turnaround time for registration of varieties**

## 1) PEPSICO CASE AND DEC 2021 JUDGMENT

- **Background:**

- » **PEPSICO has sued three Gujarat potato farmers** for growing its proprietary varieties without authorization. The commercial court had stayed farmers from growing and selling the potatoes. But after a lot of protest, Pepsico withdrew the case in May 2019.
- » PEPSICO India holding Pvt limited has informed the court that it uses the registered variety of potatoes called **FL 2027** (of FC5 variety), which is a hybrid of **FL 1867** and **Wischip** varieties, for manufacturing of chip for its brand.
- » The company is registered breeder of the FL 2027 under the protection of Plant varieties and Farmers' Rights Act, 2001.

- **In Dec 2021**, the Protection of Plant Varieties and Farmer's Right Authority (PPV&FRA) revoked PepsiCo India's registration of its potato variety used in Lays chips.

- » In the process, the authority has indicted itself by listing a series of procedural lapses by the registrar in approving the registration despite omissions and fudging in the application submitted by PepsiCo.
- » The argument of farmer's rights and public interest was also used for revocation.
  - The judgment said that **farmers had been put to hardship** including the looming possibility of having to pay huge penalty on the purported infringement they were supposed to have been committing noting that Pepsico had claimed damages of more than Rs 1 crore each from small farmers. This **violated public interest**.
- **Significance:**
  - » After this judgement, the process of registration is expected to get more streamlined as the authority has identified several procedural flaws

### 43. THE SCHEDULED TRIBES AND OTHER TRADITIONAL FOREST DWELLERS (RECOGNITION OF FOREST RIGHTS) ACT, 2006

- **Background: Need of the law -> Ending the Exploitation under the Indian Forest Act, 1927**
  - Under the **Indian Forest Act, 1927** areas were often declared to be "**government forests**" without recording who lived in the areas, what lands they were using, what uses they made of the forests and so on.
  - **Consequences**
    - » **End of pre-existing traditional rights**
    - » **Eviction, Harassment, exploitation and loss of livelihood**
    - » **Destruction of forests**
      - The loss of more than 90% of India's grasslands to commercial Forest Department plantations
      - Destruction of large areas of forest for mines, dams and industrial projects
    - » **Community management system was destroyed**
- **Introduction**
  - The 2006 law concerns with rights of forest dwelling communities to land and other resources, denied to them over decades as a result of the continuance of colonial forest laws in India.
- **Main Objectives of the 2006 act**
  - i. Grant **legal recognition to the rights of forest dwelling communities**, partially correcting the injustices caused by the forest laws.
  - ii. To address the adverse living conditions of many tribal families living in forests.
  - iii. Make a beginning towards giving communities and the public a voice in forest and wildlife conservation.
- **Nodal agency** for implementing the act: The Ministry of Tribal Affairs
- The main **Provisions** can be summarized as follows
  1. **Individual Forest Rights/ Land Ownership** to land that is being farmed by tribals or forest dwellers as on 13 Dec 2005, subject to maximum of 4 hectares.
    - **Three steps in recognizing land ownership rights under the**
      - Section 6 of the act provides a transparent 3 step procedure for deciding who gets the rights

- » **First**, the gram Sabha (full village assembly, NOT gram Panchayat) makes a recommendation - i.e., who has been cultivating land for how long, which minor forest produce is collected etc.
  - » **Two stages of screening committee**
    - Gram Sabhas recommendation goes through two stages of screening committees at the Taluka and district levels.
    - The district level committee makes the final decision.
2. **Community Rights -> Resource Use Rights** - to minor forest produce (also including ownership), to grazing areas, to pastoralist routes, etc.
  3. **Forest Protection and Management Rights** - to protect forest and wildlife
    - This include right to protect, regenerate, or conserve or manage any community forest resources which they have been traditionally protecting and conserving for sustainable use.
  4. **Relief and Development Rights** - to rehabilitate in case of illegal eviction or forced displacement, and to basic amenities, subject to restrictions for forest protection.
  5. **Powers to Gram Sabha**
    - The act provides for diversion of forest land for public utility facilities managed by Government, such as schools, dispensaries, fair price shops, electricity and telecommunication lines, water tanks etc. with the recommendation of Gram Sabhas.
  6. **Rights of conversion of forest villages into revenue villages** -> Adjudicated by the Gram Sabha, Sub divisional level committee and the District level committee.

- **Significance of the Act**

- i. **Sense of Security:** Individual Forest Rights give forest dwellers a sense of security against future eviction.
- ii. **Huge Potential** to further the goals of:
  - **Grassroot democratization of forest governance -> Empowerment**
    - Communities in different parts of the country have successfully used the FRA to protect forest and their biocultural habitats as illustrated in the examples of Dongria Kondh's campaign to protect Niyamgiri hills.
  - **Sustainable Development and Conservation**
  - **Area:** In terms of area, potentially, up to 85.6 million acres or 34.6 million hectares of forests could be recognized as Community Forest Reserves (CFRs) in the country.
  - **Population:** In terms of potential beneficiaries, an estimated 200 million scheduled tribes and other traditional forest dwellers (OTFDs) in over 1,70,000 villages are the users of potential area, and could, therefore, gain collective rights over forests under the CFR provisions of the FRA.
- iii. **Alleviate poverty in forest heartlands**
  - By ensuring that benefits from forest product harvests and enterprises, and from reforestation, carbon sequestration, and provision of ecological services, go directly to the right-holding gram sabhas and their members.
    - For instance, several tribal and OTFD gram sabhas in Gadchiroli district of Maharashtra and Narmada district of Gujarat have earned tens of lakhs of rupees from the sale of bamboo and tendu leaves from their CFRs.

- iv. **Land Reform:** FRA if properly implemented can become the largest land reform in India's history
- v. **Internal Security:** Potential to deal with Left Wing Extremism

## 44. OTHER NATIONAL EFFORTS

### 1) NATIONAL MISSION ON BIODIVERSITY AND HUMAN WELL-BEING

- In 2018, the Prime Minister's Science, Technology and Innovation Advisory Council (**PM-STIAC**) in consultation with the MoEF&CC and other ministries approved an ambitious **NMBHWB**.
- A Bengaluru based Biodiversity Collaborative is working with the National Biodiversity Authority to hold consultation and prepare roadmap for the mission that will be steered by a core of the country's leading biodiversity science and conservation organizations, from public, academic, and civil society organizations.
- **The mission will:**
  - Strengthen the science of restoring, conserving, and sustainably utilizing India's natural heritage.
  - Embed biodiversity as a key consideration in all developmental programs, particularly in agriculture, ecosystem services, health, bioeconomy, and climate change mitigation.
  - Establish a citizen and policy-oriented biodiversity information system
  - Enhance capacity across all sectors for the realization of India's national biodiversity targets and UN SDGs.
- The mission will also allow India to emerge as a leader in demonstrating linkages between conservation of natural assets and societal well-being.
- **Other advantages of the mission**
  - **Increase natural assets** by millions of crores
  - **Fight climate change**
  - **Increase agri-production**
  - **Restoration activities** across India's degraded lands, which amount to almost a third of our land area.
  - Meet the commitments of **international conventions and agreements** like CBD, SDGs etc.

### 2) ECO-SENSITIVE ZONES (ESZS) AROUND PROTECTED AREAS

- **Introduction**
  - Eco-sensitive zones are buffer zones around protected areas (NP, WLS etc) where only regulated activities for specialized eco-system are allowed.
  - **Why?**
    - » They protected against damages caused by developmental activities and act as shock absorbers.
    - » They also act as transition zone from areas of high protection to areas involving lesser protection.
- **SC Judgment 2006**
  - » In December, 2006, the Supreme Court had ordered all states and Union territories for sending proposals to the MoEF for demarcation of ESZs.
  - » In case no ESZ proposal is sent, ESZ of 10 km shall apply around Protected Areas.

- **MoEF guidelines for creating Eco-Sensitive Zones:**
  - In 2011, MoEF came out with **new guidelines to create eco-sensitive zones**.
  - **Activities Prohibited**
    - » Commercial mining, saw mills, polluting industries, commercial use of fire wood, major hydro power projects etc.
    - » Tourism activities like flying over protected areas in an aircraft or hot air balloon, and discharge of effluents and solid waste.
  - **Activities restricted with safeguards**
    - » Felling of trees, drastic change in agriculture systems and commercial use of natural water resources, including ground water harvesting and setting up of hotels and resorts, are the activities regulated in the area.
  - **Activities Permitted**
    - » Ongoing agriculture and horticulture practices by local communities, rainwater harvesting, organic farming, adoption of green technologies, use of renewable energy resources.
  - **Width of ESZs**
    - » May vary from protected area to area
    - » As a general principle, the width could go up to 10 Kms around the protected area.
- **Controversy over Eco-Sensitive Zone for the Western Ghats**
  - In 2010, MoEFCC set up the **Western Ghat Ecology Expert Panel (WGEEP)** under the **chairmanship of Prof. Madhav Gadgil**.
  - The **Main recommendations** of WGEEP were:
    - i. **Entire Western Ghat** (1,29,037 sq km) should be designated as Ecologically Sensitive Area (ESA).
    - ii. **Three levels of Ecological Sensitivity:** Assign three levels of Ecologically Sensitivity to different regions, termed as ESZ1, ESZ2 and ESZ3.
    - iii. **No new dams based on large scale storage** be permitted in ESZ1.
    - iv. **Restrictions on Mining:**
      - Indefinite moratorium on new environmental clearances for mining in ESZ1 and ESZ2
      - Phasing out of mining in ESZ1 by 2016, and continuation of existing mining in ESZ2 under strict regulation.
    - v. **No New polluting industries**, which would include coal-based power plants, should be permitted to be established in ESZ1 and ESZ2.
    - vi. Establish a **national level Western Ghats Ecology Authority (WGEA)** for the protection of the region.
  - **The report met with resistance** from the governments of all six stakeholder states and could not be implemented. **Key Criticisms** were on the grounds of practicality, energy, and development needs of the region.
- The Delhi High Court directed the government to take action on the recommendations which led to MoEF&CC setting up another High-Level Working Group (HLWG) under the chairmanship of Dr.

Kasturirangan, to suggest an all-round and holistic approach for sustainable and equitable development while keeping in focus the preservation and conservation of ecological systems in Western Ghats.

- **HLWG made the Following main points of recommendations** which were seen as watering down of the Gadgil committee recommendations.
  - **37% of the Western Ghats as ESZ:**
    - It broadened the definition of Western Ghats to include 1,64,280 sq km. Out of the estimated 1,64,280 sq. km of the Western Ghats area, the natural landscape constitutes only 41%. The remaining area was cultural landscape where, where human settlements, agriculture and plantations existed.
    - The area identified as ecologically sensitive is about 37%, (around 60,000 sq km) i.e., about 90% of the natural landscape.
  - **Prohibitory and Regulatory regime in ESA** for those activities with maximum interventionist and destructive impact on the ecosystem.
    - Complete ban on mining, quarrying and sand mining in ESA.
    - No new thermal power projects should be allowed in ESA. Hydropower projects may be allowed but subject to conditions
    - All "Red" category industries should be strictly banned.
  - **Strengthening of existing framework of environment clearance** and setting up of state of art monitoring agency.
- **Non-implementation of Gadgil/Kasturirangan Committee recommendations and impact on Kerala Floods of Aug 2018**
  - According to experts if the recommendation of these committees would have been properly implemented the damages due to flood in Kerala would not have been too severe.

### 3) URBAN FOREST SCHEME (NAGAR VAN SCHEME)

- **Details**
  - The program is aimed at developing 200 Urban forests across the country in next five years.
    - » Wajre Urban Forest in Pune and Gurgaon's Aravalli Biodiversity Park, may act as a model for the scheme.
  - In this initiative there will be a renewed focus on people's participation and collaboration between forest departments, municipal bodies, NGOs, Corporates and Local Citizens.
  - These will primarily be on forest land in the City or any other vacant land offered by local urban bodies.
- **Funds:**
  - CAMPA
- **Significance of Urban forests**
  - Lungs of the cities
  - Moderates temperature
  - Reduces level of ozone, SO<sub>2</sub> and PM
  - Fights Climate change - removes CO<sub>2</sub> and supplies oxygen

- Space for nature and wildlife

- **Note:**

- The theme for World Environment Day (5th June), 2020 was '**Biodiversity**'.
- India organized WED celebrations virtually in view of the COVID-19 crisis with this year's theme with focus on **Nagar Van** (Urban Forests)

#### 4) HERITAGE TREES

- **Why in news?**

- Maharashtra Legislative Assembly and Legislative Council i.e. both houses, cleared an amendment that protects old trees and provides them 'heritage tree tag'. (July 2021)

- **Details**

- The Maharashtra Legislative Assembly has passed an amendment to the Maharashtra (Urban Areas) Protection and Preservation of Trees Act, 1975, which allows classification of 50 year old trees as "heritage" trees with an aim to increase the forest cover.
  - » The amendment not only conserves old trees in urban areas but also tightens the rules for felling of trees for development works.
- The act also provides for the **formation of the Maharashtra State Tree Authority** and **tree authorities in local civic bodies and councils**.
  - » The tree authority is tasked with increasing the tree cover in urban areas.
  - » The permission for felling of more than 200 trees should come from the state tree authorities.
- The amendment makes it mandatory to plant trees equivalent in numbers to the age of the tree in years, in case felling of trees is allowed for development projects.
  - » The planted trees should be 6-18 feet in height and the survival of such trees should be ensured by geo-tagging.
- In case the compensatory plantation is not possible, the tree feller has to pay compensation for the economic valuation of the trees being felled.
- It also provides for census of trees every five years with the use of new technologies such as GIS etc.
- The amendment also increased the fines for illegal felling of trees from a maximum of Rs 5,000 to Rs 1 Lakh.
- **Extra: Determining the age of a tree:**
  - » The most common method for determining the age of the tree is **Dendrochronology** - or tree ring dating also called growth rings.
  - » A tree, roughly every year adds to its girth. The new growth is also called a tree ring.
  - » By counting the ring of a tree, the age of the tree can be estimated.
  - » **However**, the process is **invasive**.
    - To extract core samples, a borer is screwed into the tree and pulled out. This brings out a straw-size sample of wood. Then, the hole in the tree is sealed to prevent disease.

#### 5) SACRED GROVES

## - Introduction

- Sacred groves comprise of patches of forests or natural vegetation – from a few trees to forests of several acres – that are usually dedicated to **local folk deities** (Example – Ayyanar and Amman) or **tree spirits** (Vanadevatais).
- These spaces are **protected by local communities** because of their religious beliefs and traditional rituals that run through several generations.
- The degree of sanctity of the sacred forests varies from one grove to another.
  - In some forests even the dry foliage and fallen fruits are not touched. People believe that any kind of disturbance will offend the local deity, causing diseases, natural calamities or failure of crops.
    - For example, the Garo and the Khasi tribes of northeastern India completely prohibit any human interference in the sacred groves.
- In other groves, deadwood or dried leaves may be picked up, but the live tree or its branches are never cut.
  - For example, the Gonds of central India prohibit the cutting of a tree but allow fallen parts to be used

## - Classification of sacred groves

- **Traditional Sacred Groves** – It is the place where the village deity resides, who is represented by an elementary symbol
- **Temple Groves** – Here a grove is created around a temple and conserved.
- Groves around the burial or cremation grounds.

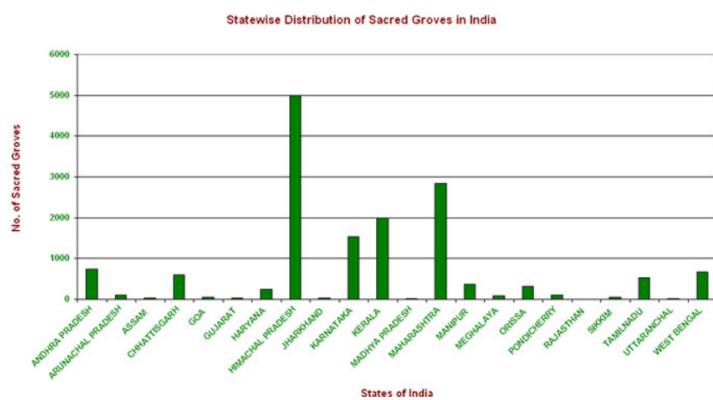
## - Ecological Significance

- i. Conservation of Biodiversity
- ii. Recharge of aquifers
- iii. Soil conservation

## - Distribution of Sacred Groves in India

- In India, sacred groves are found all over the country and abundantly along the western Ghats. Although, there has been no comprehensive study of sacred groves in the entire country, experts estimate that the total number of sacred groves in India could be in the range of 1,00,000 - 1,50,000.

(Source: "Cultural and Ecological Dimensions of Sacred Groves in India" by Malhotra, K.C., Gokhale, Y., and Chatterjee, S., 1998)



## - Threats to Sacred Groves in India

The threats vary from one region to the other and even from one grove to the other. But the common threats identified are:

- **Disappearance of the traditional belief systems**, which were fundamental to the concept of sacred groves. These systems and their rituals are now considered mere superstition.
- Sacred groves in many parts of our country have been destroyed due to **rapid urbanization** and **developmental interventions** such as roads, railways tracks, dams including commercial forestry. Encroachment has led to the shrinkage of some of the largest groves in the country.
- Many groves are suffering due to '**Sanskritisation**' or the transformation of the primitive forms of nature worship into formal temple worship.
- **Invasion by exotic weeds** such as Eupatorium odoratum, Lantana camara and Prosopis juliflora is a serious threat to some groves.
- Pressures due to **increasing livestock** and **fuelwood collection**.

## • Local Terms used for Sacred Groves in the country

Sl.No.	State	Local term for Sacred Groves	No. of documented sacred groves
1	<u>Andhra Pradesh</u>	Pavithravana	580
2	<u>Arunachal Pradesh</u>	Gumpa Forests (Sacred Groves attached to Buddhist monasteries)	101
3	<u>Goa</u>	Deoral, Pann	55
4	<u>Jharkhand</u>	Sarana	29
5	<u>Kerala</u>	Kavu, Sara Kavu	299
6	<u>Maharashtra</u>	Devral, Devrahati, Devgudi	1559
7	<u>Manipur</u>	Gamkhab, Mauhak ( sacred bamboo reserves)	166
8	<u>Meghalaya</u>	Ki Law Lyngdoh, Ki Law Kyntang, Ki Law Niam	101
9	<u>Puducherry</u>	Kovil Kadu	108
10	<u>Rajasthan</u>	Orans, Kenkris, Jogmaya	255
11	<u>Tamil Nadu</u>	Swami shola, Kolkkadu	527
12	<u>Uttarakhand</u>	Deo Bhumi, Bugyal (sacred alpine meadows)	18
13	<u>West Bengal</u>	Garamthan, Harithan, Jahera, Sabitrihan, Santalburithan	39

## 45. INTERNATIONAL EFFORTS

### 1) MARINE PROTECTED AREAS

- **Why in news?**
  - Marine protection falls short of the 2020 target to safeguard 10% of the world's oceans
- **How much of Marine Protected Areas are there in the world?**
  - In 2010, world leaders updated an earlier pledge to establish a network of marine protected areas (MPAs) with a mandate to protect 10% of the world's oceans by 2020.
    - But, by 2020, MPAs only cover 7.66% of the ocean across the globe.
    - Most protected sites are in national waters where it's easy to implement and manage protection under the provision of a single country.

- In more remote areas of the high seas, only 1.18% of marine ecosystems have been gifted sanctuary.
  - Of this, southern Ocean account for a large portion, hosting two MPAs.
  - The South Orkney Islands Southern Shelf MPA covers 94,000 square kms, while the Ross Sea region MPA stretches across more than 2 million square kilometres, making it the largest in the world. CCAMLR is responsible for this achievement.

#### - MPAs in India

- MPAs in marine environment in India are primarily classified into following three categories:
  - **Category 1:** This covers National Parks and Sanctuaries and having entire areas in intertidal/subtidal or mangroves, coral reefs, creeks, seagrass beds, algal beds, estuaries, lagoons.
  - **Category 2 :** These include Islands, which have major parts in marine ecosystem and some part in terrestrial ecosystem
  - **Category 3A:** They include sandy beaches beyond the inter-tidal line but occasionally interacting with the seawater.
  - **Category 3B :** This include evergreen or semi evergreen forests of Islands.

#### ▫ Important MPAs of India in Peninsular India

Name of MPA	State	Category	Year of establishment
Marine (Gulf of Kutch)	Gujarat	NP	1995
Bhitarkanika	Odisha	NP	1998
Gulf of Mannar Marine	TN	NP	1980
Sundarbans	WB	NP	1984

#### ▪ Important MPAs of India in Islands of India

Name of MPA	State	Category	Year of Establishment
Campbell	A&N	NP	1992
Galathea	A&N	NP	1992
Mahatma Gandhi Marine	A&N	NP	1983
Middle Button Island	A&N	NP	1987
Mount Hariette	A&N	NP	1987
Rani Jhansi	A&N	NP	1996
Saddle Peak	A&N	NP	1987
South Button Island	A&N	NP	1987

## 46. MAJOR POLICIES, PROGRAMS, PROJECTS

## 1) NATIONAL FOREST POLICY, 1988

- **Basic Objectives of the 1988 Policy**
  - Maintenance of **environmental stability** through preservation and restoration of the ecological balance.
  - **Conservation of natural heritage** of the country.
  - **Checking soil erosion and denudation** in the catchment areas of rivers, lakes, reservoirs in the "interest of soil and water conservation, for mitigating floods and droughts and for the retardation of siltation of reservoirs
  - **Checking the extension of sand-dunes** in the desert areas of Rajasthan and along the coastal tracts
  - **Increasing substantially the forest/tree cover** in the country through massive afforestation and social forestry programmes, especially on all denuded, degraded and unproductive lands
  - **Meeting the requirements of fuel-wood, fodder, minor forest produce and small timber** of the rural and tribal populations.
  - **Increasing the productivity of forests to meet essential national needs**
  - **Encouraging efficient utilisation of forest produce** and maximising substitution of wood.
  - **Creating a massive people's movement with the involvement of women**, for achieving these objectives and to minimise pressure on existing forests
- **Key Concerns**
  - **No official definition of 'Forests'**. This had led to every state government having their own definition.
  - It doesn't cover provision for **protection of degraded land**.
- **Draft National Forest Policy, 2020**
  - **Why in news?**
    - A GoM has approved Forest Policy, 2020 and have sent it to the PMO and the Cabinet Secretariat for consideration (June 2020)
      - The new policy has been pending since 2016.
    - It is an overarching policy for forest management. This will be **third National Policy on Forests** (after 1952 and 1988).
      - While the NFP of 1952 was focused on production and revenue generation , NFP of 1988 was focused on environmental stability and maintenance of ecological balance, the **draft NFP** will focus on **water conservation** followed by **climate change mitigation** through carbon sequestration and finally to **secure livelihood**.
  - **Target of 33% of India's geographical area under forest and tree cover** and in the hills **2/3rd of area under forest and tree cover** has been continued from the previous policy.
  - **Key sticking Points**
    - Undermining the rights of traditional forest dwellers, roping in of the private players for afforestation, and rather than focusing on forest preservation, it talks about raising plantation.

## 2) NATIONAL WILDLIFE ACTION PLAN (NWAP), 2017-2030

- **Introduction**

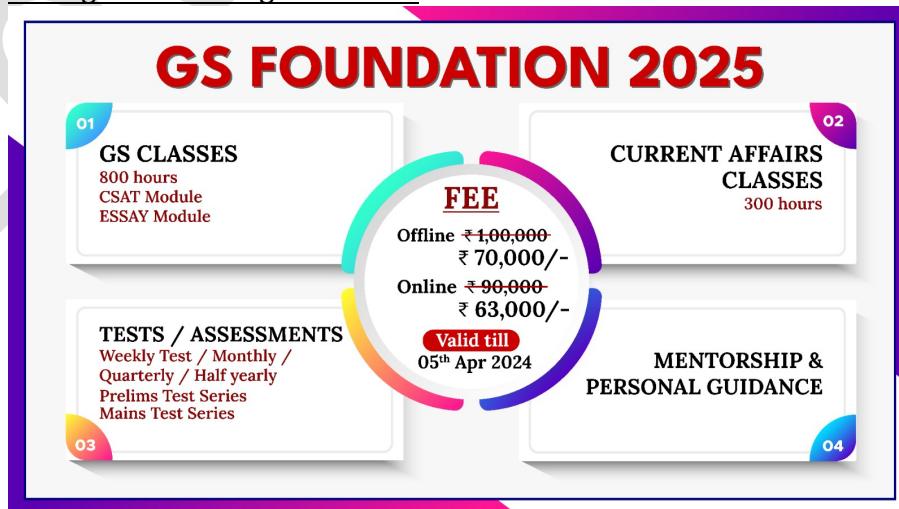
- NWAP is India's roadmap to conserving wildlife for next 15 years. This is the **third** NWAP (first in 1982 and the second in 2002)
- It was **launched Oct 2017** during the Global Wildlife Program (GWP) conference.
  - **Note:** GWP, initiated in 2015, is a World Bank led partnership of 19 countries to promote conservation and sustainable development by combating trafficking in wildlife.
- It focuses on preservation of genetic biodiversity and sustainable development.

- **Key Highlights**

- The plan adopts a "landscape approach" in conservation of all wildlife - uncultivated flora and undomesticated fauna - that has an ecological value to the ecosystem and to mankind irrespective of where they occur.
  - I.e. rather than focusing only on national parks and sanctuaries, the new strategies would be based on landscape of the region that may be limited to a reserve forest system alone.
- The plan integrates climate change into wildlife planning. This is the **first time** that India has recognized concerns relating to climate change's impact on wildlife and stressed on integrating actions that need to be taken for mitigation and adaptation into wildlife management planning process.
- The NWAP has five components, 17 themes, 103 conservation actions and 250 projects.
- **The five components are:**
  - Strengthening and Promoting the integrated management of wildlife and their habitats
  - Adaptation to climate change and promoting integrated sustainable management of aquatic biodiversity in India
  - Promoting eco-tourism, nature education and participatory management;
  - Strengthening wildlife research and monitoring of development of human resource in wildlife conservation
  - Enabling Policies and resources for conservation of wildlife in India.
- **Other thrust area in the planning**
  - Man-Animal conflict mitigation
  - Ensuring public participation in conservation
- The plan will help in mainstreaming wildlife conservation in development planning processes.
- The plan calls for increasing role of private sector in wildlife conservation. The plan lays down that the centre would ensure adequate and sustained funding including CSR funds are made available for NWAP implementation.
- The plans calls for forest rights of people living in tiger reserves and protected areas to be determined by 2020 in accordance with the forest rights act, 2006.

### 3) SECURE HIMALAYA PROJECT

- **About Secure Himalaya: Need of the Project**
  - Himalayan ecosystem is facing increasing degradation, fragmentation of area etc, which is further increasing due to high dependence of the local communities on the natural resources and unplanned infrastructure.
- **Details of Secure Himalaya:**
  - Launched in Oct 2017.
  - The Project **Securing Livelihoods, Conservation, Sustainable Use and Restoration of High Range Himalayan Ecosystems** (SECURE Himalaya) - is being implemented by **MoEF&CC, GoI and UNDP** with financial support of GEF.
  - It is a six year project aimed at conservation of locally and globally significant biodiversity, land and forest resources in the High Himalayan ecosystem.
  - It is part of **Global Wildlife Programme**.
  - **The key components of the project are**
    - i. Protection of **Snow Leopard and other endangered species** and their habitats
    - ii. Securing livelihood of people in the region.
    - iii. Enhancing enforcement to reduce wildlife crime.
    - iv. Strengthening community institutions
    - v. Improving knowledge, advocacy and information system for promoting landscape based conservation approaches.
  - The project is meant for **specific landscapes**. It includes Changthang (J&K), Lahaul - Pangi and Kinnaur (HP), Gangotri - Govind and Darma - Byans Valley in Pithoragarh (**Uttarakhand**) and Kanchenjunga - Upper Teesta Valley (Sikkim).
  - The project will contribute to Global Snow Leopard and Ecosystem Protection Program (GSLEP), an effort to protect the species in 12 range countries, including India.
  - **Financing**
    - It received a GEF grant of \$11.5 million, and will receive \$60 million in co-financing through the Indian government.



# TARGET PRELIMS 2024

## BOOKLET-43; EB&CC-12

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## 2. BIODIVERSITY

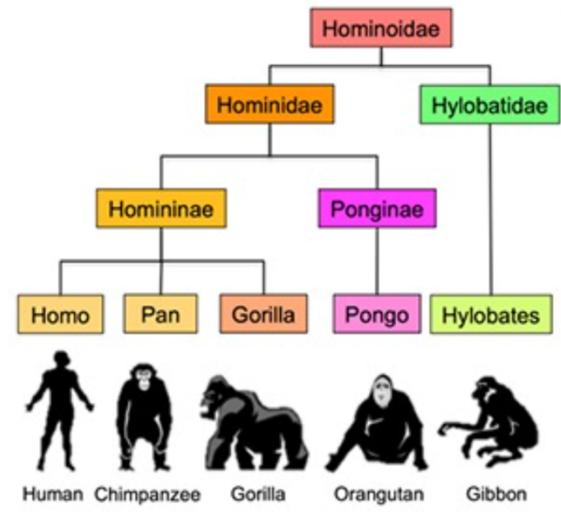
### 1) "MANIS MYSTERIA": NEW SPECIES OF PANGOLIN DISCOVERED IN CHINA (SEP 2023)

- A ninth species of Pangolin has been discovered through analysis of confiscated scales.
  - » **Tentative name assigned to new species:** "Manis mysteria."
- However, though the new species have been discovered, there are signs that it may be disappearing.
  - » Analysis showed genomic signature of a declining population, including low genetic diversity when compared to other pangolins. This happens because of inbreeding.
  - » **Distribution:** It remains a mystery.
    - The new species doesn't look very different from its Asian cousins, it may well have been overlooked in the wild.
- **Pangolin is amongst the most illegally traded species.**
  - » **Pangolin scales** are coveted for its use in traditional medicine, despite being made of keratin, just like fingernails.
  - » **Meat** - its meat is also considered delicacy in Asian countries.

### 2) GIBBONS

- Gibbons are among the fastest of all apes.
  - » Ape, (Superfamily Hominoidea), include any tailless primate of the families **Hylobatidae** (gibbons), and **Hominidae** (Chimpanzees, Bonobos, Orangutans, Gorillas, and Human Beings)
  - » Apes are distinguished from Monkeys by the complete absence of tail and the presence of appendix and by their more complex brains.
  - » **Gibbons** are referred as lesser apes.
  - » The **Gorilla, chimpanzees, bonobo, and orangutans** are called Great Apes in recognition of their comparatively large size and humanlike features.

#### CURRENT CLASSIFICATION SCHEME



### 3) HOLOCK GIBBON (CLASS: MAMMALIA; ORDER PRIMATES; FAMILY: HYLOBATIDAE)

- It is a species of gibbon found in tropical forests of southeastern Asia. It is also found in India's north-east.
- Found in India's northeast, it is one of the 20 species of gibbons found in the world and only ape found in India.
- **Estimated population** of the hoolock gibbons is 12,000.
- **Features:** Like other apes, they are intelligent, have distinct personalities, strong family bonds etc.
- They are also characterized by their vigorous vocal displays (Singing).
- **One Species, not two:**
  - **Background:** Over the decades, zoologists thought that the northeastern India housed two species of apes - The Eastern Hoolock Gibbon (Hoolock Leuconedys) found in a specific region of Arunachal Pradesh and the Western Hoolock Gibbon (Hoolock Hoolock) distributed elsewhere in the northeast.
  - **Findings of a new study:** A study led by scientists from Center for Cellular and Molecular Biology (CCMB) in 2021 proved through genetic analysis that there is only one species of apes in India. It debunked earlier research that the eastern hoolock gibbon was a separate species based on the color of its coat. The study also concluded that the two populations of the western hoolock gibbon and the assumed eastern hoolock gibbon split 1.48 million years ago.



**Western hoolock gibbon**

A female in the foreground, and a male in the background

#### Conservation status



#### IUCN Status:

- **Eastern Hoolock Gibbon:** VU
- **Western Hoolock Gibbon:** EN

**WPA:** Schedule-1

## A) THE GLOBAL GIBBON NETWORK

- In 2020, on the occasion of the International Gibbon Day (24th Oct), 20 Gibbon conservation organization came together to launch Global Gibbon Network. It included IUCN Species Survival Commission (SSC) Primate Specialist Group Section on Small Apes, International Collaboration to Conserve Gibbons and Siamang, Hainan Institute of National Parks, Eco Foundation Global etc.
- **The vision of GGN** is to safeguard and conserve a key element of Asia's natural heritage: The singing gibbons and their habitats, by promoting participatory conservation policies, legislation, and action.
- The GGN had its first meeting at Haikou in China's Hainan province from 7th - 9th July 2023.
  - The meeting highlighted several threats being faced by Hoolock gibbons in India.
    - **Felling of trees** for infra project

## 4) CHEETAL

IUCN Status: LC

WPA: Scheduled-II (as updated in 2022)

**Distribution:** Native to Indian Subcontinent (India, Nepal, Bhutan, BD, SL)

**Chital** have also been introduced in USA, Australia etc.

**State Animal** of Telangana

**Notable Features:** Sexual dimorphism

**Note:** Chital has become invasive in various parts of the world.

- » It has become invasive in Andaman and Nicobar Islands.
  - It was introduced to the A&N Islands for game hunting in the early 1990s by the British, an herbivore that multiplied unchecked for years in the absence of large predators and has become an expensive and invasive problem.
  - For e.g. on Netaji Subhash Chandra Bose Island (formerly known as Ross Island), which lies east of Port Blair and doesn't have any major residential enclaves, the 500 cheetals have depleted much of the low ground vegetation. The A&N Forest Department has been spending Rs 15-20 lakh per month since the past few months to feed on the islands.
- » W.e.f 2nd Aug 2022, the EU added the Chital to the invasive list of alien species and banned its import in EU.
- » It has also become invasive on many Hawaiian Islands.



Stag



Doe

## 5) ELEPHANT CORRIDORS

- **Why in news?**
  - **Report: Elephant Corridors of India, 2023** by Wildlife Institute of India (WII), Project Elephant (GoI), and MoEF&CC.
- **Background:**
  - Elephant Corridor is a strip of land that facilitates the movement of elephant between two or more viable habitat patches.
  - The GoI **Elephant Task Force Report, 2010** (also known as the Gajah Report), listed 88 corridors across the country.

- India has not only identified elephant corridors, but some of the critical corridors have also been restored by the efforts of forest departments of states, MoEF&CC and NGOs. Some of these restored Critical corridors include:

- Kaniyanpura - Moyar Corridor in Bandipur landscape of Karnataka
- Chilla - Motichur Corridor in the Rajaji landscape of Uttarakhand
- Thiruneli - Kudarakote corridor in the Wayanad landscape of Kerala
- Segur elephant corridor in the Mudumalai landscape of TN
- Kuldiha - Hadgarh corridor in the Simlipal landscape of Odisha
- Edayarahalli - Doddasampige corridor in MM Hills and BR Hills landscape of Karnataka
- Mudahalli - Talavadi corridor in the BR Hills Karnataka

- **Key Highlights of the 2023 Report:**

- A total of 150 elephant corridors were reported from 15 elephant range states across the four elephant bearing regions of India.
  - » WB with 26 elephant corridors has the highest number (17%) of corridors in the country.
  - » **Landscapes (Elephant bearing region) wise data:**
    - 52 corridors in the East Central Region (nearly 35%).
    - 48 corridors in the North-eastern region (nearly 32%)
    - 32 corridors in the Southern region (21%). It has to be noted that Southern region harbors the highest elephant population in the country.
    - 18 corridors in the northern region (12%). Northern region has the smallest elephant population in the country.
  - » **84% (within state boundaries);** 13% (n=19) are interstate corridors. There were also 6 transnational corridors between India and Nepal.
- Of the 88 corridors that were listed in the Gajah report, 74 were found to be presently active with respect to elephant use.
  - » **Classification:** Elephant Corridors were classified as "active" if it was being effectively used by elephants as reported by forest departments in ground survey. It was classified as "impaired" if the elephant use was perceived to be virtually non-existent.

- **Way Forward:**

- Continuous monitoring: Delineate boundaries of the corridors and include them in respective working plans and management plans.

#### A) DULUNG-SUBANSIRI ELEPHANT CORRIDOR (MARCH 2024)

- The Wildlife Division of the MoEF&CC has recently directed the forest departments of Arunachal Pradesh and Assam to prepare a proposal to notify the Dulung-Subansiri elephant corridor - downstream of the 2000 MW Lower Subansiri Hydroelectricity Project.
  - The corridor is functional and of vital importance in the larger landscape for elephants.
  - It facilitates east-west movement of elephants across the Subansiri river.

- An expert committee of NBWL, which was inspecting the compliance of conditions imposed by Arunachal Pradesh government, as part of the clearance of the hydroelectric project, had recommended the notification of the elephant corridor in May 2023.
- The proposal to demarcate elephant corridor will be presented during the next meeting of the National Board of Wildlife, which is the apex government body on wildlife conservation and regulation of development projects in wildlife areas.
- Notification of the elephant corridor will involve physically marking the relevant areas used by Elephants on the ground as well as potentially notifying parts of the corridor as either a WLS or a conservation reserve.
  - If the corridor is notified a protected area, it will provide legal sanctity to it.

## NATIONAL BOARD OF WILDLIFE

- A statutory body constituted through **WPA, 1972**.
- It is an advisory body that helps centre for policy decisions.
- Chaired by PM, vice chairman - Minister of Environment
- Functions
  - Advises centre on policy decisions.
  - Review all wildlife related issues, approve projects in and around national parks and sanctuaries.
  - Boundaries of NP or WLS can't be changed without permission of NBW

## B) ABOUT THE 2000 MW LOWER SUBANSIRI HYDRO-PROJECT

- It is being executed by the National Hydroelectric Power Corporation (NHPC), has been in the works since 2003 and is yet to be commissioned.
- It is located in the Kamle and Dhemaji districts of Arunachal Pradesh and Assam, respectively, and is being constructed on the Subansiri River, a tributary of the Brahmaputra River
- A report from Wildlife Institute of India (WII) has pointed out that hydropeaking for power generation from the project will pose a threat of sweeping away elephants, especially calves, due to flash floods.
  - Hydropeaking refers to regulating the flow of water released from a dam to generate power, depending on demands.

## 6) CAPTIVE ELEPHANT (TRANSFER AND TRANSPORT) RULES, 2024

- **Background:** Under the WPA, 1972, Elephant has been kept in Schedule-1. A Schedule-1 species can't be captured and traded.
  - **Section 12** of the act allows schedule-1 animals to be translocated for 'special purposes' such as education and scientific research. They can be translocated for population management of

wildlife without harming any wild animal and collection for specimens for recognized zoos/museums.

- **Captive Elephants** because of their historical role in forest management, timber transport, presence in estates of erstwhile royal families and in temple precincts for religious purpose can be owned and therefore come under a special category. However, **strict rules guide the transfer of such elephants.**
- **Section 40(2)** of the WPA, 1972, prohibits the acquisition, possession, and transfer of a captive elephant without the written permission of the Chief Wildlife Warden of the State.
- Until 2021, the provisions explicitly said that such transactions ought not to be of a 'Commercial nature'.
- The 2021 amendment, however, allowed the transfer of elephants for 'religious or any other purposes'. This broad reason was criticized by civil society and even the Standing Committee of Parliament. But it was passed as a law.
- What do the "Captive Elephant (Transfer and Transport) Rules, 2024 say?
  - New relaxations under which captive elephants can change owners or be transferred?
    - i. Situation when an owner is no longer in a position to maintain the elephant or when a State's Chief Wildlife Warden "deems it fit and proper" to transfer the elephant in circumstances which calls for better upkeep of the elephant.
      - » Other pre-requisites for transfers within states: An elephant's health has to be ratified by a veterinarian, and the Deputy Conservator of Forests has to establish that the animal's current habitat and prospective habitats are suitable. The **Chief Wildlife Warden** on receipt of such documents may choose to reject or approve such transfer.
      - » If the transfer is taking place outside state, similar conditions apply.
    - ii. Before a transfer is affected, the "genetic profile" of the elephant has to be registered with the MoEF&CC.
    - iii. **Permission from both originating and recipient state** is required.
      - » Earlier rules required that an elephant being transferred would need permissions from Chief Wildlife Wardens of every state that the elephant passes through in the process of being ferried by road.
      - » Now, the permission only from originating and receiving states are required.
    - iv. **Conditions to be fulfilled during transfer:**
      - » The elephant must be accompanied by a mahout and an elephant assistant.
      - » A health certificate from veterinary doctor confirming fitness for transport.
      - » Proper feeding and water arrangement must be made during transport
      - » Sedative and Tranquilizers could be used to control temperamental elephants.

## CHIEF WILDLIFE WARDEN (CWW)

The Chief Wildlife Warden (CWLW) is the statutory authority, under the Wildlife Protection Act, who heads the Wildlife Wing of the Forest Department and exercises complete administrative control over Protected Areas (PAs) within a state. Every PA is typically classified as a Wildlife Division and is headed by a Deputy Conservator of Forests (DCF).

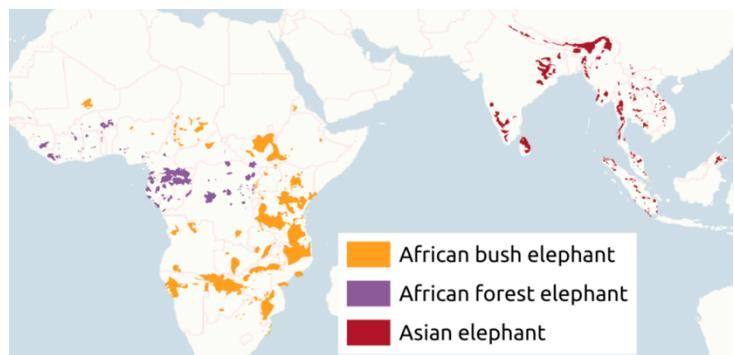
## 7) DNA PROFILING OF 270 CAPTIVE ELEPHANTS COMPLETED: GOI (MARCH 2023)

- In Aug 2022, while announcing the 30-year celebration of '**Project Elephant**', officials said that the DNA Profiling of elephants, which would act as the 'Aadhaar Card of captive elephants', was started. It was done for 'Gaj Soochna' mobile application for forest officials.
  - The process is being carried out in collaboration with Wildlife Institute of India.
- As of March 2023, DNA Profiling for 270 of the 2675 captive elephants in the country has been completed.
  - With the app, forest officers can identify each elephant and track it and therefore its transfer - which often takes place in case of captive elephants.
- **After the elephant profiling**, focus will be shifted to elephant care. With unique information about elephants, it will be possible to provide better medical care for them.
- **Note:** Unlike Project Tiger, the Project Elephant looks at the Welfare and Health of Captive Elephants too.

## 8) BOTSWANA'S ELEPHANT PROBLEM

### A) AFRICAN ELEPHANTS

- African elephants are the largest animals walking the earth. Their herd wander through 37 countries. They have large ears which allow them to radiate excess heat.
  - » There are two species of African Elephants.
    - i. The Savanna (or bush) elephant
    - ii. The Forest Elephant
  - » **Savanna elephant** are larger than the forest elephants and their tusk curve outwards. They are the largest species of elephants and the biggest terrestrial animal on earth.
    - IUCN: EN
  - » **Forest** elephants are uniquely adapted to the dense forest habitat of Congo basin. They are smaller and darker; their tusks are straighter and point downwards. There are also differences in the size and the shape of the skull and skeleton between the two species.
    - IUCN: CR



## B) PROBLEM OF INCREASING ELEPHANT POPULATION IN BOTSWANA

- Why in news?
  - » The President of Botswana has threatened to send 20,000 elephants to Germany in a dispute over conservation (April 2024)
- Elephant Problem in Botswana:

**Botswana** has the world's highest number of elephant population roughly 1.3 lakh). This is around 33% of the world's elephant.

**Why does Botswana has such large population?**

- **Political Stability , and small human population** has led to the country remaining safe haven for elephants. For instance, when conflict led mass poaching in Namibia and Angola began, elephants (known to be intelligent species) stopped crossing the Chobe river, preferring to stay in the safer Botswana instead.
- **Strict Conservation Policies in Botswana:** For e.g. during peak poaching period of 2013, Botswana announced a "shoot-to-kill" policy targeting suspected poachers.

So elephant population which was 10,000 in 1960s has increased to 1.3 lakh today. Around 40% of Botswana land is inhabited by Elephants.



**How large population of elephants is creating problems?**

- Spike in human-animal conflict: it had become a menace for country's rural communities, regularly damaging homes, damaging crops, drinking water shortage, and trampling people and cattle to death.
- **Biodiversity loss:** Elephant tear down trees for fodder and consume large amounts of water.

- What is Botswana doing to keep the population under check?
  - » **It is giving elephants to neighbouring countries** (In 2023, it gave 8,000 elephants to Angola, and in 2022 gave 500 elephants to Mozambique).
  - » It has also lifted ban on trophy hunting in 2019. Botswana argues that it not only controls elephant population but also boosts local economy with hunters from other countries, paying as much as \$50,000 for each elephant killed.
- **Concerns:** Western countries and environmental activists have questioned the above arguments as not true or negligible.
- **Botswana Germany Issue:**
  - » Early in 2024, Germany's environment ministry suggested there should be stricter limit on importing trophies from hunting animals.
  - » **Botswana is unhappy with it.** They feel that this will impoverish people in Botswana and will also hamper efforts to control population in the country. Germany is one of the largest importers of hunting trophies in the EU.

## 9) ATTENBOROUGH ECHIDNA REDISCOVERED IN INDONESIA (NOV 2023)

### A) ECHIDNAS (SPINY ANTEATERS)

- It is a member of **monotremes** - an egg laying group that separated from the rest of the mammal's tree of life about 200 million years ago.

- **Habitat / Distribution:** Australia and New Guinea

- In Echidnas eggs are carried in a pouch on the female's belly until the young hatches, at which point the barely developed young must find a mammary gland and latch onto it for nourishment.

- Echidnas are nocturnal and shy. This makes it difficult to find them.

- Echidnas also curl into a ball and deter predators with its spines.

- **Note:** There are 4 species of Echidnas known:

- » The short beaked Echidna (*Tachyglossus aculeatus*)
  - IUCN: LC
  - Only member of the genus *Tachyglossus*).
- » Sir David's long beaked echidna (*Zaglossus attenboroughi*)
  - IUCN: CR
  - Till its sighting recently, it was not seen since 1961.
- » Eastern Long Beaked Echidna (*Zaglossus bartoni*)
  - IUCN: VU
- » Western Long Beaked Echidna (*Zaglossus bruijnii*)
  - IUCN: CR

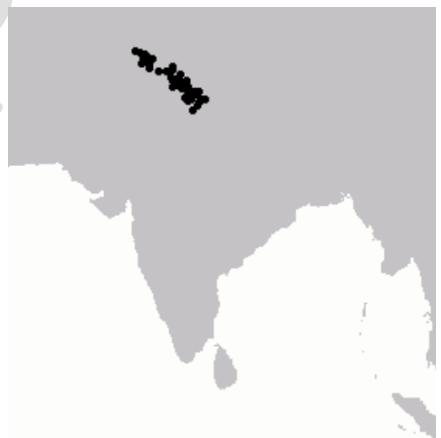
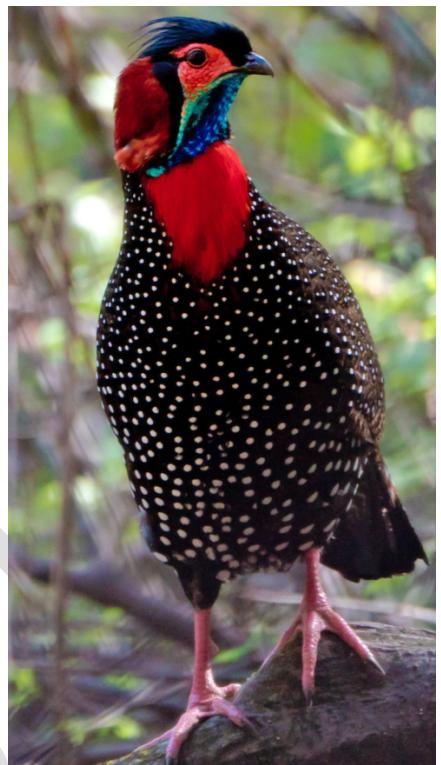


### B) ELUSIVE ATTENBOROUGH ECHIDNAS REDISCOVERED IN INDONESIA (NOV 2023)

- The *Zaglossus attenboroughi*, a kind of long-beaked echidna named for famed British naturalist David Attenborough, had last been seen in 1961.
- It has never been recorded outside the extremely remote Cyclops Mountains of Indonesia's Papua region. The rediscovery has happened here only.

## 10) WESTERN TRAGOPAN (TRAGOPAN MELANOCEPHALUS)

- It is a medium sized pheasant found along the range of Himalayas from northwestern parts of Pakistan to Kashmir, Himachal and Uttarakhand in India.
- Like other pheasants, the species shows sexual dimorphism.
  - **Male** appears mostly dark with prominent white dots all over.
  - **Female** is brownish Grey in color with paler underparts and is finely streaked with white.
- **IUCN: VU**
- **State Bird of Himachal Pradesh.**
- **Threats:** Habitat loss, hunting, and other anthropogenic factors.
- **Captive Breeding:**
  - Because of efforts by government of Himachal Pradesh, there has been steady growth in population of the bird in captivity in the State's Sarahan Pheasantry, the conservation breeding centre. The population was 2 in 2002 and has increased to 47 individuals in 2023.
- **Next Challenge** is of re-introduction in wild.
  - In 2019, four families (Four males, four females) and a few chicks were released in two phases, one in 2020 and the other in 2021 in the Daranghati WLS in the vicinity. While most of them perished, one had not perished on records. It's a fair success as per the international scientific standards.



## 11) HOUSE SPARROW (PASSER DOMESTICUS) (GOURIYA IN HINDI)

The House sparrow is a bird of the sparrow family Passeridae, found in most parts of the world.

- It is native to most of Europe, the Mediterranean basin, and a large part of Asia.
- It's intentional or accidental introductions to many regions, including parts of Australasia, Africa, and the Americas, make it the most widely distributed wild bird.

**Habitation:** It is strongly associated with human habitation and can live in urban and rural settings.



- It feeds on the seeds of grains and weeds but is an opportunistic eater and commonly eats insects and many other foods.
- In Sanskrit it is called Chataka. But there is one other Sanskrit name called Grihabalibhuj, since it captures the nature of a house sparrow. It is a bird that feeds on offerings strewn around the house.

**IUCN status:** LC

- But IUCN has remarked that the population is showing declining trend.

### **State Bird of Delhi and Bihar**

#### **Unique Features:**

- **Anting:** Birds rub insects (usually ants) on their bodies to get relief from parasites. This behaviour is known as anting. The body fluids of the ants are thought to repel parasites.

### **World Sparrow Day: 20th March**

It is a joint initiative by the India-based **Nature Forever Society** in collaboration with the France-based **Eco-Sys Action Foundation** and other national and international organizations across the world. Since 2009, we have been observing World Sparrow Day on March 20 every year.

**Note:** Nature forever society was formed with a vision to involve citizens from all walks of life, diverse backgrounds and different parts of the country and the world.

#### **Why the sparrow population decreasing in Urban Areas:**

- **Not enough food and nesting sites:**
  - » **Shrinking Green Space** - Not enough food and nesting sites
  - » **Modern Urban Architecture:** For e.g. in the past, houses had ventilators (Roshandaan) and invariably sparrows or pigeons will build nest in the ventilators. Age of air conditioners have eradicated ventilators.
  - » **Vanishing Home Gardens** - which used to be a food source for sparrows.
- **Increased pesticide use:** It has reduced insects on which sparrows depended.

**Goraiya Gram:** It means a house of sparrow and this village for sparrows have been set up in Garhi Mandu forest, one of the four city forests in Delhi.

## **12) DODO (EFFORTS TOWARDS DE-EXTINCTION)**

#### **About Dodo Bird:** Dodo is an extinct bird which was endemic to island of Mauritius.

- It had evolved into a **flightless bird** because of lot of food resources available on ground and absence of predators.
- Though the dodo has historically been portrayed as being fat and clumsy, it is now thought to have been well-adapted for its ecosystem.
- It used **gizzard stones** - they swallowed stones and retained them in their guts to grind away at stubborn elements in their diet.
- But Dutch Colonists first landed in Mauritius in 1598. Dodos disappeared around 80 years later. It was because it was hunted for meat and other animals such as Dogs, cats, rats etc also wreaked havoc on the defenseless dodos and their eggs.
- **The closest relative of Dodo was the also extinct and flightless Rodrigues solitaire.**



Dodo skeleton cast (left) and model based on modern research (right), at [Oxford University Museum of Natural History](#)

- The closest living relative of Dodo is the Nicobar Pigeon.

#### A) EFFORTS TOWARDS DE-EXTINCTION

- An ambitious project which is a collaboration between genetic engineering company Colossal Biosciences and the Mauritian Wildlife Foundation - promises to not just bring the dodo back to life, but also re-introduce it in its once native habitat in Mauritius.
- **How?**
  - » Team of scientists at Colossal have sequenced the entire genome of the dodo using DNA extracted from a skull in the collection of the Natural History Museum of Denmark.
    - This is now being compared to genome of Rodrigues Solitaire to understand the unique features of Dodo.
    - Colossal has also sequenced the gene of the Nicobar pigeon, the dodo's closest extant relative, and found its primordial germ cells (PGCs). PGCs are basically the embryonic precursors of a species' sperm and egg.
    - The Nicobar Pigeon's PGC will now be edited to express the physical traits of dodo, with the insight gathered from the comparison of the genomes of all three birds.
  - » These edited PGCs will then be inserted into the embryos of a sterile chicken and rooster, who will act as 'interspecies surrogates'. In theory when the chicken and rooster reproduce, they will give birth to a dodo offspring.
- Re-introduction will be another huge challenge: Because Mauritius of past doesn't exist anymore.

### 13) PENGUINS (DOMAIN: EUKARYOTA; KINGDOM: ANIMALIA; PHYLUM: CHORDATA; CLASS: AVES; ORDER: SPHENISCIFORMES; FAMILY: SPHENISCIDAE)

Penguin are species of flightless marine birds.

#### Distribution:

They live primarily in southern hemisphere.

The majority of species live not in Antarctica but rather between latitudes 45 degree and 60-degree S, where they breed on islands.

A few penguins also inhabit temperature regions, and one, the Galapagos penguin, live at the Equator.

**Population:** The total population of some species, such as emperor penguins are estimated in the hundreds of thousands, but most species of smaller penguins certainly run into millions.

#### Key threats:

**Climate Change and rising ocean temperature**

#### Locomotion and Orientation:



Penguins are adapted for rapid locomotion in water, in which the wings, or flippers, are used for propulsion; i.e. the birds fly underwater. When moving at high speed, they frequently leave the water in leaps that carry them a metre or more through the air; It is during this time they breathe.

On land, penguins are much more awkward, even amusing, as they rock from side to side as they walk. Despite their short legs, they can run with surprising speed.

**On snow or ice**, many penguins "toboggan", sliding on the belly as they propel themselves with the feet and flippers.

## 14) EMPEROR PENGUIN

### Emperor Penguin (*Aptenodytes forsteri*)

It is the largest, tallest and heaviest of all living penguins.

**Distribution:** It is endemic to Antarctica.

**Features:** Like other penguins, it is flightless, with streamlined body, and wings stiffened and flattened into flippers for a marine habitat.

**Food:** Fish, crustaceans such as krills, and cephalopods, such as squids.

**Special Feature:** it is the only penguin that breeds during the Antarctic winter. Emperor penguin trek 50-120 km over the ice to breeding colonies which can contain upto several thousand individuals. Females lay a single egg in May/June that is incubated solely by the males, but parents share the chick rearing duties.

**IUCN:** NT

**Negative Impact of Climate Change:** Antarctica's melting sea ice killed thousands of emperor penguins chicks.

- In late 2022, four out of five emperor penguin colonies located in Antarctica's Bellingshausen region experienced total breeding failure due to sea ice loss.
- Upto 10,000 emperor penguin chicks across four colonies may have died.
- **Why?**
  - Emperor penguins hatch their eggs and raise their chicks on the ice that forms around the continent each Antarctic winter and melts in the summer month.
  - If the sea ice breaks up under them, the young chicks will drown or freeze to death.
  - The sea ice disappeared before the start of the emperor Chick's fledging period, during which they develop their waterproof adult wings and learn to swim.

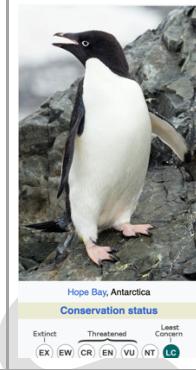


## 15) ADELIE PENGUIN

**Adelie penguin (*Pygoscelis adeliae*)** is a species of penguin common along the entire coast of the Antarctic continent. It is the only place it is found.

**In March 2024**, a team of researchers found 532 dead Adelie penguin, with thousands more thought to have died.

**Reasons:** The researchers suspect the deadly H5N1 bird flu virus killed the penguins, the field test were inconclusive. Samples have been sent to labs for more details.



## 16) GALAPAGOS PENGUIN

**Galapagos Penguin (*Spheniscus mendiculus*)**: It is the most northerly of all penguin species. It inhabit the western part of the Galapagos Islands; Some organisms may occasionally venture to other islands of archipelago.

It is among the smallest of all penguins species.

**Physical Features:** It is a species of penguin characterized by the presence of narrow C-shaped band of white feathers, that extends beyond from the eye to the chin on each side of the head and a single band of black feathers that cuts across the large region of white feathers on the breast.



## 17) FISH: GHOL (BLACK SPOTTED CROAKER) (SCIENTIFIC NAME: PROTONIBEA DICANTHUS)

- It is not only considered a delicacy but is valued for its medicinal properties in many countries. **Ghol fish bladder** is among Gujarat's high value exports.
- It is a large fish, and a single fish can weigh as much as 25 kg.
- It is also known as Sea Gold for its high market value. It is also known as fisherman's lottery. As 1 kg of the bladder can fetch upto Rs 25,000 kg.
- **Distribution:** Widely distributed in the Indo-Pacific region from the Persian Gulf to the Pacific Ocean.
- **IUCN:** NT
- **State Fish of Gujarat:** In 2023, the state of Gujarat announced Ghol as their state fish during the Global Fisheries Conference in Ahmedabad.
  - Boost attempts to conserve and create awareness about the fish.

## 18) FISH OTOLITHS (SEA GEM)

- **Why in news?**
  - Fish Otolith ornaments make market debut (March 2024)
- **What is Fish Otolith?**
  - Fish otoliths are biomineralized ear stones. They help fish hear and provide it a sense of balance.

- They are important in fish studies as they have species shapes and grow throughout their life.
- Counting the annual growth rings on the otoliths is a common technique in estimating the age of the fish.
- They were known to Romans and Egyptians as Lucky stones and continues to be used in countries like Brazil.

## Ornaments made of Otoliths now in market:

- This the first-time ornaments from fish otoliths are being produced and sold in and organized and sustainable manner.
- It has been made possible due to efforts of enthusiastic fisherwomen in Vizhinjam (Kerala), trained by scientists from Central Marine Fisheries Research Institutions (CMFRI).
  - The ornament has been crafted by fisherwomen under SHG Sea Gems Mahila Sahrudam Group. It recently went on display at Kerala Arts and Crafts Village showroom Kovalam, Thiruvananthapuram.



## 3. POLLUTION

### 1) SOLAR WASTE: REPORT

- Introduction:**
  - Solar waste** refers to waste generated during the manufacturing of solar modules and waste from the field (project lifetime)
  - E-Waste Management Rules, 2022** includes solar waste in the definition of E-waste.
- Current Situation of India:** Report: "Enabling a circular Economy in India's Solar Industry - Assessing the Solar Waste Quantum"
  - The analysis was done by MNRE and Council on Energy, Environment and Water (CEEW), a climate think tank in March 2024
  - Generation of solar waste:** 100 Kilotons in FY22-23. It is expected to reach 600 kt by 2030 (this report is referring to end of life waste)
    - The current solar capacity of India was 66.7 GW as of March 2023 which is expected to go to 293 GW by 2030.
    - Therefore, management of solar waste has to be given very high priority.
  - 5 States** - Rajasthan, Gujarat, Karnataka, TN, and Andhra Pradesh - will be responsible for around 67% of the waste produced.
  - Critical Minerals:** Discarded modules also contain critical minerals such as Silicon, Copper, tellurium, and Cadmium. These minerals have been classified as critical minerals for the country's economic development and national security.

- **Key Recommendations of the Report:**

- » **Maintain a comprehensive database; Promote Recycling; Shift towards high-value recycling:**
  - Conventional recycling involves mechanical process like crushing, sieving, and shearing of the waste. This method is able to recycle glass, aluminium, and copper, more valuable materials like silver and silicon can't be recovered through this method.
  - High value recycling involves mechanical, thermal and chemical processes, to recycle the module. It is also able to recycle silver and silicon.

## 2) THE SC SET ASIDE A NOTIFICATION ISSUED BY THE MOEF&CC IN 2020 THAT EXEMPTED EXTRACTION OF ORDINARY EARTH FOR LINEAR PROJECTS, SUCH AS ROADS AND RAILWAY CONSTRUCTION, FROM OBTAINING ENVIRONMENTAL CLEARANCE (EC) (MARCH 2024)

- **Background:**

- » In Sep 2006, MoEF&CC notified activities that would require prior EC.
- » In Jan 2016, another notification was issued which exempted certain category of projects from this requirement.
- » In March 2020, third notification added "Extraction or sourcing or borrowing of ordinary earth for the linear projects such as roads, pipelines etc." to the list of exempted activities.

- **Why the exemption?**

- » The general purpose of the exemption was to conform to the amendments made to the Mines and Minerals (Development and Regulation) Act, 1957 in March 2020, allowing new lessees to continue mining for two years with the statutory clearance and license issued to their predecessors.
- » The Centre also argued before the NGT that the exemption was necessary "for the aid of general public", and would help "the Kumhars (potters), farmers, gram panchayats, vajaras, oads of Gujarat".
- » Government also said that grant of exemption was a policy matter that didn't warrant judicial interference.

- **Challenge to the Exemption:**

- » The exemption was challenged before the NGT on the ground that allowing the extraction of earth indiscriminately was arbitrary and violative of Article 14 of the Constitution of India.
- » The petitioner also argued that the exemption violated the Supreme Court verdict in **Deepak Kumar versus the State of Haryana (2012)** which required for prior EC in the leases.
- » Ministry had also "circumvented the legal procedure of inviting public objections before issuing the 2020 notification by wrongly exercising its powers to do away with such requirements "under the garb of 'public interest' during the COVID-19 national lockdown.

- **NGT in Oct 2020**, asked government to "revisit" the notification within three months and held that **the ministry should strike a balance and instead of being blanket exemption**, it needs to be hedged by appropriate safeguards.

- Center sat on NGT order until the matter went to SC. After SC concluded the hearing and reserved the judgement, the MoEF&CC notified that exemption in question would be subject to the compliance of SOP and environmental safeguards issued in this regard from time to time.
- Supreme Court Verdict:
  - "Completely unguided and blanket exemption" was arbitrary and violative of Article 14 because the 2020 notification didn't even define linear projects, or specify the quantum and extraction area. This defeats the purpose of EP Act.
  - The court held that the Ministry offered no justification for concluding "that in the public interest, the requirement of public notice should be dispensed with" at any stage - neither in the notification itself or in its submissions to the NGT and SC.
  - Even the Aug 2023 notification failed to elaborate on the concept of linear projects, specify the authority responsible for environmental safeguards, restrictions on the quantum of extraction etc.
  - The court also said that it failed to understand the undue haste shown by Central government in issuing the impugned notification which was issued two days after the nationwide lockdowns was imposed.
- Past cases where these kinds of exemptions have been brought under Judicial Scrutiny:
  - In July 2021, through a notification Ministry sought to perpetuate an amnesty window opened for just six months in March 2017 to clear projects under the "violation category" and issued ex-post facto approval to more than 100 projects, until the Supreme court stayed it in Jan 2024.
  - In March 2024, the High Court of Kerala quashed a 2014 notification that exempted institutions and industrial sheds with build-up areas of more than 20,000 sq m from obtaining EC

## 4. CLIMATE CHANGE AND ASSOCIATED ISSUES

### 1) INITIATIVES TO TAKE AHEAD THE 'LIFE' – LIFESTYLE FOR ENVIRONMENT

- To take ahead LiFE movement announced by the Hon'ble PM in 2021, MoEF&CC has introduced two pioneering initiatives that indicates the country's proactive approach to climate change, sustainability, and promotion of eco-conscious practices.
- Both the programs Green Credit Program (GCP) and The Ecomark Scheme were notified in Oct 2023.

#### A) GREEN CREDIT PROGRAM (GCP)

- The program is a domestic voluntary market mechanism which incentivize environmental actions across diverse sectors and by different stakeholders like individuals, communities, ULBs, private sector etc.
  - Under environmental actions, 8 activities have been identified. It includes : Afforestation, Water Conservation; Sustainable Agriculture, Waste management, air pollution reduction, mangrove conservation and restoration; Ecomark (a government scheme to identify environment friendly products) and sustainable building and infrastructure.

- The environmental actions will earn Green credits and these green credits will be tradable and those earning them will be able to put these credits up for sale on a proposed domestic market platform.
- In its initial phase, the GCP focuses on two key activities: Water Conservation and Afforestation.
- **Institutional Framework:**
  - The GCP's governance framework is supported by inter-ministerial Steering Committee.
  - The Indian Council for Forestry Research and Education (ICFRE) serves as the GCP administrator, responsible for program implementation, management, monitoring and operation.
  - The Green Credit Registry and trading platform, being developed by ICFRE along with experts, would facilitate the registration and thereafter, buying and selling of Green Credits.
- **How to obtain Green Credit:**
  - **Registration of the Activity:** To obtain Green Credits, Individuals and entities must register their activities through the central government's dedicated app/website [www.moefcc-gcp.in](http://www.moefcc-gcp.in).
  - **Verification:** The administrator will verify the activity through a designated agency, with self verification for small projects.
  - **Granting of Certificate:** After completion of the verification, the administrator will grant Green Credit Certificate which will be tradable on the green credit platform.
- **How is Green Credit Initiative different from Carbon Credit Initiative:**
  - **Carbon Credit** can be claimed by reducing carbon footprint, whereas Green Credit has a much wider scope and can be claimed by various types of environment friendly activities.
  - While carbon market (carbon credit) is more focused at industry and corporations, green credit program can benefit individuals and communities.
- **How will Green Credit work in case of afforestation:**
  - Under the initiative, registered and approved entities can pay to finance afforestation in specific tracts of degraded forest, and wasteland. The actual afforestation will be carried by the forest department. Two years after planting - and following an evaluation by ICFRE - each planted tree could be worth one 'green credit'.
  - **How credits can be used?**
    - » These credits can be bought to meet obligations under Corporate Social Responsibility (CSR) and Environmental, Social, and Governance (ESG). It can also be used to meet compensatory afforestation requirements under the Forest (Conservation) Act.
  - This green credit could be used by companies which have diverted forest land and non-forest purposes and razed thousands of trees to offset some of their obligations under India's compensatory afforestation laws.
  - **Weeks** after the Union Environment Ministry announced the rules for its Green Credit Program (GCP), ten states have identified parcels of degraded forests land that will be made available for individuals, groups, public and private sector units to earn - and potentially trade - green credits.

- **Concerns:**
  - **Linking Green Credits to Compensatory afforestation** activities is even trickier as the program in essence facilitates the creation of land banks that could be easily diverted to commercial entities **and contribute to even greater level of diversion of forest land.**

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## B) THE ECOMARK SCHEME

- The Scheme replaces the previous notification and provides accreditation and labelling for household and consumer products that meet specific environment criteria while maintaining quality standards as per Indian norms.
  - Products accredited under the scheme will adhere to specific environment criteria, ensuring minimal environment impact.
- It will build consumer awareness; and encourage eco-conscious choices.
- It will also motivate manufacturers to shift towards environment friendly products.
- The scheme also seeks to ensure accurate labelling and prevent misleading information about the products.
- **Administrator:** The CPCB administers the eco-mark scheme in partnership with Bureau of Indian Standards (BIS), which is the national body for standards and certification.

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# TARGET PRELIMS 2024

## BOOKLET-44; ECONOMY-9

### INDUSTRY

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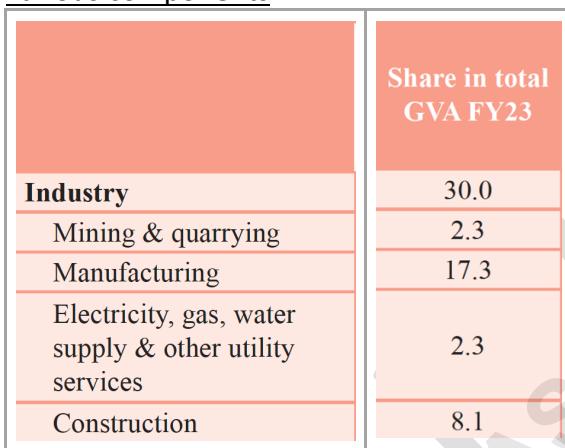
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## 2. 3 SECTORS OF ECONOMY

Year	Agriculture	Industry	Services
1947	55%	15%	30%
2022-23:	17%	29%	54

## 3. INDUSTRY

- Industrial sectors consist of manufacturing; construction; Electricity; Gas; water supply & utility; Mining & Quarrying.
- **Share of various components:**



- Industry holds a prominent position in India's economy, accounting for **31% of GDP**, on average, during FY12 and FY21 and employing over 12.1 crore people.
  - o The sector is also significant because of a number of direct and indirect linkages:
    - **Reducing reliance on imports**
    - **Multiplier effect**: Industrial growth has multiplier effect, which translates into employment growth.
      - Industries such as textile and construction have high employment elasticities.
      - Industrial sector also spurs growth in services sector such as banking, insurance, logistics etc.

### 1) IIP

- **Definition:**
  - o The **IIP** is a composite indicator that measures changes in the volume of production of a basket of industrial products over a period of time, with respect to chosen base year.
  - o The IIP is computed and published by the **Central Statistics Organization (CSO)** on a monthly basis, six weeks after the reference month ends.
- **Description**

- It classifies industry into Manufacturing, Mining and Electricity Sector and measures growth in production in each industry.
  - In addition, use based classification of basic goods, intermediate goods and capital goods is also available. This helps in predicting GDP growth as industry is one of the major contributors to growth.
    - The weight of the 3 categories of sectors are as follows:
      - **Manufacturing** has a higher 77.6%.
      - **Mining (14.4%)**
      - **Electricity (8%)**
    - The weight of various categories under **user-based classification includes:**
      - Primary Goods (34%)
      - Capital Goods (8.2%)
      - Intermediate Goods (17.2%)
      - Infrastructure/construction goods (12.3%)
      - Consumer durables (12.8%)
      - Consumer non-durables (15.3%)
- **Base Year:** 2011-12
- **Purpose:**
- **Policy decisions.**
  - **Crucial input for compilation of GVA** of the manufacturing sector
  - Used by financial intermediaries, policy analysts and private companies for various analytical purposes.
- **Why changes in the IIP calculation methods need to happen regularly?**
- To capture the changes in the structure and composition of the industry over time due to technical changes, economic reforms, changes in pattern of demand and supply.
- **Current Situation**
- For the month of Feb 2024, the Quick Estimates of IIP with base 2011-12 stands at **147.2**.

## 2) ANNUAL SURVEY OF INDUSTRIES (ASI)

- It is the most important source of Industrial statistics of the registered manufacturing sector of the economy.
  - It covers all factories registered under Sections 2(m)(i) and 2(m)(ii) of the Factories Act, 1948, where the manufacturing process is defined under section 2(k) of the said act.
    - It covers all factories employing 10 or more workers using power and those employing 20 or more workers without using power.
  - It also covers Bidi and Cigar manufacturing establishments registered under the Bidi and Cigar Workers (Conditions of Employment) Act, 1966.
  - All Electricity undertakings engaged in generation, transmission, and distribution of electricity, not registered with Central Electricity Authority (CEA) are also covered under ASI.

- Units with 100 or more employees registered in the Business Register of Establishments (BRE) prepared and maintained by the State Governments as and when such lists are shared by the respective State governments.
  - **Industries excluded:** Defence establishments, oil storage and distribution depots, departmental units of railway workshops, RTC workshops, Govt Mints, sanitary, water supply, gas and storage etc., are excluded from the purview of the survey.
- The survey is conducted under the Collection of Statistics Act, 2008 as amended in 2017 and Rules framed there under in 2011.
- It is conducted by **CSO Industrial Statistics (IS) wing** and is released by MoSPI.
- It ensures timely dissemination of statistical information about dynamics of manufacturing sector.
- The data is given with a lag of two years.
- **Note:** For other categories of factories/establishments, which are not covered under the ASI, the information is collected through the unorganized sector surveys conducted by NSSO every 5 years.
- **MoSPI** has released the results of ASI for FY21 and FY22 (Feb 2024)
  - The results show resilience shown by the Indian Manufacturing Sector and tells the unique turn-around story of Indian Manufacturing sector after the COVID-19 crisis.
  - **Employment:** Marginal fall in 2020-21; It was more than compensated in 2021-22 with total estimated employment in the sector showing a robust growth of 7.0% (Y-o-Y).
    - In fact, the estimated number of persons engaged in the sector in 2021-22 has exceeded the pre-pandemic level (i.e. 2018-19) by more than 9.35 lakh.
  - **States:**
    - In terms of GVA, Maharashtra is ranked-1 in FY22 and Gujarat is ranked-2 in FY22. These states are followed by Tamil Nadu, Karnataka and Uttar Pradesh.

### 3) IIP VS ASI

- **IIP is monthly indicator whereas ASI is a long-term industrial statistics.** It is used to track the health of the industrial activity in the economy over a longer period.
- The index is compiled out of a much large sample of the industries compared to IIP.

### 4) PURCHASING MANAGER'S INDEX (PMI)

- **What is Manufacturing PMI?**
  - An indicator of the economic health of the manufacturing sector. It predicts the level of industrial production in advance.
  - It is based on five major indicators.
    1. New orders
    2. Inventory levels (stocks of items purchased)
    3. Backlog of work
    4. Suppliers' delivery times
    5. Employment levels

- The **purpose** of the PMI is to provide information about current business condition to company decision makers, analysts and purchasing managers.
- How is info collected?
  - Monthly surveys sent to purchasing executives at approximately 400 manufacturers.
- What does the indicator mean?
  - PMI > 50: Expansion of manufacturing compared to previous month.
  - PMI = 50: No change
  - PMI < 50: Contraction of manufacturing compared to previous month.
- **Famous Manufacturing PMI's of India**
  - S&P Global's Manufacturing PMI
- **Beginning:** It was started by the US-based Institute of Supply Management in 1948. Over the years it has become one of the most closely watched indicators of business activity across the world

## 4. INDUSTRY-CORE SECTOR

### 1) THE COMBINED INDEX OF EIGHT CORE INDUSTRIES (ICI)

- The ICI measures the collective and individual performance of production in select eight core industries.
  - These eight industries comprise 40.27% of the weight of items included in the IIP.
  - It is compiled and released by Office of Economic Advisor, DIPP, Ministry of Commerce and Industry.
    - » **Base Year: 2011-12.**
    - » **Weights of different sectors:** Coal (10.33%), Crude Oil Production (8.98%), Natural Gas (6.88%), **Refinery Products (28.04%)**, Fertilizers (2.63%), **Steel (17.92%)**, Cement (5.37%) and **Electricity (19.85%)**.
  - ICI for a reference month is released with a time lag of 1 month, a fortnight prior to release.
- **Updates:**
  - ICI increased by 6.7% (provisional) in Feb 2024 as compared to the Index of Feb 2023.

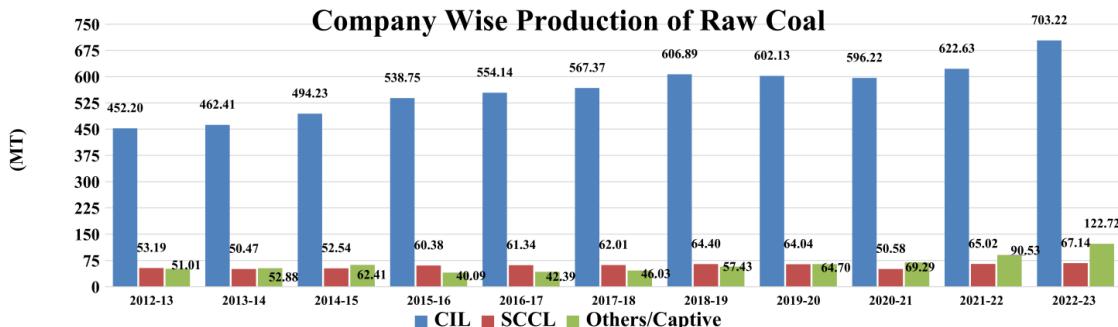
### 2) COAL INDUSTRY

- **Coal** is the most important and abundant fossil fuel in India. It accounts for 55% of the country's energy need.
- **India will continue to rely on coal for foreseeable future:**
  - » **Surging power demand in India:** As per the latest World Energy Outlook published by International Energy Agency (IEA), India will witness the largest energy demand growth of any country or region in the world over the next 30 years.
  - » **Renewable** only contributes to 22% of energy being produced in the country. Fossil fuels (mainly coal) still provide for 75% of India's power supply.
    - **Issue of intermittency** in the renewable sector.
- **Coal power dependency is also growing globally:**

- » For e.g. as per a report by US-based think-tank, Global Energy Monitoring, - coal fired powerplant capacity grew 2% last year, the highest annual increase since 2016.

## A) COAL PRODUCTION IN INDIA

- In recent years, India's coal production is on increasing trend (except 2020-21)



Year	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
<b>Total Production (Million tonnes)</b>	609.18	639.23	657.87	675.40	728.72	730.87	716.08	778.20	893.08

- The All-India Production of Coal during 2022-23 was **893.19 MT** with a positive growth of 14.77%.
  - » Coal India Limited (CIL) produces around 78% of coal in India.
  - » Singareni Collieries Company Limited (SCCL) around. 8% of coal production in the country.
  - » Captive and others are responsible for more than 14% of the production.

## B) COAL IMPORT

- As per the present import policy, coal can be freely imported (under Open General License) by the consumers themselves considering their needs based on their commercial considerations.
- **Coking Coal** is being imported by Steel sector mainly to bridge the gap between requirement and indigenous availability and to improve the quality.
  - » Note: Coking Coal (also known as metallurgical coal) is a grade of coal that can be used to produce good-quality coke. Coke is an essential fuel and reactant in the blast furnace process for primary steelmaking.
- Other sectors like Power Sector, cement, etc. and coal traders are importing non-coking coal.

Coal	2019-20	2020-21	2021-22	2022-23	2023-24*
Coking Coal	51.83	51.20	57.16	56.05	48.29
Non-Coking Coal	196.70	164.05	151.77	181.62	172.20
<b>Total Coal Import</b>	<b>248.53</b>	<b>215.25</b>	<b>208.93</b>	<b>237.67</b>	<b>221.19</b>
Coke	2.88	2.46	2.48	3.63	3.21

\*Import upto Jan, 2024 (Source:-DGCI&S)

## **NEW US SANCTIONS ON MOSCOW AND IMPACT ON INDIA'S IMPORT OF COAL FROM RUSSIA (FEB 2024)**

- Russia was historically a minor exporter of fuel to India. But this changed after western sanctions against Moscow over its war in Ukraine.
- **New US Sanctions** are more likely than previous ones to cut Indian imports of thermal coal from Russia because they specifically cite top exporters SUEK (Russia's largest coal producer and exporter) and Mechel. It also includes Russia's payment system, financial institutions and energy production.
  - **Indian conglomerates** JSW Group, Vedanta and consortium Arcelor Mittal Nippon Steel India were among the biggest importers of Russian thermal coal in the last six months.

### **C) MINISTRY OF COAL AND COAL PSUS**

- MoC has the overall responsibility of determining policies and strategies in respect of exploration and development of coal and lignite reserves, sanctioning of important projects of high value and for deciding all related issues.
- **Three PSUs** come under the Ministry.
  - a. **Coal India Limited (CIL)**
    - » A 'Maha Ratna' company under the Ministry of Coal, with headquarter at Kolkata, WB.
    - » It is the single largest coal producing company in the world and one of the largest corporate employers with a manpower of 3,46,638.
    - » In **FY24**, Coal India Limited (CIL) has surpassed its annual supply target of 610 MT to the thermal power sector, achieving 610.8 MT till 27th March 2024.
      - It's coal supply to the sector rose by 29.3 million tonnes in absolute volume terms compared to the corresponding period last fiscal.
  - b. **Neyveli Lignite Corporation Limited (NLC)**
    - » A 'Navratna' with registered office at Chennai and corporate office in Neyveli in TN.
  - c. **Singareni Collieries Company Limited (SCCL)** which is a joint sector undertaking of Government of Telangana and Government of India with an equity capital ratio of 51:49.

### **D) COAL CONTROLLER ORGANIZATION (CCO)**

- It is a subordinate office of the Ministry of Coal, having its headquarter at Kolkata and field offices in Dhanbad, Ranchi, Bilaspur, Nagpur etc.
- It collects and maintains coal production data of all private and public sector coal mines in the country. The info is collected on a monthly basis.
- **History:**
  - » Office of Coal Controller (earlier Coal Commissioner) was established in 1916. It is one of the oldest offices in Indian coal sector.
    - The mains aim was to have government control over coal production to adequately meet the coal requirements during World War-1.
- **Functions and Responsibilities:**
  - » Inspection of collieries to ensure the correctness of the class, grade or size of coal.

- » To issue directives for the purpose of declaration and maintenance of grades of coal of a seam mined in a colliery.
- » To act as the appellate authority in case of dispute between consumers and owner arising out of declaration of grade and size of coal.
- » To regulate disposal of stock of coal or the expected output of coal in the colliery.
- » Quality surveillance with respect to maintenance of grade, loading of coal in wagons/ trucks according to laid down procedures regarding grades and sizes.
- » To grant opening / re-opening permission of coal mine, seam or a section of seam or to subdivide a mine.
- » Assessment and collection of excise duty levied on all raw coal raised and dispatched.
- » Submission of monthly coal data to different ministries of central and state governments, national and international organisations

#### E) COAL DEPOSITS IN INDIA (FROM INDIA YEAR BOOK)

- Coal Reserves (308.80 billion tonnes) of coal reserves have been estimated by Geological Survey of India. The reserves have been found mainly in Jharkhand, Odisha, Chhattisgarh, West Bengal, Madhya Pradesh, Telangana and Maharashtra.
- Lignite Reserves (44.59 billion tonnes) have been estimated by GSI. The major deposits are located in Tamil Nadu, followed by Rajasthan, Gujarat, Kerala, West Bengal, Jammu & Kashmir and UT of Puducherry.

#### F) TYPES OF COAL:

- The degree of change undergone by a coal as it matures from peat to anthracite is known as coalification. Coalification has an important bearing on coal's physical and chemical properties and is referred to as rank of the coal. Ranking is determined by the degree of transformation of the original plant material to carbon. There are four main categories of coal which differ in heating value, carbon content, Sulfur levels, and moisture contents. The ranks of coals, from those with the least carbon to those with the most carbon, are lignite, sub-bituminous, bituminous and anthracite.
  - Peat is a layer of vegetable material directly underlying the growing zone of coal forming environment. The vegetable material shows very little alteration and contains roots of living plants.
    - » Uses
      - Peat is widely used as domestic fuel in rural parts of Scotland and Ireland.
  - Lignite or Brown Coal, (lowest carbon content of 25-30%). It is the youngest coal type geologically, makes up the largest portion of the world's coal reserves. It is brown and can be soft and fibrous, containing discernible plant material. However, lignite has very high moisture and ash content and low energy content.
    - » Uses
      - It is used almost exclusively for electric power generation.
      - Jet a compact form of lignite, is sometimes polished and has been used as an ornamental stone since the upper Paleolithic.
  - Sub-bituminous Coal (35-45% carbon) is a dull black coal with a slightly higher heat value than lignite. Despite its low heat value, it has lower sulfur content and is clean to burn.
    - » Uses:
      - It is used primarily as fuel for steam electric power generation

- Important source for light aromatic hydrocarbons for the chemical synthesis industry.
- **Bituminous Coal or soft coal (45-86% carbon)** : Older than subbituminous coal, dense sedimentary rock, usually black, but sometimes dark brown.
  - » **Uses**
    - Primarily as fuel in steam electric power generation
    - Substantial quantities used for heat and power applications in manufacturing and to make **coke**.
- **Anthracite (86-98% carbon)**, highest rank of coal, is a harder, glossy black coal. Low in volatile matters which can form tars, oils and gasses when heated. Only a small percentage of the overall market.
  - » **Uses**
    - Primarily for residential and commercial space heating
- **Graphite (100% technically)**, technically the highest rank coal, difficult to ignite and is not commonly used a fuel.
  - » **Uses**
    - It is mostly used as pencils.
    - When powdered, also used as Lubricant.

### 3) OPENING UP OF COMMERCIAL COAL MINING

- **Background**
  - » **Nationalization of Coal Mines, 1973**
    - Coal Mines (Nationalization) Act, 1973 nationalized all the coal mines in India.
    - **Why?**
      - Adequate investment needs in the coal mining sector were not fulfilled by the private sector.
      - Unscientific mining practices adopted by some private miners and poor working conditions of labour in some of the private coal mines became matters of concern for the government.
    - So, since 1970s, **Coal India** had the monopoly over mining and selling of coal in India. It accounted for 80% of the country's coal supply. Another public sector company is Singareni Collieries, a venture of Coal India and the Telangana (earlier Andhra) government.
    - The rest of the requirement is met through **import** and **production from captive mines by private players**.
      - These coal mines were allocated on recommendation basis (not auction) only for their specific use (also called Captive Mining)

- **In Sep 2014, Supreme Court cancelled 214 coal block allocations since 1993.**
  - » The 4 allocation which were not cancelled included government run blocks on non-Joint-venture basis.
  - » **The Coal Mines (Special Provisions) Act, 2015** passed in March 2015, contained provisions enabling government to allocate coal mines through auction. This thus theoretically opened coal mining sector in theory to private sector.

- **In Feb 2018, Cabinet approved bidding process for Commercial Coal Mining: Key features:**
  - » Ascending forward auction on an online platform where the bid parameters will be the price offer in rupees per tonne, which will be paid to the state government on the actual production of coal.
    - No share for centre from commercial mining.
  - » **No restriction on sale and/or utilization** of the coal from mine.
  - » **No cap on price and type** of coal.
- **100% FDI allowed in Coal mining through automatic route in commercial coal production (Aug 2019)**
- **Government unveils auction process for Coal Mines (June 2020)**
  - » This marks the full opening of Commercial coal mining for the private sector through auction and ends seven decades of restrictions.
    - Commercial Coal Mining Auctions are completely different from the earlier regime of restricted sectors, use and price. Now there is no such restrictions.
- **Terms and conditions** of the auction are also **very liberal**.
  - » New companies (without prior experience) in coal mining can participate.
  - » Reduced upfront amount.
  - » Adjustment of upfront amount against royalty
  - » Liberal efficiency parameters.
  - » 100% FDI through automatic route allowed.
  - » Reasonable financial terms and revenue sharing model based on National Coal Index

#### 4) NATIONAL COAL INDEX (NCI)

- **National Coal Index (NCI):**
  - » The NCI is a price index which reflects the change of price level of coal on a particular month relative to the fixed base year. The base year for the NCI is FY 2017-18.
  - » It has been created by combining the prices of coal from all the sales channels - Notified prices, Auction Prices and Import Prices.
  - » The index is meant to encompass all transaction of raw coal in Indian market. This includes coking and non-coking coal of various grades transacted in the regulated (power and fertilizer) and unregulated sector.
    - **Note:** Washed coal and coal products are not included.
  - » It was first rolled out in June 2020.
  - » It consists of **five subindices**: three for non-coking coal and two for coking coal.
    - The three subindices for non-coking coal are combined to produce index for Non Coking coal and the two sub-indices for Coking coal are combined to arrive at the Index of Coking coal.
    - **Thus, Indices are separate for coking and non-coking coal.**
  - » The NCI is released every month.
- **The concept and design of the index** as well as the Representative Prices have been developed by the Indian Statistical Institute, Kolkata.

- **Purpose**

- » Ministry of Coal has started **commercial auction of coal on revenue share basis**. The amount of revenue share per ton of coal produced from auctioned blocks would be arrived by using the NCI by means of defined formula.
- » Thus, NCI will truly reflect the market price.

## 5) OTHER RECENT REFORMS/INITIATIVES IN COAL SECTOR

i. **Scheme for Harnessing and Allocating (Coal/Koyla) Transparently in India (SHAKTI) Policy:**

- Launched in May 2017
- **Need:**
  - Before SHAKTI, coal supply to thermal power plants (TPPs) were done according to New Coal Distribution Policy (NCDP), 2007. CIL had provided Letter of Assurance (LOAs) for around 1,08,000 MW capacity by 2010 and after that no new LOAs were issued due to prevailing scarcity scenario.
  - In 2013, CCEA's decision directed CIL to sign Fuel Supply Agreement (FSA) with TPPs of around 78,000 MW.
  - So, the remaining 30,000 MW plants were lacking fuel supply agreement and thus awaiting fuel supply.
- **Aim:** Promoting transparency and competition in the allocation of coal mines. It is applicable to all coal-based power plants in the country.
- **Key Provisions of the Policy**
  - **Right to fuel produced by Coal India/SCCL** for thermal capacities in the private sector which are equipped with long term PPAs.
    - The policy prescribes direct linkage allocation to public-sector plants and reverse auction for supply of coal linkages to private players.
  - **Coal linkages is awarded to designated state-owned power distribution companies (DISCOMS).**
    - State or central power generation companies would be assigned linkages via allocation.
    - The firms (independent power producers (IPPs)) with PPAs based on domestic coal will participate in the auction and will bid for discount on existing tariff. This is expected to result in a win-win situation of IPPs having a long-term supply security of coal from a source of their choice while consumer will benefit from a lower tariff.
    - Firms without PPAs shall be bidding for linkage over the notified price of the coal company (i.e. they will bid for fuel linkages with CIL's notified price serving as the reserve).
- By FY2023, 209.614 million tonnes coal linkages have been booked/ allocated under different provisions of SHAKTI Policy.

ii. **New sub-sector under the Policy for Auction of coal linkages of Non-Regulated Sector (NRS):-** A new Sub-sector 'Production of Syn-Gas leading to coal gasification' has been created in 2022 under the NRS linkage auctions in order to encourage coal gasification technology so that new consumers requiring

coal for gasification are incentivized. This will also mitigate the adverse impacts of the conventional use of coal on the environment.

- iii. **Single window for e-auction of coal:** - Government has recently approved a new mechanism for e-auction of coal by the coal companies. The erstwhile sectoral e-auction windows of Coal India Limited has been done away with and henceforth, all the non-linkage coal of the coal companies would be sold through one e-auction window of Coal India Limited / Singaren Collieries Company Limited. This single e-auction window will cater to all the sectors like power & nonregulated sector included traders. Therefore, coal of any particular grade would be sold in the market to all consumers at one rate (**one nation – one coal grade- one rate**).
- It will remove market distortions. It will increase operational efficiencies and lead to an increase in domestic coal demand.
- iv. **Amendment to NCDP:** To promote optimum utilization of coal resources in the national interest, enabling provisions have been made by way of amendment to the New Coal Distribution Policy (NCDP), 2007, in order to allow the coal produced from Closed / Abandoned / Discontinued mines of CIL / SCCL to be sold through a transparent and objective manner as per the guidelines issued by Ministry of Coal from time to time.
- v. **Coal linkages for gasification plants of the coal companies:** CIL / SCCL have been allowed to provide long term allotment of coal to their own gasification plants at prices as may be decided by the coal company. This move will encourage coal gasification technology in the country and will help in early establishment of this new use of coal.
- vi. **Mission Coking Coal:**
- **Understanding Coking Coal:** Metallurgical coal or Coking coal is a grade of coal that can be used to produce good quality coke. It is an essential fuel and reactant in the blast furnace process of steel making. The demand for coking coal is coupled with demand for steel.
  - **Domestic Coking Coal** is high ash coal (mostly between 18% - 49%) and is not suitable for direct use in blast furnace. Therefore, Coking coal is washed to reduce the ash percentage and is blended with imported coking coal (<9% ash) before utilization in blast furnace.
  - **Imports:** About 50 MT coking coal is imported by the country on an annual basis and the value of coking coal imported in FY2020-21 was Rs 45435 crores.
- **Inter-ministerial committee** including stakeholders from industry to strategize augmentation of coking coal production in India submitted its recommendations. Based on this, Ministry of Coal has set up Mission Coking coal to evolve a roadmap for increasing production and utilization of domestic coking coal.

## 5. CRUDE OIL AND PRODUCTS

### 1) PRODUCTION

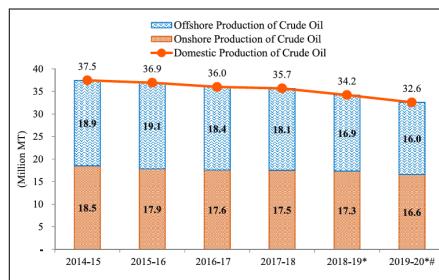
- **India's total Crude oil Production** (on-shore and off-shore production) was **29.18 million metric tonnes (MMT)** in FY22-23.

- India's oil production is one of the lowest among the major economies of the world and has been declining over a period of time.

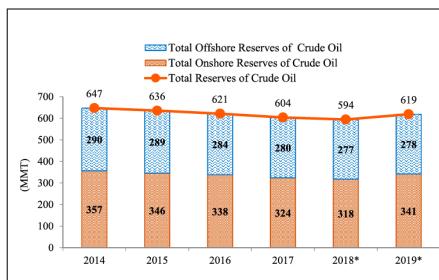
» It has seen a continuous decline since 2014.

- **Why? -> Natural decline and ageing and matured fields and no major discoveries.**
- » Proven reserves have decreased concurrently since 2014, with the steeper fall in onshore reserves. This fall has seen a reversal in 2019.

(a) Production of Crude Oil



(b) Reserves of Crude Oil



Source: Ministry of Petroleum and Natural Gas and Economic Survey calculations.

## 2) IMPORTS

- India is the **third largest oil importer and consumer**, shipping in about **85% of its crude needs** and **relies heavily** on the middle east.
- » **India's total import in FY23 was 140 million tonnes.**

### Spot Cargoes vs Term Cargoes:

» India purchases crude oil from the Middle East through term contracts, and with Russia through the spot market.

- **Term Contracts** are finalized on a yearly basis, and this is done with National oil Companies (NoCs), while the balance is covered by spot tenders.

- **Advantages of Term Contract:** Stability in price and supply

- **Advantage of Spot market:**

- **Flexible purchases** to meet varying seasonal/market demand and to meet operational exigencies.
- **Competitive purchase opportunities** -> if price drops in the market
- **Explore new crude oil grades** from diverse geographies.
  - There are many grades where term contracts are not available.

» India imported 49.6 million tonnes from the spot market (35.13% of imports) and 91.6 million tonnes using term cargoes (64.87%).

- Since 2018, India has increased its dependency on spot contract.

### Diversification of Crude Oil Sources:

» Oil PSUs have started importing crude oil from the US, Canada, Russia, Australia, Brazil, Guyana, Norway, Egypt, Ghana, Congo, Equatorial Guinea, Libya, Nigeria, etc. and have diversified its crude supply.

### Oil Imports from Russia:

- » In the first half of FY24, the share of Russian oil in India's overall import rose to 40%, consolidating Moscow's position as the top supplier as refiners curbed purchase from middle east.
- » Though, the imports from Russia have started decreasing in the 2nd half of FY24.
  - In Jan 2024, India's Russian import of oil fell to a 12-month low.
- India's imported 21.4 million tonnes crude oil in Jan 2024 - the highest in last 20 months (since April 2022)
  - » **Reasons:** Increasing domestic consumption and rising export demand for export products.
  - » In Jan 2024, India also received first cargo of Venezuelan oil after a gap of three years, as the US eased sanctions on the south American producer.

### 3) VARIOUS CRUDE OIL BENCHMARKS

- **Intro: Various characteristics of Crude**
  - There are different types of Crude oil - the thick, unprocessed liquid that drillers extract below the earth - and some are more desirable than others.
    - » For instance, it's easier for refiners to make gasoline and diesel fuel out of low-sulfur, or "sweet" crude that oil with high sulfur concentration.
    - » Low-density, or "light" crude is generally favorable to the high density variety for the same reasons.
    - » Where the oil comes from also makes a difference - transport cost
- **The main benchmarks**
  - There are dozens of different oil benchmarks, with each one **representing crude oil from a particular part of globe**. However, the price of most of them are pegged to one of the three primary benchmarks.
    - i. **Brent Blend**
      - Two-third of the all crude contracts around the world reference Brent Blend making it most widely used oil marker of all
      - These days, "Brent" actually refers to oil from four different fields in the North Sea: Brent, Forties, Oseberg and Ekofisk.
      - Crude oil from this region is light and sweet, making it ideal for refining of diesel fuel, gasoline and other high demand product.
      - Also because supply is waterborne, it is easy to transport to distant locations.
    - ii. **West Texas Intermediate**
      - WTI refers to oils extracted from the wells in the US and sent via the pipeline to Cushing, Oklahoma. The fact that supplies are land locked is one of the drawbacks - its relatively expensive to ship.
      - The product itself is sweet and light, making gasoline refining very easy, in particular.
      - It continues to be the main benchmark for oil consumed in US.
    - iii. **Dubai/Oman**

- The middle eastern crude is a useful reference for oil of a slightly lower grade than WTI or Brent.
- A "basket" product consisting of crude from Dubai, Oman or Abu Dhabi, it's somewhat heavier and has higher sulfur content, putting it in the sour category.
- Dubai/Oman is the main reference for Persian Gulf oil delivered to the Asian market.



- Russian Oils:

- Urals

- Russia produces several types of crude oil, but its main export blend is Urals, which is a medium sour crude. Other grades include Siberian Light, Sokol, Sakhalin Blend, Arctic Oil, and Novy Port.

## 4) STRATEGIC CRUDE OIL RESERVE PROGRAMME

- Background

- » The erstwhile Planning Commission in its Integrated Energy Policy, 2006, identified supply market and technical risks as major threats to India's energy security and recommended to "maintain a reserve equivalent to 90 days of oil imports for strategic-cum-buffer- stock purposes".

- Need of strategic petroleum reserve

- » Potential Supply crisis -> West Asia is very volatile, tension between major powers etc.
  - » Price Fluctuations -> A situation like 1970s is very harmful for economies.
  - » Exchange rate fluctuations

- Crude Oil Storage facilities

- » These are underground rock caverns. The rock must be strong enough for the cavern to be stable. A wide range of rock types are suitable, such as igneous (granite, diorite), metamorphic (gneiss, schists) and even sedimentary rocks (sandstones, limestone, chalk, shale)

- » Why underground caverns

- Safety from hazard of leakage.
    - Lower capital cost and lower operating cost compared to conventional tanks
    - Inherent safety over the above ground storage systems

- Safety from natural calamities and various forms of sabotage.
- **Locations**
  - » Mostly coastally located - as imports are easy and suitable refinery capabilities.
- **Strategic reserves in India**
  - » State owned Special Purpose Vehicle (SPV), India Strategic Petroleum Reserve Limited (ISPR) has established Strategic Petroleum Reserve (SPR) facilities with total capacity of 5.33 million Metric Tonnes (or 39 million barrels) at **3 locations** under Phase-1.
    - **Vishakhapatnam** (1.33 MMT)
    - **Mangalore** (1.5 MT)
    - **Padur** (Uduppi district, Karnataka) (2.5 MT)
    - Taking advantage of low crude oil prices in April/May 2020, the Strategic petroleum reserves were filled to full capacity. This led to national saving of around Rs 5,000 crores.
  - » **In 2021**, government has approved the establishment of two additional commercial-cum-strategic facilities with total storage capacity of **6.5 MMT** at Chandikhol and Padur on PPP Model.
    - **Chandikhol** (Odisha) (4 MMT)
    - **Padur** (2.5 MMT).
  - » **In 2024**, ISPR has invited bids for constructing 2.5 million tonnes of underground storage at Padur in Karnataka.
    - Bids are due on 22nd April 2024 and tender is to be awarded by 27th June 2024.
  - » **The entire facility will be owned by Gol.**
    - The Concessionaire shall transfer the SPR with Single Mooring Point (SPM), onshore and offshore pipeline to the Gol, at the end of the 60 years of concession period.
    - Gol will also have the first right to take the oil in case of the Oil Shortage Event.
- **For how many days can India be served by these strategic reserves:**
  - » As per the consumption pattern of 2019-20, the **total capacity in first phase** (5.33 MMT) is estimated to provide for about **9.5 days of crude oil requirement**.
  - » Further, the **oil marketing companies** have a storage capacity of **64.5 days** requirements.
  - » The **Phase-2 reserves** with a total capacity of **6.5 MMT** will be able to serve 12 days of India's requirement.
- **Updates: India hold back \$600 million strategic oil reserve top-up: (Jan 2024)**
  - » It has been done due to market volatility and the prospect of further decline in prices.
  - » Government has decided to lease out around 1 million tonnes of vacant strategic crude oil storage capacity to Indian and International Companies, instead of spending government money on filling up the available capacity in the caverns.

## 6. MINING SECTOR

### 1) THE MINES AND MINERALS (DEVELOPMENT AND REGULATION) AMENDMENT ACT, 2023

- Amends the 1957 act.
- The act specifies the condition for getting mining and prospecting license.
- **Other Recent Amendments:**
  - » It was comprehensive amended in 2015 to bring several reforms in the mineral sector, notably, mandating method of auction for grant of mineral concessions to bring transparency in allocation of mineral resources; for establishing District Mineral Fund (DMF) for the welfare of the people and areas affected by mining; Establishment of National Mineral Exploration Trust (NMET) to give thrust to exploration and for ensuring stringent penalty for illegal mining.
  - » The act was further amended in 2016 and 2020 to address emergent issues.
- It was again amended in 2021, to bring further reforms in the sector, such as, removing the distinction between captive and merchant mines, transfer of statutory clearances to ensure continuity in mining operations even with changes of lessee, removing the restrictions on transfer of mineral concessions, lapsing of rights of non-auctioned concession holders which have not resulted in mining leases to ensure that concessions to private sector are only granted through auctions etc.
- **Key changes by 2023 Amendment:**
  - » **Reconnaissance to include sub-surface activities:**
    - **Before amendment** the act defined reconnaissance operations as operations undertaken for preliminary prospecting and includes (i) aerial surveys (ii) geophysical surveys, and (iii) geochemical surveys. It also includes geological mapping. But it prohibited pitting, trenching, drilling, and subsurface excavation as part of reconnaissance.
    - **The amendment** allows these prohibited activities.
  - » **Introduction of a new type of mineral concession called Exploration License (EL) for Specified Minerals:**
    - **Before amendment**, the act provided for a reconnaissance permit, a prospecting license, a mining lease, and a composite license for prospecting and mining.
    - **Amendment** introduces an exploration license, which will authorise either reconnaissance or prospecting, or both activities for specified minerals.
      - The exploration license can be issued for 29 minerals specified in 7th schedule.
        - These include gold, silver, copper, cobalt, nickel, lead, potash, and rock phosphate.
        - These also include six minerals out of 12 which were earlier classified as atomic minerals under the Act:
          - (i) Beryl and other Beryllium mineral, (ii) Lithium, (iii) niobium, (iv) titanium, (v) tantalum, and (vi) zirconium
      - **Note:** The amendment has omitted 6 minerals from the list of 12 atomic minerals specified in Part-B of the First Schedule of the Act:

- These six minerals have various application in renewable energy sector, space sector, electronic sector and are **critical in net-zero emission commitment of India.**
  - **Impact:** Removal of these minerals from the list of atomic minerals will open up the exploration and mining of these minerals to private sector.
  - **Note:** Unlike other minerals, the prospecting and mining of atomic minerals is reserved for government entities under the act.
  
- **Central Government, through rules,** will prescribe the details such as manner of auction, term, conditions, bidding parameters etc. The **state government**, through competitive bidding will grant the license.
  
- **Validity of exploration license** will be **5 years** (extendable by 2 years by application to state government (after completion of 3 years, but before the expiry of license)).
  
- **Maximum Area in which activity can be conducted:**
  - Under the act, a prospecting license allows activities in **area upto 25 sq km**; a single reconnaissance permit allows activities in area upto 5,000 sq kms.
  - **Amendment** allows activities under a single exploration license in area upto 1,000 sq km.
  
- **Submission of geological reports regarding findings** within three months of the completion of the operations or expiry of the exploration license is a must.
  
- **Incentive for exploration licensee:** If the resource are proven by exploration, the state government must conduct an auction for mining lease within six months of the submission of the report by the exploration licensee. The licensee will receive a share in the auction value of the mining lease for the minerals prospected by them. The shares will be prescribed by the central government.
  - If auction doesn't happen in six months, the state government will pay to exploration licensee an amount prescribed by the central government.
  
- **Significance:**
  - » The proposed EL would facilitate, encourage, and incentivize private sector participation in all spheres of mineral exploration for critical and deep-seated minerals. This will lead to introduction of new technology, finance, and expertise in exploitation for deep seated and critical minerals.
  
- **Central government has been empowered to exclusively auction some critical and strategic minerals:**
  - » Under the act, auction of concession is undertaken by the state governments, except in certain specified cases.
  - » The amendment empower the central government, to exclusively auction mining leases and composite license for certain critical minerals viz., molybdenum, rhenium, tungsten, cadmium, indium, gallium, graphite, vanadium, tellurium, selenium, nickel, cobalt, tin, platinum group of elements, minerals of "rare earth" group (not containing

Uranium and Thorium); **fertilizer minerals** such as potash, glauconite and phosphate (without uranium) and minerals being removed from the list of atomic minerals.

» **Why?**

- It will increase the pace of auction and early production of minerals which have become indispensable for new-technologies such as space, electronics, IT, energy transition, food security, etc.
- » **Note:** Even though the auction will be conducted by Central Government, the mining lease or composite license for these minerals to the successful bidders will be granted by the State Government only and the auction premium and other statutory payments shall continue to be received by the State governments.

- **Significance of the Amendment:**

- » Attract FDI and other investment in Mining sector.
- » Encourage new junior mining companies in the sector.
- » Promote exploration and mining of critical minerals.

## 2) CRITICAL MINERALS

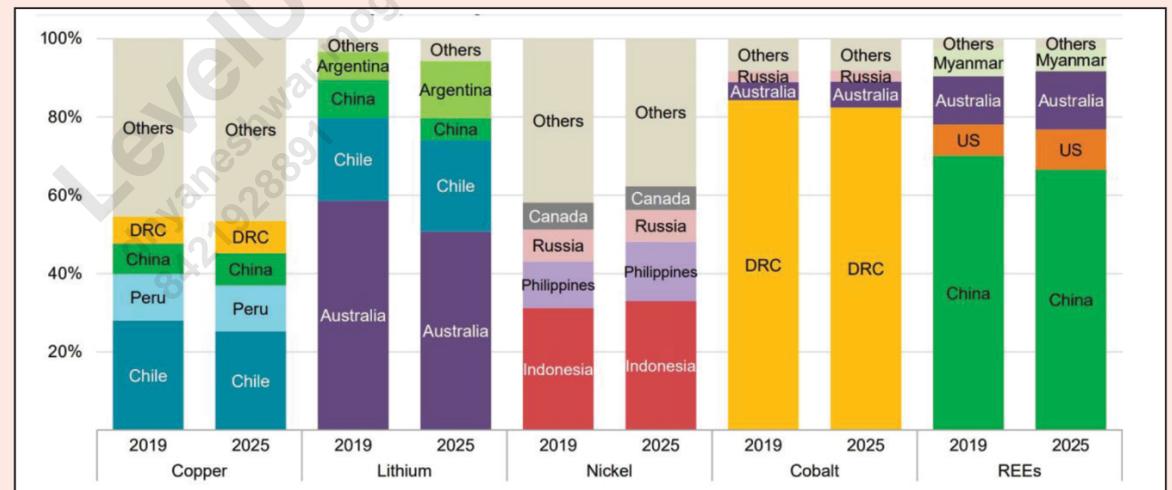
- **Why in news?**

- » Report: Critical Minerals for India: By Ministry of Mines (June 2023)

- **Critical Minerals** are those minerals that are essential for economic development and national security.

- » Scarcity of these minerals or concentration in few countries may create supply chain vulnerabilities.
  - In fact, the demand for critical minerals is set to increase with renewable energy transition, the supply chain is very concentrated and unevenly distributed.

**Figure VII.11: Concentration of production of selected minerals in 2019 and 2025**



Source: International Energy Agency Report on 'The Role of Critical Minerals in Clean Energy Transitions'

- **Critical Minerals** are essential for advancement of many sectors, including high-tech electronics, telecommunication, transport and defence. They are also vital for global transition to clean energy.

» For e.g.:

- Lithium, nickel, cobalt, manganese, and graphite are crucial to battery performance, longevity and energy density.
- REEs are essential for permanent magnets that are vital for wind turbines and EV motors.
- Electricity networks need a huge amount of copper and aluminium, with copper being a cornerstone for all electricity-related technologies.

- Which are the minerals which are considered critical?

- » The Ministry of Mines have formed a committee in 2022 to identify the minerals critical for India. Based on three stage assessment process and also considering important parameters such as reserve position in the country, production, import dependency, use for future technology/clean energy, requirement of fertilizer minerals in an agrarian economy the committee has identified a set of 30 critical minerals: These are:
- Antimony, Beryllium, Bismuth, Cobalt, Copper, Gallium, Germanium, Graphite, Hafnium, Indium, Lithium, Molybdenum, Niobium, Nickel, PGE, Phosphorous, Potash, REE, Rhenium, Silicon, Strontium, Tantalum, Tellurium, Tin, Titanium, Tungsten, Vanadium, Zirconium, Selenium and Cadmium.
  - **Note:** Platinum Group Elements (PGE) consist of Platinum (Pt), Palladium (Pd), Rhodium (Rh), Ruthenium (Ru), Osmium (Os) and Iridium.
  - **Note:** Of these 30 critical minerals, 24 are included in the list of critical and strategic mineral in Part D of Schedule-1 of MMDR Act.
- » The committee also recommends creation of a Centre of Excellence for Critical Minerals (CECM) in the Ministry of Mines which will periodically update the list of critical minerals for India and notify the critical mineral strategy from time to time and will execute a range of functions for the development of an effective value chain of critical minerals in the country.

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**A) OTHER STEPS TAKEN TO PROMOTE THE PRODUCTION AND AVAILABILITY OF CRITICAL MINERALS IN THE COUNTRY:**

- » The Ministry of Mines have created a joint venture company - Khanij Bidesh India Ltd (KABIL) with the equity contribution from three Central Sector Enterprises namely, National Aluminium Company Ltd, Hindustan Copper Ltd, and Mineral Exploration and Consultancy Ltd with the objective to ensure consistent supply of critical and strategic minerals to Indian domestic market.
- KABIL is also mandated to identify and acquire overseas mineral assets of critical and strategic nature, such as Lithium, Cobalt etc.
  - It has already initiated engagement with several state-owned organizations of the shortlisted source countries, through Ministry of External Affairs and the Indian Embassies in Countries like Argentina and Australia to acquire mineral assets overseas primarily the critical and strategic minerals.
- » The 2023 Amendment to MMDR Act, 1957 has also streamlined the auctioning process of critical and strategic minerals.

- 24 Critical and Strategic Minerals have been inserted in part D of the Schedule-1 of the MMDR Act, 1957.
  - Central government has been empowered to auction the critical and strategic mineral blocks.
- » **Ministry of Mines** under its '**Science and Technology Program**' provides **grants for Promotion and Research and Innovation in Start-Ups and MSMEs** in Mining, Minerals Processing, Metallurgy and Recycling Sector (S&T-PRISM).
- One of the thrust areas of S&T-PRISM includes focus on extraction of strategic and critical minerals and elemental level.
- » The Ministry is also actively involved in Mineral Security Partnership (MSP) and other multilateral/bilateral partnerships with various countries to secure the critical mineral demand of India.

#### **A) MINERAL SECURITY PARTNERSHIP**

- The MSP is a collaboration of 14 countries and the EU to catalyze public and private investments in responsible critical minerals supply chains globally.
  - » It aims to accelerate the development of critical energy sector in a diverse and sustainable manner. It will be working with host government and industry to facilitate targeted financial and diplomatic support for strategic projects along the value chain.
  - » It seeks to ensure that critical minerals are produced, processed, and recycled by catalysing investments from governments and private sector across the full value chain.
  - » **Members:** India became the 14th member in June 2014. Other members include USA, Canada, UK, France, Germany, Italy, Norway, Sweden, Finland, Estonia, Japan, Republic of Korea, Australia, and the European Union (represented by European Commission).

#### **B) SUPPLY CHAIN RESILIENCE INITIATIVE**

- It was unveiled by India, Japan and Australia in 2021 to strengthen economic ties and to reduce dependency on countries like China for critical imports. It is aimed at addressing vulnerabilities in the global supply chain which were exposed by the COVID-19.
- **Goals:**
  - » Build a more resilient, stable, and inclusive supply chain network in the Indo-Pacific region.
  - » Promoting diversification of trade and investment among the three countries
  - » Use technology (especially digital technology) to enhance the supply chain efficiency.

### 3) RARE EARTH METALS

- Rare earth elements are a **group of 17 chemical elements** that occur together in the periodic table (see image)

- The group consists of **Yttrium (39)** and **15 Lanthanide (57-71)** elements

» Lanthanide elements include.

- Lanthanum, Cerium, Praseodymium, Neodymium, Promethium, Samarium, **Europium**, Gadolinium, Terbium, Dysprosium, holmium, Erbium, Thulium, Ytterbium, and Lutetium.

» **Scandium** is found in most rare earth element deposits and is sometimes classified as rare earth element. International Union of Pure and Applied Chemistry (IUPAC) includes scandium in their rare earth element definition.

Rare Earth Elements																	He					
H	Li	Be	Na	Mg	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe					
Cs	Ba	La-Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn					
Fr	Ra	Ac-Lr	Rf	Db	Sg	Bh	Hs	Mt														
Lanthanides																	Actinides					
La Ce Pr Nd Pm Sm Eu Gd Tb Dy Ho Er Tm Yb Lu																	Actinides					
Ac Th Pa U Np Pu Am Cm Bk Cf Es Fm Md No Lr																						

- They are all metals and have many similar properties which often cause them to be found together in geological deposits.

- **Uses of Rare Earth Metals, why the demand has increased in last few decades, why is it expected to increase further?**

» They are used in **electronic devices** (e.g. computer memory, DVDs, rechargeable batteries, cell phones, catalytic converters, magnets, fluorescent lightings etc.)

- Explosion in demand in last 30 years => Telecommunication revolution.
- E.g. **Neodymium** is a critical component of permanent magnets and has the ability to carry material 1,300 times its own weight.
- E.g. **Europium** is necessary for **LED bulbs** and **Color television screens**.
- E.g. **Samarium** is used in optical lasers.

» **Batteries of electric and hybrid electric batteries.**

- Concern for climate change, energy independence => will further increase the demand

» Rare earths are also used as **Catalysts, Phosphors, and Polishing compounds**.

- These are used for air pollution control, illuminated screens on electronic devices, and the polishing of optical quality glass.
  - All these products are expected to rise in demands.

» **Emerging Medical Technologies:** Several rare earth metals are used in these.

» **Critical Defense uses.**

- Rare earth metals are key ingredients for **making the very hard alloys used in armored vehicles and projectiles**.
- **Defense Electronic**

- Night vision goggles, precision guided weapons, communication equipment, GPS equipment, batteries and other defense electronics.
  - Substitutes are not as effective and diminishes the superiority of military
- So, it is clear that Sunrise technologies currently being developed are rare earth intensive.
- **Rare???**
  - Despite being named rare, the metals are plentiful in earth's crust. However, these metals are very difficult to mine because it is unusual to find them in concentrations high enough for economic extraction. Because of geochemical properties these metals are typically dispersed.
- **Production and Trade**
  - Before 1965 - very little demand; supply from placer deposits in India and Brazil; in 1950s South Africa leading supplier, US also producing.
  - First Explosion of Demand - Color television - Europium essential element to produce color.
    - US became leading producer from Mountain pass mine California.
  - China - began to produce notable amount in 1980s and became leading producer in 1990s and early 2000s.
    - **Why was China able to become world leader in Rare Earth Metals?**
      - Long term view and consistent support from government
      - Mineral Availability
      - Weak Environmental laws
      - Cheap Production -> Closure of mines in other parts of the world
      - Huge Demands in China as China is the world leader in consumer electronics.
  - Until a few years ago, China controlled 90% of the supply of rare earths. The danger of this fact was illustrated most starkly in 2010 and 2011, when China imposed extreme export restrictions. The entire world was left scurrying to fend for Rare Earth Supplies. It led to more than 700% jump in global prices, crippling downstream industries dependent on rare earths worldwide.
  - Now, after aggressive production by the US, Australia and Canada, **China's share is down to 60%**. But still, China's control over global market remains a pain point for all involved.
  - Further, COVID-19 disruptions and tensions with China have demonstrated major supply side insecurities which India may face.
  - A group of Western countries are cooperating to develop alternatives to China through '**China plus one**' strategy.
- **India and Rare Earth Metals:**
  - India's rapidly growing economy currently has two massive input deficiencies which threaten its stability - Oil, and rare earths. India is almost 100% import dependent for most rare earths.
  - Interestingly though, India has great potential for domestic production as it possesses 4th highest reserves of rare earths in the world (after China, Russia and Vietnam).
- **Why India produces very small quantity of REMs**
  - a. In India, they are classified as atomic minerals. Why?

- Because some of these elements occur in the earth's surface along with thorium and uranium which are radioactive minerals. Thorium is prevalent in the same beach sands where other rare earth minerals also occur.
  - Thus, mining for rare earth in India is reserved for government companies of which there are only two in India: Indian Rare Earths Ltd (IREL) (owned by GoI) and Kerala Minerals and Metals Ltd (owned by Kerala Government). And their production capacities and technologies are limited which is why India is import dependent.
  - Beach sand mining was banned in 2016 in an attempt to conserve strategic minerals including rare earth and thorium.
- b. **Expertise mismatch:** Present policies separate the rare earth ecosystem from other R&D ecosystems like electronics and metallurgy.
- c. **Incentive Mismatch:** For IREL, most of the income come from the production and marketing of other minerals contained in beach sands - ilmenite, sillimanite, and zircon. With access to beach sand with easily recoverable other minerals, IREL has little incentive to refocus on globally competitive rare earth extracting and processing.
- d. **Fragmented, siloed, and severely inefficient research system**
- e. **Lack of proper linkages between miners and manufacturers**
- f. **License-Permit Raj:** Even after 1991 Economic reforms, some sectors like agriculture and mining continue to be highly regulated.
  - For e.g. in 2019, the central government amended the atomic Minerals Concessions rules, 2016, whereby threshold values for a range of minerals were drastically reduced. This decision effectively nationalized beach sand and forced several private players out.

## 7. NEXT BOOKLET

- 1) TEXTILE SECTOR**
- 2) ELECTRONICS SECTOR/ SEMICONDUCTOR SECTOR**
- 3) E-VEHICLE SECTOR**
- 4) MSME SECTOR**
- 5) VARIOUS SCHEMES LIKE PLI SCHEME**
- 6) SERVICE SECTOR**

# TARGET PRELIMS 2024

## BOOKLET-45; ECONOMY-10

### INDUSTRY-2

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## 2. INDUSTRY

### 1) MINING (CONTINUATION FROM PREVIOUS BOOKLET)

#### A) NATIONAL MINERAL EXPLORATION POLICY, 2016

- The primary aims of the policy is to accelerate the exploration activity in the country through enhanced participation of the private sector.
- **Why is such policy needed?**
  - To uncover full mineral potential of the country and thus to put the mineral resources of the country to best use.
- **NMEP has following main features.**
  1. Auctioning of identified exploration block to private sector on revenue share basis.
    - Provisions for attracting private investment in exploration through attractive revenue sharing model.
  2. If the explorer agencies do not discover any auctionable resource, their exploration expenditure will be reimbursed on normative cost basis.
  3. Government will carry out a National Aerogeophysical Program for acquiring state-of-art baseline data for targeting concealed mineral deposits.
  4. A National Geoscientific Data Repository is proposed to be set up to collate all baseline and mineral exploration information generated by various central and state government agencies and also mineral concession holders and to maintain these on geospatial database.
  5. National Central for Mineral Targeting: It is proposed to be set up as a not-for-profit autonomous institution to address the mineral exploration challenges of the country.
  6. Special initiative to probe deep/seated concealed minerals.

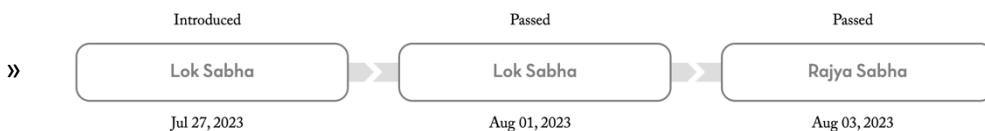
#### B) NATIONAL GEOSCIENCE DATA REPOSITORY (DEC 2023)

- **Why in news?**
  - » Union Minister Prahil Joshi launched National Geoscience Data Repository Portal (NGDRP) (Dec 2023)
- **Ministry of Mines**
- **NGDR** has been created, as a part of the National Mineral Exploration Policy, 2016, **hosting all baseline and exploration related geoscientific data in a single GIS platform**, to expedite, enhance and facilitate the exploration coverage of the country.
  - » The survey is spearheaded by Geological Survey of India (**GSI**) and Bhaskaracharya Institute of Space Application and Geoinformatics (**BISAG-N**).
  - » It will make available all geological, geochemical, geophysical, and mineral exploration data in public domain on a digital geospatial platform. This will include baseline geoscience data and all mineral exploration information generated by various central and state government agencies and mineral concession holders.
  - » It represents a significant leap forward in democratizing critical geoscience data, empowering stakeholders across industries and academia with unprecedented access to valuable resources.
- **How to access the portal?**

» <https://geodataindia.gov.in.>

## C) OFFSHORE AREAS MINERAL (DEVELOPMENT AND REGULATION) AMENDMENT ACT, 2023

### - Why in news?



- **About the Offshore Areas Mineral (Development and Regulation) Act 2002 (OAMDRA, 2022)**
  - » The act regulates mining in maritime zones of India.
  - » It categorizes offshore mining-related activities into:
    - (i) Reconnaissance, which involve a preliminary survey to locate mineral resources.
    - (ii) Exploration, which includes exploring, proving, or locating mineral deposits, and
    - (iii) Production, the commercial activity of the extraction of minerals.
  - » The act came into force in 2010.
  - » However, no mining activity has been undertaken in the offshore areas till date. Therefore, central government has brought some changes which are focused on improving the ease of doing business.
- **Key Highlights of the amendment:**
  - » **Introduction of Composite License:**
    - The act provides for a reconnaissance permit, exploration license and a production lease.
    - **The amendment** introduces a composite license for granting rights for exploration as well as for production. Under the composite license, the licensee will be required to complete exploration within three years.
      - The maximum area of exploration under a composite license will be 30 minutes latitude and 30 minutes longitude. The maximum area for undertaking production under a single composite license will be 15 minutes latitude and 15 minutes longitude.
- **Extension in the validity of concession:**
  - » The act provides that concession lease be granted for a period of 30 years and can be further renewed for upto 20 years.
  - » The amendment, provides that the production lease, as well as production lease under a composite license, will be valid for 50 years.
- **Competitive bidding for production lease and composite lease:**
  - » The act provides for grant of concession through administrative allocation.
  - » The amendment, mandates competitive bidding, for a production lease and a composite license to private entities.
- **Government Joint Ventures allowed to mine in reserved areas:**
  - » The act allows the government to reserve offshore areas that are not held under any operating right.
  - » The amendment allows composite license or production license to the government or government company. Joint ventures of government companies will also be eligible, subject to certain conditions. These conditions are:

- i. Partner must be selected through competitive process.
  - ii. Government company owns at least 74% of the paid up capital.
- **Mining of atomic minerals only by Government:**
    - » The amendment, says that in case of atomic minerals, exploration, production and composite licenses will be granted only to the government or government companies.
    - » **Note: What are atomic minerals?**
      - They are defined under MMDRA, 1957 and includes:
        - Rare Earth Minerals containing Uranium and Thorium
        - Pitchblende and Uranium Ores
        - Uriniferous allanite, monazite and other thorium ores.
  - **Reduction in Standard Area Blocks:**
    - » The Act, the size of one block for offshore mining is five minutes latitude by five minutes longitude.
    - » The amendment, reduces this to one minute latitude and one minute longitude. It also limits the maximum area one entity can acquire under all concessions to 45 minutes latitude by 45 minutes longitude.
  - **Offshore Areas Mineral Trust (OAMT) set up:**
    - » The amendment creates OAMT. The concession holder will be required to pay an amount to the Trust in addition to any royalty.
    - » The fund can be used for specified purposes including (i) exploration in offshore areas (ii) research and studies about the mitigation of adverse effects of offshore mining on the ecology, and (iii) Relief upon the occurrence of a disaster.
  - **Increase in fines** for violating the law.
  - **Note:** Royalty, Auction Premium and other revenues from the production of minerals from offshore areas shall accrue to the Government of India.

#### D) DRAFT RULES FOR OFFSHORE MINERAL BLOCKS AUCTION FOR PUBLIC CONSULTATION (DEC 2023)

- In order to implement the provisions of the amended act, the Ministry of mines have framed two draft rules i.e.,
  - (i) Offshore Areas Mineral Auction Rules
    - It provides for ascending forward online electronic auction.
  - (ii) Offshore Areas Existence of Mineral Resource Rules
    - This draft rule provides norms for exploration of various types of minerals and deposits.

#### 2) SPECIAL ECONOMIC ZONES (SEZS)

- **Background**
  - » The Indian Government had long used export processing zones (EPZs) to promote exports. In fact, Asia's first EPZ was established in 1965 at Kandla, Gujarat state.
  - » **SEZ policy in India first came into inception on April 1, 2000.**
    - Prime Objective was to enhance the foreign investment and provide an internationally competitive and hassle-free environment for exports. The idea was to promote exports from the country and realizing the need that level playing field must be made available to the domestic enterprises and manufacturers to be competitive globally.

- Special Economic zones denote geographical areas which enjoy special privileges as compared with non-SEZ area in the country.
  - SEZs in India functioned from 1st Nov 2000 to 9th Feb 2006 under the provisions of Foreign Trade Policy and Fiscal incentives were made effective through provisions of different laws.
- **SEZ Act, 2005 and SEZ Rules 2006:** To ensure stable SEZ policy, the Special Economic Zones (SEZs) Act, 2005 was passed by Parliament in 2005.
- » It envisages key role for the state governments in Export Promotion and Creation of related infrastructure.
  - » A Single Window SEZ approval mechanism has been provided through a 19-member inter-ministerial SEZ Board of Approval (BoA).

**How a SEZ is set up? (Just note the process for Prelims)**

The developer submits the proposal for establishment of SEZ to the concerned state Government. The state government has to forward the proposal with its recommendations within 45 days from the date of receipt of the proposal to the Board of Approval.

The applicant also has the option to submit the proposal directly to the Board of Approval.

**Board of approval** has been constituted by the Central government in exercise of powers conferred under the SEZ act. The decision is taken by Board of approval by consensus. It has 19 members and is headed by the chairperson (secretary, Department of Commerce).

- » SEZ Rules came into effect in 2006. It provided for drastic simplification of procedures and for single window clearance on matters relating to Central as well as State governments.

- **Key features of the SEZ Scheme:**

- » A designated duty-free enclave to be treated as a territory outside the customs territory of India for the purpose of authorized operations in SEZ.
- » No License required for import.
- » Both manufacturing or service activities are allowed
- » The Unit shall achieve positive net Foreign Exchange to be calculated cumulatively for a period of five years from the commencement of production.
- » Domestic sales subject to full customs duty and import policy in force.
- » SEZ units will have freedom of sub-contracting.
- » No routine examination of customs authorities of export/import cargo.
- » SEZ developers/ Co-developers and Units enjoy tax benefits as prescribed by SEZs Act, 2005.
  - For e.g. 100% income tax exemption on export income from SEZ units for the first five years; Exemption from GST and levies imposed by state government (supplies to SEZs are zero rated under IGST Act, 2017, meaning they are not taxed).
- » Single Window Clearance for all state and federal government approvals.

- **Primary Objectives:**

- Economic growth; export promotion; increase investments (both from domestic and foreign sources); employment; improvement in infrastructure.

- **Notable SEZs in India:**
  - » **Nodia** (Uttar Pradesh); **Falta** (West Bengal state); **Vishakhapatnam** (Andhra Pradesh); **Chennai** (TN); **Cochin** (Kerala); **Santa Cruz** (Maharashtra), **Indore** (Madhya Pradesh), **Kandla & Surat** (Gujarat).
- **Numbers:**
  - » As of Jan 2023, 425 SEZs are approved in the country of which 270 are operational.

#### A) SEZ (FIFTH AMENDMENT) RULES, 2023

- The amendment is specifically tailored for IT enterprises and IT Enabled Services (ITES) SEZs. This amendment introduces a ground-breaking concept - non-processing areas, geared towards fostering enhanced development.
- **Sub-leasing non-processing areas (Section 11B):** Developers now have the liberty to request demarcation of non-processing area within IT/ITES SEZs.
  - These areas can harbor businesses engaged in IT or ITES services, abiding by conditions set by the Board of Approval.
  - Guidelines mandated that non-processing areas must encompass complete floors, fortified with access control mechanism. These surplus areas can be sublet to other tenants that fit the criteria of an SEZ based business.
- **Navigating Limits of Non-Processing areas:** Businesses within non-processing areas face restrictions, barring them from enjoying rights or facilities navigable to SEZ units.

#### 3) PRODUCTION LINKED INCENTIVE SCHEME (PLI SCHEME)

- Keeping in view India's vision of becoming 'Atmanirbhar', **Production Linked Incentive (PLI) Schemes** for 14 key sectors have been announced with an outlay of **Rs 1.97 lakh crore (over US\$ 26 billion)**.
  - » The purpose of the PLI Schemes is to:
    - i. Attract investments in key sectors and cutting-edge technology.
    - ii. Ensure efficiency and bring economies of scale in the manufacturing sector.
    - iii. Make Indian companies and manufacturing globally competitive.
  - » They focus on enhancing India's manufacturing capabilities and Exports. It has the potential of significantly increasing production, employment and economic growth.
- **When was it launched?**
  - » It was initially launched in March 2020 and focused on three industries. It was later extended to 14 sectors.
- **PLI scheme** for 14 sectors have been notified by concerned ministries/departments after due approval. These schemes are in various stages of implementation.
  - » **The sectors are:** (i) Mobile Manufacturing and Specified Electronic Components, (ii) Critical Key Starting Materials/Drug Intermediaries & Active Pharmaceutical Ingredients, (iii) Manufacturing of Medical Devices (iv) Automobiles and Auto Components, (v) Pharmaceuticals Drugs, (vi) Specialty Steel, (vii) Telecom & Networking Products, (viii) Electronic/Technology Products, (ix) White Goods (ACs and LEDs), (x) Food Products, (xi) Textile Products: MMF segment and

technical textiles, (xii) High efficiency solar PV modules, (xiii) Advanced Chemistry Cell (ACC) Battery, and (xiv) Drones and Drone Components.

- The scheme is also expected to have a **cascading effect on the country's MSME sector**. The anchor units that will be built in every sector are likely to set up a new supplier/vendor base in the entire value chain.
  - » As of Jan 2024, **176 MSMEs have been direct beneficiaries** in sectors such as Bulk drugs, medical devices, pharma, telecom, white goods, food processing, textiles and Drones.
- **Progress:**
  - » As of Jan 2024, **746 applications** have been approved in **14 sectors** with expected investment of **Rs 3 lakh crores**.
  - » **176 MSMEs** are also PLI beneficiaries.

#### A) PLI SCHEME 2.0 FOR IT HARDWARE

- **Background:**
  - » In Feb 2021, the **government approved the PLI scheme for IT hardware, covering the production of laptops, tablets, all in one PCs, and serves with an outlay of Rs 7,350 crores.**
  - » However, **industry players requested government to increase the outlay.**
- In May 2023, the Union Cabinet approved the **PLI Scheme 2.0 for IT hardware** with a **budgetary allocation of Rs 17,000 crores**. The **tenure of the program is six years**.
- The scheme covers **laptops, tablets, all in one PCs, servers, and ultra-small factor devices**.
- **Ministry:** Ministry of Electronics and Information Technology (MeitY)

#### 4) TEXTILE AND APPAREL SECTOR

- **Significance:**
  - » **Employment** Textile sector and apparel sector **directly employs more than 5 crore of the population** and is the **2<sup>nd</sup> largest employer** after Agriculture sector in the country.
  - » **GVA:** 10% of **India's industrial GVA**.
  - » **Export Earnings:** \$40 billion in FY23.
  - » **Inclusive Growth:** Textile mills give **opportunity to weaker sections including women**.
- **Key Initiatives:**

#### A) PM MITRA (PM MEGA INTEGRATED TEXTILE REGION AND APPAREL)

- **Details of the Scheme:**
  - » Announced in the Budget 2023
  - » **Ministry of Textiles**
  - » Government has approved setting up of **seven PM MITRA Parks** in **Greenfield/Brownfield** sites with world class infrastructure.
  - » The parks will not only **reduce logistics costs** and **improve competitiveness of Indian textiles** but also boost employment generation, attract domestic investment and FDI, and position India firmly in the global textile market.
  - » Government expects the parks to attract investments worth **Rs 70,000 crores**, generate jobs for **20 lakh people**, and can **create integral value chain for the products**.

- The government has finalized 7 states viz. Tamil Nadu (Virudhnagar), Telangana (Warangal), Gujarat (Navsari), Karnataka (Kalaburagi), Madhya Pradesh (Dhar), Uttar Pradesh (Lucknow) and Maharashtra (Amravati) for setting up PM Mitra Parks.
- **Ministry:** Ministry of Textiles

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#### B) PLI SCHEME FOR TEXTILES

- Approved outlay of Rs 10,683 crores (over five years starting from Jan 2022) to promote investment and increase the production of Man-Made Fibre (MMF) Apparel, MMF Fabrics and Products of Technical Textile.
- This will enable the textile sector to achieve size and scale, enhancing export competitiveness.

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#### C) SAMARTH (SCHEME FOR CAPACITY BUILDING IN TEXTILE SECTOR)

- **Details about SAMARTH:**
  - » It is a flagship skill development initiative of Ministry of Textiles.
  - » Launched in 2017, it aims to provide demand-driven, placement-oriented skilling programs to incentivize and supplement the efforts of the industry in creating jobs in the organized textile and related sectors.
  - » It was formulated under the broad skilling policy framework adopted by M/o Skill Development & Entrepreneurship (MSDE).
  - » It has provisions for skilling in Apparel & Garmenting segments both at the entry level as well as upskilling/reskilling of existing workers.
  - » It also caters to the upskilling/reskilling requirement of traditional sectors such as handloom, handicraft, silk and Jute.
- **Progress:**
  - » As of July 2023, the Ministry of Textiles has partnered with 157 Industries/Industry associations, 16 central/state government agencies and 3 sectoral organizations of the Ministry undertaking the training program SAMARTH.
  - » Out of the skilling target of 4.72 lakh beneficiaries allocated so far, 1.88 lakh beneficiaries have been provided training.
  - » More than 85% of the beneficiaries trained so far under the schemes are women. More than 70% of the beneficiaries trained in organized sector course have been provided placement.

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#### D) VIRAASAT

- By Ministry of Textile
- VIRAASAT-Celebrating Handloom Home Décor (20th Jan 2023 - 30th Jan 2023)
- VIRAASAT - Celebrating handloom Sari Exhibition (two phases: 16th Dec - 30th Dec , and 3rd Dec to 17th Dec)
  - » This exhibition was held at handloom haat, Janpath, New Delhi.

## 5) TECHNICAL TEXTILE

- Technical textiles are textile materials and products used for their technical performance and functional properties.
  - Technical textiles include textiles for automotive applications, medical textiles (e.g. implants), geotextiles (reinforcement of embankments), agrotextiles (textiles for crop protection), and protective clothing (e.g. heat and radiation protection for fire fighter clothing, molten metal protection for welders, stab protection for bulletproof vests, and spacesuits).

### A) NATIONAL TECHNICAL TEXTILE MISSION

- The National Technical Textile Mission (NTTM) is a scheme launched by the Government of India to promote technical textiles and boost the manufacturing of such textiles in the country. Here are some key highlights of the mission:
  - i. **Objectives:** Increase the use of technical textiles in various sectors such as healthcare, agriculture, transportation, and construction among others. It also seeks to promote innovation, research and development, and create job opportunities in the technical textile sector.
  - ii. **Budget:** The mission has a total budget of Rs. 1480 crore, which will be implemented over a period of four years (2020-2024).
    - The mission has been extended till 2026.
  - iii. **Focus Areas:** The mission focuses on four key areas, namely, research and development, promotion and market development, export promotion, and skill development.
  - iv. **Implementation:** The mission is implemented by the Ministry of Textiles in collaboration with other stakeholders, including industry associations, research organizations, and academic institutions.
- **Helping Startups in the field of Technical Textile:**
  - A portal for start-ups in technical textiles segment to submit applications for support under the Mission will be launched soon.
- **Standardization:** the Bureau of Indian Standards (BIS) has developed 600 quality standards for technical textile products and Quality Control Orders (QCO) have been issued for various TT products.

## 6) ELECTRONICS SECTOR/ SEMICONDUCTOR SECTOR

- **Need for promoting electronics manufacturing in the country.**
  - » There is a need to improve the electronics manufacturing within the country as this sector holds tremendous potential in terms of significant employment generation, ability to transform socio-economic identity of citizens, contribution in the upliftment of the economy, value addition, forex savings etc.
- **Current Situation and Targets:**
  - » India has also seen an improvement in manufacturing and export of electronics over the last five years. Electronic goods were among the top five commodity groups exhibiting positive export growth in Nov 2022, with the exports in this segment growing YoY by 55.1%.

- » As of **FY20**, the domestic electronics industry is valued at US\$ 118 billion.
- » **Government of India** targets to reach US\$ 300 billion worth of electronics manufacturing by FY26 and exports worth US \$120 billion.

- **Most Important Products:**

- » Mobile phones, consumer electronics, industrial electronics
  - In Mobile phones, India has become the second highest mobile phone manufacturer globally, with the production of handsets going up from six crore units in FY15 to 31 crore units in FY22. These numbers are further expected to increase as more international players set up their base in India.

**Government initiative to promote the sector:**

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**A) NATIONAL POLICY ON ELECTRONICS, 2019 (NPE, 2019):**

The vision of the policy is to position India as a global hub for Electronics System Design and Manufacturing (ESDM) by encouraging and driving capabilities in the country for developing core components, including chipsets, and creating and enabling environment for industry to compete globally.

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**B) PLI SCHEME FOR LARGE SCALE ELECTRONICS MANUFACTURING**

- It is an initiative under MEITY.
- The scheme aims to attract large investments in the mobile phone manufacturing and specified electronic components, including assembly, testing, marking and packaging (ATMP) units.
- Under this 4% to 6% incentive is being provided on incremental sales of goods manufactured in India. These incentives will be offered for a period of five years subsequent to base year (FY 2019- 20). The applicant companies will be required to meet minimum thresholds of investment and production. The scheme has an outlay of USD 5.5 billion.
- For e.g.: In Dec 2022, Empowered Committee headed by CEO, NITI Aayog, approved incentives for two companies – one a domestic and other global – for mobile Manufacturing under PLI scheme for LSEM:
  - » **Foxconn India** (a Taiwanese company) to receive incentives under mobile manufacturing for the period 1st Aug 2021 to 31st March 2022 based on its incremental investments and sales figures.
  - » **M/s Padget Electronics Pvt. Ltd**, a domestic company, has been approved by the Empowered Committee to receive incentives under mobile manufacturing.

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**C) SCHEME FOR PROMOTION OF MANUFACTURING OF ELECTRONICS COMPONENT AND SEMICONDUCTORS (SPECS):**

Notified in 2020, it provides financial incentive of upto 25% on capital expenditure for the identified list of electronics goods.

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**D) MODIFIED ELECTRONICS MANUFACTURING CLUSTERS (EMCS 2.0) SCHEME:**

Notified in April 2020. It provides support for creation of world class infrastructure along with common facilities and amenities, including **Ready Build Factory** (RBF) sheds/ Plug and Play Facilities etc.

#### E) MODIFIED SCHEME FOR SEMICONDUCTORS AND DISPLAY FAB ECOSYSTEMS:

- **Ministry:** MEITY
- In furtherance of the vision of Atmanirbhar Bharat and positioning India as the global hub for ESDM, a comprehensive program for the development of semiconductors and display manufacturing ecosystem in India was approved by GoI with an outlay of Rs 76,000 crore in Sep 2022.
- The program provides active incentive support to companies / consortia that are engaged in Silicon Semiconductor Fabs, Display Fabs, Compound Semiconductors/ Silicon Photonics/ Sensors (including MEMS) Fabs/ Discrete Semiconductor Fabs etc.
- **Following Schemes** are offered by the Scheme:
  - i. **Semiconductor Fabs and Display Fabs:** Offers fiscal support of 50% of the project cost on pari-passu basis to applicant who are eligible and have technology and capacity.
  - ii. **Compound Semiconductors/ Silicon Photonics / Sensors (including MEMS) Fabs and Semiconductor ATMP/ OSAT Units:** Fiscal support of 50% of the capital expenditure on pari-passu basis to applicant who are found eligible.
  - iii. **Semiconductor Design Companies:** The Design Linked Incentive (DLI) shall extend product design linked incentive of upto 50% of eligible expenditure; and product deployment linked incentive of 6% - 4% on net sales for five years.
    - C-DAC (Centre for Development of Advanced Computing), a scientific society operating under MeitY, will serve as the nodal agency for implementation of the DLI scheme.
  - iv. **Semiconductor Laboratory (SCL):** MEITY will take requisite steps for modernization and commercialization of semi-conductor Laboratory (SCL), Mohali. MeiTy will explore the possibility of joint venture of SCL with a commercial fab partner to modernize the brownfield fab facility.
  - v. **India Semi-Conductor Mission:** In order to drive the long-term strategies for developing a sustainable semiconductor and display ecosystem, a specialized and independent "**ISM**" has been set up. It will be led by global experts in semi-conductor and display industry.
- **Note:** In the older scheme, there were different rate of incentives for different areas and thus was making it difficult to go for integrated development of various different parts

#### F) 100% FDI

As per the existing FDI Policy, FDI up-to 100% under the automatic route is permitted for electronics manufacturing.

### 7) E-VEHICLE SECTOR

- **Why we need to promote electric vehicles in India?**
  - i. **Energy Security**
  - ii. **Transition to renewable**
  - iii. Dealing with **air pollution and Noise Pollution** in big cities
  - iv. Reducing Greenhouse gas emission -> Achieve Paris Targets on Climate Change
  - v. **Competitive Domestic Manufacturing Ecosystem: Technology Development and Make in India**

- vi. Making Transportation less expensive:
- vii. Power sector growth
- viii. EVs can act as storage for Solar Energy

- **Schemes / Programs / Policies / Other steps to promote EV in India**

1. Subsidy, Tax Incentives and PLI

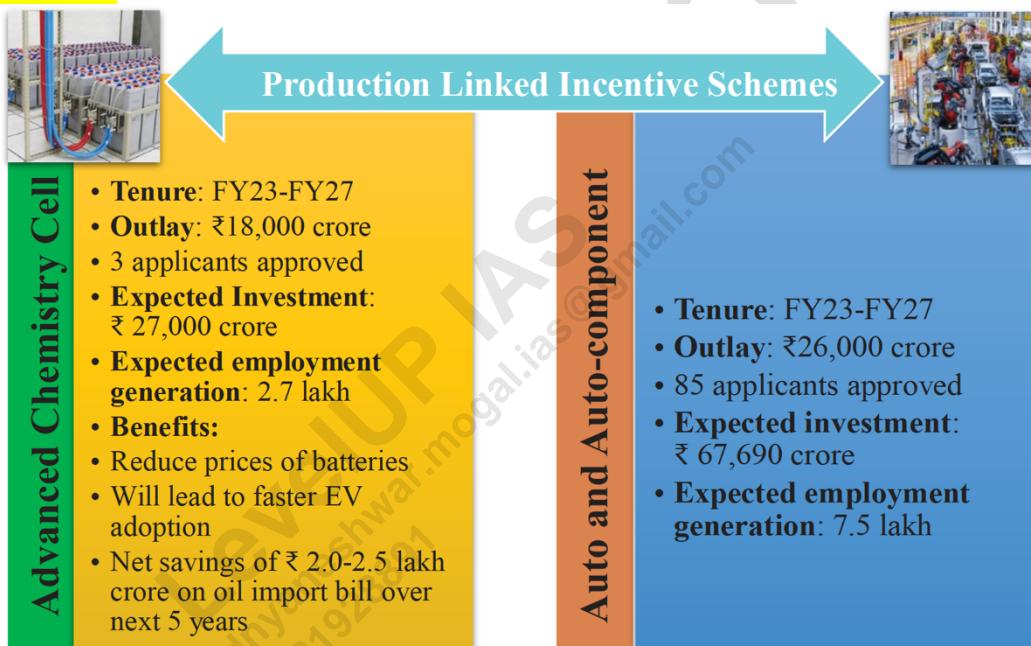
- a. FAME (Faster Adoption and Manufacturing of Electric (& Hybrid) Vehicles):

- It is the key subsidy scheme for electric vehicles through which government incentivizes buyers to purchase e-vehicles.
- Phase-1 had started in 2015 and Phase-2 has been running since 2019.
- Under phase-2 companies may offer a discount of upto 40% on the cost of locally manufactured vehicles and claim it as a subsidy from government.

- b. Tax Incentives:

- GST on Electric Vehicles is on the lower bracket of 5% as against 28% for conventional vehicles.
- Budget 2019-20: Tax Subsidies for EVs: Additional income tax deduction of Rs 1.5 Lakh on the interest paid on the loans taken to purchase electric vehicles before 31st March 2023.

- c. PLI Schemes:



Source: Ministry of Heavy Industries

- In April 2023, government released SOP for the PLI scheme for the automobile and auto component industry.

2. EV Policies of Select States and Uts:

- A number of state/UT governments have formulated policies for the successful implementation of the national EV mission and FAME scheme.
  - For e.g., Delhi targets that 25% of all new vehicles registration should be EVs by 2024.

3. National E-Mobility Program of Ministry of Power (Launched in March 2018)

- Aggregate demand by procuring electric vehicles in Bulk to get economies of scale

4. **National Mission on Transformative Mobility and Battery Storage** (approved by cabinet in March 2019)
  - The mission recommends and drive the strategies for transformative mobility and PMPs for EVs, EV components, and Batteries.
    - The mission will ensure holistic and comprehensive growth of the battery manufacturing industry in India.
  
7. **E-Amrit Portal:** It is a web portal on electric vehicles and provide one stop solution for all information related to EVs - bursting myths around the adoption, details about policies/ subsidies etc.
  - The portal has been developed and hosted by NITI Aayog under a collaborative knowledge exchange program with UK government and as part of the UK-India Joint Roadmap 2030, signed by the Prime Ministers of the two countries.
  
- **Key challenges of India's EV Sector:**
  1. **Battery Cost**
  2. **Low Lithium Reserves in India:**
  3. **Limited availability of Charging Infrastructure and long time for EV Charging**
  4. **Policy Conundrums:** Provisions of Electricity Act, 2003 is restrictive in nature and hinder setting up of charging stations - it is important to bring reforms here to promote ease of doing business.

## 8) MSME SECTOR

- MSMEs are considered **pillar of economic growth/ engine of growth** in both developed and developing countries of the world. They have played a prominent role in the economic development of India too.
- There are more than 6.34 crore MSMEs in India and around 50% of them are situated in rural areas.
- The revision of the **definitions of MSMEs** brought in w.e.f. 1st July 2020 as part of the AtmaNirbhar Bharat Package introduced a composite criterion of investment and annual turnover - and identical limits for manufacturing and service sector.

<b>Micro</b>	Investment [in Plant and Machinery or Equipment] <u>doesn't exceed Rs 1 crore</u> and <u>turnover doesn't exceed Rs 5 crore</u> .
<b>Small</b>	Investment <u>doesn't exceed Rs 10 crore</u> and <u>turnover doesn't exceed Rs 50 crore</u>
<b>Medium</b>	Investment <u>doesn't exceed Rs 50 crore</u> and <u>turnover doesn't exceed Rs 250 crore</u> .

- **Note:** In the older definition, only investment criteria was used and separate parameters were there for Manufacturing sector and service sector.
  
- **Significance of the above change:**
  - The change in definition will facilitate expansion and growth of these enterprises.
    - The resulting economies of scale can enhance productivity without MSMEs losing out on several government incentives including market support, export promotion, preferential procurement in the public sector, and incentives through various government initiatives (MSE-CDP, PMEGP, SFURTI).

- This change will also align MSMEs with GST regime and would prove to be a good tool to assess the contribution of the MSMEs to GDP. It will also avoid unnecessary inspections and enable authorities to verify claims of businesses using GST network sales data
  - Same criteria for both manufacturing and Service SME will simplify the classification.
- **Importance of MSME Sector:**
  - **Economic:**
    - Share of MSME in the country's GVA is approx. **33.08 percent** (current price, 2019-20 (as per ESI 2021-22)).
    - It employs around **11 crore people** in India.
      - High Labor to capital ratio
      - It provides maximum opportunities for self-employment and wage employment outside the agri-sector.
    - Manufacturing -> 40% of the total manufacturing output.
    - Exports: Around **50%** of the total manufacturing exports
  - **Curtailing Regional Disparity**
    - Geographical distribution of MSME's are more even.
- **Government Initiatives and Programs for MSME Sector:**
  1. **Initiatives under Atmanirbhar Bharat Abhiyan**
    - Emergency Credit Liquidity Guarantee Scheme (ECLGS) (extended till March 2023)
    - New Definition of MSMEs
    - Rs 20,000 crore of subordinate debt to stressed MSMEs.
  3. **Raising and Accelerating MSME Performance Scheme (RAMP) in July 2022:**
    - **Ministry:** Ministry of MSME
    - It is a World Bank supported Central Sector Scheme. It is aimed at strengthening institutions and governance at the Centre and State, improving Centre-State linkages and partnership and improving access of MSMEs to market and credit, technology upgradation and addressing issues of delayed payments and greening of MSMEs.
    - **Duration:** it will be implemented over a period of five years.
    - **Outlay:** The total outlay of the scheme is Rs 6,062.45 crores or USD 808 million, out of which Rs 3750 crore or USD 500 million would be a loan from the World Bank and the remaining Rs 2312.45 crore or USD 308 Million would be funded by GoI.
  4. **MSME Cluster development program of Ministry of MSME**
    - MSME is running two cluster development programs.
      - i. Micro and Small Enterprises - Cluster Development Program (MSE-CDP)
      - ii. Scheme for upgradation of rural and traditional industries (**SFURTI**)

- **Advantages of such cluster programs**
  - Quicker dissemination of info allows easy sharing of knowledge and best practices
  - Better cost effectiveness due to distribution of common cost
  - Focuses on holistic development covering infra, common facility, testing, technology, & skill upgradation, marketing and export promotion.
  - Weaves the fabric of networking, cooperation and togetherness in the industry

## 5. Other Past steps for Easy Credit Availability

- Interest Subvention Scheme for MSME Sector**
  - The scheme was launched in 2018 and provides a 2% interest subvention to GST Registered MSME sector.
- MUDRA** initiative focuses on collateral free loans of upto Rs 10 lakh for non-farm sector.
- MSME sector brought **under PSL** by RBI from July 2016. From 2018, foreign banks also have to follow the PSL norms.
  - Banks should **advance 7.5% of their loans to MSME** under PSL guidelines.

## 6. Steps to increase production by MSME and demand of MSME products

- Reservation of items to be manufactured by MSME sector** -> provided in the Industries (development and regulation) Act, 1951.
- Purchase Preference Policy:** All CPSUs/Central Government Departments are required to procure **25%** of their annual procurement from MSMEs (including 4% from MSEs owned by SC/ST and 3% from MSEs owned by women entrepreneurs) and there is a sub-target of 20% for procurement of MSMEs owned by SC/STs under the Procurement Policy launched in 2012.
  - **MSME SAMBANDH Portal** - To monitor the implementation of the public procurement from MSEs by Central PSUs.
- Price Preference Policy:** For selected items a price preference of 15% premium over the lowest quotation of the large scale unit is provided to MSME.
- Benefits in tendering:** MSMEs are provided benefits such as exemption from payment of security deposit etc.
- Marketing Assistance Scheme:** Provides assistance to MSMEs for the following activities: Organization of exhibitions abroad, co-sponsoring of exhibitions organized by other organizations, organizing buyer seller meets etc.

## 7. Other Initiatives to Increase Ease of Doing Business for MSMEs

- Udyam Registration (UR) Portal** (became operational in July 2020)
  - It provides faceless, fully online, paperless, and transparent MSME registration process fully integrated with Income Tax and GSTIN system. It is also integrated with government e-market place to make end to end MSME registration paperless.
  - In 2021, government has included Retail and wholesale trade as MSMEs. They are allowed to be registered on Udyam registration portal. But the benefits to them is restricted to PSL only.
- MSME SAMADHAN PORTAL**

- It was set up under the Micro, Small and Medium Enterprise Development (MSMED) Act to monitor the outstanding dues to the MSME sector.
    - MSMEs can directly register their cases relating to delayed payments by Central ministries/departments/CPSEs/Statements governments.
- iii. **TReDS (Trade Receivable Discounting System) Platform** for facilitating the discounting of trade receivable of MSMEs through multiple financiers.
  - TReDS is an institutional mechanism for financing of trade receivables of MSMEs from corporate buyers through two or more financiers.
  - There are 3 direct participants involved in the activities of TReDS viz.
    - MSME Sellers
    - Corporate Buyers
    - Financiers
  - TReDS provides a platform to bring these participants together for facilitating, uploading, accepting, discounting, trading and settlement of the invoices / bills of MSMEs.
- iv. **The CHAMPIONS portal ([www.champion.gov.in](http://www.champion.gov.in)):**
  - It is a grievance redressal portal for MSMEs launched by Ministry of MSME in June 2020.
    - It is an ICT based technology system for making the smaller units big by helping and handholding them. A network of control rooms is created in a Hub & Spoke Model where hub is situated in the Ministry of MSME.
  - The portal continues to improve through initiatives such as localization of the portal in 11 regional languages and introduction of chatbot.
- v. **GST Composition Scheme** (turnover limit 1.5 crore (75 lakh in case of NE States)
- vi. **Budget 2020-21: Easing Compliance burden.**
  - In order to reduce the compliance burden on small retailers, traders and the MSME sector, the auditing threshold has been raised by 5-times from INR 1 Cr in turnover to INR 5 Cr. This would be applicable only to those MSMEs that transact less than 5% in cash.
- viii. **Zero Defect Zero Effect (ZED) Scheme** to rate and handhold MSMEs to delivery top quality products using clean technology.
- ix. **Pre-Packaged Insolvency Resolution**

## 9) AGRICULTURE UPDATE FOR MSME SECTOR

### A) PRADHAN MANTRI MATSYA KISAN SAMRIDHI SAH – YOJANA (PM MKSSY)

- PM-MKSSY is a central sector sub scheme under Pradhan Mantri Matsya Sampada for Formalization of Fishery Sector and supporting fisheries MSMES.
- It was approved by cabinet in Feb 2024.
- **Expenditure Involved:**
  - » The estimated outlay is Rs 6,000 crores consisting of 50% i.e. Rs 3,000 crore public finance including the World Bank and the AFD external financing, and rest 50% i.e. Rs 3,000 crore being the anticipated investment from the beneficiaries/private leverage.
- **Duration:**
  - » The scheme will be implemented for 4 years from FY 2023-24 to FY 2026-27 across all the states and Uts.
- **Intended Beneficiaries:**
  - » Fishers, Fish (Aquaculture) Farmers, Fish workers, Fish Vendors or such other person directly engaged in fisheries value chain.
  - » Micro and Small enterprises in the form of Proprietary Firms, Partnership Firms and Companies registered in India, Societies, Limited Liability Partnerships (LLPs), Cooperatives, Federations, Village Level Organizations like Self Help Groups (SHGs), Fish Farmers Producer Organizations (FFPOs) and Startups engaged in fisheries and aquaculture value chains.
  - » FFPOs also include Farmers Producer Organizations (FPOs).
  - » Any other beneficiaries that may be included by the Department of Fisheries, GoI as targeted beneficiaries.
- **Implementation Strategy:** The sub-scheme has following main components:
  - i. **Component 1-A: Formalization of fisheries sector and facilitating access of fisheries microenterprises to Government of India programs for working capital financing.**
    - » A National Fisheries Digital Platform (NDFP) will be created and all the stakeholders (fish producers, vendors, processors, MSME in fishery sector) will be mobilized to register on it.
      - It will serve multiple functions including disbursement of financial incentives.
      - It is also proposed to undertake activities such as training and extension support, improving financial literacy, facilitating project preparation etc.
  - ii. **Component 1-B: Facilitating adoption of aquaculture insurance:**
    - The scheme will facilitate creation of appropriate insurance product and to cover at least 1 lakh hectare of aquaculture farms during the project period to provide the scale of operation.
    - One time incentive to the willing famers against purchase of insurance with farm size of 4 hectares of water spread area or less. This incentive will be at the rate of 40% of the premium subject to a limit of Rs 25,000 per hectare (i.e. maximum incentive of Rs 1 lakh)
      - For more intensive form of aquaculture other than farms such as cage-culture, Recirculatory Aquaculture System (RAS), bio-floc, raceways, etc. the incentive payable is 40% of the premium. Maximum incentive payable is Rs 1 lakh and the maximum unit size eligible will be 1800 m<sup>3</sup>.

- The benefit will be provided as 'onetime incentive' and will be provided for aquaculture insurance purchased for one crop only i.e. one crop cycle.
- SC/ST/Women beneficiaries will be provided an additional incentive @10% of the incentive payable for General categories.

iii. **Component 2: Supporting microenterprises to improve fisheries sector value chain efficiencies:**

- Through a system of performance grants with associated analytics and awareness campaign.
- The scale of performance grant and the criteria for providing performance grants are indicated below:
  - The performance Grant for a Microenterprise shall not exceed 25% of the total investment or Rs.35 lakhs, whichever is lower, for General Category and 35% of total investment or Rs.45 lakhs, whichever is lower, for SC, ST and Women owned microenterprises.
  - Performance Grant for Village Level Organizations and Federations of SHGs, FFPOs and Cooperatives shall not exceed 35% of total investment or Rs.200 lakhs, whichever is lower.
  - The total investment for the purpose above shall consist of expenditure incurred on capital investments made on new plant and machinery, equipment including technical civil/electrical works and associated infrastructure, transport and distribution infrastructure, energy efficient devices including Renewal Energy devices, technology interventions, such other interventions leading to improvement in value chain efficiency; and salary bills for additional jobs created in the year of application made under the scheme.

iv. **Component 3: Adoption and expansion of fish and fishery product safety and quality assurance systems:**

- This component proposes to incentivize fisheries micro and small enterprises to adopt safety and quality assurance systems in marketing of fish and fishery products through provision of performance grants against a set of measurable parameters.

v. **Component 4: Project management, monitoring and reporting:**

- Under this component, it is proposed to set up Project Management Units (PMUs) to manage, implement, monitor and evaluate project activities.

## 10) PHARMACEUTICAL INDUSTRY

### A) CURRENT SITUATION

- Indian Pharmaceutical industry is an important player in global pharma sector.
- **Market Size in India:** India's domestic pharmaceutical market is estimated at US\$ 41 billion in 2021 and is likely to grow to US\$ 65 billion by 2024 and is further expected to reach US\$ 130 billion by 2030.
- **India** is ranked 3rd worldwide in the production of pharma products by volume and 14th by value.

- India is also the largest provider of generic medicines globally, occupying a 20% share in global supply by volume, and is leading vaccine manufacturer globally with a market share of 60%.

## B) PLI SCHEME TO BOOST MANUFACTURING CAPACITY IN PHARMA SECTOR

Critical KSMs/DIs/APIs	Medical Devices	Pharmaceuticals
<ul style="list-style-type: none"> <li>• <b>Tenure:</b> FY21 to FY30</li> <li>• <b>Outlay:</b> ₹6,940 crore</li> <li>• <b>Progress:</b> Until Dec 2022, 51 applicants approved with committed investment of ₹4,138.4 crore.</li> <li>• <b>Employment:</b> Estimated employment generation from 51 projects is 10,598 persons.</li> <li>• <b>Financial incentive:</b> NA</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Tenure:</b> FY21 to FY28</li> <li>• <b>Outlay:</b> ₹3,420 crore</li> <li>• <b>Progress:</b> Until Dec 2022, 21 applicants approved with committed investment of Rs 1,058.97 crore.</li> <li>• <b>Employment:</b> Estimated employment generation from 21 projects of around 6,411 persons.</li> <li>• <b>Financial incentive:</b> The financial incentive at the rate of 5 per cent on incremental sales of medical devices for 5 years.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Tenure:</b> FY21 to FY29</li> <li>• <b>Outlay:</b> ₹15,000 crore</li> <li>• <b>Progress:</b> Until June 2022, 55 applicants approved with actual investment of Rs 18,669 crore.</li> <li>• <b>Employment:</b> Estimated employment generation from 55 projects : 20,000 direct and 80,000 indirect jobs.</li> <li>• <b>Financial Incentive:</b> on incremental sales under various categories at varying rate over the years ranging from 10 per cent to 3 per cent.</li> </ul>

Source: Department of Pharmaceuticals

KSMs: Key Starting Materials

DIs: Drug Intermediaries

APIs: Active Pharmaceutical Ingredients (APIs)

## C) NATIONAL MEDICAL DEVICES POLICY, 2023

- Approved by Cabinet in April 2023
- **Ministry:** Ministry of Chemical and Fertilizer
- **Salient Features:**
  - » **Vision:** Accelerated growth path with a patient-centric approach and to emerge as the global leader in the manufacturing and innovation of medical devices by achieving 10-12% share in the expanding global market over the next 25 years.
    - Policy is expected to help the Medical Devices Sector grow from present \$11 Bn to \$50 Bn by 2030.
  - » **Mission:** Policy lays down a roadmap for accelerated growth of the medical devices sector to achieve the following missions viz, Access & Universality, Affordability, Quality, Patient Centred

& Quality Care, Preventive & Promotive Health, Security, Research and Innovation and Skilled manpower.

» **Strategies to Promote Medical Device Sector:** These strategies will cover six broad areas of policy intervention.

- **Regulatory Streamlining:** In order to enhance ease of doing research and business and further to balance patient safety with product innovation measures such as creation of a **Single Window Clearance System' for Licensing of Medical Devices** co-opting all the stakeholder departments / organizations such as AERB, MeitY, DAHD, etc, enhancing the Role of Indian Standards like BIS and designing a coherent pricing regulation, will be followed.
- **Enabling Infrastructure:** The establishment and strengthening of large medical device parks, clusters equipped with world class common infrastructure facilities in proximity to economic zones with requisite logistics connectivity as envisioned under the **National Industrial Corridor Program** and the proposed National Logistics Policy 2021 under the ambit of PM Gati Shakti, would be pursued with the State Governments and Industry for better convergence and backward integration with medical device Industry
- **Facilitating R&D and Innovation:** The policy envisages to promote Research & Development in India and complement the Department's proposed National Policy on R&D and Innovation in the Pharma- MedTech Sector in India. It also aims at establishing Centres of Excellence in academic and research institutions, innovation hubs, 'plug and play' infrastructures and support to start-ups.
- **Attracting Investments in the Sector:** Along with recent schemes and interventions like Make in India, Ayushman Bharat program, Heal-in-India, Start-up mission, the policy encourages private investments, series of funding from Venture Capitalists, and also Public-Private Partnership (PPP).
- **Human Resources Development:** In order to have a steady supply of skilled work force across the value chain such as scientists, regulators, health experts, managers, technicians, etc., the policy envisages:
  - Leveraging the available resources in Ministry of Skill Development and Entrepreneurship
  - Supporting dedicated multidisciplinary courses for medical devices in existing institutions to ensure availability of skilled manpower for futuristic medical technologies, high-end manufacturing and research, to produce future ready MedTech human resources and to meet the evolving needs of the Sector.
  - Developing partnerships with foreign academic/industry organizations to develop medical technologies in order to be in equal pace with the world market.
- **Brand Positioning and Awareness Creation:** The policy envisages the creation of a dedicated Export Promotion Council for the sector which will be an enabler to deal with various market access issues.

#### D) STRENGTHENING OF PHARMACEUTICAL INDUSTRY (SPI) SCHEME

- Launched in March 2022 with a total outlay of Rs 500 crores for five years from FY22 to FY26 with multiple objectives:

- » **First**, it aims to strengthen the existing infrastructure facilities by providing financial assistance to pharma clusters to create common facilities.
- » **Second**, it upgrades the production facilities of MSMEs to meet national and international regulatory standards by providing interest subvention or capital subsidy on their capital loans.
- » Third, it also promotes knowledge and awareness about the pharmaceutical and medical devices industry by undertaking studies, building databases, and bringing industry leaders, academia and policymakers together to share their knowledge and experience.

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# TARGET PRELIMS 2024

## BOOKLET-46; ECONOMY-11

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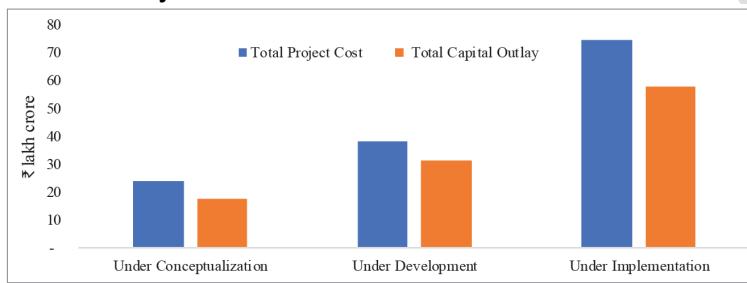
## 2. MAJOR INITIATIVES IN INFRASTRUCTURE SECTOR

### 1) NATIONAL INFRASTRUCTURE PIPELINE (NIP) 2020-2025

- In 2019, Ministry of Finance estimated that to achieve a GDP of \$5 trillion by 2024-25, India needed to spend about \$1.5 trillion (Rs 111 lakh crore) over these years in infrastructure. Keeping this in mind, government has launched National Infrastructure Pipeline (2020-25) with projected infrastructure investment of around Rs 111 lakh crores. It also envisages to improve project preparation and attract investment, both domestic and foreign in infrastructure.

- **Progress So Far:**

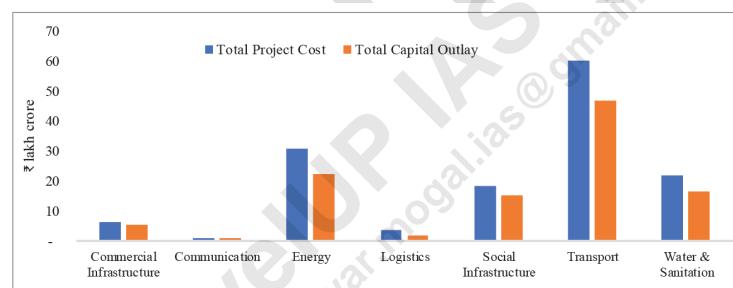
- » The NIP currently has 9,288 projects with a total investment of more than Rs 108 lakh crore under different stages of implementation.
  - » **Status of Projects under NIP**



Source: Department of Economic Affairs.

Note: Data as of 13 January 2023

- **Transportation Sector Dominates the NIP**



Source: Department of Economic Affairs.

Note: Data as of 13 January 2023

- **Jointly funded by Central Government, State Government and Private Sector:**

- **Some steps to improve the implementation of NIP:**

- **Invest India Grid (IIG):**

- NIP is hosted on the Invest India Grid (IIG) platform and provides opportunities for states/UT and ministries to collate all major infrastructure projects at a single location. It is thus a centralized portal to track and review project progress across all economic and social infrastructure sub-sectors. It also provides the project sponsoring authorities to showcase investment opportunities to national and international investors.

- **Project Monitoring Group (PMG)**

- It is an institutional mechanism put in place by the government for resolution of issues related to large-scale projects. It is also involved in fast tracking of approvals/ clearances for projects with an anticipated investment of Rs 500 crore and above. Now it has been proposed to integrate NIP and PMG portals. PMG portal will pick up data, as per requirements (project cost of Rs 500 crore

or more), from the NIP database. This will save substantial time and effort by Ministries and States/UTs and ease monitoring of large-scale projects.

## 2) NATIONAL MONETIZATION PIPELINE

- **Background**
  - » **Asset Monetization** is one of the key recommendations of National Infrastructure Pipeline (2020-25). Consequently, National Monetization Pipeline was announced in 2021. It focuses on the principle of 'asset creation through monetization' and thus taps private sector investment for new infrastructure creation.
- **Details:**
  - » Asset monetization entails a limited period license/lease of a brownfield underutilized asset owned by government or a public agency, to a private sector entity for an upfront or periodic consideration.
    - **The private sector entity** is expected to operate and maintain the asset based on the terms of the contract/concession, generating returns through higher operating efficiencies and enhanced user experience.
    - **Public authority**, which receives the fund, will invest it in new infrastructure or deploy it for other public purposes.
  - » A robust asset pipeline has been prepared to provide a comprehensive view to investors and developers of the investment avenues in infrastructure.
    - It includes selection of de-risked and brownfield assets with stable revenue generation profile (or long rights) which will make for an attractive investment option.
  - » Total indicative value of NMP for core assets of the Central Government has been estimated at Rs 6.0 lakh crore over 4-year period (FY22 - 25) (5.4% of the total infrastructure investment envisaged under NIP)
- **National Land Monetization Corporation (NLMC)**: Cabinet approved the setting up of the NLMC to monetize surplus land and building assets of CPSEs and other agencies linked to government (March 2022)
- **Progress so far: ESI 2022-23:**
  - Against the monetization target of 0.9 lakh crore in FY22, Rs 0.97 lakh crore have been achieved during the period under roads, power, coal and mines.
  - NMP's 2nd year target, i.e. FY23 target is ₹ 1.6 lakh crore (27% of the overall NMP target).

## 3) PM GATISHAKTI NATIONAL MASTER PLAN

- **Need of PM GatiShakti:**
  - There are many infrastructure projects like roadways, railways, airways, waterways, internet connectivity (optical fiber), Gas Pipelines etc. These projects come under different ministries, leading to lack of coordination in planning and implementation of these projects. This leads to duplication of work, delays, financial loss, increase in cost etc., which eventually puts more burden on the public exchequer and impacts the quality of services reaching people.
    - E.g. 1: Newly built roads being dug by water departments to lay pipelines.
    - E.g. 2: Newly built fertilizer factory not working properly as the gas supply infrastructure isn't available.

- E.g. 3: Separate tunnel for roadways and railways
- Details
  - PM GatiShakti is aimed at breaking departmental silos and bring more holistic and integrated planning and execution of projects with a view to address the issue of Multi-Modal connectivity and last mile connectivity.
    - This will help in bringing down the logistic cost and will translate into enormous financial gains to consumers, farmers, youth as well as those engaged in businesses.
- The PM GatiShakti National Master Plan entails creation of a common umbrella platform with all infrastructure projects pertaining to various ministries/ departments incorporated within a comprehensive database for efficient planning and implementation on a real-time basis.
  - The projects pertaining to seven engines (roads, railways, airports, ports, mass transport, waterways, and logistic infrastructure) in the NIP have been aligned with PM GatiShakti framework.
  - In order to facilitate integrated planning and coordinated implementation, a GIS based and data driven decision support called PM GatiShakti National Master Plan has been introduced.
  - The portal will also allow various government departments to track, in real time and at one centralized place, the progress of various projects. This will enable various government departments to synchronize their efforts into a multi-modal network.
  - The portal will also highlight all the clearances any new project would need, based on its location - and allow stakeholders to apply for these clearances from the relevant authority directly on the portal.
- Six Pillars of PM Gati Shakti
  - PM Gati Shakti is based on six pillars: Comprehensiveness, Prioritization, Optimization, Synchronization, Analytics and Dynamic.
- How were inter-ministerial issues resolved earlier?
  - At regular meetings of infrastructure related ministries.
  - PM PRAGATI (Pro-Active Governance and Timely Implementation) portal also helped in resolution of several issues even prior to inter-ministerial meetings.
  - **How would GatiShakti portal help?**
    - It will reduce the human intervention required as ministries will be in constant touch, and projects will be reviewed by the project monitoring group in real time.
- Who has built the portal?
  - The Bhaskaracharya Institute for Space Applications and Geoinformatics (BISAG-N).

## 4) NATIONAL INVESTMENT AND INFRASTRUCTURE FUND (NIIF)

- Introduction
  - » NIIF was proposed in Union Budget 2015 and was set up by GoI in Dec 2015 with a corpus of Rs 40,000 crore to provide long term capital for infrastructure projects.
- Objectives
  - » To maximize economic impact through infrastructure development in viable projects both greenfield and brownfield, including stalled projects, mainly in the core infra sector.
- Structure

- » NIIF has been structured as a Fund of funds and set up as Category II Alternate Investment Fund (AIF) under SEBI.
- » **Gol has 49% stake** in NIIF with rest being held by marquee foreign domestic investors such as Abu Dhabi Investment Authority (ADIA), Temasek and HDFC group. This helps NIIF to be seen with characters of both sovereign fund as well as private fund (and is sometimes referred as India's quasi sovereign wealth fund).
- » The government invested Rs. 20,000 crores into it from Budget while the remaining 20,000 crores are expected to come from private investors (including foreign).
- » **Fund of funds** means that there would be multiple alternative investment funds underneath the main fund.
  - **How much does it manage presently?**
    - NIIF manages about \$5 billion of capital commitments across four funds, each with a distinct investment strategy.
      - **NIIF Master Fund:** It focuses on infrastructure and operating assets. It is the largest infrastructure fund in India, with commitment of over US\$1.8 billion. It has the largest size of US\$2.1 billion.
      - **NIIF Private Market Fund:** It invests in funds managed by third-party managers in infrastructure and associated sectors.
      - **NIIF Strategic Opportunities Fund:** It invests and develops large-scale businesses and greenfield projects that are of strategic importance to the country. It has a target size of \$3 billion.
      - **India-Japan Fund:** It is NIIF's first bilateral fund and invests in environmental preservation in India. It also seeks to enable opportunities for collaboration between Indian and Japanese companies in India.

#### - Governance

- » NIIF has been set up as a Trust registered under the Indian Trust Act. The activities of NIIF will be overseen by a Governing Council, which will be headed by Finance Minister.

#### - Functions of NIIF

- » NIIF would raise funds from investors and markets and would invest the same in companies, institutions and infrastructure projects.
- » It will also provide advisory services.

#### - Sources of Funds

- » The sources of funds of NIIF are as follows.

- **Government Budgetary Funds** to each AIF set up under NIIF, these funds will be provided every year as required.
- **Private investors.** The funds will solicit equity participation from strategic anchor partners. It is also expected to attract overseas investors, PSUs, domestic pension, provident funds and NSSF (National Small Savings fund) also.

---

## A) ALTERNATE INVESTMENT FUND (AIF)

- Alternative Investment Funds are a class of investment entities that are not covered under the usual SEBI regulatory framework for investment institutions.
  - AIF refers to any privately pooled investment fund (trust, company or LLP) which are not presently covered by any regulation of RBI, SEBI, IRDA and PFRDA. They may be foreign or Indian.
- They include private equities, Venture Capital Funds, Hedge Funds, Commodity Funds, Debt Funds, infrastructure funds etc. They are generally owned by big corporate houses or wealthy individuals.
- This classification is done for the purpose of regulation.
- **SEBI in 2012 had notified guidelines for AIFs** as funds established or incorporated in India for pooling in of capital from Indian or foreign investors for investing as per a pre-decided policy.
- **SEBI guidelines have classified AIF in three categories:**
  1. **Category1:** AIFs which can produce positive spillovers in the economy and for that get incentives from government, SEBI or other regulators. They include social venture funds, Infra funds, Venture capital funds including angel investors, SME funds etc.
  2. **Category2:** For these funds no specific incentives or concessions are given by the government or any regulator. These includes private equity funds, debt funds, Funds of Funds and such other funds.
  3. **Category 3** AIFs are institutions like hedge funds that trade with a view to make short term returns. They employ diverse or complex trading strategies and do leverage including investment in listed or unlisted companies.

## 5) INFRASTRUCTURE INVESTMENTS TRUST (INVITS)

- InvITs are mutual funds like institutions that enable investment into the infrastructure sector by pooling small sums of money from multitude of individual investors for directly investing in infrastructure so as to return a portion of the income (after deducting expenditures) to unit holders of InvITs, who pooled the money.
- They are designed to attract low-cost, long-term capital in infrastructure sector and reduce pressure on the banking system.
- **Structure of InvITs in India**
  - » InvITs are set up as a trust and registered with SEBI.
  - » **Regulation**
    - InvITs are regulated in India by SEBI.
    - SEBI notified **SEBI (Infrastructure Investment Trusts) Regulations, 2014**, providing for regulation and registration of InvITs in India with an objective of facilitating investment in Infrastructure sector.
  - InvITs can invest in infrastructure projects, either directly or through a special purpose vehicle (SPV). In case of a PPP project, such investments can only be through SPV.
  - As per the present regulations, InvIT unit's minimum size is Rs 10 Lakh and thus are suitable only for High net worth individuals, institutional and non-institutional investors like pension funds, FPI, MF, banks and insurance firms.

- InvITs are listed on exchanges just like stocks - through IPO
- Taxes
  - Capital Gain Tax
- India's First InvIT issue was done by road developer IRB Infrastructure in May 2017 which garnered Rs 5,035 crore through IPO.

### 3. PUBLIC PRIVATE PARTNERSHIP (PPP)

- **Introduction:**
  - In 1997, the report of the **Rakesh Mohan Committee (RMC)** concluded that India's problem was that of poor infrastructure holding back development. It also highlighted the importance of bringing in the private sector into most areas of infrastructure in the country.
- **Public Private Partnership (PPP)** is a collaborative arrangement between government and private sector to jointly plan, mobilize resources, develop, and/or operate infrastructure projects.
- **Significance of Public Private Partnerships:**
  - **Mobilization of Resources:** For e.g. in the BOT (Toll/ Annuity) model of road construction, private player invests the entire initial money for the construction of the road project).
  - **Getting Private Sector expertise and Innovation:** E.g. in the EPC model, private sector engineers and construct the entire road.
  - **Risk Sharing**
  - **Increased Efficiency and Reduced cost of the project**
  - **Increased Transparency and Accountability**
  - **Better Infrastructure**
- But, the success of PPPs lies in the robustness of institutional structure, financial support, and use and availability of standardized documents, such as Model Requests for Qualifications (RFQ), Model Request for Proposal (RFP) and Model Concession Agreement (MCAs).
- Government of India has taken several measures:
  - Government of India has streamlined the appraisal and approval mechanism for Central Sector PPP projects to ensure speedy appraisal of projects, eliminate delays, and have uniformity in appraisal mechanisms.
    - » Procedure for approval of PPP projects was finalized in 2005 and in 2006, the Public Private Partnership Appraisal Committee (PPPAC) for the appraisal of was notified in 2006. It has cleared 79 projects with a total cost of Rs 2,27,268 crore from FY15 to FY23.
  - **Viability Gap Funding (VGF) Scheme, 2006**
    - » It provides financial assistance to financially unviable but socially/economically desirable PPP projects.
      - » **Economic Sector Projects** may get upto 40% of Capex as VGF grant.
      - » **Social Sector Projects** include higher provisions of VGF grant. It may get upto 80% of CAPEX and upto 50% of the Operating Expenditure (OPEX).

- **India Infrastructure Project Development Fund (IIPDF) Scheme** notified in Nov 2022
  - » The scheme aims to develop quality PPP projects by providing necessary funding support to project sponsoring authorities, both in the central and the state governments, for creating a shelf of bankable and viable PPP projects by on-boarding transaction advisors.
  - » It has an outlay of Rs 150 crores for a period of 3 years from FY23 to FY25.
  - » Under the scheme a maximum amount of Rs 5 crores for a single proposal, inclusive of any tax implications, can be funded which can include cost of consultants/transaction advisors of a PPP project.
  - » By: Department of Economic Affairs (DEA), Ministry of Finance, GoI
  
- **Several types of PPP Models** are used in India in different sectors:
  - » **EPC Model (Engineering, Procurement, and Construction)**: In this model, the cost of project is completely borne by government. Private sector with its expertise is responsible for engineering, procuring raw material and constructing the project. Ownership remains with government.
  - » **Built Operate and Transfer (BOT)** model involves private player entity designing, financing, constructing, operating, and maintaining an infra projects for a specific period. After the specified period, the ownership is transferred back to government. This model has been used in sectors like Roadways, Ports, Airports and Power Generation. It can be of two types - BOT (Toll) & BOT (Annuity).
  - » **Hybrid Annuity Model (HAM)**: It is a mix of EPC and BOT (Annuity) model.
  - » **Build Own Operate (BOO)**: The private sector entity builds and owns the asset, and then operates it for a specified period of time.
    - Government has agreed to "buy" the goods and services delivered by the project on mutually acceptable terms and circumstances.
  - » **Build Own Operate Transfer (BOOT)**:
    - It is a model of PPP in which a private company is granted a concession to finance, build, own, and operate a project for a specified period of time. At the end of the concession period, the project is transferred back to government.
      - E.g. of project under BOOT model, Delhi Mumbai Expressway, The Mumbai Metro, the Bangalore International airport etc.
    - It involves a private sector entity being responsible for the complete lifecycle of the project, including design, financing, construction, operation, and maintenance. However, here private sector entity retains ownership of the project even after the concession period.
  - » **Build Own Lease Transfer (BOLT)**: It is a PPP model in which a private company is granted a concession to finance, build, own and lease a project to the government for the specified period of time. At the end of the concession period, the project is transferred back to government. Some notable BLT projects in India are, the Delhi-Gurgaon Expressway and the Mumbai-Pune Expressway.
  - » **Design Build Finance and Operate (DBFO)**: It allows a private sector to design, build, finance, and operate a project for a specified period of time. This public sector client retains the ownership of the project, but the private sector contractor is responsible for all aspects of its delivery.

- E.g. Delhi Metro: Project was awarded to a consortium of private companies, which designed, built, financed, and operated the metro for a period of 30 years. At the end of the concession period, the metro will be transferred back to government.
  - » **Lease Developed Operate (LDO) Model:** Private company is granted a concession to finance, develop, and operate a project for a specified period of time. The government sector retains the ownership, but the private sector is responsible for all aspects of its delivery. At the end of the concession period, government may choose to operate the project itself, or it may contract with another private company to operate the project.
  - » **Rehabilitate-Operate-Transfer (ROT) Model:** Under this model, government allows private promoters to rehabilitate and operate a facility during a concession period. After the concession period, the project is transferred back to government / local bodies.
- **Recommendations of Vijay Kelkar Committee:**
- » Vijay Kelkar Committee on "Revisiting & Revitalizing the PPP model of infrastructure Development" was set up in the Union Budget of FY15-16. It recommended:
    - The Need of PPP contract to be more focused on service delivery.
    - The need to identify, balance and allocate risks amongst the different stakeholders.
    - Viability Gap Funding for unviable social and economic projects
    - Careful monitoring of performance as well as managing the risk.

## 4. LOGISTIC SECTOR

- Logistics, including transportation, inventory management, warehousing, material handling & packaging, and integration of information, is related to management of flow of goods between the point of origin and the point of consumption.
- **LOGISTIC PERFORMANCE OF INDIA:**
  - » As per the Logistics Performance Index, 2023 released by World Bank, India is ranked 38/139 countries in terms of the logistics performance.
  - » Logistics Cost in India have been in the range of 14-18% of the GDP against the global benchmark of 8%.
  - » Thus, logistic sector can play a crucial role in promoting the competitiveness of our industries. Besides it will also play a role in job creation and enhancing India's GDP.

### 1) NATIONAL LOGISTIC POLICY, 2022

- The vision of NLP is " to develop a technologically enabled, integrated, cost-efficient, resilient, sustainable and trusted logistics ecosystem in the country for accelerated and inclusive growth."
- **The Targets** for achieving the vision of NLP are to
  - reduce the cost of logistics in India to be comparable to global benchmarks by 2030.
  - improve the Logistics Performance Index ranking - endeavour is to be among the top 25 countries by 2030, and
  - create a data driven decision support mechanism for an efficient logistics ecosystem.

- The Policy has **four key features (four key pillars)**: Integration of Digital System (IDS); Unified Logistics Interface Platform (ULIP); Ease of Logistics (ELOG); and System Improvement Group (SIG);
  - **Under IDS, 30 different systems of seven departments are integrated** - including data from the road transport, railways, customs, aviation and commerce departments.
  - **ULIP would bring all digital services related to the transportation sector into a single platform.**
  - **Ease of Logistics (E-Logs)** is a new digital platform which has been started for industry associations to resolve issues by reaching out to the government.
  - **Systematic Improvement Group (SIG)** has been created along with the **Network Planning Group (NPG)** to improve coordination across government ministries and between the state and central governments.
- The policy will be implemented through CLAP (Comprehensive Logistics Action Plan), which proposes the following interventions:
  - **Integrating digital logistics systems** to develop a system of unified logistic interface.
  - **Sectoral Plan For Efficient Logistics**
  - **Facilitating the development of logistics Park**
  - **EXIM logistics**
  - **Logistics manpower skill development and capacity building**
  - **Service Improvement Program**
  - **Standardizations of physical assets and benchmarking service quality standards**
  - **Engagement with different Indian states**

## 2) MULTIMODAL LOGISTICS PARKS

- **What is Multi-Modal Logistic Park (MMLP):**
  - MMLPs have been conceptualized to enable seamless intermodal freight movement and offer multiple functionalities such as freight aggregation, and distribution. Storage, warehousing solutions, value-added services like custom clearances and IT services will be provided.
  - The parks will enable the switch from a point-to-point to a hub-and-spoke model in the logistic parks, eventually bringing down logistics costs by at least half and enabling more efficient movement of new generation vehicles.
- **Details about Multi-Modal Logistic Park (MMLPs):**
  - MoRTH&H is developing 35 MMLPs under Bharatmala Phase-1.
    - Of these 6 MMLPs are undertaken by MoRTH in port cities namely Cochin (Kerala), Chennai (TN), Vishakhapatnam (Andhra Pradesh), Mumbai (Maharashtra), Kolkata (WB), and Kandla (Gujarat).
- **Advantages:**
  - Logistic Efficiency -> Reduced time and cost
  - **Seamless Intermodal transports** -> simplify imports and exports
  - Improved warehousing -> reduced wastage of food
  - Improved Employment opportunities
  - Helps in growth of MSME sector
  - **Environmental benefits** -> improved efficiency -> reduced dependency on fossil fuels

## B) SOUTH INDIA'S LARGEST MULTIMODAL LOGISTICS PARK IN BENGALURU (JAN 2024)

- The groundwork for 400-acre facility has begun at Obalapura on the northern outskirts of Bengaluru.
- It will provide a host of logistics, warehousing and cold storage facilities that are aimed at reducing overall logistics costs from 13% to 9% and making exports competitive.
- It will handle 30 million tonnes of cargo by 2070.
- This is a 1770 crore project and is being developed by Bengaluru MMLP Pvt Ltd, a special-purpose vehicle with three stakeholders.
  - The NHAI's National Highways Logistics Management Ltd (NHLML) owns the majority of stake (51.29%), followed by the Karnataka Industrial Areas Development Board (32.38%) and Rail Vikas Nigam Limited (16.33%).

## 3) LOGISTIC EASE ACROSS DIFFERENT STATES (LEADS) INDEX, 2023

- **Why in news?**
  - » Ministry of Commerce and Industry releases the 5th edition of the LEADS index (Dec 2023)
- **About the Index**
  - » It is a composite indicator to assess international trade logistics across states and Union Territories and is based on stakeholders' survey and uses the World Bank's Logistic Performance Index (LPI) methodology (LPI).
  - » While LPI relies entirely on perception-based surveys, LEADS incorporates both perception as well as objectivity thereby enhancing the robustness and comprehensiveness of the exercise.
- **The 5th edition of the LEADS annual exercise - LEADS 2023 report**, provides insights into improvement of logistics performance at State/UT level.
  - » The report signals a positive shift in States' performance across the key pillars - Logistics Infrastructure, Logistics Services and Operating and Regulatory Environment.
  - » The report is based on a pan-India primary survey, conducted between May and July 2023, covering over 73,000 responses across 36 states/UTs. Additionally, over 750 stakeholder consultations, facilitated by National, regional, and state associations, significantly contributed to this comprehensive evaluation.
  - » **Performance Highlights:**
    - **Coastal Group**
      - Achievers: Andhra Pradesh, Gujarat, Karnataka, Tamil Nadu
      - Fast Movers: Kerala, Maharashtra
      - Aspirers: Goa, Odisha, West Bengal
    - **Landlocked Group**
      - Achievers: Haryana, Punjab, Telangana, Uttar Pradesh
      - Fast Movers: Madhya Pradesh, Rajasthan, Uttarakhand
      - Aspirers: Bihar, Chhattisgarh, Himachal Pradesh, Jharkhand
    - **North-East Group**
      - Achievers: Assam, Sikkim, Tripura
      - Fast Movers: Arunachal Pradesh, Nagaland

- Aspirers: Manipur, Meghalaya, Mizoram
- **Union Territories**
  - Achievers: Chandigarh, Delhi
  - Fast Movers: Andaman & Nicobar, Lakshadweep, Puducherry
  - Aspirers: Daman & Diu/ Dadra & Nagar Haveli, Jammu & Kashmir, Ladakh

## 5. SHIPPING AND INLAND WATERWAYS

### 1) HUGE POTENTIAL IN SHIPPING SECTOR

- **India's Geography:** India is endowed with a rich coastline of ~7500 km and has a strategic location on key international maritime trade routes.
- **India's fleet** is just 1.2% of the world's fleet and carries only 8% of India's Exim trade.

### 2) SEAPORTS IN INDIA

- Our coastline is not very serrated and therefore we have very few natural seaports on our coast. There are **13 major and about 200 non-major ports** in India.
- **Port development** in India is a concurrent subject.
- The Major seaports are maintained and managed by central government (Ministry of Shipping) under **Major Port Authorities Act, 2021** and other seaports are controlled by the state governments under the Indian Ports Act, 1908.
- **Installed capacity of major ports** in India has increased to 1534.91 MTPA in March 2020.

### 3) MAJOR PORT AUTHORITIES ACT, 2021

- **The need of this act?**
  - Major Ports Trust Act of 1963 was very restrictive which made it difficult for major ports to function in highly competitive environment and respond to market challenges.
  - The Board of Trustees was considered too large and disparate to allow efficient decision making.
- The 2021 act provides for regulation, operation, and planning of major ports in India. It was enacted in Sep 2021 and replaced the Major Port Trusts Act, 1963.
- **Key Provisions:**
  - It vests the administration, control and management of major ports in the **Boards of Major Port Authorities (MPAs)**. It will replace the existing port trusts.
    - » **Responsibility:** The boards are responsible for overall planning, development, and operation of the port. They are also responsible for fixing the scale of rates for port services and assets.
  - **Greater autonomy to MPAs in decision making:**
    - » MPAs are now free to enter into public-private partnership (PPPs) for the development and operation of port facilities.

- » **Significance:** This will allow the ports to be more responsive to the needs of their users and to make decisions that are in the best interest of the port community.
  - They are also responsible for fixing the tariffs for port services based on market conditions.
  - » **Significance:** This will allow ports to be more competitive and to attract more traffic.
  - **Reorient the governance model** in the major ports to landlord port model in line with the global practices.
  - **Improved grievance redressal mechanism:** The act provides for creation of an adjudicatory board to resolve disputes between MPAs and stakeholders.
- The above changes are also expected to increase investment in the port sector.

## 4) MAJOR SEAPORTS OF INDIA

### i. Kandla (now known as Deen Dayal) - Gujarat

- Located in Gulf of Kutch and is the largest port by volume of cargo handled. Its harbor is natural and protected.
- Kandla port also is a free trade zone, where import duties are not levied. The basic concept is that entrepreneurs setting up units in the zone can import raw material and machinery free of duty, but the manufactured products must be completely exported and not sent into hinterland. Consumable articles like TV, tape recorders etc can't be imported in the free trade zone.
- The port is famous for import of petroleum products.
- One limitation of the port is that it is situated in a earthquake prone zone (zone v).
- Updates:

» **Kandla becomes the first Green SEZ (July 2021)**

- It achieved CII's IGBC (Indian Green Building Council) Green Cities Platinum Rating.
  - With this KASEZ (Kandla SEZ) has become the first Green SEZ to achieve the IGBC Green Cities Platinum Rating for Existing Cities.
  - It has been awarded for 'Green Master Planning, policy initiatives, and implementation of Green infrastructure'.
- It shows that GoI is working towards ensuring environmentally sustainable development.

### ii. Mumbai: It is situated in the natural serrated area of the Salsette Island and thus have a natural harbour which is safe too.

- Here also, there has been an establishment of free trade zone.
- It is the largest port in India.

### iii. Nhava Sheva or Jawaharlal Nehru Seaport (JLNP)

- It is an all whether tidal port.
- Developed near Panvel in Navi Mumbai to ease off the pressure of Mumbai port. It is the most modern sea-port of the country.

iv. **Mormugao Port**- Situated on the left bank of Zuari river in Goa. It is a natural seaport protected by backwater and also by a mole. It is specially known for the export of iron ore (as Goa is rich in it), other products which are exported from here includes Cashew, fish, spices, rice etc.

v. **New Mangalore**

- It handles iron ore export from Kudremukh mines. Other items exported include, fish, fertilizers, cashew, forest products and coffee.



vi. **Kochi**

- It is a natural harbour located in the Vembanad lake on Wellington Island on the coast of Kerala. It is situated on the mouth of a large lagoon parallel to the sea.
- Major items exported from here are coconut products, cashew, tea, rubber, fish and spices.
- Important items imported from this port includes mineral oil, fertilizers, coal and edible oils.

vii. **New Tuticorin (V.O. Chidambarnar Port)**

- It is one of the major ports in TN, located in Gulf of Mannar. It is an artificial, deep sea, open seaport which is located 9 km from the eastern side of Hare Island.
- Its harbour has been made deeper and it has been developed artificially.
- The port handles the trade of coal, food grains, salt, sugar, petroleum products etc.

viii. **Chennai Port**

- It is a major seaport on east coast of India. It is an artificial port and is located in open seas where the ships have to face the wave. To protect the ships, a long wall has been built at 3 km away from the coast.
- It is the second largest trading seaport after Mumbai.
- Key imports: Iron ore, food grain, leather, sugar, tobacco, coconut products, etc.
- Key exports: Petroleum, coal, edible oil, chemicals, cotton etc.

ix. **Ennore Port (Kamarajar Port)**

- Located in Tamil Nadu, North of Chennai. Developed to ease pressure on Chennai.
- Especially significant for coal trading. The Tamil Nadu government gets internal and imported coal for itself from this seaport.

- It is different from the other major ports which are run as trusts, it is incorporated as a company.
  - **Note:** Chennai Port Trust acquired the 67% stake of Centre in the Kamarajar Port Limited on 27th March 2020. The remaining 23% was already held by the **Chennai Port Trust**.

x. **Vishakhapatnam**

- Port of Vishakhapatnam, a deep, natural harbour, was opened to commercial shipping in 1933. It is self-protected from storms because of a hills called 'Dolphin Nose' jutted out of the sea at the mouth of the harbour.
- It is the only Indian Port possessing three international accreditations viz. ISO 14001; 2004 (EMS)/OHSAS 18001 and ISO 90001:2000 (QMS).
- The iron ore of Bailadilla area is exported from this seaport.

xi. **Paradeep**

- It is an artificial seaport on the coast of Odisha. Here there is a mechanical facility of loading and unloading of Iron ore and coal.

xii. **Kolkata Port Trust / Dr. Shyama Prasad Mukherjee Port Trust** (renamed to Dr. Shyama Prasad Mukherjee Port in Jan 2020)

- **About the Port**
  - It is a riverine port located on the left bank of the Hugli River in West Bengal. It is the only riverine major port in the country.
  - It is the **oldest operating port** in India and was constructed by **British East India Company**.
    - Deposition of silt doesn't allow big ships to reach this port. So, the Diamond Harbour has been constructed in the open bay 64 km away from Kolkata.
    - The port has twin dock system viz., Kolkata Dock System on the eastern bank and a deep water dock at Haldia Dock Complex on the western bank of river Hooghly.
      - **Haldia dock complex** eases off the pressure on Kolkata Seaport. It is the harbor of those large sized ships which don't reach Kolkata.
  - In Jan 2020, on the occasion of **150th birth anniversary** celebration of the Kolkata Port Trust, it has been renamed after **Dr. Shyama Prasad Mukherjee**. This was approved by Cabinet in June 2020.

xiii. **Port Blair Port**

- Under the Indian Port Act, 1908, GoI declared Port Blair port as major port in 2010.
  - All major provisions of the Major Port Trusts Act, 1963 has become applicable to the major Port Blair from 1 June 2010.
- The port is of **strategic importance** for India and is located close to **two international shipping lines**, namely Saudi Arabia-Singapore and US-Singapore.
- But **lack of traffic** may soon become a reason for government taking away the major port tag.



# TARGET PRELIMS 2024

## BOOKLET-47; POLITY-1

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## 2. FUNDAMENTAL RIGHTS

### 1) EWS RESERVATION

- The **103rd Constitutional (Amendment) act** amended the constitution to provide economic backwardness as a ground for reservation.
  - » Article 15(6) has been added which empowers the state to make any special provision for advancement of EWS and to provide reservation to EWS for admissions to education institutions (other than minority educational institutions mentioned in Article 30(1))
  - » Article 16(6) empowers the state to provide reservation to people from EWS in government jobs.
  - » Both these kinds of reservation are capped at 10% and can't be claimed by people who are getting reservation benefits under other clauses of Article 15 and Article 16.

### A) SUPREME COURT VERDICT: JANHIT ABHIYAN V. UNION OF INDIA, 2022

- **Background:** In Aug 2020, a batch of petitions challenging the 103rd Constitutional Amendment Act was referred to a **five judge Constitutional Bench**.
  - » The SC has agreed that the case involved at least **three substantial questions of law**:
    - i. Economic criteria alone can't be the basis to determine backwardness.
    - ii. The EWS quota exceeds the ceiling cap of 50% set by the Court.
    - iii. The Rights of unaided private institutions (to run their trade freely)
- In Nov 2022 A Constitutional Bench of the Supreme Court, in a 3:2 majority decision, upheld the Constitutional Validity of EWS Reservation:
  - » **Ques:** Whether reservation on the sole basis of economic criteria violated basic structure of the Constitution?
    - The three judges (Justice Maheshwari, Justice Bela Trivedi, Justice Pardiwala) in majority held that the "legislature didn't violate the Basic Structure of the Constitution".
      - Justice Maheshwari took an expansive view that reservation was an "instrument of affirmative action by the state" and shouldn't be confined to SCs, STs, SEBCs, but also include "any class or sections so disadvantaged as to answer the description of 'weaker section'"
      - Justice Bela Trivedi in her separate but concurring opinion upheld the amendment based on presumption that "the legislature understands and appreciates the needs of its own people".
  - » **Ques:** Does 10% EWS quota breach the ceiling of 50% on reservation
    - The Majority verdict held that the 50% formed by the Supreme Court in the Indira Sawhney judgment in 1992 was "not inflexible". Further, it applied only to SC/ST/SEBC/OBC communities and not to general category.
  - » **Ques:** Can private (unaided) colleges be forced to have EWS quota?
    - Only Justice Maheshwari's opinion, part of the majority view, engaged with this issue to some extent. It said "Unaided private institutions, including those imparting

professional education, cannot be seen as standing out of the national mainstream.  
Thus, reservations as a concept cannot be ruled out in private institutions where  
education is imparted"

- Judges have unanimously agreed to this.

## B) SUPREME COURT DISMISSES REVIEW PETITION (MAY 2023)

- The Supreme Court dismissed the review petitions filed against its judgement upholding the validity of 103rd Constitutional Amendment that introduces 10% reservation for the EWS.
  - The SC held "Having perused the review petitions, there is no error apparent on the face of the record. No case for review under Order XLVII Rule 1 of the Supreme Court Rules 2013. The review petitions are, therefore, dismissed".

## 2) RIGHT TO FREEDOM OF SPEECH AND CRIMINAL DEFAMATION

- **Why in news?**
  - » Supreme Court stays Rahul Gandhi's conviction in 'Modi surname' remark criminal defamation case (Aug 2023)
    - Earlier in July 2023, the Gujarat High Court dismissed Rahul Gandhi's plea against his conviction in defamation case. In March 2023, a Surat magistrate court sentenced Congress leader Rahul Gandhi to two years' simple imprisonment for criminal defamation, in a case filed by BJP leader Purnesh Modi.
    - The case relates to Mr. Gandhi's remark while campaigning for the 2019 Lok Sabha poll in Karnataka. The High Court upheld the Surat Session Court's ruling in which Mr. Gandhi's plea seeking a stay on his conviction was rejected.
- **In India**, defamation falls under **both civil and criminal offence**.
  - » **Civil Defamation** is covered under the Law of Torts where a person who is defamed can move to the court and seek compensation.
  - » **Criminal Defamation** is covered by Sections 499 and 500 of IPC.
    - Section 499 criminalizes speech that is intended to mar the reputation of any person. Section 500 details the punishment for defamation, making a person liable for imprisonment up to two years (with or without a fine).
- **Supreme Court in Subramaniam Swamy vs Union of India, 2016 upheld the constitutional validity of the penal law on defamation (Section 499 and 500 of IPC)**
  - » The court did not agree with the contentions that criminalizing defamation attacks freedom of speech and expression guaranteed under Article 19 (1) of the constitution.
  - » It said that the Freedom of Speech and Expression is not absolute and Reputation of one can't be allowed to be crucified at the altar of the other's right of free speech.
  - » The court also said " **a free press is the heart and soul of political intercourse and is a public educator, but this freedom is not absolute and cannot be used by the media to cause injury to an individual's precious reputation**".
  - » The court also held that criminal defamation law protected the feeling of fraternity - or solidarity - between members of society.

- But various legal experts find a number of problems with the law
  1. The defamation provisions stifle Freedom of Speech and Expression in many ways by powerful and strong (especially that of weaker section and press)
  2. Misused by government/large corporations/ Politicians to stifle any kind of opposition and criticism by journalists and critics.
  3. Other countries have abolished/weakened it.
    - USA, Canada and South Africa have weakened the criminal defamation and UK has completely abolished the law to give more protection to freedom of speech and expression.

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#### **A) RAHUL GANDHI CASE: SUPREME COURT STAYS RAHUL GANDHI'S CONVICTION IN 'MODI SURNAME' REMARK HE ALLEGEDLY MADE DURING A POLITICAL RALLY IN 2019.**

- The Apex Court pointed out that Gujarat Trial judge, failed to give even a single reason for serving the Congress leader with maximum sentence of two years' imprisonment.
  - Court also said that Mr. Gandhi's alleged remarks, if made, were "not in good taste".
- 

#### **B) MOBASHAR JAWED AKBAR VS PRIYA RAMANI**

- In Feb 2021, in the **Mobashar Jawed Akbar vs. Priya Ramani** a district court in Delhi, dismissed the criminal defamation case against Priya Ramani and acquitted her from all charges.
  - » Ms Ramani premised her defence on the First Exception to Section 499 which postulates that "It is not defamation to impute anything which is true concerning any person, if it be for the public good that the exception should be made or published".
  - » Ms Ramani also pleaded truth as her defence, made in good faith, in public interest, and for public good. She also contended that the complainant is not a man of stellar good and impeccable reputation, and the accused didn't defame him by publishing the tweets and articles.
  - » The court accepted the defence of the accused that she disclosed the truth regarding the incident of sexual harassment against her on the basis of testimony of two witnesses (Niloufer Venkatraman and Ghazala Wahab)

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#### **C) DEFAMATION PROVISIONS UNDER THE BHARTIYA NYAYA SANHITA, 2023:**

- **Section 356:**
  - (1) Whoever, by words either spoken or intended to be read, or by signs or by visible representations, makes or publishes in any manner, any imputation concerning any person intending to harm, or knowing or having reason to believe that such imputation will harm, the reputation of such person, is said, except in the cases hereinafter excepted, to defame that person.
  - **Explanation 1:** It may amount to defamation to impute anything to a deceased person if the imputation would harm the reputation of that person if living and is intended to be hurtful to the feelings of his family or other near relatives.
  - **Explanation 2:** It may amount to defamation to make an imputation concerning a company or an association or collection of persons as such.
  - **Explanation 3:** An imputation in the form of an alternative or expressed ironically, may amount to defamation.

- **Explanation 4:** No imputation is said to harm a person's reputation, unless that imputation directly or indirectly, in the estimation of others, lowers the moral or intellectual character of that person, or lowers the character of that person in respect of his caste or of his calling, or lowers the credit of that person, or causes it to be believed that the body of that person is in a loathsome state, or in a state generally considered as disgraceful.

### 3) HATE SPEECH

- **Introduction:**
  - Hate Speech refers to any form communication (written, oral or otherwise) that expresses hostility, prejudice or violence towards individuals or groups based on attributes such as their race, ethnicity, religion, gender, sexual orientation etc. It often seeks to demean, dehumanize, or marginalize the targeted individuals or groups, and it can contribute to fostering a hostile or discriminatory environment.
- **Legal Provisions for Hate Speech:**
  - » India doesn't have a formal legal framework for dealing with hate speech.
  - » Several provisions of IPC can be invoked. These are primarily laws to deal with offences against religion. These include:
    - **Section 153A:** It penalizes promoting enmity between different groups on grounds on religion, race, place of birth, residence, language etc.
    - **Section 153B:** imputations, assertions prejudicial to national integration
    - **Section 295A:** It defines and prescribes punishment for deliberate and malicious acts, intended to outrage religious feelings of any class by insulting its religion or religious beliefs.
    - The chapter include other provisions also:
      - **Section 295:** Penalize damage or defilement of a place of worship with intent to insult the religion.
      - **Section 296, 297 and 298** also deal with religious issues.
  - » **Representation of People's Act, 1951:**
    - A person convicted under Section:
      - 153A of IPC;
      - Protection of Civil Rights Act, 1955 (preaching untouchability)
    - Is disqualified from being a MP/MLA
  - » **Religious Institutions (Prevention of Misuse) Act, 1988:**
    - Section 3(g) prohibits religious institutions or their managers from using religious premises to promote disharmony or hatred among various religious groups.

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#### A) BHARTIYA NYAYA SANHITA, 2023:

- » **Section 196:** It penalizes - Promoting enmity between different groups on grounds of religion, race, place of birth, residence, language, etc., and doing acts prejudicial to maintenance of harmony.

- » **Section 299:** Whoever, with the intention of wounding the feelings of any person, or of insulting the religion of any person, commits any tress pass in any place of worship or on any place of sculpture, or any place set apart for the performance of funeral rites etc. shall be punishable with imprisonment of either description for a term which may extend to one year, or with fine, or with both.
- » **Section 353(1) and 353(2):** In penalizes publication or circulation of any statement, false information, rumor, report etc. with intention of causing
  - 353(1):
    - (a): mutiny in security forces;
    - (b): fear or alarm to the public, or to any section of public whereby any person may be induced to commit an offence against the state or against the public tranquility.
    - (c): Inciting a community of persons to commit any offence against any other class or community.
  - 353(2): Feeling of enmity, hatred, ill will between different religious, racial, language or regional groups or castes or communities.

## B) SUPREME COURT VERDICT (AUG 2023)

- Supreme Court advocated for 'practical and effective' steps to deal with the problem of hate speech so that its earlier decisions are followed both in letter and spirit.
  - It sought responses from the state government, on the status of their compliance with the Tehseen Poonawalla guidelines requiring the establishment of district level officers.

## 4) SECTION 66A OF THE INFORMATION TECHNOLOGY ACT AND SHREYA SINGHAL JUDGEMENT

- **What was Section 66A of the IT Act?**
  - » Section 66A was a provision under IT Act, 2000 which was introduced by an amendment in 2008.
    - It gave the government power to arrest and imprison an individual for allegedly "offensive and menacing" online posts.
    - It empowered police to make arrests over what policemen, in terms of their subjective discretion, could construe, as "offensive" or "menacing" or for the purposes of causing annoyance, inconvenience, etc.
- **Did Section 66A curb or safeguard the social media?**
  - » The law prescribed 3-year jail for anyone causing "annoyance and inconvenience" on the social media. But annoyance and inconvenience are very subjective. Further, subjectivity of cyber cell of police as questionable. Moreover, it encroached upon the freedom of expression (specifically, freedom of expressing political dissent).
- **Supreme Court in Shreya Singhal vs Union of India quashed the Section 66A of the IT Act, 2000, for being violative of Article 19(1)(a) and not saved under Article 19(2)**
  - » **Background:**
    - A petition came up in the court following the arrest of two girls in Maharashtra by Thane Police in November 2012 over a Facebook post. The girls had made comments on the shutdown of Mumbai for the funeral of Shivsena chief Bal Thackeray. The arrests

triggered outrage from all quarters over the manner in which the cyber law was used. The petition was filed by Shreya Singhal, then a 21-year-old law student.

» **Supreme Court Verdict:**

- **Section 66A is unconstitutional** for being violative of Article 19(1)(a) and not saved under Article 19(2).
  - These provisions were vague and had a chilling effect on the Constitutional Mandate.
  - It is cast so widely that virtually any opinion on any subject would be covered by it, And if it is to withstand the test of constitutionality, the chilling effect on free speech would be total.
- **Marketplace of idea doctrine** - "the truth will emerge from competition of ideas in free, transparent, public discourse and concludes that ideas and ideologies will be culled according to their superiority or inferiority and widespread acceptance among population."
- **The judgement** was considered a landmark judicial pushback against state encroachment on the freedom of speech and expression.
- **Supreme Court Verdict on the issue of continuous use of Section 66A of the IT Act (Oct 2022)**
  - **Background:** A write petition was filed by the NGO People Union for Civil Liberties (PUCL) which highlighted the issue of section 66A of IT Act being invoked despite the judgment in Shreya Singhal vs. UOI (2015).
  - **Supreme Court verdict:**
    - No one should be prosecuted under the section 66A of the IT Act.
    - Directions were issued to DGPs and Home Secretaries of all states to ensure that reference to section 66A is removed from all pending cases.
    - Bare Acts of IT Act published should adequately inform the readers that section 66A has been invalidated.

## 5) RIGHT TO PRIVACY

- **Evolution of Right to Privacy as a fundamental Right in India:**
  - Constitution of India, upon its adoption in 1950, didn't explicitly mention the right to privacy. However, the framers of the Constitution envisioned a holistic protection of individual rights under Article 21, which guarantees right to life and personal liberty. Over time, this broad provision became foundation for the development of right to privacy jurisprudence.
  - **MP Sharma case, 1954**
    - In this case, the SC had held that the Constitution of India didn't explicitly include the Right to Privacy as a fundamental right. It stated that the concept of privacy was not well-defined in Indian law, and therefore, it couldn't be invoked to challenge the validity of government action.
- **Kharak Singh Case, 1962**

- This case marked the first explicit reference to Right to Privacy by the Supreme Court. Though it recognized right to privacy as an essential element of personal liberty, it didn't rule on the constitutionality of surveillance.
- **Maneka Gandhi Case, 1978**
  - Though this case was not about Right to Privacy, it broadened the scope of Article 21 and held that personal liberty included more than just physical liberty. This laid foundation for the judicial interpretation of privacy in subsequent cases.
- **PUCL v. Union of India (1997)**
  - Here, the SC held that telephone tapping infringed upon an individual's right to privacy unless authorized by law and necessary in a domestic society.
  - This case established the principle that privacy is a fundamental right inherent in Article 21.
- **Justice K.S. Puttaswamy (Retd.) v. Union of India (2007)**: This landmark judgment marked the watershed moment in the evolution of right to privacy. The SC recognized privacy as a fundamental right under Article 21 and Article 19, with an individual's autonomy, personal dignity, and informational self-determination as integral aspect of privacy.

#### A) JUSTICE KS PUTTASWAMY VS UNION OF INDIA

- In **Justice K.S. Puttaswamy vs Union of India** case, a 9 judge constitutional bench, on 24th Aug 2017, unanimously affirmed that the Right to Privacy is a fundamental right under the Indian Constitution.
- **Key Highlights of the judgment**
  - The decision in **MP Sharma case (1955)** and **Kharak Singh Case (1962)** which held that right to privacy is not protected by the Constitution stands over-ruled.
  - **The right to privacy is protected as an intrinsic part of the right to life and personal liberty under Article 21 and as part of the freedoms guaranteed by Part III of the constitution.**
    - » The court agreed that Privacy is a fundamental right and have provided an all-encompassing interpretation. All nine judges agreed that privacy was at the heart of individual self-determination, of dignity, autonomy, and liberty. It is inseparable from the meaningful exercise of other guaranteed freedoms such as speech, association, movement, personal liberty, and freedom of conscience.
  - **Right to Privacy is however not an absolute right.**
    - » It is a qualified right subject to national security, public interest, and other reasonable restrictions.
    - » But it may be **restricted only by state action that passes each of the three tests:**
      1. **First**, such state action must have legislative mandate.
      2. **Second**, it must be pursuing a legitimate state purpose.
      3. **Third**, it must be proportionate i.e., such state action - both in its nature and extent, must be necessary in a democratic society and the action ought to be the least intrusive of the available alternatives to accomplish the ends.

- » The courts will conduct as case-by-case analysis to determine the scope of this right to privacy.

## B) OTHER JUDGEMENTS WHICH EMANATED DUE TO PUTTASWAMY JUDGMENT

- A number of landmark judgments since Puttaswamy have referred to this judgment:
  - » **Navtej Singh Johar vs Union of India** -> Decriminalized homosexuality
    - The judgement was built in part upon the **autonomy doctrine** of personal choice from the privacy doctrine
  - » **Joseph Shine v. Union of India** -> Decriminalized Adultery
  - » **Shafin Jahan v. Ashokan KM** -> Restrained the courts from dictating the choice of an adult women to choose her partner.

## 6) DIGITAL PERSONAL DATA PROTECTION ACT, 2023

- **Why in news?**
  - The Digital Personal Data Protection Bill, 2023 passed in both Lok Sabha and Rajya Sabha (Aug 2023)
- **Need of a Personal Data Protection Law**
  - National Security**
  - Preventing Misuse of Data**
  - Protecting Fundamental Rights of Citizens:** Ensuring Right to Privacy which is a fundamental right (**KS Puttaswamy judgement**)
  - Strengthening of bargaining powers of Data Principals**
  - Absence of Institutional Framework** for data privacy and security. For e.g. there was a lack of independent supervisory authority such as privacy commissioner that individuals may approach in case of noncompliance.
  - Right to Forget** is increasingly being considered an integral part of right to privacy, but this is not available in India yet.
- **Key Provision of the Act:**
  - Definitions:**
    - Personal Data** is defined as any data about an individual who is identifiable by or in relation to such data.
    - Processing** has been defined as wholly or partially automated operation or set of operations performed on digital personal data.
  - Unlike the 2019 bill, this act narrows the scope of the data protection regime to personal data protection.**
    - It will apply to the processing of digital personal data within India where such data is collected online, or collected offline and is digitized. It will also apply to such processing outside India if it is for offering goods and services in India.
  - Consent:** Personal Data may be processed only for a lawful purpose upon consent of an individual.

- Consent may not be required for specified legitimate uses such as voluntary sharing of data by the individual or processing by the state for permits, licenses, benefits and services.
- iv. **Special Protection to Children:** The act places three conditions on data processing entities for children's data:
  - Obtaining Verifiable consent; Not causing harm to children; and no tracking or monitoring children or targeting ads to them.
- v. **Rights and Duties of Data Principal:**
  - Right to obtain information about processing, seek correction and erasure; Nominate other person to exercise rights in the event of death or incapacity; grievance redressal.
  - Duties include not registering false complaints; not furnishing false info or impersonate other person.
  - Violation of duties will be punishable.
- vi. **Obligation of Data Fiduciaries:** Data Fiduciaries are required to maintain the accuracy of data, keep data secure, and delete data once its purpose has been met; inform data principal and data protection board in case of a breach.
- vii. **Concession to Cross Border Data flow:** The bill allows transfer of personal data outside India, except to countries restricted by the Central government through notification.
- viii. **Exemptions:** Central government may exempt government agencies from the provisions in the interest of security of state, public order, and prevention of offences.
  - Personal data which is processed for research, archiving, or statistical purpose will also be exempted under clause 17(2)(b).
- ix. **Data Protection Board of India** - To be established by central government to adjudicate on non-compliance with the provision of the bill.
  - The members will be appointed for a period of 2 years and can be reappointed.
- x. **Amendment to IT Act, 2000** to remove clause for obligation on corporates to award damages to affect persons in case of negligent handling of sensitive data.
- xi. **Amendment to RTI Act, 2005** to protect the personal information from disclosure.
  - Section 44(3) of the bill amends section 8(1)(j) of the RTI Act, which will have the effect of totally exempting personal information from disclosure.

## 7) PERSONALITY RIGHTS

- **Why in news?**
  - » Delhi High Court protects Anil Kapoor's Personality Rights (Sep 2023)
- **What is a personality right?**

- » 'Personality Rights refer to the right of a person to protect his/her personality under the right to privacy or property. The personality may include name, images, voice, signature, or any other feature which is easily identifiable by the public.
  - This personality may be inappropriately used in commercials by various businesses to increase sales. Therefore, to protect their personality rights, famous people and celebrities take legal recourse in a court of law.
  - Many celebrities may register some aspects as a trademark to use them commercially. For e.g., Usain Bolt's 'bolting' or lighting pose is a registered trademark.
  
- **How is Personality rights protected in India?**
  - » Personality Rights or their protection are not directly expressed in the Constitution of India or any of the laws, the Indian Courts have sought to derive the same from Article 19(1)(a) and Article 21 of the Indian Constitution and the Right to Property.
    - Many concepts in Intellectual Property Rights used in protection of trademarks such as passing off, deception etc can be applied while deciding whether a celebrity deserves to be protected through an injunction.
  
- **Important Court Verdicts in India:**
  - » **Anil Kapoor vs Simply Life India & Ors, 2023**
    - Anil Kapoor had moved to the Delhi High Court in a civil suit seeking protection of his personality - his name, photograph, manner of speaking, gestures, etc. He also claimed protection of his copyright in a dialogue and in the image and other associated work.
    - Kapoor's lawyer, IP Right specialists, Praveen Anand argued that several defendants had misappropriated Kapoor's name and elements of his persona to earn profits.
    - The Delhi High Court passed granted ex-parte, omnibus injunction restraining 16 entities from using Kapoor's name, likeness, image, using technological tools like AI, face morphing, and even GIFs for monetary gain or commercial use.
      - **Note:** An ex-parte injunction is when relief is granted to a party without hearing the other side. An omnibus injunction granted against any unauthorized use- even those that are not mentioned in the plea.
  
  - » **Amitabh Bachchan Case vs Rajan Negi 2022**
    - Delhi High Court injunctioned the use of personality rights including "unique style of addressing computer as' Computer Ji' and lock kiya jaye.
    - **The High Court had relied on a 2012 verdict: Titan Industries Ltd. V. Ramakumar Jewelers, 2012:**
      - » In this case the defendant unlawfully exploited the photograph of Indian actor Mr. Amitabh Bachchan and his wife, Ms. Jaya Bachchan, taken specifically for use in endorsing plaintiff's jewellery product.
      - » The Delhi High Court granted a permanent injunction against the defendant. It also observed that "a renowned person's name can be used in advertisements for business purpose, but only with the person's consent and approval".
      - » The court also defined 'celebrity' as a "a famous or a well-known person and is merely a person who "many" people talk about or know about".
      - » The court also held that "the right to control commercial use of human identity is the right to publicity".

- » **Shivaji Rao Gaikwad v. Varsha Production, 2015:** In this case the Madras High Court was dealing with a case that was filed by the reputed Indian actor Mr. Rajnikanth.
  - In this case the famous actor Rajnikanth had filed lawsuit against the producer of the movie "Main Hoon Rajnikanth" claiming that his name, image, style of delivering dialogue had infringed his personality rights.
  - The court observed that 'personality rights vests on those persons, who have attained the status of celebrity'. It said that from the title of the movie, the public viewing the movie would identify it with only the actor alone.
- » **Note:** Despite corporate bodies being viewed as legal persons by the legal system, the personality or publicity rights are specific to and applicable solely to "individuals" and not to corporate organizations.

## 8) PREVENTIVE DETENTION

- **What is Preventive Detention?**
  - Preventive detention is the arrest of a person to "prevent" a crime from happening i.e. there is a strong suspicion/probability that the arrested person if allowed to remain free would get involved in some illegal activities.
- **History of Preventive Detention Laws in the country**
  - Bengal Regulation III of 1818 -> empowered government to arrest anyone for defence or maintenance of public order without giving the person recourse to judicial proceedings
  - Rowlatt Acts of 1919 -> allowed confinement of suspect without trial.
  - Preventive Detention Act of 1950 - Expired on Dec 31, 1969
  - Maintenance of Internal Security Act (MISA) in 1971 -> repealed in 1977 by the Janta Party government.
  - National Security Act, 1980 -> brought by Indira Gandhi government when she came back to power.
- **Constitutional Provisions regarding Preventive Detention in India**
  - **Article 22(4)-22(7)** deals with cases of **preventive detention** here certain safeguards/rights have been provided to person getting detained under Preventive Detention Laws. These safeguards are available to **both Citizens and Aliens**.
    - » **(22(4)):** No person can be detained for a period more than 3 months (reduced to 2 months by 44th amendment, but not notified yet) unless
      - a. An advisory Board consisting of persons who are, or have been, or are qualified to be appointed as, Judges of a High Court has reported before the expiration of the said period of three months that there is sufficient cause for such detention.
        - Nothing in the above sub-clause shall authorize detention beyond maximum period prescribed by parliament under sub clause (b) of clause (7)
    - » **(22(5))** provides for communication of grounds on which detention order has been made and affording earliest opportunity of making representation against order.
    - » **(22(6))** Nothing in clause (5) shall cause the disclosure of facts which the authority considers to be against the public interest to disclose.
    - » **(22(7))** provides that Parliament may by law provide for

- a. The circumstances under which, and the classes of cases in which a person may be detained for a period longer than three months under any law providing for preventive detention without obtaining the opinion of an Advisory Board.
- b. The maximum period for which any person may in any class or classes of cases be detained under any law providing for preventive detention.
- c. Procedure to be followed by an advisory board in an enquiry.

- **Other Constitutional Provisions**

» Division of legislative powers

- The parliament has exclusive power to make laws of preventive detention on the subjects of defence, foreign relations and security of India.
- Both Parliament and State legislatures can concurrently make a law of preventive detention on subject of security of state, maintenance of public order and the maintenance of supplies essential to the community.

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## C) NATIONAL SECURITY ACT, 1980

- **About the Act**

- » It is a law aimed at preventing crimes which may affect India's security and public order. The provision of the act allows for preventive detention which can be extended for months.
- » **The grounds for preventive detention under the Act include:**
  - i. Acting in a manner which is prejudicial to the defence and security of India or India's relations with foreign powers.
  - ii. Regulating the continued presence of foreigners in India or for making arrangements for their expulsion from India.
  - iii. Preventing them from acting in a manner prejudicial to the security of the state, public order, or maintenance of supplies and services essential for the community.
- » Preventive detention under NSA happens through administrative order passed by the Divisional Commissioner or the District Magistrate (DM) - and not detention ordered by police based on specific allegations or for a specific violation of law.
- » Under the NSA, an individual can be detained without charge for upto 12 months (advisory board made of high court judges have to approve detention beyond 3 months); the state government needs to be intimated that a person has been detained under the NSA.
  - The person can be detained under the NSA for upto 10 days without being told the charges against them.
  - » The detained person can appeal before the high court advisory board, but they are not allowed a lawyer during the trial.

- **Various Preventive Detention Laws under state governments**

- » Various state governments have their own Goondas Acts which provide for preventive detention for maintenance of public order, supply of essential commodities etc.

- **Criticism of the Preventive Detention laws** (violation of rights (human, constitutional and statutory); misuse; political tool; used regularly rather than in exceptional cases; violates separation of power; against the grain of fair trial; No Records with NCRB)

- **Arguments in support of Preventive Detention laws** (Necessary evil; reforms can reduce the misuse; Constitution allows reasonable restrictions on the ground of national security and public order)

- In July 2023, the Supreme Court emphasized on the importance of strictly adhering to procedural requirements in cases concerning preventive detention laws.
  - » The court recognized that "All laws on preventive detention are necessarily harsh. They curtail personal liberty of an individual, who is kept behind bars without any trial. In such cases, procedure is all a detenue has. Laws of preventive detention must therefore be strictly complied".

### 3. PLACES OF WORSHIP (SPECIAL PROVISIONS) ACT, 1991

- Why in news?
  - » A slew of petitions have been filed in the Supreme Court against the act, contending that the law has barred Hindus, Jains, Buddhists, and Sikhs, from approaching courts to "re-claim" their places of worship which were "invaded" and "encroached" upon by fundamentalist barbaric invaders".
- The act prohibits conversion of any place of worship and provides for maintenance of religious character of any place of worship as it existed on 15th Aug 1947.
  - » Section 3 of the act declares that no person shall convert any place of worship of any religious denomination into one of different religious denomination or sect.
  - » Section 4(1) provides that religious character of a place of worship shall continue to be the same as it was on 15th Aug, 1947.
  - » Section 4(2) provides that all pending suits, appeals or other proceedings regarding conversion of the character of a place of worship existing on 15th Aug 1947, will stand abated when the act commences, and no fresh proceedings shall be filed.
    - But legal proceedings can be initiated with respect to the conversion of the religious character of any place of worship if the change of status took place after 15th Aug 1947.
  - » Exemptions:
    - Section 4(3)(a) further exempts from the operation of the act, any place of worship which is an ancient and historical monument or an archeological site or remains covered by Ancient Monuments and Archeological Sites and Remains Act, 1958.
    - The act will also not apply to any suit that has been finally settled or disposed of, any dispute that has been settled by the parties before the 1991 Act came into force, or to conversion of any place that took place by acquiescence.
    - Section 5 of the Act particularly exempts the Ram Janmabhoomi from its application.
- Ayodhya Judgment, 2019:
  - » A five-judge bench of the Supreme Court had found that the 1991 Act spoke to our history and to the future of the nation... In preserving the character of places of public worship, the Parliament has mandated in no uncertain terms that history and its wrong shall not be used as instruments to oppress the present and the future.
  - » But, in an Oct 2022 hearing, Solicitor General Tushar Mehta, who appeared for the government, had however, ventured his personal opinion that the remarks made in the Ayodhya Judgment about the 1991 act wouldn't preclude the court from examining the validity of the statute now.

- **Supreme Court in July 2023:**
  - » The Supreme Court gave the Centre "sufficient time" till 31st Oct to clarify its stand on the validity of the Places of Worship Act.
    - Solicitor General Tushar Mehta had said that the government required "a little more time to make its mind about the law. Earlier in 2022 and 2023 also government took a similar stance of seeking more time to make up its mind.
- **Analysis:** Arguments supporting the act:
  - » Prevent future communal tensions.
- **Various Grounds on which act is being challenged:**
  - a. The act creates a statutory bar against judicial remedy:
    - The act legitimizes historical forcible occupation of places of worship.
  - b. Abatement of Pending Proceedings:
    - Not only does the act obstructs aggrieved persons/ communities from taking recourse to legal remedies, it goes a step ahead by taking away pre-existing rights/ remedies of persons, who had already taken legal recourse to the injustice caused to them.
  - c. Arbitrary and Irrational Cut-off date:
    - The petitioners have argued that destruction/occupation of their religious places of worship has taken place over a period of centuries, which has no nexus with the cut-off date of Aug 15, 1947.
  - d. Discrimination Qua Exception:
    - The law is violative of Article 14, as it put worshipper of one deity (Lord Rama) on a higher pedestal than other Hindus who worship other deities.
  - e. "Pilgrimages, other than pilgrimages to places outside India" is mentioned in the state list.

#### A) GYANVAPI MOSQUE CASE

- A suit was filed in 2022 in the Varanasi district court by a group of Hindu women worshippers seeking to assert their right to worship deities they claim are still found on the premises of the Gyanvapi mosque.
  - » The plaintiffs say that they have a right to worship Ma Sringar Gauri, Ganesh, Hanuman, and other "visible and invisible" deities.
- Another batch of suits filed in 1991 seeking a declaration that a part of the site of the Gyanvapi mosque belongs to Lord Vishweshwar.
  - » The main basis for the suits is that the Hindu side says that an old temple of Lord Vishweshwar lies at the centre of the Gyanvapi compound. The site, they contend, is the abode of the 'self-manifested' deity since time immemorial. They claim that the temple was demolished on the orders of Aurangzeb in 1669.
- **Courts:**
  - » So far, court orders have favoured the position that these suits are not barred by the Places of Worship Act.
    - On the district court's order, the ASI has conducted a survey of the premises.
    - The ASI report, submitted to the Varanasi District Court, claims that a temple existed there prior to the construction of the mosque. Subsequently, the court has allowed the conduct of Hindu prayers at a cellar on the premises. The order allowing Hindu prayers

has been questioned by the Anjuman Intezamia Masjid Committee, which administers the Gyanvapi mosque.

## B) SHAHI IDGAH OF MATHURA

- The suits in Mathura pertains to the Shahi Idgah mosque that stands adjacent to the Krishna Janmabhoomi Temple there. The suits claims that the mosque was built over the birthplace of Lord Krishna. The mosque committee denies the allegation.
  - The dispute was settled through a compromise between the Sri Krishna Janmasthan Seva Sansthan and the Shahi Idgah Trust in 1968 and implemented through a decree in 1974. As part of the settlement the Sansthan had given up a portion of the land to Idgah.
- The current suits challenge this compromise as 'fraudulent' and seek the transfer of the entire parcel of land to the deity.
- The Allahabad High Court has transferred to itself all suits pertaining to the Mathura dispute.

## C) WHY HAS THE PLACES OF WORSHIP (SPECIAL PROVISIONS) ACT, 1991 NOT BARRED SUITS ON GYANVAPI AND SHAHI IDGAH

- In both the disputes, the respective mosque committees had opposed the suits using the provisions of Places of Worship (Special Provisions) Act, 1991. However, the court orders so far say the Act doesn't bar these suits and that they must go on.
- In the Gyanvapi case, the ruling is that the suits aimed to assert the right of worship of Hindu deities and didn't seek to convert the status of the mosque.
  - » Regarding the earlier batch of suits, the Allahabad High Court has taken the view that the Act doesn't define the term 'religious character'. A structure can't have the dual character of being both Hindu and Muslim, and that only an examination of evidence can determine its religious character. The act can't be an absolute bar on proceedings to ascertain its religious character.
- Regarding Mathura Dispute:
  - » The district court has taken the view that the suits are not barred by the Places of Worship Act, as what is under challenge is the compromise decree based on the 1968 agreement. As the decree was drawn up before the commencement of the 1991 act, it is not applicable in the case.

## 4. BHARTIYA NYAYA (SECOND) SANHITA, 2023 (BNS2)

- Why in news?
  - Bhartiya Nyaya Sanhita, 2023; Bhartiya Nagarik Suraksha Sanhita 2023; and Bhartiya Sakshya Adhiniyam, 2023 passed by both houses of the Parliament (2023)

- **Background: Indian Penal Code (IPC), 1860:** It is the principal law on criminal offence in India. It includes offences those affect:
  - (i) Human Body such as assault and murder.
  - (ii) Property such as extortion and theft.
  - (iii) Public Order such as unlawful assembly and rioting.
  - (iv) Public health, safety, decency, morality, and religion
  - (v) defamation
  - (vi) offences against state
  - **Over the years**, several new offences have been added. Courts have also decriminalized several offences such as homosexuality, adultery, attempt to suicide.
  - **Several states** have amended the IPC to provide different punishments for sexual offences, selling minors for prostitution, adulteration of food and drugs and sacrilege of religious texts.
- **Bhartiya Nyaya Sanhita (BNS)** was introduced on 11th Aug 2023. It was examined by the Standing Committee on Home Affairs. The BNS2 was introduced in Dec 2023 to incorporate some recommendations of the standing committee.
- **Bhartiya Nyaya (second) Sanhita, 2023 (BNS2, 2023): Key Highlights**
  - **Offences against body:**
    - The IPC criminalizes acts such as murder, abetment of suicide, assault, and causing grievous hurt.
    - **The BNS2 retains these provisions.** It adds new offences such as:
      - **Terrorism** is defined as an act that intends to threaten the unity, integrity, security or economic security of the country, or strike terror in the people.
        - Earlier, terrorism was covered under UAPA, 1967.
      - **Organized Crimes** includes crimes such as kidnapping, extortion, and cyber-crime committed on behalf of a crime syndicate. Petty organized crime is also an offence now.
        - So far, Organized crime is covered under state laws such as the **Maharashtra Control of Organized Crime Act, 1999 (MCOCA)**, and similar laws enacted by Karnataka, Gujarat, Uttar Pradesh, Haryana and Rajasthan.
        - **Significance:** Since the organized crimes may occur in all states, so addition of organized crime under BNS2 makes sense.
        - **Concerns:**
          - Duplication with several state laws.
          - Bhartiya Nagarika Suraksha (Second) Sanhita, 2023 (BNSS2) and Bhartiya Sakshya (Second) Sanhita (BSS2) don't provide for a separate criminal procedure for these offences.
            - **But, special laws like UAPA have several departures** from ordinary criminal procedure. The remove several safeguards such as condition of bail and the establishment of police confessions. NIA Act 2008 establishes special courts for terrorism cases.
            - **Under BNSS2**, case of terrorism will be tried in session courts. This will result in varying investigation and trial procedure for similar offences.

- **Mob Lynching:** The BNS2 adds murder or grievous hurt by five or more people on specified grounds, as an offence. These grounds include race, caste, sex, language, or personal belief.
  - **Sexual Offences against women:**
    - The IPC criminalizes acts such as rape, voyeurism, stalking, and insulting the modesty of a woman.
    - **BNS2 retains these provisions.** It increases the threshold for the victim to be classified as a major, in the case of a gangrape, from 16 to 18 years of age. It also criminalizes sexual intercourse with a woman by deceitful means or making false promises.
  - **Sedition is no more an offence.**
    - **BNS2 instead penalizes the following:**
      - (i) exciting or attempting to excite secession, armed rebellion, or subversive activities,
      - (ii) encouraging feelings of separatist activities, or
      - (iii) endangering the sovereignty or unity and integrity of India.
    - These offences may involve exchange of words or signs, electronic communication, or use of financial means.
  - **Rulings of the Supreme Court** have been incorporated and several offences have been omitted. It includes adultery, homosexuality etc. as offence.
  - It introduces **community service** as a form of Punishment in offences such as: (i) theft of property worth less than Rs 5,000, (ii) attempt to commit suicide with the intent to restrain a public servant, and (iii) appearing in a public place intoxicated and causing annoyance.
  - **Concern:** The BNS2 doesn't define what community service will entail and how it will be administered. The Standing committee had recommended defining the term and nature of 'community service'.
- **Key Issues:**
- a. **Age of Criminal Responsibility higher than several other jurisdictions:**
    - Under IPC, nothing is considered an offence if committed by a child below the age of 7 years. The age of criminal responsibility increases to 12 years, if the child is found to not have attained the ability to understand the nature and consequence of his conduct.
    - The BNS2 retains these provisions. This age is lower than the age of criminal responsibility in other countries (Germany: 14 years; England and Wales: 10 years; Scotland: 12 years). In 2007, a UN Committee recommended states to set the age of criminal responsibility to above 12 years.
  - b. **Age threshold of the victim for similar offences against children varies:**
    - For rape, the penalty is different based on whether the victim's age is below 12 years, between 12 and 16 years, or above. This is inconsistent with POCSO, 2012, which classifies all individuals below the age of 18 as minor.
    - Under BNS2, age threshold of the victim for certain offences against children is not 18 years.
      - For e.g. Kidnapping or abducting a child with the intent to steal from a parent applies only to a child under 10 years.

- It means that if a child of age 11 years or above is kidnapped, it would be treated as kidnapping of adult.

c. **Duplication of offences with other special laws:**

- This overlap may cause additional compliance burden and costs. It may also lead to multiple laws providing varying penalties for the same offences; it may also lead to multiple regulatory regimes.

BNS2	Special Law
<b><i>Adulteration of food or drink for sale</i></b>	
Imprisonment up to 6 months, fine up to Rs 5,000, or both.  Non-Cognizable, bailable. (IPC Sec. 272, 273; BNS2 Clause 274, 275)	<b>The Food Safety and Security Act, 2006:</b> Imprisonment up to life, and a fine up to Rs 10 lakh for manufacture, storage, sale of unsafe food. Sentence proportionate to damage caused. (Sec. 59)
<b><i>Adulteration of drugs, and sale of adulterated drugs</i></b>	
Adulteration penalised with imprisonment up to a year, fine up to Rs 5,000, or both.  Sale of adulterated drugs penalised with imprisonment up to 6 months, fine up to Rs 5,000 or both.  Non-Cognizable, bailable. (IPC Sec. 274, 275; BNS2 Clause 276, 277)	<b>The Drugs and Cosmetics Act, 1940:</b> Consumption of adulterated drugs causing death or grievous hurt penalised with imprisonment between 10 years and life, and fine of at least Rs 10 lakh, or 3 times the value of the seized drugs, whichever is higher.  In other cases, penalty is imprisonment of 3-5 years, and fine of at least Rs 1 lakh, or 3 times the value of the seized drugs, whichever is more. (Sec. 27)
<b><i>Unlawful compulsory labour</i></b>	
Imprisonment up to one year, fine, or both.  Cognizable, Bailable. (IPC Sec. 374; BNS2 Clause 146)	<b>The Bonded Labour System (Abolition) Act, 1976:</b> Imprisonment up to 3 years and fine up to Rs 2,000. (Sec. 16, 17, 18).
<b><i>Abandoning a child</i></b>	
Parent or guardian abandoning a child below the age of 12 is punishable with imprisonment up to 7 years, fine, or both.  Cognizable, bailable. (IPC Sec. 317; BNS2 Clause 93)	<b>The Juvenile Justice Act, 2015:</b> Abandoning or procuring a child for abandonment is punishable with imprisonment up to 3 years, fine up to Rs 1 lakh, or both. Biological parents abandoning a child due to circumstances beyond their control are exempt. (Sec. 75)

Punishable with imprisonment up to 6 months, fine up to Rs 1,000 or both.

Cognizable, bailable, non-compoundable. (*IPC Sec 279; BNS2 Clause 281*)

**The Motor Vehicles Act, 1988:** Punishment for first offence: imprisonment up to 6 months, and/or fine up to Rs 5,000.

Subsequent offence within three years: imprisonment up to 2 years and/or a fine up to Rs 10,000. Cognizable, bailable, compoundable. (*Sec. 184*)

d. **Penalty for a crime by member of a gang differs from that of an individual**

- The BNS2 defines **petty organized crime** as an offence. It includes: vehicle theft, pick-pocketing, selling of public examination papers, any other similar criminal acts. To qualify as petty organized crime such offence must be committed by members of a group or gang. This offence is penalized with imprisonment of one to 7 years, and a fine.
- **But, the penalty creates a distinction between the offence committed by a member of a gang and a person committing an offence on his own.**
  - For e.g., the penalty for a theft is upto 3 years imprisonment, whereas if the same is committed by a gang or group, the penalty is between 1 to 7 years of imprisonment.

e. **In the offence of Rape, several recommendations made by Justice Verma Committee and Supreme Court** has been ignored

f. **BNS2 retains the provisions for Solitary confinement** for offences that are penalized with rigorous imprisonment. Such offences include criminal conspiracy, sexual harassment, kidnapping or abducting to murder. The BNS2 retains these provisions.

- **But, Supreme Court** (1979) has held that measures such as pushing prisoners into solitary confinement deprives them of their right to life and liberty under Article 21.
- **In 1971**, even Law Commission of India recommended removing solitary confinement from the IPC.

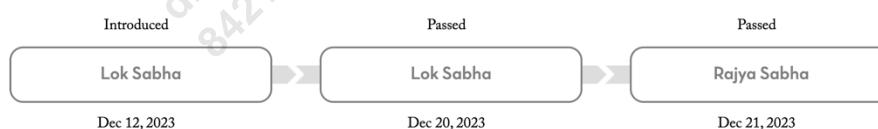
g. **Some Drafting Issues:**

- For e.g. BNS2 doesn't retain section 377. This implies that rape of an adult man will not be an offence under any law, neither will having intercourse with an animal. The standing committee of Home Affairs (2023) has recommended re-introducing this provision.

## 5. BHARTIYA NAGRIK SURAKSHA (SECOND) SANHITA, 2023 (BNSS2, 2023)

- **Why in news?**

Ministry: Home Affairs



- **Background:**

- The Code of Criminal Procedure, 1973 (CrPC) is a procedural law established for the administration of the Indian Penal Code (IPC). It governs the procedure for investigation, arrest, prosecution, and bail for offences.
- CrPC was first brought in 1861 to address the problem of multiplicity of legal system in India. The existing CrPC was introduced in 1973 to replace the previous one. It introduced the concept

of anticipatory bail. It was amended in 2005 to add changes such as provisions for plea bargaining and rights of arrested persons.

- **CrPC governs the procedural aspects of criminal justice in India.** The key features include:
  - **Separation of Offences:** The CrPC classifies offences into **two categories**:
    1. **Cognizable offences** are those in which police can arrest and initiate an investigation without a warrant.
    2. **Non-Cognizable** offences require a warrant and, in some cases, a complaint by the victim or a third party.
  - **Nature of Offence:** CrPC dealt with various types of offence including traffic violation to murder.
  - **Bailable and non-bailable offence:** Bailable offence are those in which the accused has the right to bail from police custody.
- **The BNSS, 2023** was introduced in Lok Sabha in Aug 2023. The bill was examined by the Standing Committee on Home Affairs. **BNSS2** was introduced in Dec 2023 after incorporating some recommendations of the committee.
- **The BNSS2 retains most of the provisions of CrPC:** Key changes proposed include:
  - » **Detention of Undertrials:**
    - **CrPC** says that if an accused has spent half of his maximum period of imprisonment in detention, he must be released on personal bond. This doesn't apply to offences punishable by death.
      - **The BNSS2** retains the above provision and adds:
        - **First time offenders**, get bail after serving one-third of the maximum sentence.
      - **The BNSS2** also adds that provisions will also not apply to:
        - (i) Offences punishable by life imprisonment and (ii) Person against whom proceedings are pending in more than one offence.
  - » **Medical Examination:**
    - **CrPC** allows medical examination of the accused in certain cases, including rape cases. This medical examination can only be done after request from at least a sub-inspector level police officer.
    - **The BNSS2** provides that any police officer can request such examination.
  - » **Forensic Investigation:** The BNSS2 mandates forensic investigation for offences punishable with seven years' imprisonment or more.
    - Forensic experts will visit crime scenes to collect forensic evidence and video record the process.
  - » **Signature and Finger Impressions:** The **CrPC empowers a Magistrate** to order any person to provide specimen signature or handwriting.
    - **BNSS2** expands this to include finger impressions and voice samples. It allows these samples to be collected from a person who hasn't been arrested.
  - » **Timeliness for Procedure:** The BNSS2 prescribes timelines for various procedures.
    - For instance, it acquires medical practitioners who examine rape victims to submit their reports to the investigating officer within 7 days.

- Other specified timelines include: (i) giving judgement within 30 days of completion of arguments (extendable upto 45 days), (ii) informing the victim of progress of investigation within 90 days, (iii) framing of charges by a sessions court within 60 days from the first hearing on such charges.
- » All trials, inquiries, and proceedings may be held in electronic mode. Production of electronic communication devices, likely to contain digital evidence, will be allowed for investigation, inquiry, or trial.
- » If a proclaimed offender has absconded to evade trial and there is no immediate prospect of arresting him, the trial can be conducted, and judgement pronounced in his absence.
- » **Hierarchy of Courts:**
  - The CrPC establishes a hierarchy of courts for the adjudication of criminal matters in India.
    - These include: (i) **Magistrate's Courts**: subordinate courts responsible for the trial of most criminal cases, (ii) **Sessions Courts**: Presided over by sessions judge and hear appeals from Magistrate's courts (iii) **High Courts**: They have inherent jurisdiction to hear and decide criminal cases and appeals, and (iv) **Supreme Court**: Hear appeals from High Courts and also exercise its original jurisdiction in certain matters.
    - The CrPC empowers the state governments to notify any city or town with a population of more than 1 million as a **metropolitan area**. Such areas have **Metropolitan magistrate**. The BNSS2 removes the classification of metropolitan areas and **Metropolitan magistrate**.

## 6. BHARTIYA SAKSHYA ADHINIYAM, 2023 (BHARTIYA SAKSHYA (SECOND), BILL, 2023)

- **Background:**
  - » The Indian Evidence Act, 1872 (IEA) governs the admissibility of evidence in Indian Courts. It applies to all civil and criminal proceedings.
  - » With changing times and technology, IEA has been regularly amended. For e.g. In 2000, the IEA was amended to provide for the admissibility of electronics records as secondary evidence. In 2013, it was amended to add provisions related to consent in case of rape. It shifted the onus on accused to prove that consent was given and added that the character of the victim and sexual history will not be relevant when determining consent.
- **Bhartiya Sakshya Adhiniyam, 2023:**
  - » It retains most of the provisions of IEA. These include:
    - i. **Admissible Evidence**: Parties in a legal proceeding can only present admissible evidence. Admissible evidence can be classified as either 'facts in issue' or 'relevant facts'.
      - IEA provides for two kinds of evidence - documentary and oral evidence.
    - ii. **Police Confessions**: Any confession made to a police officer is inadmissible. Confessions made in police custody are also inadmissible, unless recorded by a Magistrate. However, if a fact is discovered as a result of information received from an accused in custody, that information may be admitted if it distinctly relates to the fact discovered.

» Key changes made by BSA, 2023 include:

i. Documentary Evidence:

- Under the IEA, a document includes writings, maps, and caricatures.
- The BSA, 2023 adds that electronic records will be considered as documents.

ii. Oral Evidence:

- Under the IEA, oral evidence includes statements made before Courts, by witnesses in relation to a fact under inquiry.
- BSA, 2023 allows oral evidence to be given electronically. This would permit witnesses, accused persons, and victims to testify through electronic means.

iii. Admissibility of Electronic or digital records as evidence: Documentary evidence includes information in electronics records that have been printed or stored in optical or magnetic media produced by a computer.

- BSA (or BSB2) provides that electronic or digital records will have the same legal effect as paper records.

iv. Secondary Evidence: The BSA, 2023 expands secondary evidence to include: (i) Oral and Written Admissions, and (ii) the testimony of a person who has examined the document and is skilled to examine the documents.

v. Joint Trials: A joint trial refers to the trial of more than one person for the same offence.

- The IEA states that in a joint trial, if a confession made by one of the accused which also affects other accused is proven, it will be treated as a confession against both.
- The BSA adds an explanation to this provision. It states that a trial of multiple persons, where an accused has absconded or has not responded to an arrest warrant, will be treated as a joint trial.



# TARGET PRELIMS 2024

## BOOKLET-48; POLITY-2

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## 2. FUNDAMENTAL DUTIES CONTINUES:

### 1) RIGHT AGAINST SELF-INCRIMINATION/ RIGHT TO SILENCE

- The right against self-incrimination includes the right to refuse to take the witness stand and the right to refuse to answer an incriminatory question.
- Under Constitution of India, the right against self-incrimination is provided under **Article 20 (3)**. It says that no person accused of any offence shall be compelled to be witness against herself.
  - » The above protection extends to both oral evidence and documentary evidence.
  - » However, it doesn't extend to:
    - Compulsory production of material objects.
    - Compulsion to give thumb impression, blood samples etc.;
    - compulsory exhibition of the body.
    - Further, it extends only to criminal offences and not to civil proceedings or proceeding which are not of criminal nature.
  - » **Note:**
    - The right to be presumed innocent until proven guilty, and the right to remain silent in an interrogation essentially flow from this constitutionally guaranteed right against self-incrimination. The right also ensures that police can't coerce anyone to confess to a crime, and obtain a conviction based on that offence.
    - Since the onus of proving the case against the accused beyond reasonable doubt is on the state, a person can't be compelled to testify against himself or share information that might go against him in trial.
- **Supreme Court Verdicts:**
  - » **The State of Bombay vs Kathi Kalu Oghad, 1961**: In this case, an 11 judge bench of the SC ruled that obtaining photographs, fingerprints, signatures, and thumb impressions wouldn't violate the right against self-incrimination of an accused. The court distinguished "to be a witness" from "furnishing evidence".
  - » **Selvi vs State of Karnataka, 2010**: Here, the SC ruled that a narcoanalysis test without the consent of the accused would amount to violation of the right against self-incrimination.
    - However, obtaining a DNA sample from the accused is permitted. If an accused refuse to give a sample, the court can draw adverse inference against him under section 114 of the Evidence Act.
  - » **Ritesh Sinha vs State of Uttar Pradesh, 2019**: The SC broadened the parameters of handwriting samples to include voice samples, adding that this would not violate right against self-incrimination.
- **All accused have a right to silence and investigators can't force them to speak up or admit guilt:** Supreme Court (July 2023)
  - » The Constitution accords every person a right against self incrimination.
  - » "**Cooperation**" with an investigation can't mean "confession", and thus the investigation agency can't make out a case against the accused just because they choose to remain silent.

### 3. DPSPS

#### 1) UNIFORM CIVIL CODE

- **Why in news?**
  - The 22nd Law Commission of India on Wednesday sought fresh suggestions from various stakeholders, including public and religious organizations, on the Uniform Civil Code (June 2023)
- Uniform Civil Code means **same law for every citizen of the country** in civil matters such as marriage & divorce, succession & inheritance; Minority & Guardianship; and adoption & maintenance.
  - » It doesn't only mean same law (or equality before law) between different communities, but also within the communities (i.e. between men, women, transgenders etc.)
- Article 44, of the Constitution of India declares that the state shall endeavor to secure the citizens a Uniform Civil Code.
  - » Further Article 37 of the constitution states that "the principles laid down under DPSP are fundamental in the governance of the country and it shall be the duty of the state to apply these principles in making laws".
- At the time of independence, UCC was only accommodated as a DPSP due to communal disharmony and resistance to remove personal laws against the backdrop of partition.
  - » There was a need to placate every community by providing that their way living was not endangered in India.
- **Need of Uniform Civil Code**
  - » **National Integration**
  - » **Absence of UCC can be seen as Violation of Fundamental Right to Equality**
  - » Different civil laws complicates the legal system and leads to more delays.
  - » **Opportunity to reform personal laws**
  - » **Supreme has supported introduction of UCC in a number of rulings:**
- **Why India has not been able to implement UCC yet.**
  - » **Lack of understanding of UCC among people:**
  - » **Diversity of personal practices in India**
  - » **Contradictory Provisions of the Constitution (UCC vs other provisions of the Constitution)**
    - The sixth schedule of the Constitution was added for the administration of tribal areas in Assam, Meghalaya, Tripura and Mizoram and confers powers on district councils and Regional Councils in those states to make laws with respect to inheritance, marriage, divorce and social customs.
    - **Special Provisions** (Article 371A for Nagaland, 371F for Sikkim, and 371G for Mizoram provide special provisions protecting the religious or social practices and customary laws.
  - » **Various laws allow for diversity in Civil Code:**
    - For e.g. PESA Act, 1996; the Chota Nagpur Tenancy Act, 1908; and the Santhal Parganas Tenancy Act, 1876, recognize various customary practices among tribals. This is also protected under 5th schedule of the Constitution.
- **Some criticisms of UCC**
  - » **'United' Nation does not mean uniformity.**
  - » **Secularism cannot contradict the plurality prevalent in the country**
  - » **Society is not ready.**

## 2) UTTARAKHAND UCC

- **Why in news?**
  - » President approves Uttarakhand's UCC Bill (March 2024)
- **Process of passage of the UCC:**
  - » UCC was a poll promise made by then CM of UK Dhami in case of re-election. UK government had formed an expert committee (headed by Retd Justice Ranjana Prakash Desai) in June 2022, to examine the way UCC can be introduced in the state. This committee submitted its report in Feb 2024 and within a few days the state assembly passed the bill. The bill approved by the Governor and was then sent to President. This is because UCC is a matter of concurrent list and thus requires approval of the President. President has given its approval in March 2024.
  - » With this, Uttarakhand has become the first state in independent India to have a Uniform Civil Code (UCC).
  - » Government has already formed a committee to make rules and implementation of UCC which is headed by retired IAS officer and UCC draft committee member Shatruघan Singh.
- **Key Highlights:**
  - » The bill has kept tribal out of its ambit.
  - » It has complete ban on practices like, Polygamy, Polyandry, halala, Iddat and Talaq as both men and women will have same rights in matters related to marriage and divorce.
  - » It also allows marriages to be solemnized only between a man and a woman. The age of marriage has been set at 21 years for boys and 18 years for girl.
  - » It also makes it mandatory to register marriage and divorce, failing which the couple concerned will be deprived of the benefits of all government facilities.
    - But, no marriage shall be deemed to be invalid solely because it was not registered or details mentioned in the memorandum were defective, irregular, or incorrect.
    - All marriages after 26th March 2010, would have to be registered in the state within a period of six months.
  - » **Child Custody:** In case of divorce or domestic dispute between husband and wife, the custody of the child upto 5 years of age will remain with the mother.
  - » **Provisions related to live-in relationship:**
    - **Mandatory Registration of Live-in relations:** Stringent provisions for failures to register live-in relations which calls for imprisonment upto three months and a fine not exceeding Rs 25,000 or both.
    - The live-in status registration will be required if such couples want to rent or buy property in the hill state.
    - **The child born out of live-in relationship** will be considered a legitimate child of the couple under UCC and will have all legal rights applicable to children born out of a marriage.
    - **If a women gets deserted** by her live-in partner, she shall be entitled to claim maintenance.
    - **Termination of relationship** also needs to be intimated in format prescribed by government.
  - » **Equal Rights to Property** have been given to sons and daughters for all classes.
  - » **No distinction between legitimate and illegitimate child, adopted child, child born through surrogacy and children born through assisted reproductive technology**.

» After the death of a person, his wife and children are given equal rights in his property along with the deceased's parents.

- **Analysis: Criticism:**

» Doesn't deal with adoption, maintenance and guardianship (though it provides for maintenance during matrimonial dispute).

## 4. BASIC STRUCTURE

- **Why in news?**

» 50 years of basic structure doctrine: The verdict was given on 24th April 1973 (April 2023)  
» Vice-President Jagdeep Dhankar has criticized the Supreme Court for using Basic Structure Doctrine to strike down constitutional amendments by Parliament, such as the NJAC Act. (April 2023)

- **What is the Basic Structure Doctrine?**

» The Basic structure doctrine is a judicial innovation of the Constitution of India which puts a limitation on the amending powers of the Parliament. It says that the Constitution has some 'Basic Features' that can't be altered or destroyed by amendments by Parliament. .

- **Evolution of the Basic Structure Doctrine - Keshavnand Bharti Case and Minerva Mill Case**

» The extent of amending powers exercised by Parliament became a cause of adjudication from the very first Constitutional Amendment Act (1951) which curtailed the Right to Property (which was a fundamental right then).

» In **Shankari Prasad case** (1951) the SC held (6/11 majority) that the powers of Parliament to amend the Constitution under Article 368 of the Constitution includes the power to amend Fundamental Rights and that the word 'law' in Article 13 of the Constitution includes only ordinary laws and not the Constitutional Amendment Acts. Thus, the Parliament can take away any of the fundamental rights by Constitutional Amendment.

» However, in **Golak Nath case** (1967), the Supreme Court reversed its earlier stand and held "the Fundamental Rights are given a transcendental and immutable' position and hence Parliament can't abridge or take away any of these rights. It also held that a CAA is also law within the meaning of Article 13 of the Constitution and hence would be void for violating Fundamental Rights.

» **The Parliament sought** to supersede the Golakhnath judgement by amending Article 368 itself through 24th CAA, 1971.

▫ The amendment said that an amendment under Article 368 will not be considered a law within the meaning of Article 13 of the Constitution and the CAA can't be challenge on the ground that it affects a fundamental Right.

» **In Keshavananda vs State of Kerala 1973**, the Supreme Court upheld the 24th CAA.

▫ Thus, the question of amendability of the Fundamental Rights have been settled i.e. a CAA can amend fundamental rights in India and a CAA will not be considered law under the meaning of Article 13 of the Constitution.

- However, the Constitutional Bench (largest ever - 13 judges) also held that there are certain basic features of the Constitution of India, which can't be modified by an amendment under Article 368 of the Constitution of India.
  - These basic features include (without being exhaustive) - sovereignty and territorial integrity of India, the federal system, judicial review, Parliamentary system of government etc.
- Using the doctrine of the 'Basic feature of the Constitution', the Apex court declared second part of the section 3 of 25th CAA as unconstitutional as it limited the powers of Judicial review which is one of the basic features of the Constitution.
- Through 42nd CAA, the Parliament tried to remove any limitation on its power of amendment by adding that there is no limitation on the constituent power of the Parliament and no amendment can be questioned in any court on any ground including that of the contravention of any FR.
- However, the Supreme Court in the **Minerva Mills case** invalidated the above amendment as it excluded Judicial review which is one of the basic features of the Constitution.
  - » The Court held "*Since the Constitution had conferred a limited amending power on the Parliament, the Parliament cannot under the exercise of that limited power enlarge that very power into an absolute power. Indeed a limited amending power is one of the basic features of the Constitution and, therefore, the limitations on that power cannot be destroyed*"

- **Elements of the Basic Structure**

- So far, Supreme Court has not defined an exhaustive list of the Basic structure doctrine. But from various judgments we can enumerate following features as part of basic features of the Constitution of India
  - Supremacy of the Constitution; Sovereign, Democratic and Republican nature of the Indian Polity; Secular character of the Constitution of India; Separation of Power; Federal Character of the Constitution of India, Unity and Integrity of the nation; Welfare State; Judicial Review; Freedom and Dignity of the individual; Parliamentary System; Rule of Law; Principle of Equality; Free and Fair Elections; Independence of Judiciary etc.

- **Other important Supreme Court Verdicts which expanded the Basic Structure Doctrine:**

- » **Indira Gandhi vs Raj Narain 1975:** The Basic structure doctrine was used for the first time to strike down 39th Constitutional amendment Act (1975) provision that barred court's jurisdiction over election disputes.
- » **Kihoto Hollohan vs Zachillhu (1992):** Free and Fair Elections
- » **Indira Sawhney vs Union of India, 1992:** Rule of Law
- » **Bommai Case (1994):** Democracy, Federalism, and Secularism.
- » **M Nagraj Case (2006):** Equality
- » **Coelho Case (2007):** Judicial Review
- » **NJAC Case (2015):** Judicial Independence

## 5. THE UNION (EXECUTIVE AND LEGISLATURE)

## 1) PRESIDENT

- **Why in news?**
    - » The 2022 Indian Presidential Election was the 16th Presidential election in India held on 18th July 2022 to elect President of India. BJP candidate Droupadi Murmu won the election by a margin of 296, 626 votes against Yashwant Sinha, the United Opposition candidate (July 2022)
      - **Note:** Droupadi Murmu is the first member of a Scheduled Tribe and only the second women to become President of India, as well as the first President of India who was born after Independence.
  - **Introduction:**
    - » President of India is the head of the Union Executive.
  - **Constitutional Provisions:**
    - » **Article 52:** There shall be a President of India.
    - » **Article 53:**
      - (1)The executive power of the Union of India shall be vested in the President and shall be exercised by him either directly or through officers subordinate to him in accordance with the Constitution
      - (2) The Supreme Command of the Defence Forces of the Union shall be vested in the President and the exercise thereof shall be regulated by law.
    - » **Article 54: Election of President**
      - The President shall be elected by the members of an electoral college consisting of the elected members of both Houses of Parliament; and the elected members of the Legislative Assemblies of the States.
    - » **Article 62(1):** An election to fill a vacancy caused by the expiration of the term of office of President shall be completed before the expiration of the term.
  - **Election of the President: Details**
    - President of India is elected by indirect election, i.e., by an electoral college, in accordance with the system of proportional representation by means of the single transferable vote and the voting is by absolute majority.
    - As per Article **54** of the Constitution of India, the President is elected by an electoral college consisting of elected MPs of both houses of Parliament and elected MLAs of the states and Delhi and Puducherry.
- |                |  |
|----------------|--|
| <b>Note-1:</b> | <b>Wherever an assembly is dissolved</b> , the <u>members cease to be qualified to vote in presidential election, even if fresh elections to the dissolved assembly are not held before the presidential election</u> .  |
| <b>Note-2:</b> | <b>The nominated members</b> of both the houses of Parliament, the nominated members of the state legislative assemblies, <u>the members (both elected and nominated)</u> of the state legislative councils (in case of bicameral legislature) and the nominated members of the legislative Assemblies of Puducherry <u>don't participate in the election of the President</u> . |
- **Value of Votes of MLAs and MPs:**

- » Article 55: As far as practicable, there shall be uniformity of representation of the different states at the election, according to the population and the total number of elected members of the legislative assembly of each state, and parity shall also be maintained between the States as a whole and the Union.
- » To achieve this "uniformity" and "parity" the number of votes of each MLA and MP is determined as follows:
  - **Votes of each MLA:** (Total Population of State)/(Total number of elected MLAs in the state \* 1000)
  - **Votes of Each MP:** (Total value of votes of all MLAs of all states)/Total number of elected members of Parliament:
  - **Electoral quota to win the elections:** [(Total number of valid votes polled)/2] + 1
- All doubts and disputes in connection with election of the President are inquired into and decided by the Supreme Court whose decision is final.

<b>Note:</b>	The <u>election of a person as President cannot be challenged</u> on the ground that the <u>electoral college was incomplete</u> (i.e. the existence of any vacancy among the members of electoral college). <u>If the election of a person as President is declared void by the Supreme Court, acts done by him before the date of such declaration of the Supreme Court are not invalidated and continue to remain in force.</u>
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- Why did India go for an Indirect form of election for the selection of President?
  - » It is in harmony with the Parliamentary form of government, where the President is only a nominal head, and the real powers are vested in the council of ministers.
  - » **Save time and cost:** Direct elections of the President would have used a lot of resources of the country. This was unwarranted considering that the president was only going to be the nominal political head.
- Why has role been given to MLAs (other than MPs) in the election of President -> Current system ensures that the President is a representative of the Union and the States equally.
- The term '**Proportional Representation**' is a misnomer and should be called 'preferential and alternative vote system'.

<b>Note</b>	Proportional representation takes place where two or more seats are to be filled. In case of President, the vacancy is only one. It could better be called a ' <u>preferential or alternative vote system</u> '.
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- **Qualification:** In order to be qualified for election as President, a person must:
  1. Be a citizen of India
  2. Have completed the age of 35 years
  3. Be qualified for election as a member of the House of People; and
  4. Must not hold any office of profit under the Gol or the Government of any state or under any local or other authority subject to the control of any of the said government.
- **Nomination Stage:** Before election comes the nomination stage, where the candidates intending to stand in the election, files the nomination along with a signed list of 50 proposers and 50 seconders.
  - These proposers can be anyone from the electoral college from the states or national level.
  - **Why?**

- The rule for securing 50 proposers and 50 seconders was implemented in 1974. It was because, several candidates, many without even a bleak chance of winning, would file their nomination to contest the polls.
- An elector cannot propose or second the nomination of more than one candidate.

## 2) PARLIAMENTARY SECRETARY

- **Who is a parliamentary secretary?**
  - A parliamentary secretary is a member of Parliament in the Westminster system, who assists a more senior minister with her duties. She often holds the rank of Minister of State and has the same entitlement as is assigned to a government department.
- **What are the main criticisms of the office of Parliamentary secretaries?**
  - These posts tend to violate some constitutional provisions
    - Office of Profit clause** (discussed in detail separately)
    - Cap on the number of ministers**.
  - **Article 164(1A)** (and Article 75(2) at central government level) specifies that the number of ministers including the chief minister has to be within 15% of the total number of members of the assembly.
    - This provision was included by the 91st constitutional amendment of Indian constitution on the recommendation of the National Commission for Review of the Working of the Constitution headed by former Chief Justice of India, M.N. Venkatchaliah on misuse and drainage of public money to put a ban on over-sized cabinet.
  - **Article 239AA** provides that in case of National Capital Territory of Delhi, the number of ministers should not exceed 10% of the total number of members in the assembly.

## 3) OFFICE OF PROFIT AND ASSOCIATED ISSUES

- **Why in news?**
  - » Governor CP Radhakrishnan said that Raj Bhavan is examining the Election Commission's report on an **Office of Profit case** against CM Hemant Soren over the extension of a stone mining lease to him. The Election Commission sent its recommendation in Aug 2022. (Dec 2023)
- Office of profit refers to those positions under the government which a member of parliament or legislative assembly should not be holding. The term originated in 18th century England, where no person holding an office or receiving any salary from the king was allowed to serve as a member of house of common.
  - » **The Constitution of India** (Article 102(1) and Article 191(1)) specifies holding of office of profit as one of the conditions which disqualify MPs, and MLAs from membership of their respective legislative institutions.
  - » The **essence of this provision** is that there should be no conflict between the duties and interests of an elected member.
  - » Articles 102 and 191 also clarify that a person holding office of minister will not be deemed to hold an office of profit.

- Article 192(2) says that Before giving any decision on any such question, the Governor shall obtain the opinion of the Election Commission and shall act according to such opinion.
- Which offices would be considered office of profit?
  - » '**Office of Profit' has not been defined under the constitution.**
  - » Over the years following broad principles have evolved from various Supreme Court Judgments (Maulana Abdul Shakur vs Rikhab Chand (1958); Guru Gobind Basu vs Sankari Prasad Ghosal (1964); Pradyut Bordoloi vs Swapan Roy (2001)) to determine whether an office is office of profit or not:
    - Whether the government has the control over the appointment, removal or function of the holder of office.
    - Whether the government pay any remuneration.
    - Whether the office has government powers (releasing money, allotment of land, granting of licenses etc.)
    - Whether the body in which office is held wields influence or power by way of patronage.
    - **Note: Not all the conditions have to be satisfied at one go**
      - Supreme Court in various cases has held that all the above tests need not exist conjointly for determining whether an office is an office of profit under the government.
  - » In **Jaya Bachan vs. Union of India** case, the Supreme court said that if the pecuniary gain is receivable in connection with the office then it becomes an office of profit, irrespective of whether such pecuniary gain is actually received or not
  - » Similarly, in **Raman v. PTA Rahim, 2014**, the court had said that only posts that are capable of yielding pecuniary gains, as distinguished from compensatory allowances, would be offices of profit. Another important point decided in this case is that 'status', 'influence' etc of an office should not be taken into consideration while deciding the question of office of profit.
- Provisions for exemptions to office of profit rule:
  - » The Constitution specifies that Parliament and state Legislative Assemblies have the power to enact laws and keep certain offices out of the purview of the office of profit.
  - » **Parliament enacted a law in 1959** to specify offices that would not attract disqualification under the constitution. This law has been amended on several occasions. In 2006, it was amended to include the office of Chairperson of NAC and office of UPFDC, making them immune from disqualification.

#### 4) RAJYA SABHA: SIGNIFICANCE AND ASSOCIATED ISSUES

- Details
  - » Rajya Sabha is the upper house of the bicameral Parliament of India. It is a permanent house and can't be dissolved. To ensure continuity, one-third of its members retire after every second year, under Article 83(1) of the Constitution, and "biennial elections" are held to fill these vacancies. The term of a member is six years.
  - » Out of 245 members:

- » **12** are nominated by the President and;
  - Under Article 80(3), the 12 nominated members should have special knowledge or practical experience in matters like literature, science, art etc.
  - A nominated member may join a party within six months of taking a seat.
- » **233** are representatives of the States and UTs of Delhi and Puducherry.

- **Significance of Rajya Sabha:**

- » **Institutionalize federal principle** of power sharing between Centre and States. It acts as safety valve within the legislature itself, easing federal tensions.
- » **Review and re-evaluation of the bills**
- » **Enhances deliberation.**
- » **Platform for nonpolitical talent and expertise:**
- » **Representation to Vulnerable Sections**
- » **Some Special powers to Rajya Sabha:**
  - Rajya Sabha can pass a resolution [with a majority of not less than 2/3rd of the members presents and voting] empowering the Parliament to make laws in the State List (Article 249) and to create one or more All India Services [Article 312]
  - In case the Lok Sabha is dissolved, and emergency is proclaimed, the proclamation remains valid if a resolution approving it is approved by the Rajya Sabha.

- **Elections of Rajya Sabha MPs:**

- As per Article 80(4) of the Constitution, members of Rajya Sabha are elected by indirect election by the elected members of the Legislative assembly of each state. Here the method of proportional representation by means of single transferable vote method is used.

- **Criticism of Rajya Sabha:**

- **No direct election** -> not directly accountable to the voters
- **No Equal Representation** to states
- **Money bill mechanism** is being misused to bypass Rajya Sabha
- It has become a placement mechanism for losing candidates.
- **Nominated members** haven't been generally very active.

## 5) SECRETARIAT OF PARLIAMENT

- **Constitutional Provisions:** Article 98 in the Constitution of India provides for Secretariat of Parliament.
  - » It says that each house of the Parliament shall have a separate secretariat staff and that Parliament may by law regulate the recruitment, and the conditions of service of persons appointed to these secretariats.
    - Clause (1) says that each house of the parliament shall have separate secretariat staff. It further adds that nothing in this clause shall be construed as preventing the creation of posts common to both Houses of Parliament.
    - Clause (2) provides that Parliament may by law regulate the recruitment, and the conditions of service of persons appointed, to the secretariat staff of either house of the Parliament.
    - Clause (3) provides that until provisions under clause (2) are made, President may after consultation with the Speaker of the Lok Sabha or the Chairman of the council of States, as

the case may be, make rules regulating the recruitment, and the conditions of services of persons appointed, to the secretariat staff of the House of the People or the Council of States, and any rules so made shall be subject to provisions of any law made under the said clause Conduct of Business.

» Note: Article 187 makes similar provisions for the Secretariat of State Legislatures.

#### - Significance of Separate Secretariat for Parliament

» Separate secretariat ensures independence of legislature from executive. It marks a feature of a functioning parliamentary democracy.

#### - Current Situation:

» Each House of Parliament has separate secretariat staff of its own, and there are some posts common to both the Houses.

» Recruitment and service conditions are regulated by Parliament.

» The Secretariat of each house is headed by Secretary General. He is a permanent officer and is appointed by the Presiding officer of the house.

» Speaker is assisted by Secretary-General, Lok Sabha in the discharge of her constitutional and statutory responsibilities and, Chairperson of Rajya Sabha is assisted by Secretary General, Rajya Sabha in her duties.

» Secretary General of Lok Sabha and Rajya Sabha have the same status, ranking, pay scale etc. as that of highest government officer (i.e. cabinet secretary).

» Secretary General also enjoys certain privileges such as freedom from arrest, immunity from criminal proceedings, and any other obstruction and breach of their rights.

#### - Key Issues in the functioning of Secretariat of Parliament

» Most of the Secretary Generals of Rajya Sabha have been parachuted from the Civil Services or other services from time to time.

» For e.g. the current Rajya Sabha Secretary General P.C. Mody is a retired IRS officer.

- This hampers the principle of Separation of Power (between legislature and Executive)
- Serving/retired civil servants come with long-held baggage and the clout of their past career.

» Secretary general should also have vast knowledge of parliamentary procedures, practices, and precedents. Most of the civil servants lack this aspect of expertise.

## 6) ANTI-DEFECTION LAW

#### - Why in news?

» Maharashtra assembly speaker Rahul Narwekar recognized the group led by chief minister Eknath Shinde as the "real Shiv Sena" and dismissed all the disqualification petition filed against 16 ruling MLAs (Jan 2024)

- The speaker was directed by the Supreme Court to decide on the matter.
- He also dismissed the Shinde faction's disqualification petition against 14 MLAs from the Uddhav camp.

#### - Introduction

- » *Aaya Ram Gaya Ram* was a phrase that became popular in Indian politics after a Haryana MLA Gaya Lal changed his party twice within the same day and then again within a fortnight in 1967.
  - » The **anti-defection law** sought to prevent such political defections which may be due to reward of office or other similar consideration and lead to **political instability** and **horse trading**.
  - » **Constitution (52nd Amendment) Act, 1985**, added the **10th Schedule** to Indian Constitution which lays down the process by which legislators may be disqualified on grounds of defection by the **Presiding officer of a legislature** based on a petition by any other member of the house. This law came into effect on 1st March 1985.
- **Key Provisions of the law:**
- » **A member incurs disqualification** under the anti-defection law if:
    - She **voluntary resigns / gives up membership** of the party on whose ticket she is elected to the house.
    - If she **votes/ abstains from voting** in the house against the direction given by the Political party.
    - If an **independent candidate** joins a political party after the election
    - If a **ominated member** joins a party **six months after** she becomes a member of the legislature.
  - » **Allowed Exceptions:**
    - In case at least 2/3rd legislators of a party in a house merge with or into another party, then neither members who decide to merge nor the ones who stay with the original party will face disqualification.
  - » The law also says that a **question of disqualification** under 10th schedule would be **decided by the Speaker or the Chairman of the House** and his decision in this regard would be **final**. It also **bars the jurisdiction of courts** in any matter connected with the disqualification of a member of House under this schedule.
    - Under Article 190(3) of the Constitution, the Speaker has to satisfy himself that the resignation are voluntary and genuine and can reject them if he feels they are not. The **speaker has absolute discretion on this**.
    - However, Supreme Court in **Kihoto Hollohan's case (1992)**, while analyzing the meaning of the word 'final' in the context of such clause said that it doesn't exclude court's intervention under articles 136, 226 and 227 of the constitution i.e. the decision of Speaker/Chairman is subject to judicial review.

- **Constitutional Validity of 10th Schedule**

- » The constitutional validity of the 10th schedule was analyzed by the Supreme Court in **Kihoto Hollohan v Zachillu, 1992**. The court held the provisions of 10th schedule valid and said that the provisions don't subvert the democratic rights of the elected members of the Parliament and the legislatures of the state. It doesn't violate their freedom of speech, freedom of vote and conscience as contended.

- **Other important SC judgments:**

- » **Keisham Meghachandra Singh vs The Hon'ble Speaker of Manipur Legislative Assembly & Ors (2020): Key recommendations of the SC:**
  - **Petition under the disqualification provision** should normally be decided within a period of three months from the date of their filing.

- The court suggested that an independent tribunal can be appointed which will substitute the Speaker of the LS and Legislative Assemblies to deal with matters of disqualifications under the 10th schedule.
    - This tribunal should be headed by a retired SC judge or a retired chief justice of High Courts.
- **Need of Anti-defection law**
  - » **Curbing the instability in the political system**
  - » **Controlling Horse Trading/Corruption**

## 7) DEVICES OF PARLIAMENTARY PROCEEDINGS

### A) QUESTION HOUR

- Question hour has been devised to **help Parliament hold government accountable**.
- Generally, the first hour of every parliamentary sitting is slotted as question hour. During this hour, Member of Parliaments (including from ruling party) ask questions to Ministers and hold them accountable for the functioning of the government.
  - » These questions can be of three types:
    - **Starred:** They require oral answers and hence supplementary questions can follow.
    - **Unstarred:** They require a written answer and hence, supplementary questions can't follow.
    - **Short Notice:** they are asked by giving a notice of 10 days and are answered orally.
  - » The **Parliamentary rules provide guidelines** on the kind of questions that can be asked.
    - 150-word limit
    - Precise (not very general)
    - Related to areas of responsibility of government.
    - Not seek information on secrets or matters under court jurisdiction.
  - » Now, question hour in both houses is held on all days of the session except on the day when President addresses the MPs from both the house (i.e. at the beginning of the Lok Sabha and on the first day of a new Parliamentary year) and on the day when Finance Minister presents the budget.
  - » During question hour, even an MP (non-Minister) can be questioned. Such question should be limited to the role of MP or to a bill or resolution being piloted by him.

### B) ZERO HOUR

- **Understanding Zero Hour**
  - » It is an informal device (not mentioned in the rules of procedure) available with Member of Parliaments to raise issues without any prior notice. It starts immediately after question hour and continues till the beginning of the regular business of the day.
  - » It is an **Indian innovation** in the field of Parliamentary procedure and the concept of zero hour started organically in the first decade of Indian Parliament, when MPs felt the need for raising important constituency and national issues.
- **Significance of Question Hour and Zero Hour**
  - » These parliamentary devices have been used to shine light on the functioning of government and highlight the irregularities to the public domain.

- » One of the parliamentary publications describe question hour as, "**the test of the Government's accountability, an indispensable part of the art of the opposition and even a deterrent on bureaucratic inertia**".
- » The question hour also **helps government to understand the pulse of the nation**.
- » The **information** so made available adds to **public information essential to informed debates** on matters of interest or concern.
- » Question hour is also **an instrument of unmatched criticality to hold government accountable** (i.e. fulfill the objective of parliamentary democracy) as it is available on **daily basis**, and provides **equality to every member** of the House, Rajya Sabha or Lok Sabha

## 8) LAPSLING OF BILLS DUE TO DISSOLUTION OF LOK SABHA

- On dissolution of Lok Sabha, **most of the business pending before it or its committees** (including bills, resolutions, notices, petitions and so on) lapse. These (if to be pursued in future) need to be introduced again in the newly formed Lok Sabha.
  - » **What doesn't lapse?**
    - Some pending bills and all **pending assurances that are to be examined by the Committee of Government Assurance** do not lapse on the dissolution of Lok Sabha.
    - A **bill for which joint sitting has been notified by the President**.
    - A bill **pending in Rajya Sabha** (but not passed by Lok Sabha)
    - A bill **passed by both houses** (but pending President's assent)
    - A bill **passed by both houses** (but returned back by the President for reconsideration)
- **What lapses?**
  - » **A bill pending in Lok Sabha** (whether originating in Lok Sabha, or transmitted to Lok Sabha after passage by Rajya Sabha)
  - » **A bill passed by LS but pending in Rajya Sabha lapses.**

## 9) MONEY BILL AND ASSOCIATED ISSUES

- **Why in news?**
  - The Supreme Court said that it **will constitute a seven-judge bench** to consider the **issue of validity of passage of laws** like the **Aadhaar Act** as Money Bill (Oct 2023)
    - » Its **formation is due to** the reference made by the Constitution bench in **Roger Mathew v. South Indian Bank** on the **interpretation of Article 110(1) of the Constitution of India**. The correctness of the majority judgement in Aadhaar case on this point was also doubted by the court.
    - » Thereafter in the **PMLA case**, the question was **left open for the consideration of larger bench**.
    - » The **decision of the 7-judge bench** which is yet to be formed will definitely have a far reach impact on the constitutional law and the contemporary development in the Indian Parliamentary system and politics.
- **What is Money Bill**
  - According to **Article 110** of the Constitution of India a bill is deemed to be money bill if it contains '**only**' provisions dealing with all or any of the following matters:
    - a. the **imposition, abolition, remission, alteration or regulation of any tax**;

- b. the regulation of the **borrowing** of money or the giving of any guarantee by the **Government of India**, or the amendment of the law with respect to any **financial obligations undertaken** or to be undertaken by the Government of India;
- c. the **custody** of the **consolidated Fund or the Contingency Fund of India**, the payment of moneys into or the withdrawal of moneys from any such Fund;
- d. the **appropriation of moneys** out of the consolidated Fund of India;
- e. the declaring of any expenditure to be **expenditure charged on the Consolidated Fund of India** or the increasing of the amount of any such expenditure;
- f. the **receipt of money on account of the Consolidated Fund of India or the public account of India** or the custody or issue of such money or the audit of the accounts of the Union or of a State; or
- g. any **matter incidental** to any of the matters specified in sub clause (a) to (f)

- Article 110(3)-> Speaker's decision final.
- Article 122 -> prohibits courts from inquiring into proceedings of Parliament and examining their validity.

- In order to ensure financial independence and continuity to government functioning, the Constitution gives **primacy to Lok Sabha** with respect to Money Bill. Such bills can only be introduced in Lok Sabha, can't be amended by Rajya Sabha. The upper house can only make some recommendations to the money bill passed by the lower house within a period of fourteen days which the lower house may accept or reject.
- Since **Powers of Rajya Sabha are greatly reduced on Money bill**, government (majority in Lok Sabha) sometimes bypasses the Rajya Sabha by getting a bill which doesn't satisfy the conditions for money bill declared as money bill.
- Some recent examples include:
  - Adhaar Bill, 2016 contained provisions relating to providing of benefits, subsidies and services funded from Consolidated Fund of India, but it also contained several other provisions like allowing Adhaar to be used for opening bank accounts etc.
  - Finance Bill, 2016 also had provisions other than those related to taxation. It amended the RBI Act to create Monetary Policy Committee. It also amended the Foreign Contribution Regulation Act (FCRA) (with retrospective effect) to change the definition of foreign company.
  - Finance Bill, 2017 also had provisions related to structure and organization of the Tribunals.
  - Finance Bill, 2019 was used to amend the provisions of the Prevention of Money Laundering Act (PMLA).
- Supreme Court Verdict on Aadhaar Bill, 2016 in Sep 2018
  - Accepts Adhaar Bill as money bill.
    - » The Supreme Court held that government was fine to use money bill route as long as the **main focus** on the bill fit the criteria - and even if other provisions were unconnected to taxation or government expenditure.
  - Dissenting Judgment: Adhaar Act as Money Bill is a fraud on constitution.
    - » Justice Chandrachud said that superseding the authority of the Rajya Sabha is in conflict with the Constitutional Scheme and the legitimacy of democratic institutions.
      - He pointed to an important word in provision (i) of Article 110: "only".

- Supreme Court Verdict on Finance Bill, 2017 (Nov 2019): Rojer Mathew vs South Indian Bank Ltd And Ors
  - In Nov 2019, a five Judge Constitutional Bench of the Supreme Court judgement while examining the legality of a number of changes to the composition of tribunals passed through Finance Bill, 2017, which the court struck down, it also brought up the money bill question.
  - The bench headed by CJI Ranjan Gogoi decided "It is clear to us that the majority dictum [in the Aadhaar judgment] did not substantially discuss the effect of the word 'only' in Article 110(1) and offers little guidance on the repercussions of a finding when some of the provisions of an enactment passed as a "Money Bill" do not conform to Article 110(1)(a) to (g)." The court was dissatisfied with the way the Aadhar judgement in the K Puttuswamy case had dealt with the issue of what could be certified as a money bill.
  - The court has thus also raised question of whether the Finance Act 2017 could have been passed as money bill.
  - The matter has been referred to a larger Seven Judge Bench.

## 10) PARLIAMENTARY PRIVILEGES

- Parliamentary privilege refers to rights and immunities enjoyed by Parliament as an institution, MPs in their individual capacity and various committees. These privileges ensure effective working of the Parliament and ensure authority, dignity and honour of the Parliament and its members.
- The Indian Constitution specifies the powers and privileges of Parliament in **Article 105** and those of State legislatures in **Article 194**. This includes
  - i. **Freedom of Speech** in Parliament subject to other provisions of the Constitution and standing order of the house (Article 105(1), 194(1)).
  - ii. **Immunity for all speeches and votes** in the parliament or any committee from judicial scrutiny (Article 105(2), 194(2))
    - Immunity for persons publishing any report, paper, votes or proceeding by Parliament or under the authority of parliament.
  - iii. **Powers and privileges and immunities of each house of the Parliament, and of the members and the committee of each house, shall be such as may from time to time be defined by Parliament by law.** (105(3), 194(3))
    - Until then it would have the same privilege as the British Parliament had in 1950.
      - This was amended by the **44th Constitutional Amendment Act**. It provided that other privileges of each house of Parliament, its committees and its members are to be those which they had on the date of commencement (i.e. 20th June 1979), until defined by Parliament.
        - Till now, parliament or state legislature have not passed any law to codify their privileges.
  - iv. The above immunities are also applicable to persons who by virtue of this constitution has the **right to speak in, or otherwise to take part in the proceedings of**, a House of Parliament or any committee thereof as they apply in relation to members of Parliament. (104(4), 194(4))
- Note

- Article 194 is an exact reproduction of Article 105 and it deals with the state legislatures and their members and committees.
- **Two Types of Parliamentary Privileges**
  1. **Collective Privilege:**
    - The privileges, immunities enjoyed by each house of the parliament collectively
      - Right to publish its reports, debates and proceedings
      - Excluding strangers from its proceedings
      - Holding secret sittings
      - To Punish members as well as outsiders for breach of its privileges or its contempt by reprimand, admonition or imprisonment (also suspension or expulsion, in case of members)
      - The Courts are prohibited to enquire into proceedings of a House or its committees
  2. **Individual Privilege:**
    - In Civil cases, no arrest during the session of the house of 40 days before the beginning of the session and 40 days after end of the session
    - **Freedom of Speech in Parliament.** No proceeding can be initiated against them in any court for anything said or any vote given in Parliament or its committees.
      - This freedom is subject to the provisions of the Constitution and to the rules and standing orders regulating the procedure of the Parliament.
    - They are exempted from jury service.
- **Need of Parliamentary Privileges**
  - Enable each house of the legislature to discharge function properly and free of any pressure.
  - The members of highest deliberative body in the country and in each state should have freedom of speech to ensure all views (no matter how small, fringe or different) are being discussed.
  - **Immunity from Judicial proceedings** ensure non-interference by Judiciary in the parliamentary proceedings and separation of powers.
  - These privileges ensure that undue influence, pressure or coercion is not brought on the legislature in the course of its functioning.
- **What constitutes a breach of privilege?**
  - » A breach of privilege is a violation of any of the privilege of MPs/Parliament.
    - Among other things, any action 'casting reflections' on MPs, parliament or its committees; could be considered breach of privilege.
  - » **No clearly laid out rules** on what constitutes breach of privilege and what punishment it entails.
    - This has led to a very high weightage being given to view of the members of the house.
- **Sources of the Parliamentary Privilege**
  - » **Not codified yet**
  - » They are based on following sources:
    1. Constitutional provisions
    2. Various laws made by Parliament
    3. Rules of Both the Houses
    4. Parliamentary Conventions

## 5. Judicial Interpretations

- **Cases of breach of privileges?**
  - » Several such cases.
    - In 1967, two people were held to be in contempt of Rajya Sabha, for having thrown leaflets from the visitors' gallery.
    - In 1983, one person was held in breach for shouting slogans and throwing chappals from the visitor's gallery.
      - Sentenced to simple imprisonment.
  - » Similarly, there are many cases on breach of privilege of state assemblies.
    - In June 2017, Karnataka Assembly speaker ordered the imprisonment of two journalists for a year based on recommendations in two separate reports of its privilege committee.
- **Criticism of Parliamentary Privileges:** Against Freedom of Speech; Against Right to Life and Personal Liberty; No Codification -> Unlimited Power; Conflict of Interest -> Politicians act as judge in their own case; Used for non-essential reasons; Against Separation of Power

## 11) NO CONFIDENCE MOTION

- **Why in news?**
  - Lok Sabha Speaker Om Birla admitted a motion of No-Confidence against the government moved by Congress Deputy Leader in Lok Sabha Gaurav Gogoi (July 2023)
- **Introduction**
  - Article 75(3) of Indian Constitution says that the council of ministers shall be collectively responsible to the Lok Sabha.
  - Similarly, in Part VI of the Constitution, Article 164(2) says "The Council of Ministers shall be collectively responsible to the Legislative Assembly of the State."
  - This means that majority of the Lok Sabha members/Legislative Assembly members must support the PM/CM and her Council of Ministers.
    - In other words, Lok Sabha/Legislative assembly can remove the ministry from office by passing a no-confidence motion.
- A no-confidence motion is an attempt, usually by an opposition party, to get the government of the day to prove its majority on the floor of the house.
- **Rule 198 of the Rules of Procedure and Conduct in Lok Sabha** specifies the procedure for a motion of no-confidence.
  - » Any member of the Lok Sabha can move the motion. The member moving the motion doesn't have to give reasons in support of the motion.
  - » If the speaker is of the opinion that the motion is proper, then she reads the motion to the house. A minimum of 50 members have to accept the motion. If not, the motion fails and the member who moved the motion is informed about it.
  - » **If a no-confidence motion is passed** (i.e. accepted by the majority)

- Government has to resign
- **Significance of No Confidence Motion**
  - » The motion helps in testing the majority of the government. Thus it ensures collective responsibility and thus accountability of council of ministers towards the Lok Sabha.
  - » When the motion is being taken up, members of Lok Sabha have an opportunity to present their views on performance of the government.
  - » It provides an opportunity to debate and discuss key issues of national significance.
- **History of No-Confidence Motion in India:**
  - » **27 No-Confidence Motion** have been moved so far. None of these motions, including the one against the PM Modi government in 2018, has been successful.
    - In **1979**, PM Morarji Desai realized that he didn't have the support of the majority of MPs, and therefore resigned before the house votes on the motion.
- **Note:**
  - » Difference between "No-Confidence Motion" and "Motion of Confidence / Trust Vote"
    - Motion of confidence/trust vote is moved by government, as an ordinary motion under Rule 184.
  - » The term '**No-confidence motion**' is **not mentioned in the constitution of India**. It is provided in the Rules of Procedure of the Lok Sabha.

## 12) ORDINANCE MAKING POWER OF THE PRESIDENT

- **Why in news?**
  - » In May 2023, the President of India promulgated the ordinance - 'National Capital Territory of Delhi (Amendment) Ordinance, 2023' (May 2023)
    - The ordinance promulgated by President Droupadi Murmu gave the LG of Delhi, who is appointed by the Centre, power over services, and established a "National Capital Service Authority" comprising of chief ministers and two senior IAS officials, which would decide matters "by majority of votes of the members present and voting" - essentially creating a stipulation in which the view of the elected CM could be potentially be overruled.
- **Introduction:**
  - » **Article 123 (Article 213 for Governors)** of the constitution empowers the President to promulgate ordinance during recess of Parliament. The Ordinance making power is the most important legislative power of the President. It has been vested in her to deal with unforeseen and urgent matters.
  - » These ordinances have the same force and effect as an act of Parliament, but are in the nature of temporary laws.
  - » **What can ordinance do?**
    - It cannot amend constitution. Otherwise, it can do everything which parliament is empowered to implement.
- **Constitutional Safeguards:** The exercise of the Ordinance power is subject to 4 limitations :

- i. Ordinance can be promulgated only when atleast one of the Houses of the Parliament is not in session.
  - ii. President can make ordinance only when he is satisfied that the circumstances exist that render it necessary for him to take immediate action.
    - In Cooper case, (1970), the Supreme Court held that President's satisfaction can be questioned in a court on the ground of Malafide.
  - iii. His ordinance making power is coextensive as regards all matters except duration, with the law-making powers of the Parliament. Two implications - Subject restrictions and Article 13 restriction.
  - iv. Every ordinance issued by president during recess of Parliament must be laid before both the Houses of Parliament when it reassembles.
    - If the ordinance is approved by both the houses, it becomes an act.
    - If Parliament takes no action at all, the ordinance ceases to operate on the expiry of six weeks from the reassembly of Parliament.
    - The President can withdraw ordinance at any time, however, it is not a discretionary power and must be done on the advice of Council of Ministers.
- **Statement explaining the circumstances**
- The rules of Lok Sabha require that whenever a bill seeking to replace an ordinance is introduced in the House, a statement explaining the circumstances that had necessitated immediate legislation by ordinance should also be placed before the Houses.
- **Important SC Judgments**
- In Cooper case, (1970), the Supreme Court held that President's satisfaction can be questioned in a court on the ground of Malafide.
- **D C Wadhwa Case (1987)**
- The court ruled that successive re-promulgation of ordinances with the same text without any attempt to get the bills passed by the assembly would amount to violation of the constitution and the ordinance so re-promulgated is liable to be struck down. It held that the exceptional power of law-making through ordinance cannot be used as a substitute for legislative power of the state legislature.
- **Krishna Kumar Singh vs. State of Bihar, 2017:** In a blow to Ordinance Raj, a 7 judge Constitutional Bench of the Supreme Court widened the boundaries of judicial review to the extent that it can now examine whether the President or the State Governor was spurred by an "oblique motive" to bypass the legislature and promulgate an ordinance.
- Further, the court added that "the ordinance making power is not a parallel source of legislation". The court also held that "re-promulgation of ordinance is a fraud on the constitution and a sub-version of democratic and legislative process".
- **Why this temptation for ordinance?**
- » Reluctance to face legislatures on certain issues
  - » Lack of majority in upper house
  - » Repeated and willful disruption by opposition parties

## **6. TOPICS TO BE COVERED**

- 1) SUSPENSION OF MPS**
- 2) DISQUALIFICATION OF MPS/ MLAS**
- 3) OFFICE OF SPEAKER**
- 4) DEPUTY SPEAKER**
- 5) DEPUTY CHAIRPERSON OF RAJYA SABHA**
- 6) LEADER OF OPPOSITION**
- 7) DELIMITATION COMMISSION**

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# TARGET PRELIMS 2024

## BOOKLET-49; POLITY-3

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## 2. FUNDAMENTAL RIGHTS

### 1) RIGHT TO WALK

- **Punjab** has become the first state in India to enforce Right to Walk.
  - In May 2023, Punjab enforced the Right to Walk, as per Article 21 of the Indian Constitution, following a 2010 petition filed in the Punjab & Haryana High Court demanding safety for pedestrians on state roads.
  - Government of Punjab has issued orders directing all road making agencies operating in the state, including NHAI, the state public works department and local bodies department to ensure there are footpaths in all future expansion of roads and construction of new ones.
  - **Note:** More than 4,500 lives were lost in road accidents in 2021 of which pedestrian deaths were 395. Nationwide in 2021, more than 18936 pedestrians lost their lives.

### 2) HIGH COURT QUASHES JOB RESERVATION FOR LOCALS

- **Why in news?**
  - » The Punjab and Haryana High Court on Friday quashed the Haryana government's law guaranteeing 75% reservation to locals in private sector jobs in Haryana (Nov 2023)
- **Haryana State Employment of Local Candidates Act, 2020.**
  - » The act was notified by Haryana government in Jan 2022. It provided for 75% of the new employment to be given to local candidates for jobs having salary of less than Rs 30,000 per month in various privately managed companies, societies, trusts, limited liability partnership firms, partnership firms, etc. situated in Haryana.
- **On what ground was it challenged?**
  - » It provides reservation in private employment and creates an unprecedented intrusion by the State government into the fundamental rights of employers to carry on their business and trade as provided under Article 19 of the Constitution of India.
  - » It was also submitted that the law infringed on Article 14 of the Constitution of India. It added that fundamental wedge is sought to be created between persons domiciled in different states by the law in question.
- **High Court Verdict (Nov 2023)**
  - » The bench said that the law is unconstitutional and violative of the Part-III of the Constitution.
  - » **Broad grounds on which the Court has declared the law as "unconstitutional":**
    - **Article 35 Bars state from legislating on Requirement of Domicile in Employment**
      - The court said that a perusal of the Article 35 would go on to show that there is a specific bar to the legislature of the state not to make any laws in respect of the matters which are under Article 16(3).
      - The court referred to State of Tamil Nadu and ors vs K. Shyam Sundar and Ors (2011) and opined that "it is beyond the purview of the state to legislate on the issue and restrict the private employer from recruiting from the open market for the category of employees who were receiving less than Rs 30,000 per month".
    - **Discrimination Against Individuals Not Belonging to State**

- **Violation of Equality Guaranteed under Article 14**
- **Violation of freedom guaranteed under Article 19**
- **Violation of Constitutional Morality**
  - The bench said that the concept of constitutional morality has been openly violated by introducing a secondary status to a set of citizens not belonging to the State of Haryana and curtailing their fundamental rights to earn their livelihood.

### 3. UNION (LEGISLATURE AND EXECUTIVE) CONTINUES..

#### 1) WOMEN RESERVATION IN PARLIAMENT AND LEGISLATIVE ASSEMBLIES

- **Background:**
  - » Even though the 2019 Lok Sabha elections saw the highest ever presence of women in parliament, it still stands at **78 (14.39%) among 543 seats**. This percentage is well below the global average (24.6%) showing that in India gender discrimination is quite prevalent even in case of elections to the top positions in the country. At state assemblies' level this performance is more dismal with only **9% seats being filled by women**.
  - » **Previous efforts to provide reservation for women in legislative bodies:**
    - Bills amending the Constitution to reserve seats for women in Parliament and State Assemblies have been introduced in 1996, 1998, 1999, and 2008. The first three lapsed due to dissolution of their respective Lok Sabhas. The 2008 bill was introduced in RS and passed in RS in 2010, but it also lapsed with the dissolution of 15th LS.
  - » In 2015, the **Report on the Status of Women in India** noted that the representation of women in state assemblies and Parliament continues to be dismal.
    - **Decision making positions in political parties** have negligible presence of women.
    - It recommended reserving atleast 50% seats for women in local bodies, state assemblies, Parliament, ministerial levels, and all decision-making bodies of the government.
  - » The **National Policy for the Empowerment of Women (2001)** had stated that reservation will be considered in higher legislative bodies.

#### A) THE CONSTITUTION (106TH AMENDMENT) ACT, 2023: WOMEN RESERVATION BILL, 2023 (NAARI SHAKTI VANDAN ADHINIYAM)

- **Reservation:** The amendment reserves, as nearly as possible, 1/3rd of the seats for women in Lok Sabha, State Legislative Assemblies and Legislative Assembly of NCT of Delhi. This reservation will be applicable to seats reserved for SCs and STs in Lok Sabha and State Legislatures.
- **New Articles Inserted:**
  - i. **Article 330A:** Reservation of 1/3rd of the seats for women in LS.
  - ii. **Article 332A:** Reservation of 1/3rd of the seats for women in LA.
  - iii. **Article 334A:** The reservation will be effective after the census is conducted after commencement of this act has been published.

- » **Based on census**, Based on Census, delimitation will be undertaken to reserve seats for women.
  - » **Sunset clause:** This reservation will be provided for 15 years. However this reservation will continue till such date as Parliament determines by a law.
  - » **Rotation of seats:** Seats reserved for women will be rotated after each delimitation, as determined by a new law made by Parliament.
- **Article Amended:**
- 239AA: To reserve 1/3rd of the seats for women in LA of NCT of Delhi.

## B) THE JAMMU AND KASHMIR REORGANIZATION (SECOND AMENDMENT) ACT, 2023

- Passed in Parliament in Dec 2023
- It amends the J&K Reorganization Act, 2019. This act had provided for reorganization of the state of J&K into UT of J&K (with legislature) and Ladakh (without legislature).
- **Key highlights of the amendment:**
  - » **Reservation:** The amendment reserves, as nearly as possible, one-third of all elected seats in J&K legislative assembly for women. The reservation will also apply to seats reserved for SCs and STs in the assembly.
  - » **Commencement of the Reservation:** (Same provisions as Article 334A of the Constitution)
  - » **Rotation of seats:** Seats reserved for women will be rotated after each delimitation, as determined by the law made by Parliament.

## C) THE GOVERNMENT OF UTS (AMENDMENT) ACT, 2023

- Passed in the Parliament in Dec 2023. It amends the Government of UTs Act, 1963 to provide for reservation of seats for women in Legislative Assembly of UT of Puducherry.
- Provisions are exactly same as J&K Reorganization (2nd Amendment) Act, 2023 or 106th Constitutional Amendment Act.

## 2) OFFICE OF SPEAKER

- In Lok Sabha, this presiding officer is the Speaker.
- **Selection and Removal of the Speaker**
  - Article 93 of the Constitution of India provides that *the house of people shall, as soon as may be, choose two members of the house to be respectively Speaker and Deputy Speaker thereof and, so often as the office of Speaker or Deputy Speaker becomes vacant, the house shall choose another member to be Speaker or Deputy Speaker, as the case may be.*
- **Removal**
  - Article 94 of the Constitution specifies that a speaker (or deputy speaker)
    - a. Shall vacate the office if he ceases to be a member of the house.
    - b. May at any time, by writing to Deputy Speaker (Speaker) resign his office.
    - c. May be removed from his office by a resolution of the House of the People passed by a majority of all the then members of the house.

- **Note1:** A resolution under Article 94(c) can only be moved after providing at least a **14 days' notice** of the intention to move the notice.
- **Note2:** In case of dissolution of the house, the speaker shall not vacate his office until immediately before the first meeting of the House of the People after the dissolution.

#### - Powers and Functions

- **Sources of Speaker's Power and Duties:** Powers and Duties of the speaker are derived from **three sources** - The Constitution of India, the Rules of Procedure and Conduct of Business of Lok Sabha and Parliamentary Conventions.
- **Speaker's power and functions can be carved into three broad categories:**

##### i. Speaker **Facilitates the business of the house.**

- a. She **presides** over the meeting of Lok Sabha (except when a resolution for his removal is under consideration).
- b. She also **presides** over the **joint sitting** of two houses of the Parliament (Article 118(4))
- c. Speaker has a **casting vote** in case of equality of vote in the house on any matter.
  - **Note:** The provision of the absence of vote in first instance increases the impartiality of the speaker (like in England)
- d. Within the house, she is the **final interpreter** of the Constitution of India, Rule of Procedure and Conduct of Business of Lok Sabha, and (c) the parliamentary precedents within the house.
- e. She **assists members in holding the executive accountable** by selecting members who may ask supplementary questions and compelling ministers to make statements before the house.
- f. She **appoints the chairman of all parliamentary committees of the Lok Sabha** and herself presides over Business advisory committee, the Rules Committee, and the General-Purpose Committee.

##### ii. For maintaining order in the house, he takes on the **role of a disciplinarian**

- She has primary responsibility and final power wrt **maintaining order and decorum** in the House.
  - In case of indiscipline she is empowered to suspend members, or ask them to withdraw from the house.
  - In case of gross disorder, she adjourns the house.
  - To ensure decorum, the speaker can **interrupt members to withdraw their statements** if they are un-parliamentary.

##### iii. Speaker also fulfills some **quasi-judicial roles.**

- She has the power to **designate a bill as money bill** when it is transmitted from lower house to the Upper House.
- She decides the **question of disqualification** on the grounds of **defection** of a member of the Lok Sabha.

#### - Independence and Impartiality of the Office of Speaker

- **GV Mavlankar**, the first Speaker observed: "Once a person is elected Speaker, he is expected to be above parties and above politics".
- For this Constitution has provided for following provisions:

- i. Speaker is provided with security of tenure, and he can be removed only by resolution passed by Lok Sabha by an **absolute majority** (majority of the total members of the house).
  - ii. He **can't vote in first instance** thus reducing bias in support or opposition to a bill.
  - iii. Salaries and allowances of speaker is fixed by the Parliament and are charged on the Consolidated Fund of India and thus are not subject to annual vote of parliament.
  - iv. His work and conduct can't be discussed in Lok Sabha except on a substantive motion.
  - v. The speaker's conduct in regulating the procedure or maintaining order of the house is not subject to jurisdiction of any court.
  - vi. Speaker also has a **very high position** in the order of precedence. He is **placed at seventh rank**, along with the CJI. This means, he has a higher rank than all cabinet ministers except the Prime Minister.
- **What more can be done to ensure neutrality of the Speaker:**
- **Provisions that can be taken from United Kingdom:** Other than most of the similar protections as given by the Indian Constitution, the neutrality of Speaker in UK is ensured by:
    - i. By convention, **the speaker gives up the membership** of his/her political party.
    - ii. **Promise of continuity in office** for many terms is provided for speaker. In Britain by convention, political parties (usually) don't field candidate against the speaker at the time of general elections. Thus, speaker can continue in office, until deciding to do otherwise.
    - iii. Further, **speaker don't contest on political issues** but instead stand as "Speaker seeking re-election."

### 3) HOUSE OF DEPUTY SPEAKER REMAINED VACANT IN 17<sup>TH</sup> LOK SABHA

- **Introduction:**
  - The post of Deputy Speaker has been lying vacant since the beginning of the 17th Lok Sabha in May 2019.
- **Constitutional Provisions:**
  - **Article 93:** The Lok Sabha shall, as soon as possible, choose two members of the House (simple majority) to be respectively **Speaker and Deputy Speaker** and thereof, so often as the office of Speaker or Deputy Speaker becomes vacant, the House shall choose another member to be Speaker or Deputy Speaker, as the case may be.
  - **Article 178** contains the corresponding position for speaker and Deputy Speaker of the Legislative assembly of the state.
- **Term of Deputy Speaker, vacation of office, and disqualification**
  - Once elected, a deputy speaker usually continues in office until the dissolution of the house.
  - Speaker or deputy speaker vacate her office if she ceases to be member of the house.
  - They may also **resign** or may be removed from office by a resolution of the House of the People passed by a majority of all the then members of the house.
  - **Disqualification provisions of MPs** are still valid on Speaker /Deputy Speaker except **one exception**.

- » Para-5 of the **tenth Schedule** says that a person who has been elected **speaker/deputy speaker** shall not be disqualified if she, by reason of his election to that office, **voluntarily gives up the membership of the political party** to which he belonged immediately before such election - and **doesn't**, so long as she continues to hold office thereafter, rejoin that political party or become a member of another political party.
- » **Note:** This exception is also applicable to **Vice chairperson of Rajya Sabha, Speaker/Deputy Speakers of Legislative assembly** and **Chairman/Deputy chairman of Legislative Council.**

- **Functions of Deputy Speaker**

- Deputy Speaker is a **Presiding Officer**.
  - Article 95(1) of the Constitution says that **when the office of speaker is vacant, the duties of the office shall be performed by the Deputy Speaker**.
- He is also **ex-officio chairman of some committees** by virtue of his position.
- In case of **joint sitting of the two houses** and **absence of speaker**, Deputy Speaker presides over the joint sitting of the two houses.

- **Powers of Deputy Speaker**

- In general, the **deputy speaker has the same powers** as the speaker when presiding over a sitting of the house. All references to the speaker in the rules are deemed to be references to the **Deputy Speaker** when he presides.
- Further, **no appeal lies to the Speaker** against a ruling given by Deputy Speaker or any person presiding over a sitting of the House in the absence of Speaker.
- **Note:** Deputy Speaker is **not subordinate** to Speaker. When he presides over a sitting, he has all the powers of a Speaker.

- **Is it mandatory to elect a deputy speaker?**

- Constitutional experts point out that both **Article 93 and Article 178** use the words "**shall**" and "**as soon as may be**" - indicating that not only is the selection of Speaker and Deputy Speaker **mandatory**, it must be **held at the earliest**.

- **Is there a time frame?**

- **Constitution** provides for "**as soon as possible**".

- **Conventions which are being followed:**

- **Generally**, the practice in both Lok Sabha and the State Legislative Assemblies has been to **elect speaker during the (mostly short) first session of the new House** - **usually on the third day after oath-taking and affirmation take place over the first two days**.
  - » The **election of deputy speaker** generally takes place in the **second session**, even though there is **no bar** in having the elections in the first session of the new Lok Sabha/Assembly. But the election of **deputy speaker** is usually **not delayed beyond the second session** without genuine and unavoidable constraints.
- Since, the term of **Morarji Desai government**, the tradition of the post of the Deputy Speaker **going to the Opposition party** has been followed.

- **Why Deputy Speaker hasn't been elected yet?**

- The ruling party hasn't been able to agree on a **suitable opposition party member** for the post. Opposition doesn't have the required numbers to choose their own person.
- **Speaker from the ruling party:** Rule 8 of The Rules of Procedure and Conduct of Business in Lok Sabha provides that the **election shall be held on such date as the Speaker may fix**", and the Deputy Speaker is elected once a motion proposing his name is carried.
- **Significance of Deputy Speaker**
  - **Continuity of the Speakers Office** by acting as the **Speaker** when the office becomes vacant due to illness, death, resignation, or any other reason.
  - **Unlike the panel of chairpersons**, appointed by Speaker, which comprise of 9 MPs from various political parties, who preside over the house when the Speaker is not in the chair, **they don't enjoy the same constitutional or administrative power as the speaker**.
  - Further, since the **position of deputy speaker by convention is held by opposition party**, it increases the **accountability of majority party to legislative process to some extent**.

## 4) LEADER OF OPPOSITION

- **Introduction**
  - For the success and survival of democracy, **an effective opposition is of a categorical imperative**. Towards this the office of the Leader of Opposition (LoP) plays a key role and is of great significance in the functioning of a legislature.
- **Functions/Significance of Opposition and Leader of Opposition:**
  - Increases accountability of government to public.
  - Checks hasty decisions.
  - Ensures Political neutrality in selection of key posts (CVC, Lokpal, CBI Director etc.)
- **Provisions regarding Leader of Opposition**
  - The **Constitution of India** or the **Rules of Procedure in Lok Sabha** **don't have any provision** related to the Leader of Opposition.
  - The **Salaries and Allowances of Leaders of Opposition in Parliament Act, 1977** **defines LoP** as the leader of **numerically biggest party in opposition** to the government and **recognized as such by the speaker/chairman**.
    - » The act **extends to LoPs in the Lok Sabha and Rajya Sabha** the same official status, allowances and perks that are admissible to Cabinet Ministers.
    - » Note that **there is no 10% seat requirement** in the law or in the constitution.
  - The **10% rule** originated **following the formation of the first Lok Sabha in 1952**. The rules governing Lok Sabha procedure **empowers the speaker of the house to issue 'Directions' to conduct business in the lower house**.
    - » In 1956, the then Speaker of **Lok Sabha introduced the 10% rule to Indian Parliamentary politics** through **Directions 120-123**. These directions concern the recognition of an LOP, and basically list the **requirements for an association of members to be recognized as a parliamentary "party"**. Direction **121(i)(c)** lays down **the 10% rule for recognition of a 'party'** and other parties were categorized as 'groups'.

- At the same time the Section 121(i)(a) of the direction says that pre poll alliance on the basis of ideology will also be recognized as a party.
- The **Leaders and Chief Whips of Recognised Parties and Groups in Parliament (Facilities) Act, 1998** refers to a recognised party in the Lok Sabha as a party that has not less than 55 members.
  - » But, in Clause 3(ii), it clearly mentions that such provisions are **not valid for LoP as defined in section 2 of the Salary and allowance of the Leaders of Opposition in Parliament Act, 1977.**
- **From 9th - 15th Lok Sabha**, since the requirement of having a minimum strength of 55 members was fulfilled, the Lok Sabha had duly recognized opposition parties and LoPs, including Rajiv Gandhi, L.K. Advani, Atal Bihar Vajpayee, P.V. Narsimha Rao, Sharad Pawar, Sonia Gandhi and Sushma Swaraj.

## 4. SCHEDULE AND TRIBAL AREAS

### 1) 5<sup>TH</sup> SCHEDULE

- **Constitutional Provisions: Article 244(1):** The Provisions of the fifth schedule shall apply to the administration and control of the Scheduled Areas and Scheduled Tribes in any State other than the States of Assam, Meghalaya, Tripura and Mizoram.
- **Schedule-5:**
  - » ***Declaration of Scheduled Areas:***
    - The President can declare an area to be a schedule area. She can also increase or decrease its area, alter its boundary lines, remove such designation or make fresh orders for such redesignation on an area in consultation with the governor of the state concerned.
  - » ***Executive Power of state and Centre:***
    - The executive powers of the state extend to schedule area. But, governor has the responsibility of submitting a report to the President annually or whenever the President requires about the administration of such areas.
    - The executive powers of the Centre extends to giving directions to the states regarding the administration of such areas.
  - » ***Tribes Advisory Council:***
    - Every state which has a schedule area has to set up a Tribes Advisory Council to advise on welfare and advancement of the scheduled tribes. It is to consist of 20 members, three-fourth of whom are to be the representatives of the scheduled tribes in the state legislative assembly.
    - In case a state has scheduled tribes but no schedule areas, they also have to set up a Tribes Advisory council if the President so directs.
  - » ***Law applicable to Scheduled Areas:***
    - Governor can provide that any law of parliament or the state legislature is not applicable in scheduled areas or is applicable with specified modifications and exceptions.
    - He can also make regulations for peace and good government of a scheduled area after consulting the Tribes Advisory Council.

- These regulations may prohibit or restrict the transfer of land by or among members of the scheduled tribes, regulate the allotment of land to members of the scheduled tribes and regulate the business of money-lending in relation to the scheduled tribes.
- These regulations may also repeal any act of Parliament from being applicable in these areas.
  - **Note:** All such regulations require **assent of the President**.
- » **Note:** Currently 10 states have fifth schedule areas: Himachal Pradesh, Rajasthan, Gujarat, Madhya Pradesh, Chhattisgarh, Jharkhand, Odisha, Maharashtra, Telangana and Andhra Pradesh.
- » **Note:** The Constitution requires the President to appoint a commission to report on the administration of the Scheduled areas and the welfare of scheduled tribes in the states. President can appoint this commission any time she wants, but compulsorily after ten years of the commencement of the Constitution.
  - The first such commission was formed in 1960 (U N Dhebar Commission) which submitted its report in 1961.
  - Second commission was appointed in 2002 ( Dilip Singh Bhuria Commission) which submitted its report in 2004

## 2) PANCHAYATS (EXTENSION TO SCHEDULED AREAS) ACT, 1996 (PESA ACT)

- **Background of PESA:**
  - » Article 243(M) of the Constitution says that Part IX (The Panchayats - Article 243 - 243O) shall not apply to Scheduled Areas (Article 244(1)) and Tribal Areas (Article 244(2))
  - » But, Article 243(M)(4)(b) provides that Parliament may, by law, extend the provisions of this part (Part IX) to the Scheduled Areas and Tribal areas subject to such exceptions and modifications as may be provided in the law.
- On the basis of the report of the Dileep Singh Bhuria Committee submitted in 1995, the Parliament enacted the Panchayats (Extension to Scheduled Areas) Act, 1996 to extend the Part IX of the Constitution to the Fifth Schedule areas, with certain modification and exceptions.
  - » **Note:** Ministry of Panchayati Raj is the nodal Ministry for implementation of the provisions of PESA in the states.
- **Key Highlights of PESA:**
  - » It is a unique and remarkable flagship legislation that brings together the simple system of tribal communities governed by their respective customs and traditions, and the formal system of states.
  - » **PESA** was enacted to ensure self-governance through gram Sabhas for people living in schedule areas. It gives pre-eminence to Gram Sabha rather than to elected Gram Panchayat.
  - » It legally recognizes the rights of tribal communities, residents of schedule areas, to govern themselves through their own systems of self-government, and also acknowledges their traditional rights over natural resources.
  - » **Key powers and functions given to Gram Sabhas are:**
    - **Safeguarding and Preserving** their traditions and customs, cultural identity, community resources and customary mode of dispute resolution

- Prevention of alienation of land and restoration of any unlawfully alienated land of scheduled tribes.
  - Right to mandatory consultation in land acquisition, resettlement, and rehabilitation of displaced persons.
  - Control over institutions and functionaries in all social sector.
  - Ownership of MFP
  - Control over Minor Minerals:
    - Recommendation in granting prospecting license or mining leases for minor minerals, and concessions for the exploitation of minor minerals by auction.
  - Management of minor water bodies.
  - Management of Village markets.
  - Exercise and control over money lending
  - Prohibiting/Regulating intoxicants
  - Approval of social and economic development plans.
  - Selection of beneficiaries under poverty alleviation and other programs.
- State legislatures were required to amend their respective Panchayat Raj Acts without making any law that would be inconsistent with the mandate of PESA.
- Note: PESA Act is referred as "**Constitution within the Constitution**" as it provides for the extension of the provisions of Part IX of the Constitution relating to the Panchayats to Schedule areas of 10 states.
- PESA is significant as it can play a role in:
    - **Democratization at grassroot level** - by empowering Gram Sabhas, PESA radically democratize governance.
    - **Inclusive growth:** By ensuring that benefits of minor forest product, minor minerals etc. primarily benefits tribal community
    - **Reducing Grievances of tribal people and Safeguarding tribal culture and way of life.**
    - **Environment Protection:** (For e.g. cancellation of mining projects on Niyamgiri hills)
      - In 2013, Supreme Court referred to PESA and asked the Odisha Government to go to Gram Sabha to get permission for bauxite mining in Kalahandi and Rayagada district. Local forest dwellers decided against the mining of Niyamgiri hills which led to cancellation of a huge project.
      - This case is considered a milestone and shows the power of the Gram Sabha. But, this was one of the rare achievements of PESA even as it underlines the possibilities the act carries.
    - **Reducing alienation** of tribal community and thus ensuring enhanced internal security.
      - Less alienated communities wouldn't be influenced by the LWE ideologies.
  - Progress So far:
    - As of Nov 2022, out of 10 PESA states, eight states, namely; Andhra Pradesh, Chhattisgarh, Gujarat, Himachal Pradesh, Maharashtra, Madhya Pradesh, Rajasthan, and Telangana have framed and notified their state PESA rules under their respective State Panchayati Raj Acts.

### 3) 6<sup>TH</sup> SCHEDULE

- **Why in news?**
  - Sonam Wangchuk led groups in Ladakh demand Constitutional protection under 6th Schedule (March 2024)
- **Details**
  - **Constitutional Provisions: Article 244: Administration of Scheduled Area and Tribal Areas**
    - **Article 244(2):** The provisions of the sixth schedule shall apply to administration of the tribal areas in the state of **Assam, Meghalaya, Tripura and Mizoram.**
  - **Sixth Schedule of the Constitution: Provisions as to the administration of Tribal Areas** in [Assam, Meghalaya, Tripura and Mizoram].
    - It seeks to safeguard the interests and rights of tribal population through the formation of Autonomous District Councils (ADC) and Regional Councils.
      - These are bodies representing a district to which the Constitution has given varying degrees of autonomy within the state legislatures.
    - **Autonomous Districts and Autonomous Regions**
      - Tribal areas of Assam, Meghalaya, Tripura and Mizoram have been identified as Autonomous districts.

<b>Tribal areas</b>	<b>Part-1</b>	The North Cachar Hills District; [The Karbi Anglong District.]; [The Bodoland Territorial Areas District.]
	<b>Part-2</b>	Khasi Hills District; Jaintia Hills District; The Garo Hills District Note: Almost all of Meghalaya - except a tiny area within capital Shillong - is covered by the sixth schedule to the Constitution of India under Article 244 of the Constitution.
	<b>Part-2A</b>	Tribal Area District
	<b>Part-3</b>	The Chakma District; The Mara District; The Lai District

- If there are different scheduled tribes in an autonomous district, the Governor may divide the area or areas inhabited by them into Autonomous Regions.
- The governors of these states are empowered to reorganize boundaries of these autonomous districts/regions.
- **Constitution of District Councils and Regional Councils:**
  - There shall be a **District Council** for each autonomous district consisting of not more than thirty members. Of these thirty members, not more than four would be nominated by the Governor, and the rest shall be elected by adult suffrage.
  - There shall be a **Separate Regional Council** for each area constituted as autonomous region.
  - **Powers of Administration of a region** is vested in the Regional Council and Powers of **Administration of an autonomous district** shall be vested in the **District Council** (except for those area which go under Regional Council)

- District Council will only have such powers with respect to the areas under the authority of regional council which may be delegated to it by the Regional Council.
- **District Councils and Regional Councils** have also been given various **law making and Judicial Powers**.
  - |    |   |
|----|---|
| NN | Powers have been given to <b>District Councils and Regional Councils</b> for <b>making laws</b> |
|----|---|
  - **District Councils and Regional Councils** are also empowered to constitute village councils or courts for the trial of suits and cases between the parties all of whom belong to ST within such areas.
    - **The High Court** shall have and exercise such jurisdiction over the suits and cases as the Governor may from time to time specify.
  - **District and Regional Funds** have been created. In these funds, all moneys received respectively by district council and regional council in the course of administration would be provided.
    - CAG of India shall cause the accounts of district council and regional council audited.
  - **The acts of Parliament or the state legislature do not apply** to autonomous districts and autonomous regions or apply with specified modifications and exceptions.
- **Advantages of inclusion in sixth schedule:**
  - i. **Democratic devolution of power**
  - ii. **Protect unique tribal culture and practices**
  - iii. Effectively protecting agrarian rights including rights over lands from outsiders
  - iv. **Effective development** as transfer of funds to sixth schedule area may be higher.
- **Demand for inclusion in 6th Schedule by Ladakh**
  - **Reasons:**
    - » Fragile ecology ->
      - Melting glaciers
      - Cold Desert of Ladakh is extremely sensitive to climate change
  - **Parliamentary Standing Committee on State Affairs** tabled a report in the Parliament recommending inclusion of Ladakh in the sixth Schedule because its tribal communities account for 79.61% of its total population.
    - » But the Home Ministry said in Dec 2022 that the main objective of including tribal population under the Fifth/Sixth Schedule is to “ensure their overall socio-economic development, which the UT Administration has already been taking care of since its creation. Sufficient funds are being provided to Ladakh to meet its overall developmental requirements”.

## 5. FUTURE CLASS

- Centre State Relations
- Inter-State Relations
- Judiciary
- Election related issues

# TARGET PRELIMS 2024

## BOOKLET-50; S&T-UPDATES-3

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### 3. SPACE

#### 1) SPACEPORTS OF INDIA

##### A) SATISH DHAWAN SPACE CENTRE (SDSC)-SHAR

It is the 'Spaceport of India'. It is the backbone of the ISRO in providing launch base infrastructure for the Indian Space Program.

It is situated along the east coast of Andhra Pradesh and is located 80 km off Chennai. It currently provides launch infrastructure to all ISRO missions. It is equipped with a solid propellant processing setup, static testing, and launch vehicle integration facility, telemetry services, - tracking and command network to oversee the launch – and a mission control centre.



##### B) KULASEKARAPATTINAM SPACE PORT

In Feb 2024, PM Modi laid down the foundation stone for India's second spaceport at Kulasekharapattinam, a coastal village in TN's Thoothukudi district on 28<sup>th</sup> Feb 2024.

###### Why this location?

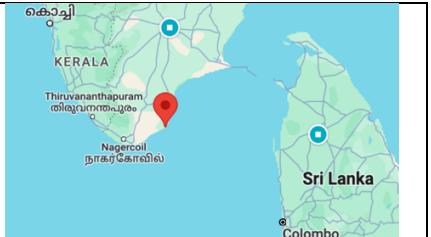
- It offers a strategic advantage, particularly in enhancing payload capability with its direct southward launch trajectory for small launch vehicles.

On the day of laying of foundation stone only, ISRO launched Rohini Sounding Rocket "RH200" from the newly established launch complex.

- The RH200 rocket, developed by Vikram Sarabhai Space Center (VSSC), has a long-standing reputation for reliability, with this launch marking its 1928<sup>th</sup> successful mission.

**Launch site is expected to be fully commissioned within 24 months** and will enhance the space activities of NGEs (Non-Government Entities).

- The new site will focus on launches of smaller payloads.
- The new facility will permit anywhere between 20 to 30 SSLV launches annually.
- Advantages:**
  - As the Penetration of private sector increases, more launchpads (spaceports) will be needed to launch satellites.



###### Problem with launching small satellites from Sriharikota:

**Dogleg Maneuver** takes extra fuel and reduces the payload capacity. Polar satellites launched from Sriharikota spaceport of south India frequently use this maneuver to avoid flying over Sri Lanka.

**Rockets make a steep 40-degree arc** in order to bypass the city of Colombo. For larger satellites, fuel required for this maneuver is insignificant compared to the total fuel. However, this is very inefficient for smaller rockets.

- The Kulasekharapattinam space port will allow a direct southward and smaller trajectory for the light weight SSLVs carrying less fuel. It is because Kulasekharapattinam is located several kms to the west of Colombo. It will enhance the payload capacity.

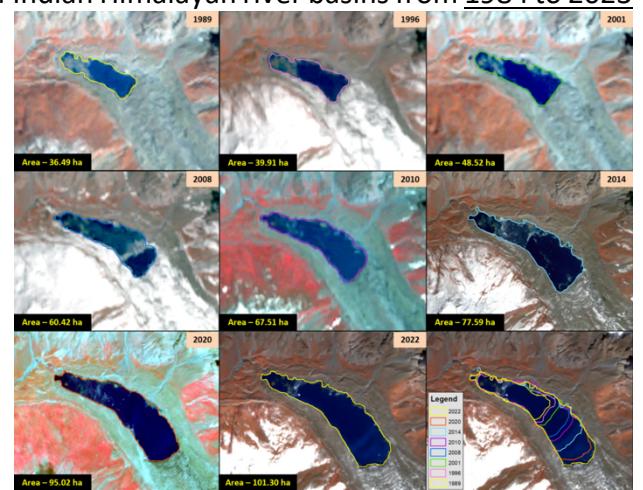


## 2) TATA ADVANCED SYSTEM LIMITED (TASL)'S TSAT-1A

- In April 2024, Tata Advanced Systems Limited (TASL) announced the successful deployment in space of its sub-metre resolution optical satellite, TSAT-1A.
  - » SpaceX's Falcon 9 rocket launched **TSAT-1A** satellite from the Kennedy Space Centre, Florida.
- About TASL:** It is a wholly owned subsidiary of Tata Sons and is a significant player for aerospace and defence solutions in India.
- About TSAT-1A:**
  - » It will deliver high resolution optical satellite images with increased collection capacity, dynamic range, and low-latency delivery through its multispectral and hyperspectral capabilities.
  - » It was assembled in TASL's Assembly, Integration and Testing (AIT) plant in its Vemagal facility in Karnataka.
- Collaboration with Satellogic:** The achievement follows the collaboration agreement signed between TASL and Satellogic in Nov 2023, leveraging Satellogic's expertise to develop and integrate an advanced EOS in India and TASL's capability to undertake complex system integration.
- About Satellogic:** It is a company specializing in Earth Observation Satellites. It is headquartered in Montevideo, Uruguay.

## 3) IN APRIL 2024, ISRO RELEASED SATELLITE DATA ANALYSIS ON EXPANSION OF GLACIAL LAKES IN THE CATCHMENTS OF INDIAN HIMALAYAS RIVER BASINS

- Satellite remote sensing technology is an excellent tool for inventory monitoring due to its wide coverage and revisit capability.
- Long term satellite imagery covering the catchments of Indian Himalayan river basins from 1984 to 2023 indicates significant changes in glacial lakes.
- **Key Highlights of ISRO's Data**
  - Of the 2,431 lakes larger than 10 hectares identified during 2016-17:
    - » **676 glacial lakes have notably expanded since 1984.** (Specifically, 130 lakes are situated within India).
      - 601 lakes (89%) have expanded more than twice
      - 10 lakes have grown between 1.5 to 2 times
      - 65 lakes at 1.5 times.
- **Long term changes in the Ghepan Ghat glacial lake** (Indus River Basin) at an elevation of 4,068 m in Himachal Pradesh, India, show a 178% increase in size from 36.49 hectares between 1989 and 2022.



The long-term changes in the Ghepan Ghat Glacial Lake area

#### 4) FIRST INDIAN SPACE TOURIST: GOPI THOTAKURA

- » **Blue Origin** was established by Jeff Bezos in 2000.
  - New Shepherd, is a fully reusable sub-orbital launch vehicle developed specifically for space tourism by Blue Origin. It completed first human flight to space on 20<sup>th</sup> July 2021 with four private citizens on board. The flight went upto a height of 107 kms.
- **Update: (April 2024)**
  - » Entrepreneur and Pilot **Gopi Thotakura** is set to become the first Indian to venture into space as tourist on the NS-25 mission of **Blue Origin** – a company founded by Jeff Bezos, who is also the founder of Amazon.
  - » This **NS-25 mission** will be suborbital mission. The whole crew members will be taken to outer space via New Shepherd.
  - » If the mission is successful, he will become only the **2<sup>nd</sup> Indian to go into space** (the first one was **Wing Commander Rakesh Sharma**, who flew to the **Salyut 7 space station** on a Soviet Spacecraft in 1984).

#### 4. BIOTECHNOLOGY UPDATES

##### 1) GENE EDITED CROPS

- **Note:** There is a slight difference between GM crops and Gene-Edited Crops:
  - **Gene-Edited crops** are trans-gene free and contain no foreign genes. Gene editing tools are used to generate changes to native genetic material to yield beneficial outcomes.

- Regulatory framework for gene editing are nascent and generally less prohibitive relative to GMOs. Legislations regarding gene editing is emerging globally and trending towards allowing gene-edited products to pass from research to production with relative ease, compared to GMOs.
- Gene Editing Tools can be used to produce GMOs. In this case, novel configurations of genetic material can be precisely inserted into the genomes of organisms by using gene editing machinery.
- Gene-Modified Crops contains foreign genes. They leverage the genetics of other organisms to improve desired traits. (e.g. BT-Cotton, DMH-11, Golden Rice)

#### A) GENE EDITED MUSTARD – LESS PUNGENT, MORE USEFUL

- **Why in news?**
  - Indian Scientists have developed first ever low-pungent mustard that is pest and disease resistant (Aug 2023)
- **Understanding the Problem:**
  - Mustard/Rapeseed is one of the most significant oilseed grown in India. But, mustard seeds have very high levels of glucosinolates, a group of sulphur and nitrogen-containing compounds contributing to the characteristic pungency of their oil and meal. This limits the acceptance of mustard oil by many users specially those who are used to less strong odour and flavour. The problem is even more in case of meal (the residual cake after extraction of oil from the seeds). Rapeseed meal is unpalatable to poultry and pigs, while having to be mixed with fodder grass and water for giving to cattle and buffaloes. Moreover, high glucosinolates are also known to cause goitre (swelling of neck) and internal organ abnormalities in livestocks.
- **Efforts to improve the quality of Mustard:**
  - Various institutions including Centre for Genetic Manipulation of Crop Plants (CGMCP) and the Indian Council of Agricultural Research has gone into breeding of rapeseed-mustard lines of so called Canola Quality. Normal Mustard (*Brassica juncea*) contains 120-130 ppm of glucosinolates. Canola has sub-30 ppm levels.
  - Scientists have bred low glucosinolates variety of mustard, but large scale cultivation couldn't take place. This is because reducing glucosinolates increases the vulnerability of crops to pests and diseases.
  - So, what is needed is to reduce the glucosinolates level in seeds, without lowering the levels in rest of the plant.
- **The Gene Editing Breakthrough:**
  - Glucosinolates are synthesized in the leaves and pod walls of mustard plants. They are transported and accumulated in seeds through the action of glucosinolates transporter or

**GTR genes.** There are 12 such genes under **two distinct classes** of GTR1 and GTR2 with six copies each.

- Scientists at NIPGER, the lead lab and CGMCP have edited 10 out of 12 GTR genes in 'Varuna', a high yielding variety of Indian mustard. They used CRISPR/Cas9 tool for this. This editing made changes in the encoded proteins which were responsible for transport of the glucosinolates to the seeds.
- **Result:**
  - **GTR Edited Low-seed high-leaf glucosinolate:** Seeds of GE Varuna mustard variety has glucosinolates content well below the 30 ppm canola quality. Other parts of the plant, especially the leaves and pod walls enclosing the seeds, has significantly higher glucosinolate accumulation.
  - **Resistance against pest is intact:** The edited variety continues to display defence against virulent fungal pathogen Sclerotinia sclerotiorum and the insect pest Spodoptera litura. This defence is at par or better than that of wild variety of mustard. This is because there is higher glucosinolate concentration in the leaves and pod walls.
    - These scientists have published their research finding in Plant Biotechnology Journal.

- **GE crops are subjected to less stringent “environmental release” regulation in India.**
  - For **GM Crops**, clearance has to come from Genetic Engineering Appraisal Committee and MoEF&CC (final nod). But, for GE crops requirement is less stringent.
  - In March 2022, an office memorandum from the MoEF&CC exempted GE Plants “free of exogenous introduced DNA” from the requirement of GEAC approval for open field trials leading to commercial release. Such clearance is now necessary only at the level of Institutional Bio-Safety Committee (IBSC), comprising scientists from the institutions engaged in the GE Crop development and from the DBT.
- **This work will increase the acceptability of mustard oil both within country and in the export market.**
- **GM Hybrid Mustard** (DMH-11) and the new GE low-seed and high-leaf glucosinolate lines are major plant breeding advancements – from Indian scientists. It can go some way towards bringing down the dependence on imported vegetable oil.

## 5. HEALTH:

### 1) TRANSMISSION MECHANISM OF VIRUSES: HOW EXTRACELLULAR VESICLES ACT AS DEFENCE MECHANISM (APRIL 2024)

- The mere presence of a virus in bodily fluid doesn't mean it is transmitted via that route.

- » For e.g. Dengue, Chikungunya, zika viruses are present in body fluid like saliva and semen but don't spread orally or sexually.
- **What do virus do inside the body?**
  - » **Transmission** is a crucial event in a virus' life cycle. A virus that can't transmit is of no consequence to anyone.
  - » **Different methods:**
    - **Through bodily fluid:** Most human virus achieve transmission by ensuring that they are present in bodily fluids that contact the outer environment, and subsequently a new host.
    - **Through Vectors:** E.g Dengue, Chikungunya etc.
  - » **Role of Surface Protein and Receptor on the host:**
    - Once inside the body, virus must be present at correct location to infect new target cells. Viruses are usually highly selective in the cells they infect. This phenomenon, called **Tropism**, occurs because most viruses have special proteins on their outer surface that contact a receptor on the host cell. Any cell-type that makes the receptor can be infected by the virus.
      - **Examples:** for HIV virus, receptor is CD4; for SARS-CoV-2 the receptor is ACE2;
      - So, the cells which express ACE2 become the target of SARS-CoV-2. These cells include cells of respiratory tract and some cardiovascular cells. T-Cells don't have ACE2 so, SARS-CoV-2 can't infect them.
  - » **One strategy virus uses to achieve more transmission is to make proteins on the surface that have receptors on multiple cell-types.**
    - This allows them to infect different cell types, allowing access to multiple body fluids, enabling faster transmission.
- **What is PS Receptor?**
  - » **Phosphatidyl Serine (PS):** It is a lipid which is usually expressed by dying cells in the body, as a signal to destroy them.
    - The immune cells express the PS receptor and fuse themselves with these cells, quietly destroying them.
  - » **Viruses hijack this pathway** with a process called **apoptotic mimicry**: By expressing PS lipid on their own surfaces, allowing them to infect the very cells that will destroy them.
  - » **PS Receptor** is expressed by many cells - apart from some cells of the immune system - the virus tends to be present in multiple compartments.
    - Yet, the mere presence of a virus in a given compartment wouldn't guarantee transmission from that route.
      - Zika virus can be detected in semen, saliva, and breast milk, but rarely spreads through these means despite the presence of target cells in the oral and genital cavities. It transmits mainly via mosquitoes.
- **Why Zika and some other viruses are not transmitted by non-conventional route?**
  - » **Body uses extracellular vesicles** in these bodily fluids to inhibit viral infection.

- **Vesicles** are small structures enclosed by fat that a cell uses to transport substances from one part of the cell to another. When they are secreted outside the cell, they're called extracellular vesicles. These vesicles are abundant in saliva and semen and contain the same PS lipids on their surface that viruses like zika use for infection. The concentration of these extracellular vesicles that contain PS is low in blood and high in saliva and semen. These PS containing vesicles compete for the same receptors the viruses use for entry, thus crowding the latter out and preventing an infection.
- **The study shows that all viruses** that use the PS receptor for apoptotic mimicry - the dengue, chikungunya, West Nile, Ebola, and the vesicular stomatitis viruses - are inhibited by the presence of extracellular vesicles. The vesicles presence didn't affect the infectivity of viruses that don't use the PS receptor for entry, such as HIV and SARS-CoV-2.
- **The discovery of PS-coated vesicles for immunity represents a novel type of host defence against viral infection.**
  - While it is too early to speculate on potential therapeutic applications from this discovery, it opens up avenues for further research.

## 2) FOOD SAFETY: LIQUID NITROGEN IN FOOD & DRINKS (APRIL 2024)

- **Why in news?**
  - The Tamil Nadu Government has issued an advisory banning the use of liquid nitrogen in food and warned of strict action against violators (April 2024)
    - » A week ago, a video of child creaming went viral on social media. There were also visuals of adults spewing white smoke from their mouth and nose.
    - » Earlier in 2017, a man drank a cocktail with liquid nitrogen in a pub and ended up with a perforation in his stomach.
- Liquid nitrogen is the cooled liquified form of nitrogen gas. It can instantly freeze anything that it comes in contact with while evaporating.
- **Applications:**
  - **Food Preservation:** It is used to improve the quality of shelf life of food. It introduced droplets of liquid nitrogen the packaging on the production line.
    - » Since nitrogen's volume expands 700-times when it evaporates, it displaces the oxygen in the food pack, preventing microbial action and preserving the freshness.
  - **Health: Cancer Therapy:** It has been used in the management of any benign pre-cancers and cancers since the 1960s. This form of treatment is generally used to manage cancers wherein conventional surgery is not possible or can be used as an adjunct to conventional surgery.
    - » Nitrogen (at -196 degree C) is used to freeze and destroy cancer cells. This treatment is scientifically described as Cryotherapy.
- A liquid nitrogen cocktail is any mixed drink whose preparation involves the use of liquid nitrogen.
- **Why liquid nitrogen is added**
  - **For smoky, bubbling "cauldron effect"**

- » Liquid nitrogen boils at -196 degree celsius and thus room temperature quickly vaporizes to give bubbly appearance to drinks. The smoky appearance is produced because of the condensation of the moisture (water vapor) in the surrounding air above.
- **Quick chilling affect**
  - » It has become popular in the preparation of the cocktails because it can be used to quickly chill glasses or freeze ingredients.
- **Why is it dangerous?**
  - **Very Cold:**
    - » Can be extremely damaging to body tissues, causing frostbite and cryogenic burning on contact.
    - » If ingested it can lead to severe internal damage, destroying tissue in the mouth and digestive tract.
  - **Explosive effect**
    - » It has a large expansion ratio 1:694 (at 20 degree celsius). When liquid nitrogen evaporates it produces a large volume of gas, which means it can burst the stomach if swallowed in a sufficiently large amount.
  - **Lack of awareness/training about its use**
    - » Drink should not be bubbling when a person consumes it, as this indicates that there is still nitrogen in it. The white smoke like liquid vapor, however, is no problem as it forms due to moisture around after the gas has evaporated and cooled the drink around.
    - » Most of the bartenders are learning the process from YouTube videos.

- **Why does its use continue?**
  - It is not a regulated substance in most of the countries.
- **Regulation in India**
  - Liquid nitrogen is permitted as an additive in frozen food as per the guidelines of the FSSAI.
  - It's use in drinks is in gray area. There is no clear cut guideline for it and generally it is considered to be a novel technique, which can be used by food and business operators.
    - Some states including Haryana, and TN have banned the use of liquid nitrogen in food (other than for food preservation).

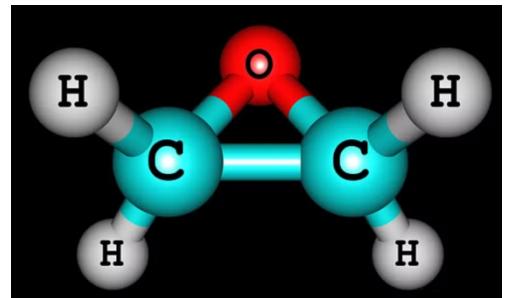
### 3) FOOD SAFETY: ETHYLENE OXIDE (APRIL 2024)

- **Why in news?**
  - In April 2024, Hong Kong suspended sales of three MDH spice blends (Madras Curry, Sambhar, Curry Powder) and an Everest mix for fish curries.
    - » Singapore Food Agency (SFA) has also issued a recall for Everest's fish curry masala, due to the detection of ethylene oxide, a pesticide, exceeding safe limits for human consumption.
    - » MDH has released a statement saying that MDH doesn't use ethylene oxide at any stage of storing, processing, or packing of spices.
    - » In view of the above development, FSSAI has started taking samples of spices of all brands, from across the country to check the quality of product sold in the domestic market.

- **About Ethylene Oxide:**
  - It is a colorless gas which is used as a pesticide and sterilizing agent. It was originally intended to sterilize medical devices.
  - **Why is ethylene oxide used in food?**
    - ETO is often used as a sterilizer in order to keep a curb on microbial load. Since it is gaseous, it can easily seep into breathable packaging and come in contact with items that require sterility assurance level. The process of sterilization neutralizes yeast, molds, bacteria etc. It disrupts the reproductive processes of micro-organisms, thus preventing food from getting spoiled.
    - If food sterilized by ETO is not aerated, it leaves behind residue. This residue in turn from toxic compounds like 2-Chloroethanol (2-CE), Ethylene Chlorohydrin (ECH), and Ethylene Glycol (EG).
- **Negative Impact:**
  - Experts believe that even short term exposure can be harmful. Individuals may face respiratory issue, headaches, nausea, vomiting, or cyanosis.
  - It is classified as a Group 1 Carcinogen by the International Agency for Research on Cancer. It poses threats like breast cancer, lymphoma, leukemia, neurotoxicity.

#### 4) FOOD SAFETY: SALMONELLA (APRIL 2024)

- **Why in news?**
  - The US has reportedly refused almost a third of shipments from MDH since Oct 2023 due to Salmonella contamination (April 2023)
- **Salmonella**
  - Salmonella is a group of bacteria that can cause gastrointestinal illness and fever called salmonellosis. It may lead to diarrhea, fever, stomach cramps etc. Children, elderlyies and people with weak immune system may face more severe symptoms and may need hospitalization.
  - **How does it spread?**
    - » According to the Centre for Disease Control and Prevention (CDC), Salmonella naturally lives in animals' intestine and can be found in their feces (poop). The bacteria spreads to human if they come in contact with bacteria infected animals or items in their environment.
- **Possible reasons:**
  - **Unhygienic practices:**
    - » The FDA had physically inspected MDH's manufacturing plant in Jan 2022, during which it noted that the "plant didn't have adequate sanitary facilities and accommodations. It also observed that plants equipment and utensils were not designed and constructed to be adequately cleaned or maintained to protect against contamination.



## 5) FOOD SAFETY AND STANDARDS ACT, 2006 (ALSO KNOWN AS FOOD ACT)

- Came into force in 2011.
- **Key Provisions**
  - i. **Consolidation of existing mechanisms**
    - » The FSS Act consolidated a number of food legislations, rules, orders etc and established a single law for all matters relating to food safety and standards.
    - » It subsumes acts like Prevention of Food Adulteration Act, 1954, The Fruit Product Order, 1955 etc.
  - ii. **Classification into standardized and non-standardized**
    - » **Standardized Food products** - Standards are prescribed and do not require product approval prior to manufacture, sale distribution, or import. The first time manufacturer or importer only requires an FSSAI license to begin a food business.
    - » **Non-standardized food products** - don't have standards as their safety parameters are either not known or either not yet ascertained.
  - iii. **Statutory Authority: Food Safety and Standards Authority of India (FSSAI) and State Food Safety Authorities**
    - » FSSAI is the apex body for food quality regulation in the country. It is responsible for setting standards and regulate, manufacture, storage, distribution, sale and import of food items to ensure food safety.
  - iv. **Commissioner of Food Safety of state**
    - » Appointed by respective state governments
    - » For efficient implementation of the Food Safety Act and various rules and regulations regarding food safety
    - » Commissioner also responsible for appointing Food Safety Officers for various local areas
  - v. **Graded Punishment and penalties** for contravention of the Act

No Injury	Sentence upto <u>six months</u> and fine upto <u>one lakh rupees</u>
Non-grievous injury	Sentence upto <u>1 year</u> and a fine <u>upto 3 Lakh rupees</u>
Grievous Injury	Sentence upto <u>6 years</u> and a fine upto <u>five lakh</u>
Death	Sentence <u>not less than 7 years</u> and <u>may extend upto life</u> and a fine <u>not less than 10 lakh rupees</u> .
  - vi. **Adjudicating and Appellate Tribunal**

## 6. COMPUTER AND IT

### A) LLAMA 3: META'S MOST SOPHISTICATED AND CAPABLE LARGE LANGUAGE MODEL YET

- **Llama** (Large Language Model AI) is a family of LLMs introduced by Meta AI in Feb 2023.
  - The **first version** of the model was released in four sizes – 7B, 13B, 33B, and 65 billion parameters.
    - » Meta has claimed that 13B model of Llama outperformed OpenAI's GPT-3 which had 135 billion parameters.

- » **Note:** Parameters is a measure of the size and complexity of an AI model and generally, a large number of parameters means an AI model is more complex and powerful.
- **The second version** (Llama-2) was released by Meta in July 2023 which was a significantly upgraded version of Llama-1. It was trained on 40% more data than Llama-1.
- **Llama-3** is the latest iteration of Meta's large language model. It is based on Llama-2 architecture, and has been released in 2 sizes, **8B** and **70B** parameters. Both sizes come with a base model and an instruction-tuned version that has been designed to augment performance in specific tasks.
  - **According to Meta**, Llama-3 is the best open-source model that is on par with the best proprietary models available today. Llama 3 outperformed Google's Gemma 7B and Mistral's 7B, Anthropic's Claude 3 Sonnet in benchmarks such as MMLU 5-shot (Massive Multitask Language Understanding), GPQA 0-Shot (A graduate level Google Proof Q&A Benchmark), HumanEval 0-shot (A benchmark for evaluating the multilingual ability of code generative AI Models), GSM-8K 8-shot and Math 4-shot, CoT (maths and word problems).
  - **For now**, only text based models in the Llama-3 collection of models has been developed. However, the company has plans to make Llama 3 multilingual and multimodal.
- Meta will be integrating its latest model into its proprietary virtual assistant – Meta AI.
- **How to try Llama-3:**
  - Meta have said that it will be integrating Llama-3 into Meta AI which can be used on Facebook, Instagram, Whatsapp, Messenger, and the Web.
  - It is readily available for developers as Meta has integrated the LLM into the Hugging Face Ecosystem. It is also available through Perplexity Lab, Fireworks AI, and on Cloud provider platforms such as Azure ML and Vertex AI.
  - Llama 3 models will soon be available on AWS, Google Cloud, Hugging Face, Databricks, Kaggle, IBM WatsonX, Microsoft Azure, NVIDIA NIM, Snowflake etc.

## LARGE LANGUAGE MODEL (LLMS)

LLMs are a category of foundation models trained on immense amounts of data making them capable of understanding and generating natural language and other types of content to perform a wide range of tasks.

## 7. IPR ISSUES

### 1) INTRODUCTION: IPR AND TYPES

#### - **Introduction**

- Intellectual Property refers to creation of mind: inventions; literary and artistic works; and symbols, names and images used in commerce.
- Intellectual Property Rights are the rights given to persons over the creations of their minds. They usually give the creator an exclusive right over the use of his/her creation for a certain period of time.

- IPRs are customarily divided in **two main types** (1. **Copyrights and Rights related to copyrights** 2. **Industrial Property**)
  - **Copyrights and Rights related to copyrights** cover rights of authors of literary and artistic work (books, music composition, painting, computer programs, films, sculpture etc.). It also includes **rights of performers** (e.g., actors, singers, musicians, broadcasting organizations etc.)
    - Generally, these rights are protected for a period of **50 years after the death of the author**.
    - **Purpose:** Encourage and reward creative work, promote innovation, provide appropriate financial benefits.
  - **Industrial Property** focuses on protecting inventions and **Creative work** (with industrial or commercial applications).
    - Industrial Property includes patents for inventions, Industrial design for aesthetic creations, and trademarks or geographical indications for distinctive signs.
    - **Industrial property can be divided into two main sections**
      1. **Protection of distinctive signs** in particular trademarks and geographical indications
        - **Trademarks** distinguish the goods and services of one undertaking from those of other undertakings
        - **Geographical indications** identify a good as originating in a place where a given characteristic of the good is essentially attributable to its geographical origin).
          - The protection may last indefinitely, provided the sign in question continues to be distinctive.
        - **Aims:** The protection of such distinctive signs aims to stimulate and ensure fair competition and to protect customers, by enabling them to make informed choices between various goods and services.
      2. **Patents, Industrial Design and Trade Secrets**
        - This is the second type of Industrial Property.
        - The aim is to stimulate innovation and design and promote creation of technology. It also gives incentive and means to finance R&D activities.
        - A functioning IPR regime also facilitates transfer of technology in the form of FDI, joint ventures and licensing.
        - The protection is usually given for finite term (typically 20 years in the case of patents)

## 2) INTERNATIONAL INSTITUTIONS / AGREEMENTS DEALING WITH INTELLECTUAL PROPERTY RIGHTS

### A) WORLD INTELLECTUAL PROPERTY ORGANIZATION (WIPO)

- It is one of the specialized organizations of UN which was created in 1967 "to encourage creative activity, to promote the protection of intellectual property throughout the world".
  - It is a global forum for intellectual property services, policy, information, and cooperation.

- WIPO administers 26 international treaties.
  - The importance of intellectual property was first recognized in Paris Convention for the Protection of Industrial Property (1883) and the Berne Convention for the Protection of Literary and Artistic Works (1886).
- In 2018, the Union Cabinet approved DIPP recommendation of accessing to WIPO Copyright Treaty, 1996 and WIPO Performance and Phonograms Treaty, 1996
  - **WIPO Copyright Treaty:**
    - It came in force on March 6, 2002, and is **A Special agreement under Berne Convention** (for protection of literary and artistic works).
    - It has provisions to extend the protection of copyrights contained therein to the digital environment.
    - Further it recognizes the rights specific to digital environment, of making work available, to address "on-demand" and other interactive modes of access
  - **WIPO Performances and Phonograms Treaty**
    - Came into force in 2002.
    - It deals with rights of two kinds of beneficiaries
      - Performers (actors, singers, musicians) etc.
      - Producers (of phonograms) etc.
    - The treaty empowers right owners in their negotiations with new digital platforms and distributors.
    - It recognizes moral rights of the performers for the first time & Provides exclusive economic rights to them.
  - **Significance**
    - Making India's IPR policy compliant to global standards
    - It will contribute to fight against online piracy.

## B) TRIPS AGREEMENT OF WTO

- The Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) is an international agreement administered by the World Trade Organization (WTO) that sets down the minimum standards for any forms of intellectual property (IP) regulation as applied to nationals of other WTO members.
- It was negotiated at the Uruguay Round of General Agreement on Tariffs and Trade (GATT) in 1994.
- **Key provisions**
  - **WTO members to provide protection of:**
    - copyrights, covering content producers including performers, producers of sound recordings and broadcasting organizations;
    - geographical indications, including appellation of origin;
    - industrial design,
    - integrated circuit layout design;
    - **Patents**;
    - new plant varieties;

- trademarks;
- trade dress;
- and undisclosed or confidential information.
- **Enforcement Procedures**
- **Dispute Resolution Procedures**

- Protection and enforcement of all IPRs shall meet the **objectives**:
  - To contribute to the promotion of technological innovation
  - To the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations.

### C) INDIA AND INTERNATIONAL PATENT REGIME

- India has gradually aligned itself with international regimes pertaining to intellectual property rights.
- In 1994, India signed the TRIPS agreement mandated by the WTO. The agreement came into effect on January 1, 1995.
- Following this, it amended its internal laws to comply with TRIPS, most notably in 2005, when process patents and patents for pharmaceutical products were brought into legislation.
- India is also signatory to several IPR related conventions, including the Berne Convention, which governs copyright, the Budapest Treaty, the Paris Convention for the protection of IPR, and the Patent Cooperation Treaty (PCT), all of which govern various patent-related matters.
- In **recent past**, some positive steps which have been taken are – Accession to WIPO Performances and Phonograms Treaty and WIPO Copyright Treaty, collectively known as the WIPO Internet Treaties, in 2018 and the Nice Agreement in 2019.

### D) 2005 AMENDMENT TO THE PATENT ACT:

- Although the TRIPS treaty was signed in 1994, India took about 10 years to establish a patent law that was in line with WTO mandate. The new patent law was officially enforced on January 1, 2005, but retrospectively from 2004.
- Through the **new Patent law of 2005 (Patent (amendment) Act, 2005)**
  - ✓ **Earlier**
    - The 1970 Act, allowed for only process patent and didn't allow product patent.
    - It became a major factor in the growth of Indian pharmaceutical sector as medicines couldn't be patented (only the process of making it could be). This was based on the recommendations of a 1959 commission chaired by the jurist Rajgopala Ayyangar, which had said that laws need to be designed "with special reference to the economic conditions of the country, the state of its scientific and technological advance, its future needs and other relevant factors.. so as to minimize if not eliminate the abuses to which a system of patent monopoly is capable of being put out".
    - They used the process of reverse engineering to manufacture the drugs
    - **Timeframe** for the validity of patent is **5-7 years**.

- ✓ **Key changes**
  - **Product Patent** reintroduced
  - **Increased the timeframe** of the applicability of patent
    - All patents were given a time frame of 20 years. (Under the 1970 act, the life of a patent was limited between five to seven years)
  - **Intellectual Property Appellate Board** was established as a specialized judiciary to hear IP cases.

## 6) ACTS AND POLICIES OF GOVERNMENT OF INDIA

### A) PATENT ACT, 1970

- Patent act defines what invention is and makes it clear that any existing knowledge of thing cannot be patented.
- **Three prerequisites for patentability defined by the act:**
  - 'Novelty' standard
  - 'Non-obviousness' or inventive step
  - Industrial applicability
  - It shouldn't attract the provisions of section 3 and 4 of the Patents Act 1970.

**Discoveries are excluded from patent protection under section 3 of the Indian Patent Act.**

- Discovery essentially refer to finding out something which already existed in nature but was unknown or unrecognized.
- **Section 3** deals with what doesn't qualify as an invention under the Act.
- **Contentious Provisions (Section 3(d) and Section 84(1))**

### B) SECTION 3D (WHAT IS NOT PATENTABLE)

- Discovery of a new form of a known substance which doesn't result in the enhancement of the known efficacy cannot be patented.
- Discovery of a new property or new use of a known substance cannot be patented
  - For e.g.
    - Ethyl alcohol acts as solvent, but further discovery of its new property as anti-knocking, thereby making it usable as fuel, cannot be patented.
    - New use of Aspirin for treatment of the cardio-vascular diseases, which was earlier used for analgesic purpose, is not patentable.
- The mere use of a known process, machine or apparatus unless such known process results in a new product or employs atleast one new reactant
  - However, a new and alternative process for preparing Aspirin is patentable
- **Aim of the provision under Section 3d: Prevent Evergreening**
- **Does section 3(d) violate TRIPS?**

- No

### C) SECTION 84(1) (COMPULSORY LICENSING)

- Why in news?

- At the time of shortage of remdesivir, opposition parties were demanding that government should issue compulsory licenses for manufacture of an affordable generic version of Remdesivir (July 2020)

- Provisions of the law:

**any person may request a compulsory license if**

- after three years from the date of grant of patent, the needs of the public to be covered by invention have not been satisfied.
  - invention is not available to public at affordable price;
  - or the patented invention is not "worked in", or manufactured in the country, to the fullest extent possible

- Compulsory Licensing - Basics

- Compulsory licensing is when a government authorizes a party other than the patent owner to produce the patented product or process, without the patent owner's consent.
  - In 2012 India Granted its first compulsory license to generic drug producer.
    - The decision effectively ended German Pharmaceutical company Bayer AG's Monopoly over an anti-cancer drug and authorizes the production of a low-cost version for the Indian market.

- **Importance of Compulsory Licensing**

- Promotes India's status as "pharmacy of the world"
    - Promotes "people's accessibility to medicines"
    - Benefits India's fight against Drug Resistance TB, HIV, Cancer etc
    - strengthen our soft power especially in African countries for whom India is a source of low-cost generic medicine.

- Is Section 84(1) (Compulsory Licensing) compliant with TRIPS agreement

- The TRIPS agreement explicitly allows compulsory licensing as long as procedures and conditions set out in Article 31 of TRIPS are fulfilled.
    - Conditions in Article 31
      - Failure of negotiation for voluntary license
      - Payment of adequate remuneration to the patent owner
      - Compulsory license can't be given exclusively to licensee (e.g., the patent holder shall continue to produce)
      - Subject to legal review within the country
      - During emergency situation, the first condition need not be met
- Doha declaration on TRIPS agreement and Public Health confirms that countries are free to determine the grounds for granting compulsory licenses.
- **So yes, compulsory licensing is complaint with TRIPS agreement**

#### D) PATENTING TRENDS REPORT RELEASED BY NASSCOM (APRIL 2024)

- India witnessed 83,000 patents being filed in FY2023, marking an annual growth rate of 24.6%, the highest in the last two decades.
  - The **number of patents granted** also witnessed significant growth rising over **2X** between FY2019-FY2023. This trend was expected to increase significantly with over **1,00,000** patents granted between 15<sup>th</sup> March 2023 and 14<sup>th</sup> March 2024.
  - **Among the top technology patents**, Deep tech companies are filing patents for Artificial Intelligence, the IoT and Neurotechnology.

### 7) COPYRIGHTS ACT, 1957 (AMENDED IN 2012)

- It was the first copyright act in Independent India, it has been amended six times by now.
- Copyright Act 1957, and the Copyright Rules 2013, as last amended in 2016 are two laws that govern copyright in India.
- **Key highlights**
  1. **Types of Work Protected:** Literary, dramatic, musical and Artistic
  2. **Duration of Protection:**
    - Lifetime of the author + 60 years from the beginning of the next calendar year next following the year in which the author dies.
  3. **Foreign Work:** Copyrights of work mentioned in the International Copyright Order (WIPO) are protected in India, as if such work is Indian work.
  4. **Ownership**
    - Author
    - For work done in author's employment under a "contract of service" or apprenticeship, the employer is considered the first owner of the copy right, in the absence of any agreement on the contrary.
  5. **Exemption to Copyright infringement in India**
    - Fair dealing with any copyright work for certain specifically mentioned purposes and
    - Certain specific activities enumerated in the statute.
      - Exception for *the educational use of copyright materials, including their production "in the course of instruction"*.
  6. **Remedies available against copyright infringement in India**
    - The act provides three kinds of remedy
      - Administrative remedies
        - Detention of the infringing goods by the custom authorities
      - Civil Remedies
        - Injunctions, damages and account of profits
      - Criminal Remedies
        - Imprisonment (up to 3 years) along with a fine (up to 200,000)
  7. **Enforcement Authorities**
    - Civil Court

- Criminal Court -> for criminal infringement
- The Copyright Board constituted under the act -> it provides an alternative forum for resolving certain limited disputes, such as those pertaining to assignments and payments of royalties.

## 8) NATIONAL INTELLECTUAL PROPERTY RIGHTS POLICY

- The policy approved in May 2016, lays down the future roadmap for intellectual property in India.
- The Policy recognizes the abundance of creative and innovative energies that flow in India, and the need to tap into and channelize these energies towards a better and brighter future for all.

- **Objectives**

- The policy lays down the following seven objectives.
  - i. **IPR Awareness:** NIPR policy comes with the most important motive of increasing awareness about social, cultural and economic benefits of IPR among all sections of society.
  - ii. **Stimulate generation of IPRs** -> maximize the number of IPRs being filed.
  - iii. **Commercialization of IPRs** to get value through them.
  - iv. **Legal and Legislative Framework** - To have strong and effective IPR laws, which balance the interests of rights owners with larger public interests.
    - For e.g. India doesn't have law on trade secrets, the policy aims to create specified laws on it.
  - v. **Administration and Management** - To modernize and strengthen service-oriented IPR administration.
  - vi. **Enforcement and Adjudication** - To strengthen the enforcement and adjudicatory mechanism for combating IPR infringements
  - vii. **Human Capital Development** - To strengthen and expand human resources, institutions and capacities for teaching, training, research and skill building in IPRs.
    - The policy focuses on recruiting people and training them in order to address the pendency of cases.
- The Policy also recommends that IP be taught in schools and colleges.

## 9) GEOGRAPHICAL INDICATION

- **Introduction**

- A 'geographical indication' (GI) is a place name used to identify the origin and quality, reputation, or other characteristics of products. It is a sign used on products that have specific geographical origin and possess qualities or a reputation by virtue of their geographical association. The owner of the GI tag has exclusive rights over the product and can prohibit others from using the same name.
- For instance: champagne, Darjeeling tea, Nagpur Orange, Kangra Paintings etc.
- **India's GI Law** "Geographical Indications of Goods (Registration and Protection) Act, 1999" has come into force with effect from Sep 2003.
  - In India, the tag is awarded by the GI Registry in Chennai, and it indicates that a produce possesses certain qualities exclusive to its land of origin.

- **WTO Law:** GIs have been defined under Article 22(1) of the WTO Agreement on TRIPS.
- **Darjeeling tea** became the first GI tagged product in India, in 2004-05. Other famous GI products of India include Basmati Rice, Chanderi Fabric, Mysore Silk, Kanchipuram Silk, Banarasi Silk Saree, Jaipur Blue Pottery, Kullu Shawl, Kangra Tea, Thanjavur Painting, etc.
- **Significance of GI registration**
  - Legal protection -> Prevents unauthorized use of GI by others.
  - Consumer protection -> right information -> GI Tag conveys an assurance of quality and distinctiveness, which is essentially attributable to the place of its origin.
  - Promotes economic prosperity of the producers of goods by enhancing demand in national and international market
  - Essential to get protection in other countries.
    1. Article 22 of TRIPS agreement says unless a geographical indication is protected in the country of its origin, there is no obligation under the agreement for other countries to extend reciprocal protection.
  - **Opportunity to promote development in rural areas:** GI registration along with strengthening of e-commerce in rural areas can promote higher income for people producing GI tagged products.
    - The hyper-localized nature of GI offers solutions to reverse urban migration and conserve India's ancient crafts, culture and food.
  - **Other wider benefits** – Encourages protection of biodiversity, local know-how and natural resources.
- **Recent GI Tagged Products: Useful for Prelims**

#### A) **RED AUNT CHUTNEY (KAI CHUTNEY) OF ODISHA**

- In Odisha's Myurbhanj district, red weaver ants are used for making chutney or a water semi-solid paste known as "Kai Chutney". This chutney is renowned in the region for its medicinal and nutritional properties.
- **In Jan 2024**, this distinctive savory chutney was awarded the GI Tag.
- **Red Weaver Ants**, scientifically known as Oecophylla smaragdina, are notable for their extremely painful sting, capable of causing blisters on the skin.

#### B) **GI TAGS TO VARIOUS PRODUCTS IN JAN 2024**

- **From Odisha:**
  - a) **Simplipal Kai Chutney**
  - b) **Dhenkanal Magji**: A type of sweet made from cheese of buffalo milk.
  - c) **Lanjia Saura Paintings**: It is a style of wall mural paintings. Those paintings are also called ekons or the idital and have a significant spiritual importance for the tribe. **Lanjia Sauras** are an indigent society today, and labour in preserving their culture – the idital being an important part of it.

- d) **Dongria Kondh Shawl (Kapdaganda Shawl):** The traditional knitted shawls are both unique and ancient. Their culture, tradition, faiths and beliefs, as well as the biodiversity of the forests are reflected in the shawl.
  - e) **Khajuri Guda (date palm jaggery):** It is a natural sweetener produced from the sweet juice of palm called neera. It is prepared by the tribal population, including the Lanja Saura, of Gajapati, Boudh, Angul, and Dhenkanal districts of Odisha.
  - f) **Nayagarh Kanteimundi Brinjal,** a vegetable crop with lots of prickly thorns on the flesh as well as the whole plant grown in whole of Nayagarh district of Odisha also received a tag.
  - g) **Koraput Khalajeera rice:** The black colored rice variety, also known as the 'Prince of Rice' is famous for its aroma, taste, texture, and nutritional value. Tribal people of the Koraput region have preserved this rice for around 1,000 years.
- West Bengal:
- a) Tangail Saree
  - b) Garad Saree
  - c) Korial Saree
  - d) Kalonunia Rice
  - e) Sundarban Honey
- Gujarat
- a) Kachchii Kharek: The indigenous variety of dates from Kutch, known as Kuchchhi Desi Kharek.
- J&K:
- a) Ramban Anardana
- Arunchal Pradesh:
- a) Wancho Wooden Craft: It intimately weaves into the socio-cultural fabric of the skillful Wancho of Longding and Changlong districts. It has been practiced by Wancho tribes for generations. It is used to decorate drawing rooms and gifts.
  - b) Adi Kekir (Ginger)

### C) GUCCI MUSHROOM (NOT GIVEN GI TAG YET)

- As per J&K Government, Gucci is the final stage of evaluation at the GI Registry.
- Gucci mushroom is locally known as "Kanngech" and as 'Morel Mushroom', it is a prized harvest for people in districts of Kupwara, Baramulla, Budgam, and Anantnag.
- The market price of this mushroom is somewhere between Rs 25,000 to Rs 30,000 per kg.
- Recent years have seen low yield for the mushroom due to climate change and other environmental factors.



# TARGET PRELIMS 2024

## BOOKLET-51; S&T-16

### S&T CA UPDATES-4

# PRELIMS MASTERS PROGRAM

## SCIENCE AND TECH – 18

### CA UPDATES-4

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## 2. HEALTH

### 1) GLYCEMIC INDEX (GI), GLYCEMIC LOAD (GL) AND DIABETES

- The **Glycemic Index (GI)** of a food refers to the property of the food to **increase blood glucose level** and is a measure of '**quality**' of carbohydrate.
  - **Glucose** or white bread is used as a comparator. The GI of glucose is taken as **100** and the GI of other foods are given as a percentage of this.
  - Food is classified as **low, medium, or high glycemic food** and **ranked on a scale of 0-100**.
  - The **lower the GI of a specific food, the less it may effect your blood sugar levels**.
  - **Here are three GI ratings:**
    - » **Low: 55 or less:** Fruits (apples, strawberries, dates, oranges, Banana, Blue Berries etc); Vegetables (Carrots (boiled)); Grains (Barley, Quinoa); Legumes (Soyabean, Kidney beans, Chickpeas, Lentils etc.); Dairy Products and alternatives (Soymilk; skim milk; whole milk; Yoghurt); Sweeteners (Fructose, Coconut sugar);
    - » **Medium: 56-69:** Fruits (Pineapple); Vegetables (Sweet potatoes (boiled)) Grains (Popcorn; Brown Rice); Sweeteners (**Honey**, Table Sugar);
    - » **High: 70 or above:** White bread, Whole Wheat Bread, White Rice, Cereals, Starchy Vegetables (potatoes, French fries), Baked goods (cake, doughnuts), Snacks (Chocolate, crackers, microwave popcorn, Chips,); Sugar Sweetened Beverages (Soda, fruit juice, sports drinks) etc.
  - **Food high in refined carbs and sugar** are digested more quickly and often have **high GI**, while foods **high in protein, fat, or fiber** typically have a **low GI**.
  - **Food that contains no carbs** are **not assigned a GI** and include meat, fish, poultry, nuts, seeds, herbs, spices, and oils.
    - » Only food containing carbohydrates are assigned GI.
  - **Is food with High Glycemic Index bad?**
    - » As per the **Prospective Urban Rural Epidemiology (PURE) study**, **diets with high GI are associated with major cardiovascular events including deaths** across all ethnicities.
  - **Advantages of Low Glycemic Diet:**
    - » Improved **blood sugar regulation**.
    - » Increased **weight loss**: Some research have shown that **following a low GI diet may increase short-term weight loss**.
    - » Could **benefit people with fatty liver**: Low glycemic food could **reduce liver fat and liver enzyme levels** in people with on-alcoholic fatty liver disease.
- **The Glycemic Load (GL):** It takes into account the **amount of food eaten**. So, **GL factors in the number of carbs in a serving of a food** to determine how it affect blood sugar levels.

### 2) ALL THE WAYS A HOTTER PLANET MAKES YOU SICKER

- **2023** was the **hottest planet on record**. It is going to **get worse in future**. Climate modelers are forecasting the year 2023 will be the **coolest year in the life of people born in 2023**.
- **Different ways** in which hot climate affect human health:
  - **Direct Effects** of **heat exposure on the body**.

- » Heat Wave will get worse with higher wet bulb temperature. As per IMD, “**moist heat**” stress has increased by 30% between 1980 and 2020.
- » Heat acts through dehydration, inability of skin to cool the body through perspiration, dilation of blood vessels, and thickening of blood with increased risk of clot formation (thrombosis).
- » Often **air pollution** colludes with the excess heat to assault the lungs and blood vessels.
- **Increased Air pollution:** Wildfires triggered by excessive heat release PM2.5 and toxic chemicals can cause extensive inflammation, increasing the risk of cardiovascular diseases, respiratory diseases, diabetes, and pre-diabetes.
- **Extreme weather events**
- **Water Scarcity**
- **Vector borne diseases.**
- **Water Borne diseases.**
- **Non-Communicable diseases** (strokes; heart attacks; diabetes; respiratory diseases; cancers)
  - » Heat increases the risk of brain strokes (paralytic attack) due to thrombosis in blood vessels of the brain.
  - » It can also precipitate heart failures and sudden death by triggering clot formation in the coronary arteries.
  - » Exercising vigorously in hot environment can be dangerous. Clots formed in the leg veins can travel to the lungs suddenly causing catastrophic “pulmonary embolism”.
  - » As our population ages and cardiovascular risk factors (like high BP, diabetes, and obesity) rise in our population, every 1-degree centigrade rise in ambient temperature will compound the risk of serious cardiovascular events.
- **Mental health disorders**
- **Food and nutritional insecurity** due to reduced food yield and nutrient quality of crops. Countries in South Asia and Sub-Saharan Africa grow rice and wheat at the highest levels of heat tolerance. A further increase of 1 degree centigrade will lower their yield by 10%. Protective foods like fruit, vegetables, and fish would also be depleted.

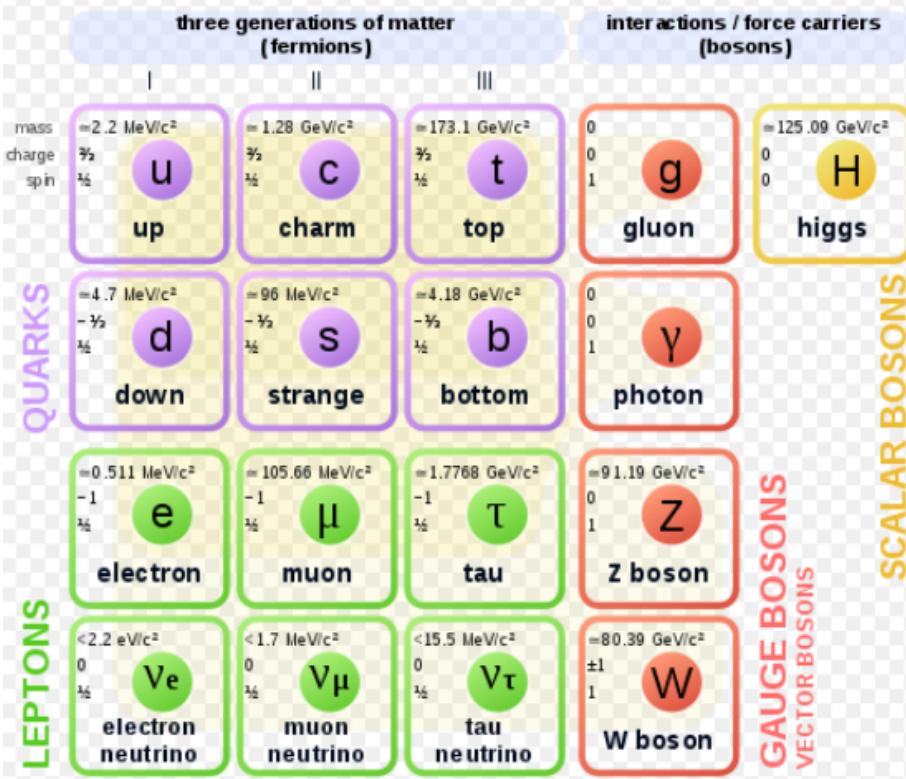
### 3. PHYSICS

#### 1) ELEMENTARY PARTICLES: STANDARD MODEL OF PARTICLE PHYSICS

##### - Background

- » **Particle physics** is a branch of physics that studies the nature of particles that constitute matter and radiation. Currently, the dominant theory explaining these fundamental particles and fields, along with their dynamics, is called the Standard Model.
- » **The Standard Model** is a rigorous theory that predicts the behavior of the sub-atomic particles. It describes three of the four known fundamental forces (the electromagnetic, weak and strong interactions, and not including the gravitational force) in the universe. It also classifies all known elementary particles.

# Standard Model of Elementary Particles



- Various particles and their roles under Standard Model

- » Everything in the universe is made up of atoms. Atoms are made up of subatomic particles - Protons, Neutrons and Electrons. Earlier it was believed that subatomic particles are not divisible.
- » But, experiments have confirmed that the subatomic particles can be further divided into 17 elementary or fundamental particles.

<b>Elementary Particles</b>				
<b>Matter Particles</b>			<b>Force Particles</b>	
<b>Quarks</b>	<b>Leptons</b>		<b>Bosons</b>	
<b>Unitary</b>	<b>Charged</b>	<b>Neutral</b>	<b>Vector Bosons</b>	
1. Up	7. Electrons	10. Electron Neutrino	13. Photon	17. Higgs Boson
2. Down	8. Muons	11. Muon Neutrino	14. W Boson	
3. Top	9. Taus	12. Tau Neutrino	15. Z Boson	
4. Bottom			16. Gluon	
5. Strange				
6. Charm				

- The 17 elementary particles can be further divided into **3 Categories** - Quarks, Leptons and Bosons
  - » **Quarks and Leptons** constitute **matter** and are called the **matter particles** whereas the **bosons** build up **force** and hence are termed **force particles**
  - » **Quarks** are the fundamental constituent of matter. They are of six types: Up quark, down quark, top quark, bottom quark, strange quark, and charm quark.
    - They combine to form composite particles called **Hadrons**.
      - Hadrons can further be divided into two types: **Baryons** and **Mesons**.

- Baryons are made up of 3 quarks and the mesons are made up of one quark and one antiquark. Most common example of Baryons are protons and neutrons.
  - The up quarks and down quarks form protons and neutrons.
- An Up Quark (UQ) carries a charge of +2/3 and a Down Quark (DQ) carries a charge of -1/3.
  - Proton is made up of two up quark and one down quark
  - Neutron is made up of one up quark and 2 down quark.
- » **Leptons** don't undergo any strong interaction with other particles but are observed during beta decay. They are of six types which can be grouped into two categories: **Charged and Neutral (Anti)**
  - **Charged leptons** include Electrons, muons and Taus. Electrons are the most stable type of leptons. Muons and Taus are very high energy and are not stable. Hence, they transform to their lower energy states, the electrons.
  - **Neutral Leptons** were theorized in 1930 when a difference in energy, momentum and angular momentum was observed between theorized and observed values of initial and final particles.
    - This was confirmed by Clyde Cowan and Frederich Reines in 1956.
    - Some people also theorize the existence of anti-neutrinos but nothing has been confirmed yet.
- » **Quarks and Leptons** both complete together the picture of atom. But it doesn't clarify about the interaction between them. This interaction is determined by particles called bosons. The man behind bosons was Sir Satyendra Nath Bose.
- » **Bosons** are called force particles as there is a boson causing every fundamental force. Bosons are of **two types**: Vector Bosons and Scalar Bosons
  - There are four vector bosons.
    - **Photons** are responsible for electromagnetic interaction.
    - **W and Z Bosons** are responsible for weak nuclear interaction, or the force which binds the nucleus and the electrons.
    - **Gluons** are responsible for the Strong nuclear interaction or the force that binds protons and neutrons.
  - **Scalar Boson** called **Higgs Boson** was discovered in July 2012. CERN - the European Organization of Nuclear Research - was responsible for this discovery.
    - These particles are **responsible for imparting mass to other particles**.
- » **Graviton**: Scientists are still not clear about how to accommodate the gravitational force in standard model. They have conceptualized a particle called 'graviton' which they say is responsible for gravity but they are not quite sure.
- These 17 elementary particles and graviton together complete the picture of the atom and its interactions as per the standard model of the particle physics.
- **Useful Videos:**
  - [What's the smallest thing in the universe? - Jonathan Butterworth](#)

## 2) NEUTRINO AND ITS PARTNERS

### - Introduction

- » Neutrinos are one of the fundamental particles which make up the Universe. It is a fermion. They are similar to electrons but without any charge.
- » Neutrinos are affected by weak subatomic force of much shorter range than electromagnetism and are therefore able to pass through great distances in matter without being affected by it.
  - Neutrinos interact very weakly with most of the things - trillions of them pass through every human body every second without anyone noticing.
- » **A neutrino spin** always points in the opposite direction of its motion, and until a few years ago, neutrinos were believed to be massless. It is now generally believed that the phenomenon of neutrino oscillations requires neutrinos to have tiny mass.
- » **Three types of neutrinos are known**, there are strong evidence that no additional neutrinos exist, unless their properties are unexpectedly very different from the known types.
- » Each type or flavor of neutrino is related to a charged particle (which gives the corresponding neutrino its name). Hence, the "electron neutrino" is associated with the electron, and two other neutrinos are associated with heavier version of electrons called muon and the tau.
- » The table below list the known types of neutrinos (and their electrically charged partners)

Neutrino	$n_e$	$n_m$	$n_t$
Charged Partners	Electron (e)	Muon (m)	Tau (t)

### - How are neutrinos formed?

- » Neutrinos are produced copiously in nuclear reactions in the Sun, stars, and elsewhere.
- » Majority of neutrinos in the vicinity of earth are from the nuclear reactions in the Sun.
- » They are formed on earth when unstable atoms decay, which happens in the planet's core and nuclear reactors.

### - Active Research Areas

- » **Large neutrino detectors**
  - Measure the neutrino masses and determine the precise values for the magnitude and rates of oscillations between neutrino flavors.

### - Motivation for research

- » Neutrinos **can be used to probe environments that other radiation (such as light or radio wave) cannot penetrate**.
  - Thus, Neutrinos can be used to probe the Universe, areas beyond our Solar system and phenomenon like Supernova.
- » They can also enhance the understanding of basic physical laws as it provides a tool to study the structure of nucleons (protons and neutrons)

## 3) INDIAN NEUTRINO OBSERVATORY (INO) PROJECT IN THENI, TAMIL NADU

- It is a Rs 1600 Crore Science Project conceived nearly 20 years ago and can put India on the world map in the field of Neutrino Physics. It will house a massive iron detector which will be placed more than a Kilo meter below the surface of the earth. With a weight of nearly 50,000 tonnes, it will be the largest particle detector in the world.
  - » The project is led by TIFR and has more than 25 top research institutions in the country as collaborators.
- Setting up of this opportunity would mean revival of a lost opportunity for India because in 1965 pioneering Indian Scientists at the Kolar Gold Field (KGF) observatory were among the first in the world to discover the traces of atmospheric neutrinos. With the closure of KGF mines in 1990s, experimental research on neutrinos came to an end in India.
- The project will be jointly supported by the **Department of Atomic Energy** and **The Department of Science and Technology**.
- **Issue Associated with INO**
  - » In 2015, the Union government had approved the project. But later NGT stayed the project citing environmental concerns. Later in 2018, the NGT upheld the environmental clearances given to the project but asked TIFR and DAE to take approval from National Board of Wildlife before moving ahead.
  - » TN Government filed a new affidavit before SC in May 2021 saying that the project fell within the Mathikettan-Periyar Tiger Corridors. TIFR team has sought wildlife clearance but the application is pending before the state board of wildlife.
  - » The matter has now reached Supreme Court which will assess the objections raised by the TN government and environmentalists vis-a-vis the central government support and regulatory approvals to decide whether an INO will become reality.

- **Useful Video:**
  - India based Neutrino Observatory A Mega Science Project

#### A) **IN A FIRST SCIENTISTS SEE NEUTRINO EMITTED BY THE MILKY WAY GALAXY (JUNE 2023)**

- For the first time, scientists have seen neutrinos originating from the central disk of the Milky Way. It was achieved with the help of IceCube Experiment. They detected high-energy neutrinos in pristine ice deep below Antarctica's surface, then traced their source back to locations in the Milky Way - the first time these particles have been observed arising from our galaxy.
- **About IceCube Experiment:**
  - » For the past 10 years, an array of small light sensors drilled into Antarctic ice has been detecting neutrinos as they zip through our planet. IceCube is an actual cube of these sensors, a km long on each side, that was sunk 1.5 and 2.5 km deep in the ice. In this translucent medium, the sensors pick up tiny flashes of so-called Cherenkov radiation that forms when a vanishingly rare neutrino hits the ice and creates a shower of secondary particles.
- **Significance:**
  - » The experiment established the galaxy as a neutrino source.
  - » Milky Way neutrinos may help scientists understand the origin of high-energy particles known as cosmic rays, which kick off the formation of neutrinos.

## 4) HIGGS BOSON

- Why in news?
  - » Peter Higgs, who proposed existence of Higgs Boson particle, had died at 94 (April 2024)

### A) ABOUT HIGGS BOSON: "GOD PARTICLE"

- » The existence of Higgs Boson, also called "**God Particle**" was first proposed by Peter Higgs in 1964. It is one of the 17 elementary particles that make up **standard model of particle physics**.
- » In 2012, the presence of the particle was confirmed at CERN.
- » It is the particle that is supposed to account for the mass of every other fundamental particles.
  - **Note:** Mass is not intrinsic to matter. Fundamental particles like electrons don't have a mass within themselves. Scientists realized this in 1950s and 1960s when the standard model was still being developed. Scientists realized that the equations didn't work if these particles had inherent mass.
  - In 1964, scientists developed the idea of all-pervasive field (later dubbed the "Higgs Field"), just like there is an electric field or a magnetic or gravitational field. It is through interaction with this field that elementary particles acquire the mass.
    - Why Peter Higgs receives pre-eminence: Because of Prediction of a new elementary Particle (which was later called Higgs Boson)
      - The day Peter Higgs submitted his original paper about the Higgs Field (at that time unnamed), on the same day, another paper by Belgian Physicists Francois Englert and Robert Brout was published describing essentially the same theory.
      - When this was brought to Higgs attention, he modified his own paper to add another prediction - that there should be a new elementary particle associated with Higgs Field. It belongs to a class of particles called bosons and would itself have an extremely high mass. This was the particle that came to be known as Higgs Boson.
      - It is the interaction of particles with the Higgs Field - the way they change the field or get changed by them - that lends them the mass. Greater is the interaction, larger is the mass. Different particles interact with the field in different ways, and that is what gives them different masses.
      - A **Photon**, which is a light particle, doesn't interact with the field at all, and is thus massless.
      - **Particles** like electrons and protons, do interact with the field and thus have masses.
      - **Higgs Boson** itself interacts with the field and thus have mass.
  - **Higgs Boson** particle is known to impart mass to every other particle. Its discovery completed what is known as Standard Model of Particle Physics, which describes all the fundamental particles and fundamental forces.

### B) ABOUT PETER HIGGS

- He was a Nobel Prize winning Physicist. Higgs won the 2013 Nobel Prize in Physics for his work, alongside Francois Englert of Belgium, who independently came up with the same theory.



- He proposed the existence of the so-called "God Particle" that helped explain how matter formed after the Big Bang in 1964.
  - » He theorized that there must be sub-atomic particle of certain dimension that would explain how other particles and therefore all the stars and planets in the Universe - acquired mass. Without something like this particle, the set of equations physicists use to describe the world, known as the standard model, wouldn't hold together.
  - » Higgs' work helps scientists understand one of the most fundamental riddles of the universe: How the Big bang created something out of nothing 13.8 billion years ago. Without mass from the Higgs, particles couldn't clump together into the matter we interact with every day.
- Details of Life:
  - » Born on May 29, 1929, in Newcastle, Northeast England. He studied at King's College, University of London, and was awarded a PhD in 1954. He spent much of his career at Edinburgh, becoming the Personal Chair of Theoretical Physics at the Scottish University in 1980. He retired in 1996.
  - » An important Highlight of Higgs' career came in the 2013 presentation at CERN in Geneva where scientists presented that the boson had been confirmed. He broke into tears, wiping down his glasses in the stands of a CERN lecture hall.
  - » He was an extremely shy person, and preferred to work in isolation. He wasn't a prolific contributor and has produced just 12 papers in his entire career, only one with a co-author.

## 5) CERN (EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH) (CONSEIL EUROPÉEN POUR LA RECHERCHE NUCLÉAIRE)

- Introduction
  - » CERN is a provisional body founded in 1952 with the mandate of establishing a world class fundamental physics research organization in Europe. At that time, pure physics research concentrated on understanding the inside of an atom, hence the word "nuclear".
  - » European Organization for Nuclear Research officially came into being in 1954, following ratification by 12 states including France and Germany. The provisional CERN was dissolved but the acronym remained.
  - » It operates the world's largest particle physics laboratory in the world.
    - Members: 23 (Israel is the only non-European Country which has been granted full membership)

- Associate Members: 7 (India, Pakistan, Turkey, Ukraine, Lithuania, Croatia and Latvia)

- **Main Contributions**

- » CERN's main function is to provide the particle accelerators and other infrastructure needed for high energy physics research.
- » CERN is also the birthplace of World Wide Web.

## 6) THE LARGE HADRON COLLIDER

- **Introduction**

- » The Large Hadron Collider (LHC) is the world's largest and most powerful particle accelerator. It first started up on 10 September 2008, and remains the latest addition to CERN's accelerator complex
- » The LHC consists of a 27-kilometre ring of superconducting magnets with a number of accelerating structures to boost the energy of the particles along the way.
- » **What is done through LHC**
  - Inside the accelerator, two high-energy particle beams travel at close to the speed of light before they are made to collide. The beams travel in opposite directions in separate beam pipes – two tubes kept at ultra high vacuum.

- **Aim:** It aims to allow physicists to test the prediction of different theories of particle physics and high energy physics like the Standard Model, and particularly prove or disprove the existence of the theorized Higgs boson and the large family of new particles predicted by supersymmetric theories. The LHC is expected to address some of the unsolved questions of physics, advancing human understanding of physical laws.

- **Two Runs**

- » **2009-2013**

- **Important Results So Far :** In 2013, the discovery of a particle matching Higgs Boson was confirmed by data from the LHC.

- » **Second Run 2015 onwards**

- » **Third Run:** The Large Hadron Collider was successfully reignited for the third time in July 2022. Since then it has discovered three exotic particles as per CERN. This will continue running for four years.

- In **10 years** since the discovery of Higgs Boson, scientists have been able to confirm that the particle is very, very close to being the Higgs Boson that is required in the so-called Standard Model of Particle Physics.

- **Future:**

- » Scientists hope to use the Higgs Boson as a tool to learn about the secrets of the universe, including Dark Matter.

## 7) EINSTEIN'S THEORY OF RELATIVITY

- Theory of Special Relativity**

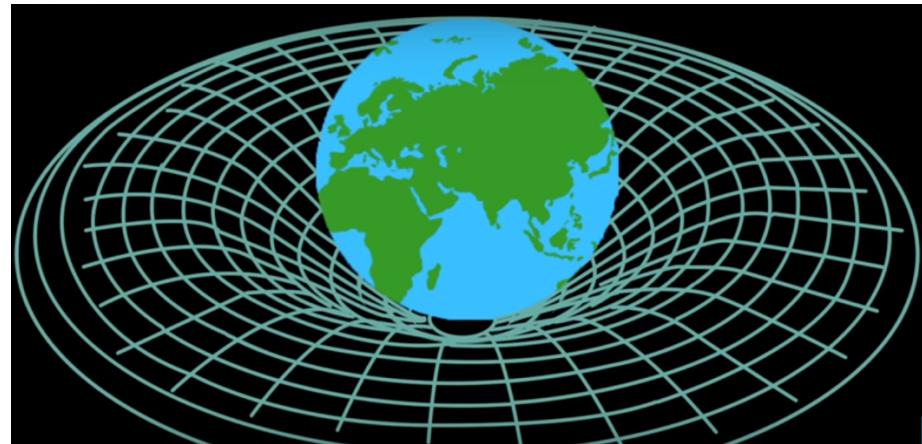
- In 1905, Albert Einstein based his theory on two principles:
  - a. the laws of physics are the same for all non-accelerating observers (inertial reference frame), and
  - b. that the speed of light in a vacuum was independent of the motion of all observers and is unchanging ( $300 * 10^6$  m/s)
    - It is the time that changes (slows down for a fast moving object)
- As a result of these principles Einstein deduced that:
  - a. There is **no fixed frame of reference** in the universe.
  - b. Every-thing was moving **relative** to everything else, hence **Einstein's theory of relativity**.
- It is known as **special** relativity as it applies only to special cases; frames of reference in constant, unchanging motion.
- As a result he found that space and time are interwoven in a single continuum known as the **space-time**. Events that occur at the same time for one observer could occur at different times for another.
- **Consequence of special theory of relativity**
  - a. **Time Dilation:** Time does not pass at the same rate for everyone.
    - A fast-moving observer measures time passing more slowly than a (relatively) stationary observer would. This phenomena is called **dilation**.
    - **Useful Video:** [Special Relativity: Crash Course Physics #42](#)
  - b. **Length Contraction:** A fast moving object appears shorter along the direction of motion, relative to slow moving one. This effect is very subtle until the object travels close to the speed of light.
  - c. **Simultaneity:** something that seems simultaneous to you might not seem simultaneous to another observer.
  - d. **Mass and energy are different manifestation of the same thing.** Einstein's famous equation ,  $E = mc^2$ .
    - As a result of this a fast moving object appears to have increased mass relative to slow moving one. This is due to the fact that increasing an object's velocity increases its kinetic energy and, therefore, its mass.
 

The increase in mass is the reasons that Einstein says that matter cannot travel faster than light. The mass is increased with velocity until the mass becomes infinite when it reaches light speed. An infinite mass would require infinite energy to move, so this is impossible
  - e. **Space and time** are part of one continuum, called space-time.
    - In Einstein's mathematics, space has three dimensions, and the fourth dimension is time. More recent theories presume extra dimensions that we do not perceive.

## ii. General Theory of relativity

- After giving special theory of relativity, Einstein spent 10 years trying to include acceleration in the theory.
- In 1915, Einstein published the General theory of relativity, which applies to frames that are accelerating with regard to each other.
- Some consequence
  - Mass causes space time to curve which is how gravity is created
    - The rubber sheet model shows that gravity results from massive objects warping space-time. The warp is called gravity well.

- Orbiting objects follow the path that is shortest and requires the least amount of energy. The planets move in ellipses, the most energy efficient path in gravity well of the sun.

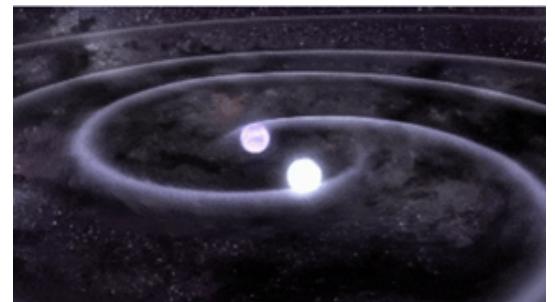


- **Gravitational lensing:** Gravity bends light. This phenomenon is called Gravitational lensing. When we observe a distant galaxy, the gravity of matter between Earth and the galaxy causes light rays to be bent into different paths. When the light reaches the telescopes, multiple images of the same galaxy appear.
- **Universe is expanding.**

## 8) GRAVITATIONAL WAVE

### - Introduction

- » Gravitational waves are ripples in the curvature of spacetime which propagate as waves, travelling outward from the source. In other words gravitational waves are disturbance in space-time, the very fabric of universe , that travel at the speed of light.
  - The waves are emitted by any mass that is changing the speed or direction. The simplest example is the binary system, where a pair of stars or compact objects (like black holes) orbit their common center of mass.
- » **Space-time around earth:** Einstein's theory of general relativity predicted that the space time around earth would be not only warped but also twisted by the planet's rotation.



- » It was predicted in 1916 by Albert Einstein on the basis of general relativity, gravitational waves transport energy as gravitational radiation.
- » The existence of gravitational waves is a possible consequence of the Lorentz invariance of general relativity since it brings the concept of limiting speed of propagation of the physical interactions with it. By contrast gravitational wave cannot exist in the Newtonian theory of gravitation, which postulates that physical interaction propagate at infinite speed.
- » **Gravitational waves are very different from the more familiar electromagnetic waves**
- EM waves -> created by magnetic charges, rather than moving masses
- Gravitational waves with appreciable strength are so much more difficult to produce because gravitational force is much weaker than electromagnetic force.

#### » **Discovery of Gravitational wave (2016)**

- In 2016, after decades of search for those ripples in space-time, which Albert Einstein predicted exactly 100 years ago, scientists working with the gigantic optical instruments in the U.S. called LIGO (Laser Interferometer Gravitational-wave Observatory) have detected signals of gravitational waves emanating from two merging black holes 1.3 billion light years away arriving at their instruments on the earth.
- The advanced LIGO observatories in the US states of Washington and Louisiana have traced the warping of space from the merger of two black holes about 1.3 billion light years ago.
- **How is gravitational wave detected in Lab**
  - The basic principle for detection is **interference** - when two waves combine, they produce a pattern based on relative positions of peaks and troughs in those waves.
  - **Normal circumstance - no light detector**
    - In LIGO, a high powered laser beam is split and sent down to L-shaped vacuum tunnels, each 4 KM long. They get reflected from two high precision mirrors and reach back at the base. They come back in such a way that they completely cancel out each other. No light is detected at the photo detector.
  - **When gravity wave passes by: Some pattern detected at the photo detector**
    - But when a gravity wave passes-by, it distorts space and changes the distance that the beams have to travel. No longer are the peaks and troughs of the two reflected waves perfectly aligned. As they do not cancel out each other now, some pattern is detected at the photo-detector.



#### - **How will the discovery of Gravitational wave change science and our world ?**

- » We will be able to
- » **Understand Universe Better**

## 9) RAMAN EFFECT AND ITS APPLICATIONS

### - About CV Raman

- » Born in Tiruchirappalli on Nov 7, 1888, died on Nov 21, 1970.
- » He discovered a **new phenomenon of scattering of light**, known as **Raman Effect / Raman Scattering**.
  - He received the 1930 Nobel Prize in Physics for this discovery and was the first Asian to receive a Nobel Prize.

### - Other Contributions:

- » He is known to give correct explanation for why the sea water appears blue.
- » He attended the foundation ceremony of BHU and also held the position of permanent visiting professor.
- » With a student, Nagendra Nath, he provided the correct explanation of the acousto-optic effect (light scattering by sound waves) in a series of articles resulting in the celebrated Raman-Nath theory.
- » In 1933, he became the first Indian Director of the IISc.
- » He also founded Indian Academy of Science the same year (1933)
- » Later, in 1948 he established Raman Research Institute in 1948 where he worked to his last days.

### - Raman Effect: Definition

- » Raman effect, change in the wavelength of light that occurs when a light beam is deflected by molecules.
- » When a beam of light traverses a dust-free, transparent samples of a chemical compound, a small fraction of the light emerges in direction other than that of the incident (incoming beam). Most of these scattered light is of unchanged wavelength. A small part, however, has wavelength different from that of the incident light. It's presence is a result of the Raman effect.
- » Chandrashekhar Venkata Raman first published the observation in 1928. (Austrian physicist Adolf Smekal theoretically described the effect in 1923).

### - Applications

- » **Chemical industry**
  - a. To study catalysts
  - b. To monitor chemical purity in petro-chemical industry
  - c. Control of polymerization reaction
- » **Nanotechnology and material science**
  - a. To study nano particles
  - b. To develop microelectronics devices and novel photovoltaic cells
- » **Biomedical applications**
  - a. In vivo study of skins
  - b. Transdermal drug transfer
  - c. Cancer identification
  - d. Bone studies
- » **Detection of Narcotics and Explosives**
  - a. Hand held Raman scanners to detect narcotics
  - b. Hand held Raman scanners to detect explosives such as TNT, RDX, HMX etc.



# TARGET PRELIMS 2024

## BOOKLET-52; ECONOMY-12

## PRELIMS MASTERS PROGRAM

### ECONOMY-18

### INFRASTRUCTURE-2

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## 2. INLAND WATERWAYS

- **Inland Waterways Potential in India**
  - Inland water transport holds great untapped potential as a means for the transportation of goods and passengers. India has a large endowment of rivers, canals, and other waterways. The total navigable length of waterways in India is around 14,850 kilometres.
- **Need for improving and Inland waterways and ports.**
  - i. **Contribution in trade:** Only 3.5% of trade in India is done through the mode of Inland waterways, which is 47% in China, 40% in Europe, 44% in Japan and Korea and 35% in Bangladesh.
  - ii. **Fuel Efficient -> Cost Effective**
  - iii. **Less Polluting**
  - iv. **Economic growth and jobs**
  - v. **Reducing Pressure on Road -> less congestion**
  - vi. **Fewer accidents** - when compared to any other mode of transport.
  - vii. **Less Land Acquisition Problems and Less Deforestation:** As land capital required in case of water transport is minimal when compared to road and rail transport.

### 1) INLAND WATERWAYS AUTHORITY OF INDIA ACT, 1985

- Empowers the government to declare waterways with potential for development of shipping and navigation as National Waterways and develop such waterways for efficient shipping and navigation.
- For development and regulation of inland waterways in the country the Inland Waterways Authority of India (IWAI) was set up in October 1986
  - » IWAI is the nodal agency under the Ministry of Shipping to make National Waterways commercially navigable. It aims to increase the cargo transportation through IWT.
  - » Currently, it is developing the National Waterways for commercial navigation, including with assistance from the World Bank.
- It is **headquartered** in **Noida** and have regional offices at Patna (Bihar), Kolkata (WB), Guwhati (Assam) and Kochi (Kerala) and sub offices at other places throughout India.

### 2) NATIONAL WATERWAYS ACT, 2016

- **Commenced in 2016**
- **Provisions**
  - » The act merged five erstwhile acts which had declared 5 National Waterways. It also proposed 106 additional National Waterways.
  - » The act has thus declared 111 rivers or river stretches, creeks, estuaries as National (inland) Waterways (including the five older ones)
  - » Now, according to entry 24 of the Union list of the seventh schedule, the union government can regulate these waterways for development with regard to shipping, navigation and transport through mechanically propelled vessels.
- **Other details**

- » These 111 waterways pass through 24 states and two UTs with an approximate length of 20274 km<sup>2</sup>. These will pass through nearly 139 river systems, creeks, estuaries and related canal systems of India.
- » Assam (17) and WB (16) will have the highest number of waterways.

### 3) OTHER STEPS TO PROMOTE NATIONAL WATERWAYS IN INDIA

- i. Sagarmala Project
- ii. Declaration of 106 new waterways as National Waterways (total 111) through an act in 2016.
- iii. Implementation of **Jal Marg Vikas Project (JMVP)** to augment capacity of NW-1 with the technical and financial support of the WB.

### 4) IMPORTANT NATIONAL WATERWAYS

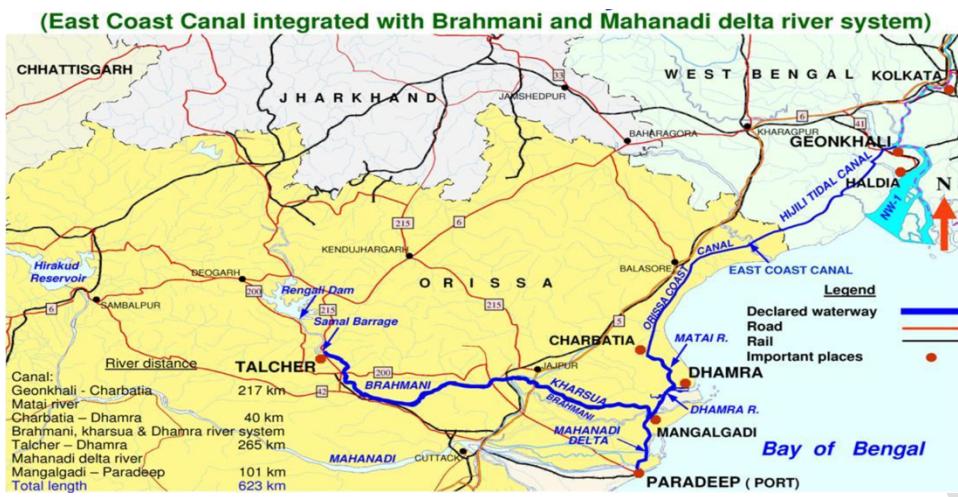
1. **National Waterway - 1:** (Allahabad to Haldia - 1620 KM): Ganga - Bhagirathi-Hoogly River system
  - **States Served:** UP, Bihar, Jharkhand and WB.
2. **National Waterway - 2:** (Dhubri - Sadiya - 891 km): River Brahmaputra
  - **States Served:** Arunachal Pradesh, Assam, West Bengal, Meghalaya.
3. **National Waterway - 3:** West Coast Canal (Kottapuram-Kollam) along with Udyogmandal and Champakara Canals (205 km)
  - **States Served:** Kerala
4. **National Waterway-4:**

Kakinada-Puducherry canals along with Godavari and Krishna rivers (1078 km)

- **States Served:** AP, TN, UT of Puducherry



5. **National Waterway - 5:** East Coast Canal integrated with Brahmani river and Mahanadi delta rivers (588 kms)



#### 6. National Waterway - 16: Between Lakhipur and Bhanga (121 km) of the Barak River.

- About Barak River:** It is the 2nd largest river in the NE region. It originates from South of Kohima in Nagaland near Nagaland-Manipur border. After traversing through Nagaland, Manipur, and Assam, it splits at Bhanga into two streams called Surma and Kushiyara. These two streams rejoin at Markuli in Bangladesh and thereafter the river is called **Meghna**. Barak-Meghna River System has a total length of 900 kms (origin to upstream Chandpur in Bangladesh). Out of this, 524 kms is in India, 31 km on Indo-Bangladesh border and the rest is in Bangladesh. Out of the portion in India, only 121 kms stretch between Lakhipur and Bhanga is navigable and has been declared as **NW-16** in the year 2016.
- State Served:** Assam, Mizoram, Tripura and Manipur

#### 7. NW-10 (river Amba, MHA), NW-68 (Mandovi river, Goa), NW-73 (river Narmada, Gujarat, and MHA), NW-83 (Rajpuri Creek, Maharashtra), NW-85 (Revadanda Creek - Kundalika River system, MHA), NW-91 (Shashtri River - Jaigad Creek system, MHA), NW-97 (Sundarban waterways, West Bengal), **NW-100** (river Tapi, Gujarat and Maharashtra), and **NW-111** (Zuari River, Goa) also are operational in parts atleast.

### 5) KOCHI WATER METRO

- Why in news?**
  - Kochi Water Metro completes one year after being formally inaugurated in 2023 (April 2024)
- Beginning:**
  - In April 2023, PM Modi inaugurated the first phase of the Kochi Water Metro - a first of its kind **public boat service in India integrated with a metro rail network**.
- Details:**
  - The Kochi Water Metro is a project being implemented by Kochi Metro Rail Corporation Limited (KMRL) with assistance of a German funding agency, Kreditanstalt fur Wiederaufbau.
  - It includes **boats** that are battery powered, air conditioned, and disabled friendly among other features. Thus, it operates like any traditional ferry, but with modern facilities, enhanced safety and security measures.
  - How is it linked to the metro rail?**
    - Envisaged as a feeder service of the Kochi metro rail, which has been operational since 2017.

- These boats have been designed as coaches of Kochi Metro. Its boat terminals, passenger entry and exit gates, ticket counters and safety measures mirror the features of the metro rail service.
  - All jetties feature electronic display boards about boat services. Announcements are made in English, Hindi and Malayalam.
- » **Routes and Terminals:** It will operate in backwaters of Kochi, connecting 10 nearby islands with mainland of Kochi, the commercial hub of Kerala.
- **Updates:** 20 lakh commuters travelled in Kochi Water Metro in a year (April 2024)
  - **Updates:** Kochi Water Metro considering hop on - hop off trips for tourists (April 2024)
    - » Talks to be held with local bodies for launching the project; efforts on to usher in first-and last-mile connectivity from various ferry terminals.
  - **Updates:** Even as the launch of the Kochi Metro is delayed by two years, the electric ferry of the project has won the famed Gussies Electric Boat Award - 2022 in the commercial ferry category. (Nov 2022)
    - » Gussies Electric Boat Award were instituted in memory of **Gustave Trouve**, a French electrical engineer who had 75 patents.

### 3. RAILWAYS

#### 1) 17 ZONES OF INDIAN RAILWAYS (SOURCE: INDIA YEARBOOK)

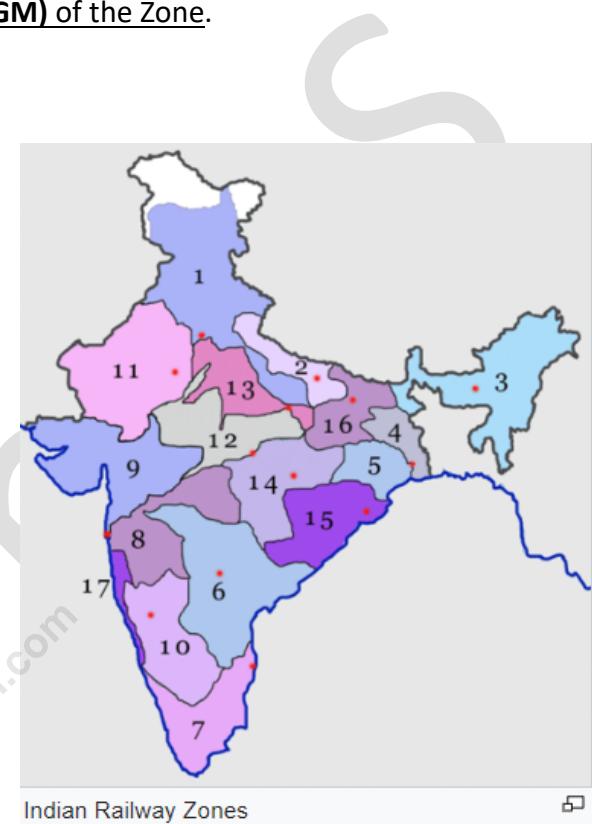
Indian Railways is divided into **17 zones** which are the basic operating Units of Railways. Each zone is further subdivided into **divisions**, each having divisional headquarters. Each of the divisions is headed by a **Divisional Railway Manager (DRM)**, who reports to the **General Manager (GM)** of the Zone.

The Zones and their headquarters are mentioned below:

SI.No.	Zonal Railways	Headquarters
1.	<b>Central</b>	Mumbai
2.	<b>Eastern</b>	Sealdah (Kolkata)
3.	East Coast	Bhubaneshwar
4.	East Central	Hajipur
5.	<b>Northern</b>	Delhi
6.	North-Central	Allahabad
7.	North-Eastern	Gorakhpur
8.	Northeast Frontier	Maligaon (Guwahati)
9.	North Western	Jaipur
10.	<b>Southern</b>	Chennai
11.	South Central	Secundrabad
12.	South Eastern	Garden Reach (Kolkata)
13.	South East Central	Bilaspur
14.	South Western	Hubli
15.	<b>Western</b>	Churchgate, Mumbai
16.	West Central Railway	Jabalpur
17.	Metro Railway	Kolkata

- Other Sources also mentions another zone: **Konkan Railway - Navi Mumbai**

#### 2) REVENUE PROBLEM OF INDIAN RAILWAYS



- **Key Challenge:**
  - » **High Operating Ratio:** While the Indian Railway's capital expenditure has increased in the recent years, IR's **Operating Ratio**, which is the **ratio of ordinary working expenses to the gross traffic receipts**, has shown no improvement. A lower ratio implies better profitability and surplus for capital investment.
  - » **Trap of Rising Debt:** Lack of surplus, leads to the need of augmentation of funds from Gross Budgetary Support (GBS) and Extra Budgetary Resources (EBS). The EBS leads to the need of repayment of principal and interest.
- **But it is important to continue to invest in railways** as investment in railways boost manufacturing and services, tax revenue for government and allows for more job opportunities.
- **Where is the problem?**
  - » IR's **freight segment is profitable**, whereas the passenger segment is making huge losses.
    - For e.g. CAG report presented to Parliament in Aug 2023 states that there was a loss of Rs 68,269 crores in all the classes of passenger services during FY22, with all profit from freight traffic nullified in cross subsidizing passenger services.
  - » **Political Economy** makes it difficult to increase the passenger fares substantially. So, increasing profits from freight traffic by increasing freight volume is crucial.
- **Indian Railways Decreasing Share in Freight Traffic:**
  - » IR's modal share in India's freight traffic has steadily decreased from 80% at the time of independence to **27% currently**.
  - » **Why the decrease?**
    - **Competition from other modes:**
      - Improvement in roadways infrastructure, and successive price hikes in railways etc.
      - Pipelines and coastal shipping have also forayed into transportation of bulk items.
    - **Poor Performance in non-bulk freight transport**
      - For e.g. in parcel segment, the tariff is pretty high. After adding the first and last mile costs, the prices are higher than truck rates.
      - Other challenges are improper terminals, inconsistent weighbridges, unreliable transit times, complex booking and delivery mechanisms.
    - **Lack of Diversity:** 11 commodities in the IR's transport basket account for **90% of tonnage and revenue**, of which coal is around 45% and iron and cement 10% each.
    - **Slow average speeds** of freight trains of around **25 km/hour**.
    - **Lack of participation of private players:** It should be noted that private container train operation policy, initiated in 2006 to boost the rail share of container movement, has not made any significant dent in improving the share.
  - » **Recent Steps taken:**
    - **Dedicated Freight Corridor (DFCs)**
    - **Gati Shakti Cargo Terminals**
    - **Focus on expanding freight basket** - by targeting more commodities (e.g. Kishan Rail)
    - Policy of "**Long term Tariff Contracts**" with major customers
    - Double Stack dwarf Container train under a wire - a new delivery model

- RO-RO Services - to reduce road congestion and environmental improvement.
- » **Note: Bulk Cargo vs General Cargo**
  - General cargo includes goods typically transported in bags, boxes, crates, drums or barrels.
  - **Bulk Cargo** consists of loose materials like grain, coal, or iron ore loaded directly into a ship's hold or train carriage, while general cargo ships in smaller units.

### 3) KEY INITIATIVES DISCUSSED IN RAILWAY SECTOR (ESI 2022-23)

#### Box XII.2: Major initiatives of the Indian Railways

- ✓ Mumbai-Ahmedabad High Speed Rail (MAHSR) Project: The MAHSR project, which was sanctioned by the government in 2015, with technical and financial cooperation from Government of Japan, is under execution and survey & design aspects of it have been finalised.
- ✓ Dedicated Freight Corridor (DFC) Project: One of the most ambitious and biggest ever infrastructure project in the railways, which comprises construction of two dedicated freight corridors, i.e., Eastern and Western DFCs along the golden quadrilateral, will offer higher transport output in the country with reduced transit time and cost.
- ✓ GatiShakti Multi-Modal Cargo Terminal (GCT): GCTs are being developed by private players on non-railway land as well as fully/ partially on railway land, based on demand from industry and potential of cargo traffic. 21 GCTs have been commissioned and more than 90 more locations have been provisionally identified for development of GCTs (as of 31 October 2022). This will boost investment from industry in the development of additional terminals for handling rail cargos.
- ✓ Induction of semi-high-speed Vande Bharat Trainsets: Semi High-Speed Self-Propelled Vande Bharat Trainsets were manufactured by Integral Coach Factory, Chennai, with indigenous efforts. These trains have ultra-modern features like quick acceleration, substantial reduction in travel time, having maximum speed of 160 kmph, on-board infotainment and Global Positioning System (GPS) based passenger information system, etc.
- ✓ Electrical/Electronic Interlocking System: envisages centralized operation of points and signals to enhance safety in train operations. These systems have been provided at 6,322 stations covering 99 per cent stations of Indian Railways (as of 30 September 2022).
- ✓ Development of Hyperloop technology: Hyperloop is an emerging transportation technology that can be faster and greener than airplanes and railways. In this system, vehicles run in the levitating state (with the help of Linear Induction Motors/Electromagnets) and in vacuum environment. The technology is still in the development phase. Indian Railways intends to develop a demonstrative project on Hyperloop Technology. Indian Railways has collaborated with IIT Madras for developing Hyperloop Technology by setting up Centre of Excellence for Hyperloop Technology at IIT Madras at the cost of ₹8.34 crore.
- ✓ Kisan Rail trains were introduced in FY21 to enable speedy movement of perishables from production or surplus regions to consumption or deficient regions. Up to 31 October 2022, Indian Railways have operated 2,359 Kisan Rail services, transporting approximately 7.91 lakh tonnes of perishables including fruits and vegetables.

### 4) NATIONAL RAIL PLAN VISION-2030

- Indian railways have prepared a National Rail Plan (NRP) for India - 2030.
- The plans are to create **future ready** Railway system by 2030.
- The NRP is aimed to formulate strategies based on both **operational capacities and commercial policy initiatives** to increase modal share of the Railways in freight to 45% (at present it is around 27%) and to sustain it.
- **Other aspects:**
  - » **Reduce transit time of freight** substantially by increasing average speed of freight trains to 50Kmph.
  - » As part of the National Rail Plan, **Vision 2024 has been launched** for accelerated implementation of certain critical projects by 2024 such as: 100% electrification, multi-tracking of congested routes, upgradation of speed to 160 kmph on Delhi-Howrah and Delhi-Mumbai routes, upgradation of speed to 130kmph on all other Golden Quadrilateral-Golden Diagonal (GQ/GD) routes and elimination of all Level Crossings on all GQ/GD route.
  - » Identify new Dedicated Freight Corridors and new High Speed Rail Corridors.
  - » Assess rolling stock requirement for passenger traffic as well as wagon requirement for freight.
  - » Assess Locomotive requirement to meet twin objectives of 100% electrification (Green Energy) and increasing freight modal share.
  - » **Assess the total investment in capital** that would be required along with a periodical break up.
  - » Sustained involvement of the Private Sector in areas like operations and ownership of rolling stock, development of freight and passenger terminals, development/operations of track infrastructure etc.

## 5) RESTRUCTURING OF RAILWAYS

- **Earlier Situation:**
  - » The **Railway Board** is the Indian Railway's apex decision making body.
    - It was constituted in 1905 to assist Ministry of Railways in key administrative and executive work of Railways.
    - It consisted of a chairman and seven members from different service departments such as Finance, traffic, civil, mechanical, electrical and signal & telecom.
    - The department heads were generally secretary level officers and are a member of the Railway Board.
    - These departments were vertically separated from top to bottom and worked in Silos.
- **The Management and Administrative arm** of the organization was staffed by officers belonging to 8 Group A Services of IR that include Indian Railway Traffic Service (IRTS), Indian Railway Account Services (IRAS), Indian Railway Personal Service (IRPS), Indian Railway Service of Engineers (IRSE), Indian Railway Service of Mechanical Engineers, Indian Railway Service of Signal Engineers, and Indian Railway Service of Electrical Engineers. (3 civil and 5 engineering services)
- **Key Problems**
  - » **Over-departmentalization** has led to work taking place in Silos
    - According to **Bibek Debroy Committee**, this over departmentalization manifests itself in the form of unhealthy competition and lack of team work and cohesion.
  - » **Various committees over the years** - Prakash Tandon Committee (1994), Rakesh Mohan Committee (2001), Sam Pitroda Committee (2012) and Bibek Debroy Committee (2015) has suggested unification of services, but the railway ministry hadn't acted on it till 2019.

- » In 2019, Union Cabinet approved restructuring of Indian Railways with the following components:
  - Reorganization of the Railway Board
    - Reduction in number of **members** of the board to **5** (a chairperson, who will act as CEO and **four members** responsible for infrastructure, operations & business development, rolling stock, and finance).
  - Unification of existing **8 group A service** into single service: **The Indian Railway Management Service (IRMS)**
    - In Feb 2022, the Union government officially issued a gazette notification about the proposed merger of existing eight services of Indian Railways, which fall under the Central Civil Services.
  - Post of General Managers working at zonal level will be upgraded to secretary level.
    - **Indian Railway Medical Services (IRMS)** to be renamed to **Indian Railway Health Services (IRHS)**
- » **Advantages:** Ending Departmentalism, create coherent vision for organization, promotes faster decision making, Recruit engineers/non-engineers as per need, bring decision making as per market realities, infuse fresh thinking etc.

## 6) DEDICATED FREIGHT CORRIDORS (DFC)

- Why in news?
  - India Railways has operationalized 90% of its DFCs, covering a distance of 2,800 kms. Utilizing the advantages of this freight focused infrastructure, India intends to build more DFCs connecting important cities. (April 2024)
- About DFCs:
  - Dedicated Freight Corridors (DFCs) are high speed and high-capacity railway corridors that are exclusively meant for the transportation of freight or goods commodities.
  - India's Ministry of Railways has undertaken the construction of two DFCs namely:
    - i. **Eastern Dedicated Freight Corridor:**
      - » 1,840 kms (between Ludhiana (Punjab) to Sonnagar (Near Kolkata, WB)). It will also include PPP section of the Sonnagar-Dankuni route.
      - » It will run through Delhi.
      - » States covered include Punjab, Haryana, Uttar Pradesh, Jharkhand, Bihar and West Bengal.
    - ii. **Western Dedicated Freight Corridor** (between **Dadri (Uttar Pradesh)** and **Mumbai** (Jawaharlal Nehru Port Terminal (JNPT)).
      - » **1,506 kms**
      - » **States covered: UP, Haryana, RAJ, Gujarat, and MHA.**
  - The DFCs are being developed by Dedicated Freight Corridor Corporation of India Ltd (DFCCIL).
  - The Funding for DFC is through World Bank (US\$ 2.725 billion) for EDFC, and Japan International Cooperation Agency (JICA) loan (38,722) for WDFC and rest from the Gross Budgetary Support (GBS).
- Expected Impact
  - Reduce travel time on the two routes for both passengers and goods.

- DFCCIL will run freight trains at the maximum speed of 100 kmph as against the current maximum speed of 75 kmph on Indian Railway tracks whereas the average speed of freight trains will also be increased from existing speed of 26 kmph on Indian Railway lines to 70 kmph on DFC.

- Benefit industries; Reduce pollution

- Progress:

- As of April 2024, India Railways have operationalized **100% of the eastern arm** and **85% of the western one**.
- **Average speed** of the trains is around 50-60 kmph (and can be increased upto 100 km per hour)
- **Estimated cost** of operationalizing the network currently stand at Rs 1,24,000 crores.

#### **A) 3 MORE DEDICATED FREIGHT CORRIDORS, INCLUDING COMMODITY SPECIFIC ROUTES, ARE BEING CONSIDERED AS PART OF THE INDIAN RAILWAYS' PLAN (APRIL 2024)**

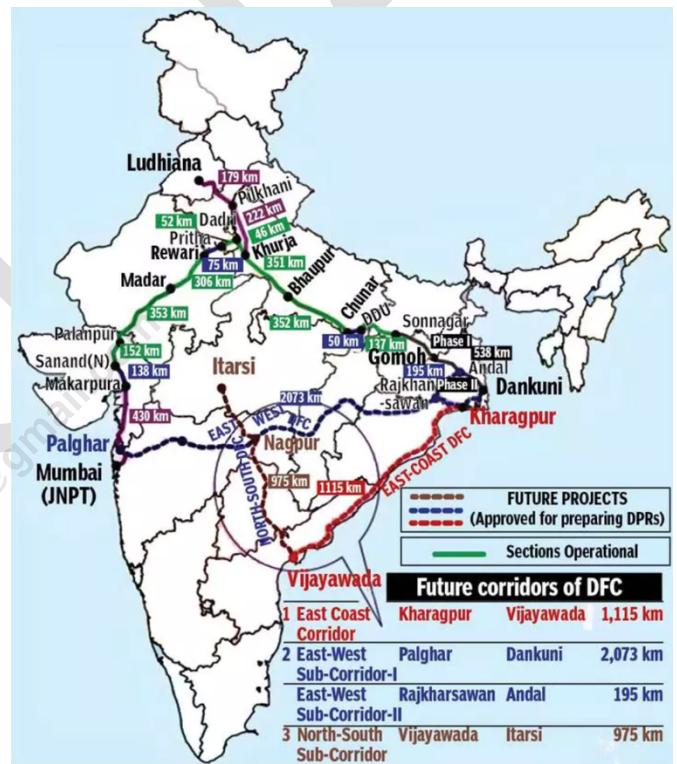
- The three corridors together will cover a length of 4,300 kms with an estimated project cost of Rs 2 lakh crores.
- Progress:

- All three network alignment reports are being prepared by the Dedicated Freight Corridor Corporation of India Ltd (DFCCIL). While two of the DPRs have been submitted, a third will be ready by the end of this month.

» **East Coast Track:** The proposed corridor is along the east coast running parallel to the existing coastal passenger rail line and covers approximately 1,200 kms starting at Kharagpur (WB) and terminating in Tenali (in Andhra Pradesh). The route passes through mineral bearing states of Bengal and Odisha, connecting the Vizag route. The target sector includes coal, fertilizers, and iron-ore movement apart from commodities like steel.

» **North South Corridor:** It covers Itarsi (in Madhya Pradesh) to Tenali (Andhra Pradesh) a distance of around 1,000-1200 kms. It will pass through Itarsi, Nagpur, Vijayawada and end at Tenali. It will pass through four states, MP, MHA, Telangana and Andhra Pradesh. Traffic would cover coal, cement, fertilizers, petroleum, lubricants etc. The long term plan would be to connect Dadri in UP with Itarshi. This will allow connecting the existing and operational DFCs with the upcoming ones.

» **The third corridor** - still under preparation- covers the East West Route connecting Andal (WB) with Palgarh (MHA). This route passes through five states which include WB, Jharkhand, Odisha, Chhattisgarh, and Maharashtra. The main line will cover close to 2,100 km and there will be spur lines with additional 300 kms.



## 7) GATI SHAKTI CARGO TERMINALS

- The Ministry of Railways has launched a new policy for developing Gati Shakti Cargo Terminals (GCTs), which are m multimodal logistics facilities that can handle rail cargo along with other modes such as road or water transport.
  - » It will provide seamless integration of rail transport with other modes of transport and enable customers to choose their preferred mode based on cost effectiveness and convenience.
- GCTs are being developed by private players with minimal intervention from the government.
- As of Dec 2023, 15 GCTs have been commissioned and around 96 more locations have been provisionally identified.
- It will provide seamless integration of rail transport with other modes of transport and enable customers to choose their preferred mode based on cost effectiveness and convenience.
- This will reduce congestion at railway stations and improve passenger amenities.

## 8) OTHER MAJOR RAILWAY INFRA NEWS

### A) AMRIT BHARAT STATION SCHEME FOR INDIAN RAILWAYS

- Ministry of Railways have formulated a new policy for modernization of stations named "Amrit Bharat Station" scheme. It envisages development of stations on a continuous basis with a long-term vision. It is based on Master Planning for long term and implementation of the elements of Master Plan as per the needs and patronage of the station.

### B) CABINET APPROVES SPECTRUM FOR RAILWAYS (FEB 2024)

- The Railways had sought 5 MHz of wireless spectrum for sending real-time data from trains, which would enhance passenger safety.
  - » TRAI had floated a consultation paper on whether the transporter should be able to get - largely free of cost.
- But Union Cabinet in a surprise move approved the proposal, even though TRAI's response was pending.

### C) CHENAB BRIDGE

Indian railways is constructing the iconic Arch Bridge on River Chenab as part of the Udhampur-Srinagar-Baramulla Railway Link (USBRL) project to connect the Kashmir valley to the rest of the nation.

It is located between Bakkal and Kauri in the Reasi district of Jammu Division of J&K, India.

It will be the world's highest railway bridge that soars 359 meters above the bed of the Chenab river in J&K.

- The bridge is 35 meter higher than the Eiffel Tower in Paris.

The 1.315 km long bridge is being constructed at a cost of Rs 1486 crore.



In April 2021, Indian **railways completed the arch closure of Chenab Bridge**. The Arch is the most difficult part of the bridge. It stands only with the support from the two embankments and without any intermediate pier.

- No pier could be used as the river is 359 meters below and no pier could possibly come at a height like that.
- Arch consists of steel boxes, which will be filled with concrete to improve stability.

The bridge is expected to be **open for rail traffic in 2024**.

#### - Other key features of the Bridge

- » The Bridge is designed to withstand high wind speed upto 266 km/hour.
  - » The bridge is also designed for blast load in consultation with DRDO for the first time in India.
  - » It can also withstand earthquake forces of highest intensity Zone-5 in India.
- **Note:** While the Chenab bridge project is being touted as the World's highest rail bridge by India, it may lose the title to neighbouring China, which is constructing the Daduhe railway bridge in Ludig along the Sichuan-Tibet Railway at a height of 380 meters.

### D) PAMBAN BRIDGE – INDIA'S FIRST VERTICAL LIFT RAILWAY BRIDGE

#### - Why in news?

- » New Pamban Bridge may miss its Nov 2023 deadline (Sep 2023)

#### - Details

- » **Background:** The existing Pamban Rail Bridge, which connects Rameswaram to mainland India is more than a 100 years old. It was built in 1914 and connects Mandapam to the Rameshwaram Island. Till 1988, it was the only link connecting the two locations when a new road bridge was built parallel to the sea link.



#### - New Railway Bridge:

- » The state-of-the-art bridge will be country's first vertical lift railway sea bridge.
  - The bridge is stretches for 2.05 km and will have a 63 meter stretch which will lift up while remaining parallel to the deck to allow access to the ships.
- » It will help railways to operate trains at higher speed and will carry more weight and increase the volume of traffic.
- » It is being executed by Rail Vikas Nigam Limited (RVNL) at a cost of Rs 535 crores.

#### - Missing Deadlines (Sep 2023)

- » Its initial deadline was March 2023, which was then extended to July 2023 and then to Nov 2023. However, in Sep 2023, due to increased wind speed at the project site the work has been hampered.
- » As of Dec 2022, 84% work has been completed.

- **Video:**
  - » See video in the link: <https://www.thehindu.com/news/national/tamil-nadu/watch-pamban-bridge-indias-first-vertical-lift-railway-bridge/article65487414.ece> to get better understanding.

## 9) REGIONAL RAPID TRANSIT SYSTEM (RRTS) PROJECT AND NAMO BHARAT RAPIDX TRAIN

- **Why in news?**
  - » PM Modi inaugurated the priority section of Delhi-Ghaziabad-Meerut RRTS Corridor at Sahibabad RapidX station in Ghaziabad, Uttar Pradesh (Oct 2023)
- **Background:**
  - » **Need:** Increasing traffic, congestion, pollution, accidents in Delhi NCR.
  - » In 2005, the Planning Commission formed a task force under the chairmanship of Secretary, Ministry of Urban Development to develop a multi-modal regional transit system for the NCR.
  - » **The Integrated Transport Plan for NCR 2032** also includes RRTS connecting regional centres.
  - » **In July 2013**, a joint venture (JV) of GoI, and the States of Haryana, Rajasthan, Uttar Pradesh, and Delhi was formed - National Capital Region Transport Corporation (NCRTC).
- **The Delhi-Meerut RRTS** is a partially operational **82.15 km** long semi-high speed rail and regional transit corridor that will connect NCR cities of Delhi, Ghaziabad, and Meerut.
  - » It is the first of the four rapid rail corridors planned under the first phase of the RapidX project managed by the NCRTC.
  - » It allows a max speed of 180 km/h and distance between Delhi and Meerut will be covered in less than 1 hour.
  - » The foundation stone for the project was laid by PM Modi in March 2019, and construction began in June 2019.
  - » **Current Scenario:**
    - As of March 2024, corridor from Sahibabad to Modinagar Depot was operational.
    - Rest of the entire **81 km** long corridor will be opened by June 2025.
  - » **Who owns the Corridor?**
    - The owner of the corridor and its trains is the NCRTC, under who the construction is also underway.
    - The operator of the corridor is DB RRTS Operations India Pvt Ltd a subsidiary of Deutsche Bahn (DB).
  - » Upon opening, the RRTS became the first regional transit system of India, also consisting the fastest rapid transit train in India.
- **Namo Bharat RapidX Train:**
  - » Trains of the RRTS will be known as 'Namo Bharat RapidX'
  - » These trains are indigenously manufactured with a designed speed potential of 180 kmph and operational speed potential of 160 kmph. They are fully air-conditioned, safe and comfortable.
  - » Every Namo Bharat RapidX Train will have six coaches, including a premium coach. One coach in every train is reserved for women.

## 10) RAILWAY SAFETY

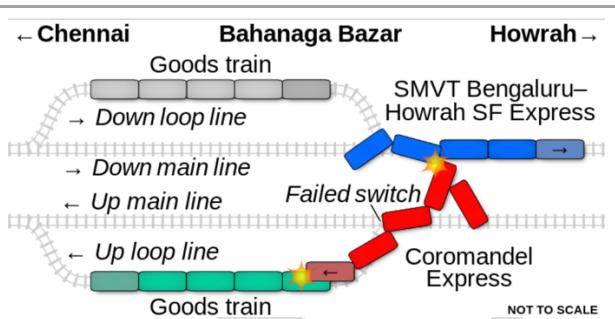
### A) ODISHA ACCIDENT

On 2nd June 2023, three trains collided in Balasore district in Odisha state. The Coromandel Express entered the passing loop instead of the main line near Bahanaga Bazar Railway Station at full speed and collided with a goods train. Due to its high speed, its 21 coaches derailed and three of those collided with the oncoming **SMVT Bengaluru-Howrah Superfast Express** on the adjacent track.

**A total of 296 people were killed, and more than 12,000 others were injured in the accident.**

It was the deadliest railway crash since the Firozabad rail collision in 1995. It was also the deadliest rail disaster worldwide since the 2004 Sri Lanka Tsunami train wreck.

**Main Reason: Signaling Failure**



### B) WHY COROMANDEL EXPRESS CRASHED: UNDERSTANDING THE BASICS OF RAILWAYS SIGNALING SYSTEM

- Interference with the "Configuration" of the track led to the Coromandel Express to smash into the stationary goods train.
- **Understanding the Interlocking in Railways:**
  - » Interlocking is a crucial safety mechanism that ensures train movements continue without any conflicts, thus preventing accidents. There are three main components of the inter-locking system: **point**, **track occupancy sensing devices**, and **signal**. The interlocking system coordinates the functions of these three components to control train movements.
- **What is the function of each of these three main components?**
  - » Signals (which are lights of green, red, and yellow color) are installed along the track to indicate the status of the track ahead.
  - » Track Circuits and Electrical Circuits (also known as the track-occupancy sensing devices) that detect the presence of trains.
    - There are various kinds of track-occupancy devices. Generally, sensors are installed on the tacks that detect the passage of wheels on the rails. These are called axle counters.
  - » **Points** allow trains to change tracks.
    - The Coromandel was supposed to go through Bahanagar Bazar on the 'Up' main line, but the point just before the station switched the express on the loop line that was already occupied by the stationary goods train.
    - How does the points work?

- The Points, also known as **Switch Rails**, are movable rails that are typically placed at the point of divergence of two tracks going to different directions. Once the direction of a train is determined, the **point gets locked to a particular position**, and cannot be budged until the train has passed. The driver, or loco pilot, has no say in this matter.
- **How is the whole system configured?**
  - » A **sound logic of what is 'safe' train operation is fed** into interlocking system, which is controlled remotely from the station.
    - Earlier, some of the components also worked manually.
  - » **Today**, out of the **7,000-odd stations** in the Indian Railway network, **only around 100 small stations** still have manual levers to control these points. The **rest operate electronically**, even though the basic principles of the logic are taken from the old and time-tested standard procedure for safety.
- **How safe is the system?**
  - » If **any of the three components** (signals, points, and track occupancy sensors) doesn't correspond to the overall 'safe' logic fed into the computer, the **system will work to stop the oncoming train**. This means **if the point is not locked**, or not set to the **desired direction**, and/or if the sensing device detects that the track is **not clear** the **signal will automatically turn red** - indicating to the oncoming train that **something is wrong** and that it should stop. This is called a "fail safe" system - one that errs on the side of the safety.
- **This interlocking system** is used in **railway networks worldwide**.
- **How are these systems secured against interference?**
  - » **The relay room** - which is the **place from where the entire interlocking/ signaling apparatus can be controlled or manipulated** - is locked with **double locks**. **One key** is with the **station master**; the **other is in the custody of the signaling staff**. To open the relay room, even for maintenance, **station master's permission is required**. With improved technology, **opening and closing of relay rooms were connected electronically to the data loggers**. Every event is **registered on a server**, and an SMS is also triggered to officials concerned.
- **What happened in Balasore accident?**
  - » As it now appears, a **signal maintainer or technician of the signaling department** at the **Bahanaga Bazar station** **did open one of the location boxes at the station to "loop" the circuit and achieve a "clear path"** (or a green signal) for the Coromandel Express.
    - **Note:** Location boxes are **the junctions of cables from various hardwares meeting circuits to work in the pre-set safety logic**.
  - » This **Safety override** is usually unauthorized.

### C) COMMISSIONER OF RAILWAY SAFETY (CRS)

- Investigation into the **recent tragic train accident in Odisha**, is being conducted by the **Commissioner of Railway Safety** for the **south-eastern circle**.
- **Rail Safety Commissioners** are part of the **Commission of Railway Safety (CRS)**, a government body that **acts as the railway safety authority in the country**.

- CRS deals with matters related to safety of rail travel and operations, among some other statutory functions - inspectorial, investigatory, and advisory - as laid down in the Railways Act, 1989.
- Investigating Railway Accidents is one of the key responsibilities of the CRS.
- It is headquartered in Lucknow.
- It is to be noted that CRS doesn't report to Ministry of Railways. It is under the administrative control of the Ministry of Civil Aviation (MoCA).
  - **Why?**
    - » To keep CRS insulated from the country's railway establishment and prevents conflict of interest.
- It was in May 1941, that the Railway Inspectorate was separated from the Railway Board and put under the administrative control of the then Department of Post and Air. This inspectorate was redesignated as the CRS in 1961.

## 11) IMPORTANT STEPS IN RECENT DECADES TO ENSURE RAILWAY SAFETY

- i. **Anil Kakodkar Committee: High Level Safety Review** Committee was formed by Ministry of Railways in 2011 and it submitted its report in Feb 2012. It recommended modernization of tracks; elimination of level crossings by building rail over and under bridges; strengthening Railway Bridges; 100% mechanized track maintenance etc.
- ii. **Rashtriya Rail Sanraksha Kosh (RRSK)** was created with a corpus of Rs 1 lakh crore over a period of 5 years for giving a major boost to safety related works.
- iii. **Induction of technology for safety improvements – Smart Coach**
  - » Smart coach with diagnostic system monitor bearing vibrations provides advance information on health of bearing wheel & track. In addition, coach has been provided with wheel slip protection monitoring.
- iv. **Complete switchover to LHB:** Indian Railways have decided to completely switch over to manufacture of LHB design main line coaches from 2018-19 onwards.
  - » **Linke-Hofmann-Busch (LHB)** coach is a passenger coach of Indian Railways. It is developed by Linke-Hofmann-Busch of Germany and produced by rail coach manufacturing units at Kapurthala, Chennai and Raibareli. They have been used since 2000 on the broad gauge network of Indian railways.
- v. **Other steps include**
  - » **Elimination of level crossings**
  - » Number of **stations with the installation of CCTV based camera surveillance** have increased.
  - » **Indian Railway Institute of Disaster Management** have been opened up in Bangalore for training of officers and staff.
  - » **Commandos for Railway Security** - Launch of first Railway Commando battalion 'CORAS' on 14th Aug 2019 to tackle the menace of terrorism and Naxalism.
  - » **Empowerment of RPF** to make seizure under Narcotics, Drugs and Psychotropic Substances (NDPS) Act
    - GoI through a notification in April 2019, empowered RPF to make seizures and arrest under NDPS act.
    - Subsequently, RPF have recovered large number of such recoveries.

- vi. **Provision of Electronic Interlocking (EI):** To increase safety and flexibility EI is being adopted on large scale to derive benefits of digital technologies in train operation and enhance safety.
- vii. **KAVACH Technology (Automatic Train Protection System)**
  - » KAVACH has been developed indigenously by RDSO in association with three Indian vendors and it has been adopted as our **National Automatic Train Protection (ATP) System**.
    - It will aid Loco Pilot to avoid Signal Passing At Danger (SPAD) and over speeding but also help in train running during inclement weather such as dense fog.
  - » **Key features:**
    - Controls speed of the train by automatic application of brakes in case Loco Pilot fails to apply the brakes
    - Repeats line-side signal in cab which is very useful for higher speeds and foggy weather
    - Works on principle of continuous update of Movement authority
    - Auto Whistling at LC gates
    - Collision avoidance by direct to loco communication
    - Supports feature of SOS in case of any mishap to control train in vicinity.
  - » **Total Expenditure** incurred so far on development work of Kavach is Rs 16.88 crores.
  - » At present (March 2022) Kavach roll out is planned on New-Delhi Howrah and New Delhi - Mumbai Section which is targeted for completion by March 2024. Further rollout will be planned based on experience gained.

## 4. URBAN DEVELOPMENT

### 1) SMART CITIES MISSION (SCM)

- Government of India launched **Smart Cities Mission (SCM)** on 25 June 2015.
  - It aims to transform 100 cities by 2019-20.
    - » The mission has been given two extensions with the new deadlines being 30th June 2024.
  - The SCM has two main aspects:
    - » **Area Based Development** consisting of three components: Redevelopment (city renewal), retrofitting (city improvement), and green field projects (city extension)
    - » **Pan city Solutions based on ICT**.
  - It is based on the idea of developing the entire urban eco-system on the principles of complete and integrated planning.
  - The **main objective** of the Smart Cities Mission (SCM) is to promote cities that provide **core infrastructure, clean and sustainable environment** and give a decent quality of life to their citizens through application of 'Smart solutions'.
  - It also aims to drive economic growth and improve quality of life through comprehensive work on social, economic, physical, and institutional pillars of the city.
  - The plan is also to create a **replicable model** which will act like a light house to other aspiring cities.
- **What was the initial plan?**
  - 100 smart cities were selected through 4 rounds of competition between Jan 2016 and June 2018.
  - **Funding:**
    - Around 2 lakh crores (coming from Center, States, ULBs and PPPs) was kept aside for the mission.

- **Implementation and Monitoring Mechanisms:**
  - The implementation of the SCM at the city level is done by SPV created for the purpose.
    - » The SPV brings in a business model of governance. It was adopted by bypassing the existing models of city governance in the country.
    - » This SPV is led by a bureaucrat or a representative of an MNC, and other major stakeholders. It was created under the Companies Act.
    - » The SPV plans, appraises, approves, release funds, implement, manage, operate, monitor and evaluate the Smart City development projects.
    - » The SPV is headed by a full time CEO, and has nominees of Central Government, State governments and ULB on its Board.
  - At the state level, the mission implementation is coordinated by the State Level High Powered Steering Committee (HPSC) chaired by Chief Secretary of the State.
  - At the national level, implementation of SCM is monitored by an Apex Committee headed by Secretary, MoHUA.
    - The apex committee regularly reports on the progress of projects through the Real Time Geographical Management Information System (GMIS).
  - A Smart City Advisory Forum (SCAF) has also been established at the city level to advise and enable collaboration among various stakeholders.
    - As of May 2023, the Smart Cities have convened more than 756 meetings of SCAF.
  - Integrated Command and Control Centres (ICCC) is operational in all 100 Smart Cities.
    - These ICCC work as the brain and nervous system for the city operations, using technology for urban management.
- **Note:** The period of implementation of SCM has also been extended upto June 2024 and all remaining projects are expected to be completed by this time.
- **Progress:**
  - » The mission has around 78,00 projects worth Rs 1.8 lakh crores. As of July 2023, around 74% of the projects were completed.
  - » As of 1st May 2023, Rs 38,400 crores were released under the Smart Cities Mission, of which around 90% (Rs 35,261) crores have been utilized.
  - » Only 22 cities out of 100 cities have been able to finish all projects commissioned under the mission.

#### **A) LABELLING STRATEGY OF SCM**

- **The 100 Cities** part of SCM are marking their completed projects with logos, in a strategy aimed at displaying the accomplishment so far.
  - » In June 2023, a letter to the Smart City CEOs asked for the implementation of the "**labelling strategy**".
    - To form a "link to build trust with the community".
    - This would act as a method for creating awareness and providing information to the stakeholders of the projects.

## B) SMART CITIES AWARD, 2022 (ANNOUNCED IN AUG 2023)

- The MoH&UA has named Indore as the best city, and Madhya Pradesh the best state in the Smart Cities Mission in its India Smart Cities Awards 2022.
  - » Surat and Agra were named second and third best among the cities and TN second in states, with the third prize being shared by Rajasthan and Uttar Pradesh.
- **How were the winners chosen?**
  - » Based on their ranking in terms of progress of projects, project outcomes, and presentations submitted for the awards.

## 2) AMRUT (ATAL MISSION FOR REJUVENATION AND URBAN TRANSFORMATION) AND AMRUT 2.0

- » Launched on 25th June 2015 to complement the Smart Cities Mission. It targeted covering 500 cities with a population of 1 lakh and more.
- » It focused on development of basic infrastructure in the sectors of water supply; sewerage and septage management; storm water drainage; non-motorized transport; and development of green spaces and parks.
- » Mission also mandated a set of 11 Reforms for all the Mission cities and Capacity building activities for the ULBs.
- » **Ministry:** Ministry of Housing and Urban Affairs
- » It is a Centrally sponsored scheme being funded through Central and State/ULB share.

## A) AMRUT 2.0

- The Union Cabinet has approved the AMRUT 2.0 for the period FY2021-22 to 2025-26, as a step towards Aatma Nirbhar Bharat and with an aim of making the cities 'water secure' and 'self-sustainable' through circular economy of water.
  - » AMRUT Mission has been subsumed under AMRUT 2.0 and ongoing projects of AMRUT 1.0 will be funded till 31st March 2023.
- It targets to provide 2.68 crore tap connections and 2.64 crore sewer/septage connections to achieve the below outcomes:
  - » **Universal coverage of water supply** by providing household tap connections in all 4,378 statutory towns.
  - » **100% coverage of household sewerage/septage management** in 500 AMRUT cities.
- **Total indicative outlay** for AMRUT 2.0 is Rs 2,77,000 crore including central share of Rs 76,760 crore for five years from FY 2021-22 to FY 2025-26.
  - » Ministry of Housing and Urban Affairs has approved State Annual Action Plans (SAAPs) of all States/Uts amounting to Rs 77,640 crores of the entire mission period.
- **Monitoring Provisions:**
  - » The mission will be monitored on a robust technology portal and the projects will be geo-tagged.
- **Other features:**
  - » Endeavour to make mission paperless

- » It promotes **Circular Economy** of water through development of **City Water Balance Plan (CWBP)** for each city focusing on recycle/reuse of treated sewage, rejuvenation of water bodies and water conservation.
- **Other Components of AMRUT 2.0:**
  - » **Pey Jal Survekshan**: To ascertain equitable distribution of water, reuse of wastewater, mapping of water bodies and promote healthy competition among the cities/towns.
  - » **Technology Sub Mission for Water** to leverage latest global technologies in the field of water.
  - » **Information, Education, and Communication (IEC)** campaign to spread awareness among masses about conservation of water.
- **The total outlay for AMRUT 2.0 is Rs 2,99,000 crore including central share of Rs 76,760 crore for five years.**
  - » This outlay includes Rs 22,000 crore (Rs 10,000 crores as central assistance) for projects of AMRUT till March 2023.
  - » The **fund** for the projects is shared by Centre, State and ULBs. Central funds is released to the states in three tranches based on the allocation to the states as per the State Water Action Plan.
  - » Mission will also mobilize market finance for mandating implementation of 10% worth of projects in cities with population above 10 lakhs through Public Private Participations.
- Entrepreneurs/start-ups will be encouraged in water ecosystems.
- The mission has a **reform agenda** focused towards financial health and water security of ULBs.
  - » Meeting 20% of water demand through recycled water, reducing non-revenue water to less than 20% and rejuvenation of water bodies are major water related reforms.
  - » Reforms on property tax, user charges, and enhancing credit worthiness of ULBs are other important reforms. ULBs will be rewarded with incentive on accomplishing the reforms.



# TARGET PRELIMS 2024

## BOOKLET-53; ECONOMY-13

## PRELIMS MASTERS PROGRAM

### ECONOMY-19

### CAPITAL MARKET

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## 2. CAPITAL MARKET – FUNDAMENTALS:

- A capital market is the financial market for long term fund. It helps to generate bulk fund for government and industries.
- The most common capital markets are the stock market and the bond market.
  - The stock market allows companies to raise capital by selling shares of ownership in the company (Equity Financing).
  - The Bond Market allows companies and governments to raise capital by selling bonds (Debt Financing).
- **Securities Market** deals with shares (equity shares, preference shares, derivatives) and debt instruments.
  - **In case of Shares** (Equity financing), investors have a share in the capital and profit.
  - In case of **Debt Financing Instruments**, the investors don't have any share in the capital.
    - » Companies use Debt Financing instruments (bonds, debentures) to raise funds.
    - » It is just lending to the company and the company is liable to pay interest on the capital borrowed through bonds. Regardless of profit and loss the debt instrument holders are entitled to receive income.
    - » **Note:** Debentures are a type of bond. Any unsecured bond without any collateral is a debenture.
      - All debentures are bonds, but not all bonds are debentures. Whenever a bond is unsecured, it may be referred as debentures.
    - » **Note:** Both bonds and debentures may be convertible (meaning that they can be converted into company stocks)

### 1) KEY DIFFERENCES BETWEEN SHARES, DEBENTURES AND BONDS

Shares	Debentures	Bonds
<u>Shares are fractions of the company's capital.</u>	<u>Debentures are medium/long term debt instruments</u> that a company issues to borrow capital.	<u>Bonds are long term debt instruments</u> that companies issue to borrow capital.
<u>Performance of shares is highly dependent on market fluctuation.</u>	<u>Debentures are risky investments</u> as they are usually <u>not backed by collateral</u> . <u>Investor makes investment decision</u> on the basis of <u>credit rating and reputation</u> of the company.	<u>Bonds are safer investment option</u> , as it is <u>backed by collateral</u> .
<u>Shareholders are company owners who own the fraction of company equivalent to fraction of shares held by them.</u>	<u>Debenture holders are lenders</u> to the company.	<u>Bond holders</u> are lenders to the company.

The company may pay <u>dividend to the shareholders</u> in case the company makes profit.	Debenture holders receive <u>interest payments</u> periodically. It depends on <u>issuing company's performance</u> .	Bond owners receive <u>interest on accrual basis</u> . It doesn't depend on the <u>company's performance</u> .
Shares are <u>highly liquid</u> as they can be sold or purchased on stock exchanges.	Debentures has <u>lower liquidity</u> when compared to shares	Bonds have the least liquidity as these are <u>long term debt instruments</u> .
Shares <u>don't have credit rating</u> .	Debentures <u>receive credit rating</u> from CRAs.	Bonds receive credit ratings from CRAs.

## 2) SHARES (EQUITY, PREFERENCE, DERIVATIVES)

### A) EQUITY SHARES

- Equity shares are ordinary stocks issued by a company for the purpose of raising capital to expand their business. The investor gets partial ownership of the company. The number of equities shares an investor buys is their portion of ownership in the company. Equity shares are non-redeemable, and therefore act as a long-term source of financing for companies.
- **Benefits:** Capital Appreciation; Dividends.
- However, these benefits are not fixed and are fluctuating.

### B) PREFERENCE SHARE

- Preference shares carry preferential rights in terms of dividend payment and repayment of capital.
  - These shares offer shareholders fixed dividends.
  - Preferred shareholders are given their dividends before equity shareholders receive theirs.
  - In terms of priority and repayment of capital, preference shares can be ranked between debt and equity.
  - In case of bankruptcy, preferred shareholders get priority over common shareholders and receive the company's assets before them.
  - At any point of time, preference shares can be converted into equity shares.
  - Preference shares can be redeemed after a certain period or after the company successfully achieves desired goals.
- **Limitations:** Preference shareholders don't get right to vote or participate in decision-making events of the company.

### C) DERIVATIVES

- Derivatives are vastly different equity stocks. They are contracts that derive their value from an underlying asset – which could be an equity stock, a currency pair or a commodity. This leads to different types of securities like equity derivatives, commodity derivatives, and currency derivatives.
- Derivatives can also be classified as futures and options based on the terms of contract.
  - **Futures:** In a future contract, two parties decide to purchase and sell the underlying asset at a specific price on a specific date in the future. This contract must be executed by both parties, and neither party has the right to let the contract expire.

- **Options:** Options contract also derives its value from an underlying asset. It gives the holder (or the buyer) of the options contract the right to purchase or sell the underlying asset at a fixed price on or before a specific date. The options buyer is not obligated to carry out the terms. Options contracts can be any one of two types – namely, call options that offer the right to buy the asset and put options that offer the right to sell the asset.

### 3) GOVERNMENT AND INDUSTRIAL SECURITIES

- **Based on the fund raiser**, the securities market can be classified into two types: 1) **Government Securities Market** 2) **Industrial Securities Market**

#### A) GOVERNMENT SECURITIES MARKET

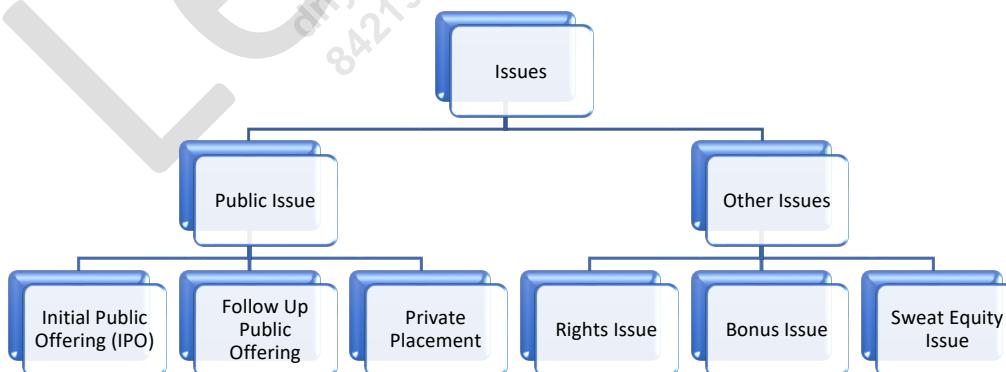
- It is a market of government and semi-government securities backed by RBI. It is also known as **Gilt Edged Market**. Gild edged means “**of the best quality**”. The government securities are more reliable and therefore they are called Gild Edged Securities.

#### B) INDUTRIAL SECURITIES MARKET

- It is a market for securities of industrial and commercial organizations.

### 4) NEW (PRIMARY) AND OLD ISSUE (SECONDARY) MARKET

- Based on the nature of issue, the securities market can be classified as **New Issue Market (Primary Market)** and **Old Issue Market (Secondary Market)**.
- **Primary Market:** Here, new securities are issued for the first time. Companies/governments raise capital by selling stocks, bonds, or other financial instruments to investors.
  - E.g.: Initial Public Offerings (IPOs) for stocks and issuance of government bonds.
  - The issue of securities in Primary Market can be classified as: 1) **Public Issue** 2) **Other Issues**



- **Public Issue** means issue of securities to public i.e. to all people, whoever wants to invest.
    - » **IPO:** If a company or financial corporation (issuer) issues shares for the first time.
    - » **FPO:** If any company or corporation has already issued shares, issues shares again, to raise additional funds it is called Follow on Public Offering.
    - » In both IPO and FPO, the issuer usually doesn't issue the security, the issuer appoints a merchant banker on behalf of it to carry out the fund raising activities.
    - » **Authorized Capital, Issued Capital, Subscribed Capital:**
      - The issuer can issue to the extent of Authorized capital. Authorized capital means the maximum amount authorized by the Memorandum of Association (MoA) of a company that can be raised by the company. A company need not issue the shares to the extent of authorized capital. It can issue less than the authorized capital. The actual amount issued by the issuer is called Issue Capital.
      - **The Subscription** may be sometimes less than the issue capital. If it is so, then it means it is unsubscribed. The actual amount of subscribed is called subscribed capital.
    - » **Private Placement** includes offering shares directly to financial institutions, mutual funds, and high worth investors.
  - **Other Issues:**
    - » **Right Issue:** Offer of security to existing shareholders in the FPO. It flows to the existing shareholders as a matter of legal rights. So, it is called the Rights issue.
    - » **Bonus Issue:** It refers to the offer of shares against distributable profit to the existing shareholders. It is also known as the scrip issue or the capitalization issue.
    - » **Sweat Equity Issue:** It denotes offer of shares to employees or Directors of the company which issues shares as recognition of their hard labour (sweat), which results in contribution to the company in the form of intellectual property rights, technical know-how etc.
- **Secondary Market (Old Issue Market):** Here, previously issued securities are traded among investors.
- E.g. Stock market where investors buy and sell shares, Bond trading platforms.
  - **Stock Exchange:** It is an institution for orderly buying and selling of listed securities.
  - **Over the counter exchange:** Platform for trading in securities that are 'not listed' on a recognized stock exchange.
- **Regulation:** In India, both New Issue and Old Issue markets are regulated by the Securities and Exchange Board of India (SEBI).

## 5) STOCK EXCHANGES

- In India, there are several small and big stock exchanges. The most prominent are National Stock Exchange (NSE) and Bombay Stock Exchange (BSE).
- **National Stock Exchange (NSE)** was incorporated in 1992 on the recommendation of Pherwani Committee. **IDBI** is the main promoter of the exchange. Some other leading financial institutions (SBI, LIC etc) are also promoters of its along with IDBI.

- **Bombay Stock Exchange (BSE)**: Established in 1887. It is Asia's oldest Stock exchange and was initially known as 'The Native Share and Stockbrokers Association'. It was owned by stock brokers. Now it is demutualized (i.e. made a public owned organization).

## A) INDEX

- Like CPI and WPI which measure the rise/fall in the price of commodities, there are share price indices which measure the rise and fall of a bucket of shares. The most prominent indices in India are Sensex, Nifty, and Nifty Junior.
- **Sensex** stands for **Sensitive Index**. This is the index of the BSE and measures the price movement of top 30 company shares. The top 30 companies are called Blue Chip Companies.
- **NIFTY** stands for **National Index for fifty**. This and Nifty junior are the indices of National Stock Exchange. NIFTY measures the price movement of top 50 companies. Nifty junior is an index of next 50 top companies.
- **How are top companies selected**: On the basis of total value of shares that are traded in the stock exchange.
  - **Value of traded shares** = Price of one share x Number of shares traded
  - This value is called **free float market capitalization**. The value of all (both traded and non-traded (the shares that are kept for a long time)) shares is called **market capitalization**.
  - **Market Capitalization** is the value of shares that were sold to public which are called outstanding shares. Market Capitalization = Price X Total outstanding shares.

## 6) INDEX PROVIDERS

- **Index Providers** are companies that design, create, calculate and manage indexes. They have the responsibility to set the rules that decide what securities to include in each index, how the index will be managed, and how securities will be added or removed from that index over time.
  - » **Examples of Index Providers**: MSCI, Standard & Poors (S&P), Dow Jones, Nasdaq, FTSE Russell, Solactive, Morningstar
  - » **Note**: The first index - Dow Jones Transportation Average - was created in 1884 to measure average performance of railroad stocks in the US.
- **In India**, Index providers are subsidiaries of stock exchanges.
  - » For e.g.
    - **NSE Indices Ltd**: It is the largest index provider in India. It manages the popular Nifty indices, including the benchmark Nifty 50 Index, Nifty Bank Index etc.
    - **Asia Index Pvt Ltd (APIL)**: It is a 50-50 partnership between S&P Dow Jones Indices LLC, the world's largest provider of financial market indices and BSE Ltd, Asia's oldest stock exchange and home to iconic SENSEX Index.
- **Regulation of Index Providers**:

## A) SEBI NOTIFIED THE 'SEBI INDEX PROVIDER REGULATIONS' (MARCH 2024)

- SEBI has mandated registration of index providers managing "significant indices" based on securities listed in India.
  - » The global index providers, however, may not have to register under the SEBI unless indices are used as benchmarks by domestic asset managers with large corpus.
  - » SEBI has excluded indices that are exclusively used in a foreign jurisdiction.
  - » Benchmarks regulated by RBI are also excluded from these regulations.
  - » Industry players like NSE limited, APIL etc. will have to register with SEBI
- Other than registration, the index providers covered under the regulation will also have to make the methodology documents public, follow a code of conduct, and bring more transparency on inclusion and exclusion.
- **Significance:**
  - » It is aimed at fostering transparency and accountability in governance and administration of financial benchmarks in the market.

## 7) DEPOSITORIES

- **Basics**
  - » Depositories are institutions that keep securities of investors in electronic format (demat format).
    - The change in ownership of shares is done electronically.
  - » Depository is an institution or a kind of organization which holds securities with it, in which trading is done among shares, debentures, mutual funds, derivatives, F&O and commodities.
  - » **Intermediaries** perform their actions in variety of securities at Depository on behalf of their clients. These intermediaries are known as **Depository Participants(DPs)**. Depository interacts with its client / investors through its agents, called DPs. For any investor/client, to avail services provided by the Depository, has to open a depository account known as Demat A/c, with any of the DPs.
    - The relationship between the DPs and the depository is governed by an agreement made between the two under the Depositories Act.
    - In a strictly legal sense, a DP is an entity who is registered as such with SEBI under the subsection 1A of Section 12 of SEBI act. As per the provisions of this act a DP can offer depository related services only after obtaining a certificate of registration from SEBI.
- **In India**, there are two depositories NSDL, Mumbai and CDSL, Mumbai
  - » National Security Depository Limited(NSDL): It is the first depository in the country. It was established by UTI, NSE and IDBI.
  - » Central Depository Service (India) Ltd (CDSL).
    - It was established by BSE, Bank of India, Bank of Baroda, SBI and HDFC Bank.

## 8) SEBI (SECURITIES AND EXCHANGE BOARD OF INDIA)

- SEBI is the regulator for the securities market in India. It was established in the year 1988 and given statutory powers on 12th April 1992 through the SEBI act, 1992.
- **Functions and Responsibilities**
  - **Basic Function:** The Preamble of the Securities and Exchange Board of India describes the basic functions of the SEBI as "to protect the interests of investors in securities and to promote the

development of, and to regulate the securities market and for matters connected therewith or incidental thereto.

- SEBI has to be responsive to the **needs of three groups**, which constitute the market:
    - » The issuer of security
    - » The investors
    - » The market intermediaries
  - SEBI has three functions rolled out into one body: **quasi-legislative, quasi-executive and quasi-judicial**.
    - » It drafts regulation in its legislative capacity.
    - » It conducts investigation and enforcement action in its executive function.
    - » It passes rulings and orders in its judicial capacity.
  - Though, this makes it very powerful, there is an appeal process to create accountability. There is a **Securities Appellate Tribunal** which is a three-member tribunal. A second appeal lies directly to Supreme Court.
  - SEBI has taken a very proactive role in streamlining disclosure requirements to international standards.
- **Composition:** The SEBI is managed by its members, which consist of **Chairman and 8 other members**.
- The **chairman** is nominated by the Union Government of India
  - **Two members** i.e., officers from Union Finance Ministry
  - **One member** of reserve bank of India
  - The **remaining five members** are nominated by Union government of India, out of them **at least three shall be whole-time members**.

## 9) RELATED TERMS

1. **P/E Ratio:** Price to Earning Ratio, is a metric used to assess a company's stock valuation. It essentially compares a company's share price to its earning.
2. **Face Value and Issue Price:**
  - Face value is the actual value of shares. It is a fixed nominal value assigned to a share by the company during its incorporation.
  - **Issue Price** is the price at which company shares are sold to the public for the first time during an IPO.
    - Premium is the extra price a share claims in the market due to high demand for it.
3. **Short Selling:** Sellers sells the securities without owning the securities. He borrows the securities and sells it.
4. **Beta:** It is a measure of stock's volatility in relation to the overall market.
  - By definition, the market has a beta of 1.0 and individual stocks are ranked according to how much they deviate from the market.
5. **Bull and Bear Trading:**
  - In bull trading, buyer buys more shares in expectation of price increase in future.
  - In Bear trading, the sellers sell the securities, with the intention to avoid loss, in the expectation that the security prices will fall.

6. **Buy Back:** Issuer buying the securities again to accumulate shares in his hands.

## 10) PARTICIPATORY NOTES (P-NOTES)

- **Introduction**
  - PNs (ODIs) are instruments issued by the registered foreign institutional investors (FIIs) to overseas investors, who wish to invest in the Indian stock markets without registering themselves with the market regulator, the SEBI.
    - FIIs use these instruments for facilitating the participation of their overseas clients, who are not interested in participating directly in the Indian stock market.
- **Advantages for investor**
  - **Anonymity:** PNs allow large hedge funds to carry out their operations without disclosing their identity
  - **Ease of trading** as participatory notes are like contract notes transferable by endorsements and delivery.
  - **Tax Saving** as the investor can invest through tax haven countries.
- **Advantages for India**
  - **More** Investment in the country
- **Key Controversy**
  - **Hides the identity of the investor**
    - According to a white paper on black money by government, a considerable portion of PNs are used by wealthy individuals as a mechanism to channelize black money kept in foreign countries to India.
    - SIT on black money has also called for phasing out of the participatory notes.
  - **Money Laundering**
    - P-notes have become one of the key money laundering mechanisms in the country.
- **SEBI has not banned P-Notes** because:
  - Used globally in many markets
  - SEBI believes that P-notes are legitimate instruments required for normal financial transactions and are prevalent in all the larger markets.
  - Then there are business reasons to permit these transactions through P-notes.
- **SEBI has taken a number of steps to tighten the norms**

## 11) GLOBAL DEPOSITORY RECEIPTS

- A GDR, also known as International Depository Receipt (IDR), is a certificate issued by a depository bank, which purchases shares of foreign companies and deposits it on the account. They are the global equivalent of the Original American Depository receipt (ADR) on which they are based.
- GDRs represent ownership of an underlying number of shares of a foreign company and are commonly used to invest in companies from developing or emerging markets by investors in developed markets. GDRs enable a company, the issuer, to access investors in capital markets outside of its home country.

### 3. DEBT SECURITIES

#### 1) WHAT IS A DEBT MARKET?

- The debt market is the market where fixed income securities of various types and features are issued and traded. This includes fixed income securities from governments, municipal corporations, government bodies, and commercial entities including Financial Institutions, Banks, PSUs, Public Ltd companies etc.

**What are the different types of instruments which are traded in debt market?**

Market Segment	Issuer	Instruments
Government Securities	Central Government	Zero Coupon Bonds, Coupon Bearing Bonds, Treasury Bills, STRIPS
	State Governments	Coupon Bearing Bonds
Public Sector Bonds	Government Agencies / Statutory Bodies	Govt. Guaranteed Bonds, Debentures
	Public Sector Units	PSU Bonds, Debentures, Commercial Paper
Private Sector Bonds	Corporates	Debentures, Bonds, Commercial Paper, Floating Rate Bonds, Zero Coupon Bonds, Inter-Corporate Deposits
	Banks	Certificates of Deposits, Debentures, Bonds
	Financial Institutions	Certificates of Deposits, Bonds

**Note-1: STRIPS – Separate Trading of Registered Interest and Principal of Securities:** STRIPS are the securities created by way of separating the cash flows associated with regular G-Sec i.e. each semi-annual coupon payment and final principal payment to be received from the issuer, into separate securities. They are essentially Zero coupon bonds. However, they are created out of existing securities only and unlike other securities, are not issued through auction. Being G-Sec, STRIPS are eligible for SLR.

**Note-2:** The G-Secs are known as **SLR securities** in the Indian markets as they are eligible securities for the maintenance of SLR ratio by the banks.

#### 2) WHAT IS MONEY MARKET?

- The money market is basically concerned with the issue and trading of securities with short term maturities and quasi-money instruments.

- Instruments traded in money market are: Treasury Bills, Certificate of Deposits (CDs), Commercial Papers, Bills of Exchange and other instruments of short term maturities (i.e. not those exceeding 1 year with regard to the original maturity).
- **Treasury Bills** (already studied with fiscal policy chapter)
- **Certificate of Deposits (CoD)**: A CoD is a saving product that earn interest on a lump sum for a fixed period of time. CD differs from saving account as the money has to remain untouched for the entire period or risk penalty fee or lost interest. It has higher interest rates than saving accounts as an incentive for lost liquidity. They are safer and more conservative investment than stocks and bonds, offering lower opportunity for growth, but with a non-volatile, guaranteed rate of return. Virtually every bank, credit union, and brokerage firm offers a menu of CD options. Although you lock into a term of duration when you open a CD, there are options for exiting early should you encounter an emergency or change of plans.
- **Commercial Papers**: Commercial Paper is an unsecured, short-term debt instrument issued by corporations. It's typically used to finance short term liabilities such as payroll, accounts payable, and inventories. It is usually issued at a discount from face value i.e. the commercial paper is issued at a discount and matures at its face value. It reflects prevailing market interest rates.
- **Bill of Exchange**: A bill of exchange is a written document used primarily in international trade. It's essentially an instruction from one party (the drawer) to another party (the drawee) to pay a fixed amount of money to a third party (the payee) at a specific date in the future, or on demand.
  - » **Drawer**: The person or entity who creates the bill and instructs the payment.
  - » **Drawee**: The person or entity who is instructed to make the payment (often the buyer in a trade transaction)
  - » **Payee**: The person or entity who is supposed to receive payment.

### 3) ADVANTAGE OF DEBT SECURITY FOR INVESTORS

- Predictable stream of payments.
- Debt securities like government bonds are also highly secure and very less volatile.
  - **Note:** The return earned on the government securities are normally taken as the benchmark rates of returns and are referred to as the risk free return in financial theory. The Risk-free rate obtained by G-Sec rates is often used to price the other non-government securities in financial market.
- It indicates wide-based efficient portfolio diversification.

### 4) IMPORTANCE OF DEBT MARKET TO THE ECONOMY:

- Efficient mobilization and allocation of resources
- Financing the development activities of government
- Transmitting signals to monetary policy.
- Development of heterogeneity among market participants

## 5) DIFFERENT TYPES OF RISKS ASSOCIATED WITH DEBT SECURITIES

- i) **Default Risk** (Credit Risk): When issuer of a bond is unable to make timely payment of interest or principal on a debt security.
- ii) **Interest Rate Risk**: This can be defined as the risk emerging from an adverse change in the interest rate prevalent in the market.
  - E.g. Upswing in the prevailing interest rate scenario leading to a situation where the investors' money is locked at lower rates.
- iii) **Reinvestment Rate Risk**: Probability of a fall in the interest rate resulting in a lack of options to invest the interest received at regular intervals at higher rates than the comparable rates in the market.

## 6) DEBT SECURITY MARKET STRUCTURE

- The debt markets in India and all around the world are dominated by Government securities which account for 50-75% of the trading volumes and the market capitalization in all markets.
- **In India, Government Securities (G-Sec)** account for 70-75% of the outstanding value of issued securities and 90-95% of the trading volumes in the Indian debt markets.
- **State Government securities & Treasury Bills** account for around 3-4% of the daily trading volumes.

## 7) WHO REGULATES FIXED INCOME MARKET (DEBT SECURITY MARKET)?

Government securities and issues by Banks and Institutions are regulated by RBI.

Non-Government securities comprising basically of Corporate Debt issues is regulated by SEBI.

## 8) BOND ANALYTICS

- **Bond Basics**: When a bond is issued, the issuing entity determines its duration, face value (also called its par value), and the rate of interest that it pays (coupon rate). These characteristics are fixed, remaining unaffected by changes in the bond's market.
  - E.g.: A Government bond with Rs 1 crore face value and a 7% coupon rate pays 7 lakhs in interest annually.
- **What is yield?**
  - Yield refers to the percentage rate of return paid on a stock in the form of dividend, or the effective rate of interest paid on a bond or note.
  - There are many different kinds of yields depending on the investment scenario and the characteristics of the investment.
    1. **Current Yield** of Bonds: Current yield of bond is calculated by dividing the annual coupon payment by bond's current market value.
      - » **E.g.**
        - i. Let's say Bond's face value is Rs 1 crore.
        - ii. Coupon is 10%.
        - iii. Bond's market value is Rs 1.1 crore.
      - » **Current yield in percentage = Annual Coupon Payment/ Bond Price**

$$= (10 \text{ lakh} / 1.1 \text{ crores}) = 0.0909 = 9.09\%$$

- » **Significance:** The current yield calculation helps investors drill down on bonds that generate the greatest returns on investment each year.

2. **Yield to Maturity:** It is the % rate of return paid on a bond, note, or other fixed income security, if you buy and hold the security till its maturity. It's a more complicated calculation and not relevant for our preparation.

- **How is the Price determined in the Debt Market?**

- The price of bond in the debt market is determined by the forces of demand and supply.
  - The price fluctuates according to change in:
    1. Economic Condition
    2. General Money market condition including the state of money supply.
    3. Interest rate prevalent in the market
    4. Future interest rate expectations
    5. Credit quality of the issuer
  - There is, however, a theoretical underpinning to the determination of the price of the bond in the market based on the measure of the yield of the security.

- **Bond Yield as a function of Price:**

- **Yield and Bond Prices** are inversely related. So, a rise in price will decrease the yield and a fall in the bond price will increase the yield.
  - **When the prevailing interest rate in market rise**, the prices of outstanding bonds will fall to equate the yield of older bonds with higher-interest rates of new issues. This will happen as there will be very few takers for the lower coupon bonds resulting in a fall in their prices.
  - **When the prevailing interest rate in market falls**, the price of outstanding bonds will rise, until the yield of older bonds is low enough to match the lower interest rate on the new bond issue.

# TARGET PRELIMS 2024

## BOOKLET-54

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## 2. S&T: DEFENCE – FIGHTER JETS

### 1) LCA PROGRAM

- In 1983, IAF realized the need of an Indian Combat for two primary purposes - i) Replacing Mig-21 fighters which were mainstay of Indian Airforce in 1980s; ii) Serving as a vehicle for an across the board enhancement of India's domestic aerospace industry.
- **Aeronautical Development Agency (ADA)** was set up in 1984 under the DRDO to oversee the development of LCA program. It is national consortium of 100 defence laboratories, industrial organizations, and academic institutions with HAL being the principle contractor.

#### A) LCA TEJAS

- **News:**
  - » LCA Tejas Mark 1A fighter aircraft completes first flight in Bengaluru (March 2024)
  - » IAF flies PM Modi on a Tejas aircraft over Bengaluru for 30 mins (Nov 2023)
    - With this, PM Modi became the first prime minister to fly in a fighter aircraft.
  - » **The Defence Acquisition Council (DAC)**, chaired by Defence Minister Rajnath Singh, cleared total procurement worth Rs 2.23 lakh crores which include procurement of 97 Tejas light combat aircraft and 156 Prachand Combat Helicopters. (Nov 2023)
- **HAL Tejas** is a single seat, single-engine, multi role light fighter developed by Hindustan Aeronautics Limited for India. It came from the LCA programme and is first aircraft of India that carries **Made in India tag**.
  - **Note:** There is a twin seat variant which is used for training.
- It is also world's smallest and lightest supersonic aircraft.
- LCA was officially named "Tejas" meaning "radiance" by the then Prime Minister Atal Bihari Vajpayee.
- The Tejas is the second supersonic fighter developed by HAL after **HAL HF-24 Marut**.
- **Role of LCA in AirForce**
  - » LCA falls in the lower tier of the evolving conventional force structure of the IAF.
    - At the upper level we have aircrafts like Su-30 MKI and Dassault Rafale. **Tejas will from the lower end of the strike package** complimenting the heavy Sukhois and the medium Rafales. It will be replacing Mig-21 aircraft.
- **Capability of Air-to-Air Refueling:** In 2018, LCA Tejas became the first Indian aircraft to complete air-to-air refueling.

#### B) LCA TEJAS MK1A

- It is a variant of LCA Tejas MK-1A which has more than 40 improvements over the Mark-1 variant.
- **Updates:** In March 2024, HAL successfully completed the first flight of indigenous LCA Tejas Mk-1A.

### C) LCA TEJAS MK2

- Cabinet committee on security (CCS) gave sanction for the development of MK-2 in Aug 2022 at a total cost of Rs 9,000 crores.
  - Prototype is expected to be rolled out by 2024-25.
- LCA Tejas MK-2 will be a larger and more capable jet and will be powered by F414 engines.
  - GE Aerospace (a US company) have delivered 8 F414 engines as part of the ongoing development program of LCA-Mk2.

### D) FEATURES OF F-414 ENGINES

- India has shortlisted the F414-INS6 model for LCA MK-II for the IAF.
  - » Afterburner turbofan 154-inch long engine in the 22,000-pound (98 kilonewton) thrust class - 35% more thrust than F404 engines.
    - Note: Afterburner thrust increases the thrust of a jet engine for short periods to improve an aircraft's take-off, climb, and combat performance.
  - » A thrust to weight ratio of 9:1, which is an indicator of aircraft propulsion.
    - The higher an aircraft's thrust to weight ratio, the higher its acceleration, excess thrust, and rate of climb.
  - » Higher Payload: It will have a payload capacity of 65,00 Kg which is almost double of 3,500 kg of LCA-MK-1 and LCA MK-1A.
  - » Low maintenance cost.
  - » More reliable and greater engine durability with reduced life-cycle cost.
    - The engine was designed to maximize time on wings, which is a measure of the operational reliability of the engine.
- Warjets around the world powered by these engines:
  - » F-414-GE-400 engine power the US Navy's Boeing F/A-18E/F Super Hornet and EA18G Growler electronic attack aircraft.
  - » F-414-G is used in SAAB's Gripen E/F fighters.
  - » It could also power the upcoming Korean KF-X.
- GE's F-414 military aircraft engine powers state of art fighters like the Boeing Super Hornet and Saab Gripen.

### E) MOU BETWEEN GE AEROSPACE AND HAL (JUNE 2023)

- During PM Narendra Modi's U.S. visit, Engine manufacturer General Electric Aerospace signed an MoU with HAL. This MoU contains provisions for production of fighter jet engines for the indigenous LCA. It includes:
  - » Provisions for joint production of GE Aerospace's F414 in India for LCA MK2 program.
    - The agreement will allow the manufacture under license in India of GE's F414 engine for the indigenous Light Combat Aircraft (LCA) Tejas Mk2.
  - » It also has an 80% transfer of technology clause. Such huge level of tech-transfer hasn't happened between India and USA in the past and it shows level of trust India evokes in the US.
    - Except for a small component, the F-414-INS6 engine will be entirely manufactured in India.

- **Critical technologies** that will be transferred are - Special coating for corrosion; casting, machining and coating for single crystal for turbine blades; etc.
- » **Note:** The proposal needs authorization from the US congress before an agreement could be concluded.
- » Once the contract is signed (after US Congress approval), it will take three years for the first engine to roll out.
- **Note:** **F404 engines** being used by LCA MK1 and LCA MK1A are produced by GE Aerospace.
  - » GE Aerospace started working with Aeronautical Development Agency in 1986 and in total, 75 F404 engines have been delivered and another 99 are on order for LCA Mk1A.
- **Significance of the deal:**
  - » The pact to build F-414 in India for the LCA Tejas Mk2 marks a key milestone in India-US ties, and the final burial of the 'technology denial regime'.
  - » Currently, only four countries - USA, Russia, UK and France have mastered the technology and metallurgy needed to manufacture an engine that can power combat aircraft.
    - Even China buys the engine for its fighter jets from other countries including UK.
    - Generally, the countries who have this technology have avoided sharing it. And therefore this India-US deal is very significant

## 2) ADVANCED MEDIUM COMBAT AIRCRAFT (MARCH 2024)

- **Why in news?**
  - » The Cabinet Committee on Security (CCS) has cleared a Rs 15,000 crore project to design and develop the Advanced Medium Combat Aircraft (AMCA), India's fifth generation fighter multirole fighter jet (March 2024)
- **Details**
  - » **AMCA** will be an Indian single seat, twin-engine, all weather fifth generation stealth, multirole combat aircraft being developed for the Indian Air Force and the Indian Navy.
    - MK-1 variant will be fifth generation.
    - MK-2 variant is expected to be sixth generation.
  - » **Nodal Agency for Implementing the Program:** The Aeronautical Development Agency (ADA) under DRDO.
    - The aircraft is designed by ADA.
    - A Special Purpose Vehicle (SPV) is being formed consisting of ADA, HAL and a private company for the development and production of AMCA.
  - » **Manufacturer:** It will be manufactured by HAL.
  - » In **March 2024**, the Cabinet Committee on Security has approved the project to design and develop AMCA, India's fifth generation fighter multirole jet. The project will be allocated Rs 15,000 crores.
- **Features:**
  - i. **STEALTH:** Advanced stealth feature to avoid detection by enemy radar.
    - This is the main difference between fifth and fourth generation aircrafts. The aircraft will have low electro-magnetic signature, which will make it difficult for enemy radar to detect it.

- It will also have powerful sensors and new weapons, so it is able to register the signature of enemy aircraft and take them out.
  - ii. **Fuel:** It will have large, concealed internal fuel tank of 6.5 tonnes capacity.
  - iii. **Weapon:** It will have internal weapon bay for a range of weapons.
  - iv. **Engine:** It will have US build GE414 engine of the 90 Kilo Newton class. It will be developed indigenously by DRDO's Gas Turbine Research Establishment (GTRE) in collaboration with a foreign defence major.
- **Timelines:** After the CCS approval, ADA hopes to have the first flight of the aircraft in four and a half to five years. The full development of aircraft is going to take 10 years from now.
- Five prototypes will be built before HAL starts manufacturing.
- **Other fifth generation fighters:**
- **USA:** F-22 Raptor and F-35A Lightning II
  - **China:** J-20 Mighty Dragon
  - **Russia:** Sukhoi Su-57.
- **IAF's Dwindling Numbers:** Sanctioned strength - 42 Squadrons; Currently -> 30 Squadrons.
- The numbers will further dwindle as squadrons of Mig-21s, Mig-29s, and Mirage 2000s are scheduled to be phased out by the middle of the decade.
- **Significance:**
- India will become one of the few countries to have indigenous fifth generation aircraft.
    - **Note:** Earlier, India was planning to jointly develop fifth generation aircraft with Russia but, India withdrew from the project in 2018.
    - **Note:** LCA Tejas is a 4.5 generation single engine multirole aircraft; Similarly, Rafale is considered 4.5 generation aircraft.

### 3) DASSAULT RAFAEL

- **India and France had signed an Intergovernmental agreement in Sep 2016 to provide 36 Rafale fighter worth nearly 59,000 rupees (€7.87 billion)**
  - » First procurement since Sukhoi in 1990s.
  - » India started getting the fighter jets in 2019 and by Dec 2022, India has received all 36 Rafale Aircraft.
- **Key features of the deal**
  - » **50% offset clause**
  - » The deal includes the aircraft in fly away condition, weapons, simulators, spares, maintenance, and performance-based logistics support for first five years.
    - No expenditure on maintenance for five years.
- **Features of Rafale fighter jets**
  - » It is a twin-engine fighter, multi-role fighter aircraft.
  - » The Rafale's strength lies in its advanced radar and an array of Meteor, Scalp and Mica missiles, besides 13 India-Specific enhancements.
  - » Equipped with latest missiles and weapon system besides multiple India specific modifications
  - » Rafale's '**Delta Wing**' make it exceptionally stable at supersonic speeds.

- » It is capable of carrying out all combat missions: air defense, interception, ground support, in-depth strikes, reconnaissance, anti-ship strikes and nuclear deterrence.
- **Impact**
  - » **Modernization: Generation 4.5**
  - » Rafale will also increase India's deterrence capability and with improved deterrence, chances of conflict will reduce.
  - » The IGA doesn't put any restriction on its use and hence it is likely to succeed Mirage Fighters for nuclear warhead delivery as part of India's nuclear doctrine.
- **Other significance**
  - » As per the contract, at least 75% of the Rafale fleet has to be operationally available, which would make it the most available fighter in the IAF fleet.
- **Understanding the involvement of Anil Ambani**
  - » **50% offset clause means** that Dassault has to invest around Rs 30,000 crore in Indian.
  - » **Dassault has chosen Reliance** as a partner to complete its offset obligations.
    - Bulk of the money will be invested through Dassault Reliance Aerospace, a joint venture between Reliance Aerostructure and Dassault.

#### 4) RAFALE-M

- The Rafale-M is a fighter jet manufactured by Dassault Aviation.
  - » It is a versatile, single seat aircraft capable of performing a range of missions including Air defense, nuclear deterrence, deep strikes, and reconnaissance.
  - » Its max take-off weight is of 24.5 tonnes and can carry an external load of upto 9.5 tonnes.
  - » The aircraft can reach a speed of 750 knots (1,389 kmph) and operates efficiently at altitude upto 50,000 feet.
- **Operational Capabilities:** It can perform both air to ground and air to air missions simultaneously.
  - » It supports variety of armament including long-range Meteor missile, MICA Missile, Hammer Missile, Scalp Missile, AM39 EXOCET, and laser guided bombs.
- Government of India has approved the acquisition of Rafale Marine fighter jets from France to equip its indigenous aircraft carrier, INS Vikrant. It is being processed through inter-governmental agreement.
  - » It was chosen over the American F/A-18 Super Hornets after rigorous testing at the shore-based test facility in Goa.
  - » **Why Rafale-M was chosen:** One core reason for choosing Rafale-M is its compatibility with the Indian Air Force's existing Rafale Fleet. This commonality is expected to reduce cost related to spares and maintenance.
  - » **Main difference between Rafale-M and Rafale:** Reinforced nose and landing gears of Rafale M, designed to handle the demanding conditions of aircraft carrier operations.
- In May 2024, India and France have started negotiations for the Rs 50,000 crore deal for 26 Rafale Marine Fighter Jets this week.

#### 3. S&T: DEFENCE: TRANSPORT AIRCRAFTS

## 1) C-295 TRANSPORT AIRCRAFT (SEP 2023)

- **Why in news?**
  - » IAF chief takes delivery of the first C-295 transport aircraft in Spain (Sep 2023)
- **About the Aircraft:**
  - » Note: India has ordered 56 C-295Ws for the Indian Air Force, with a plan to order an additional 6 aircrafts for the Indian Coast Guard and 9 aircraft for the Indian Navy.
- **Details**
  - » The aircraft comes in transport configuration, equipped with an Indian Electronic Warfare Suite.
  - » In Sep 2021, the Defence Ministry signed a Rs 22,000 crore deal with Airbus and Space S.A., Spain for procurement of 56 C-295s.
  - » **Total 56 Aircrafts are to be procured by Indian Airforce:**
    - 16 aircraft will come in a fly-away condition from Seville, while 40 will be manufactured by Airbus jointly with Tata Advanced System Limited (TASL).
    - Work is underway to set up the Final Assembly Line (FAL) at Vadodra in Gujarat and the first aircraft manufactured in India would be delivered in Sep 2026.
  - » **Need:** Replacing 56 Avro Transport Aircraft: IAF has 56 Avro Transport aircraft procured in the 1960s and they are in urgent need of the replacement.

## 2) C-130 (JAN 2024)

- **In a first**, an IAF C-130 Hercules tactical transport aircraft made a night landing at the Advanced Landing Ground (ALG) in Kargil close to LoC with Pakistan along with Garud special forces. (Jan 2024)
  - » Earlier, transport aircrafts have been landing here in the daytime and this was the first night time landing.
- **Significance:** Advanced Landing Ground (ALG) is located at an altitude of around 10,000 feet and is a restricted airstrip with unidirectional approach surrounded by rough terrain. It doesn't have night landing facilities.

## 4. S&T: DEFENCE: HELICOPTERS

### 1) HAL PRACHAND (LCH PRACHAND)

- The Prachand light combat helicopter (LCH) is designed and developed by Hindustan Aeronautics Limited (HAL). It is a twin engine LCH
- It is the first indigenous Multi-Role Combat Helicopter designed and manufactured by HAL. It has potent ground attack and aerial combat capability.
- In 2022, it was inducted in IAF in its newly raised No. 143 Helicopter unit.



- It consists of modern stealth characteristics, robust armour protection and formidable night attack capabilities.
- It was conceptualized after the 1999 Kargil war when the need for such a dedicated platform capable of operating in high altitude was felt.
  - It is the only attack helicopter in the world which can land and take off at an altitude of 5,000 meters with considerable load of weapons and fuel significantly augmenting the firepower of the IAF and the Army in high altitude areas.
- **Weapons:**
  - It is armed in 20 mm nose gun, 70 mm rockets, anti-tank guided missile 'Dhruvastra' and air-to-air missile 'Mistral-2' of MBDA which has maximum interception range of 6.5 km.
- In Oct 2023, the Army's LCH Prachand successfully carried out inaugural firing of 70 mm rocketts and 20 mm turret guns both by day and night.
  - Both the Army and Air force have inducted LCH Prachand in small numbers.
- In Dec 2023, the Defence Acquisition Council (DAC) of Defence Ministry approved acquisition of 156 LCH Prachand more (90 for Army and 66 for the Air Force)

## 2) APACHE ATTACK HELICOPTER (AH-64E APACHE)

- **Why in news?**
  - » Indian Army Aviation Corp raised its first unit at Jodhpur on March 15 that will operate the helicopters (March 2024)

### About AH-64E APACHE

- It is considered the world's most advanced multi-role combat helicopter.
- It is an advanced multi-mission helicopter and is considered world's best attack helicopter.
- It is the only available combat helicopter with a spectrum of capabilities for virtually any mission requirement, including greater thrust and lift, joint digital operability, improved survivability, and cognitive decision making.

### Role

- It is designed for all kinds of missions.
- It is equipped with laser and infrared systems for all weather, day-night operability.
- It fires the hellfire missiles, besides its arsenal of 70 mm rocketts and an automatic canon.

### Other countries which use it:



### India:

The **Cabinet Committee** had in the past sanctioned for the procurement of 39 AH-64 Apache attack helicopters from the USA.

- As part of this, the IAF inducted 22 Apaches under a deal signed in 2015.
- Later, government decided that subsequent Apache will go to Army and in 2020, Boeing signed an agreement with the Government of India for the acquisition of six more Apache Helicopters. As part of the deal, six pilots and 24 technicians were trained by Boeing in the US.
- In March 2024, Indian Army Aviation Corp raised its first unit at Jodhpur that will operate Apache Helicopters.

- Primarily operated by US Army, it has also become primary attack helicopter of multiple nations, including Greece, Japan, Israel, the Netherlands, Singapore, and the UAE.
  - It has been built under license in the UK as the AgustaWestland Apache.

- Army is set to receive three Apache attack helicopters in May 2024 and three more in July 2024

In Air force has become the first pure attack helicopter in India possession. **Russian Mi 35** has been operated for years and is now on the verge of retirement. But it was not pure attack helicopter and was used for troop transfer as well.

## 5. S&T: DEFENCE: MISSILES

### 1) INTEGRATED GUIDED MISSILE DEVELOPMENT PROGRAM

- It was an Indian MoD program for research and development of the comprehensive range of missiles. It was conceived by Dr. APJ Abdul Kalam, who later also became the President of India.
  - The program was managed by DRDO and Ordnance Factory Board.
- It started in 1982-83 and completed in 2008 after the strategic missiles were successfully developed.
  - The last major missile developed under the programme was the **Agni-3** intermediate range ballistic missile which was successfully test fired in July 2007.
  - In 2008, DRDO announced successful completion of the project IGMDP**

### 2) FIVE MISSILES DEVELOPED UNDER IGMDP

- PRITHVI** (surface to surface short range ballistic missiles)
- Agni** (surface to surface intermediate range ballistic missiles)
- Trishul** (Surface to air short range (12 kms))
- Akash** (first indigenous produced surface to air medium range; supersonic; intercept range of 30 kms.)
- Nag Missile System:** It is India's third generation "Fire and Forget" anti-tank guided missile (ATGM).

### 3) AGNI SERIES

About Agni Missiles: **Agni Missile System** (IGMDP = Integrated guided missile development program)

Missile	Project	Warhead	Payload	Range	Weight	Fuel/Stages	In Service
Agni-1	IGMDP	Nuclear, submunitions, FAE (Fuel Air Explosive)	1,000	700-1250	12,000	Single stage solid	2002

Agni-2	IGMDP	"	750 - 1000	2000 - 2500	16,000	Two and half stage solid	1999
Agni - 3	IGMDP	"	2000 - 2500	3000 - 3500	44,000 and 22000 (latest)	Two stage solid	2011
Agni - 4	Agni - 4	"	800 - 1000	3000 - 4000	17000	Two stage solid	2014
Agni - 5	Agni - 5	"	1500	5500 - 5800	50,000	Three stage solid	Tested
Agni - 6	Agni - 6	"	1000	6000 - 8000	55,000	Three stage solid	Under development

### A) AGNI-V

- Key features
  - It is a three stage solid fuel, surface-to-surface missile, which is 17 meter tall and 2 metre wide.
  - It is capable of carrying **1.5 tonne** of nuclear warhead.
  - It is the latest and most advanced variant in terms of navigation and guidance, warhead and engine.
- Significance of Agni-V
  - Agni-V is widely regarded as a strategic missile targeted at China as it can reach almost all parts of the Chinese Mainland.
    - It provides India a strategic depth needed to contain Pakistan and China.
  - Success of India's nuclear capable Agni IV and Agni V confirmed India's nuclear deterrence capability.
  - Proven ICBM capability currently exists only with the five major powers - the US, Russia, France, the UK and China.
    - When India successfully inducts Agni-V, India will be only non P-5 countries to have an ICBM. This is expected to boost India's claim for the permanent membership of UN.
- India will soon induct Agni-V into Strategic Force Command

### B) AGNI-V WITH MIRV (MARCH 2024)

- Why in news?
  - India test-fires Agni-V ballistic missile with multiple warhead technology under **Mission Divyastra** (March 2024)
- Details
  - PM Modi announced successful test firing of Agni-V ballistic Missile with Multiple Independently Targetable Re-entry vehicles (MIRV) technology by DRDO under **mission Divyastra**.
  - MIRV means a single missile may carry multiple warheads. It will ensure that a single missile can deploy multiple warheads at different locations.

- The flight test was carried from Dr A.P.J. Abdul Kalam Island in Odisha.
- **Other countries which have MIRV**
  - US was the first country to develop MIRV technology, deploying a MIRVed ICBM in 1970 and a MIRVed Submarine launched Ballistic Technology (SLBM) in 1971.
  - USSR quickly followed and by the end of 1970 developed MIRVed ICBM and SLBM.
  - China also has MIRVed tech. France, and UK have also claimed the tech;
  - Even Pakistan, has claimed to have tested an MIRV-equipped missile called Ababeel, first in 2017 and then in 2023.
- **Significance:**
  - Improves India's attack prowess;
  - It can also dodge most defence systems.

## 4) AGNI-P (ALREADY DISCUSSED IN CA UPDATES)

## 5) BRAHMOS

- **Why in news?**
  - India delivers first batch of BrahMos to Phillipines. (April 2024)
    - » This is the first export order for the supersonic cruise missile, a joint venture between India and Russia
  - Successful firing of Extended Range version of BRAHMOS Air launched missile against ship target from SU-30 MKI Aircrafts (Dec 2022)
- **About Brahmos**
  - BRAHMOS is a **supersonic cruise missile** that can be used against ship and land targets. The missile is uniquely configured for installing in ships, submarines, aircraft and on ground vehicles.
    - » Note: **Cruise missile** is a low flying missile which is guided to its target by an on-board computer. It is called cruise because the major portion of its flight is conducted at cruise speed (i.e. approximately at constant velocity).



- **Technical Specifications**
  - » **Speed:** At speed of Mach 2.5 to 2.8, it is **world's fastest cruise** missile, about three-and-a-half times faster than the American subsonic harpoon cruise missile.
    - A newer version under development aims at achieving the speeds of Mach 5.
    - The high speed doesn't only make it difficult to detect but also gives less time to the enemy.

- » **Range:** Up to 300 kms (extended range of 450 km tested in March 2017).
- » **Warhead:** It carries a conventional warhead weighing 200-300 Kg
- » **Two stage missile, one being solid and the second one a ramjet liquid propellant.**

- **Russian Partnership:**
  - » It has been developed by **Brahmos Aerospace**, a joint venture between DRDO of India and NPO Mashinostroeyenia (NPOM) of Russia.
  - » The missile has been named after two rivers **Brahmaputra** in India and the **Moskva** in Russia.
  - » Brahmos has emerged as accomplished joint venture under the Make in India category with countries lining up to purchase its products.
- **Significance for Indian Defense**
  - » The inclusion of the powerful weapon system in Indian Navy has given it a distinct operational advantage to hit the enemy target even in the most difficult and hidden terrain.
  - » **Army**
    - Army has inducted three Brahmos missile regiments so far and they have been deployed in the **western sector to counter threat from Pakistan** and in the second phase of military expansion along the China front, the government gave a go ahead for deployment of Brahmos cruise missile in Arunachal Pradesh.
  - » **Navy**
    - Many warships have also been equipped with the missiles, which has become the standard offensive weapon of Navy.
  - » **Air Force**
    - **Launch of Brahmos on several occasion have been tested from IAF's Sukhoi-30 MK fighter aircraft**
      - For e.g., in December 2022, Indian Air Force successfully test fired the extended range version of Brahmos Air Launched missile against a Ship Target from Su-30 MKI aircraft.
      - The extended range of Brahmos coupled with the high performance of the SU-30MKI aircraft gives the IAF a strategic reach and allows it to dominate the future battle fields.

## 6) NIRBHAYA MISSILE

- **Why in news?**
  - » Nirbhaya Missile to be with All Three Forces (Nov 2023: Source: ET)
- **Introduction**
  - » These are long-range sub-sonic cruise missiles being developed by DRDO indigenously.
  - » They are nuclear capable with a range of 1,000 km and payload of 300 kg.
  - » It is a terrain hugging missile. It can fly almost at the level of tree-tops to evade detection by radars.
    - It has been built to identify and strike targets in heavily populated areas with pin-point accuracy and is capable of carrying a nuclear capable warhead.
  - » It is powered by solid rocket boosters developed by Advanced Systems Laboratory (ASL).
- **Update: Nov 2023**

- In a significant boost to the firepower of the defence forces, all three defence forces will now have long-range cruise missiles of the Nirbhay class in their arsenal to strike targets at ranges of over 1,000 Km range.

## 7) ASTRA

- **More about ASTRA**
  - » It is India's first indigenously developed active radar homing beyond-visual-range air-to-air missile (BVRAAM) with a range of over 100 km.
  - » It is designed and developed by the Defence Research and Development Laboratory (DRDL), Research Centre Imarat (RCI) and other DRDO laboratories.
  - » It is intended to engage and destroy aerial targets with high maneuverability and supersonic speeds. The missile's advanced air combat capabilities allow it to engage multiple high-performance targets.
- **Fighter planes which are planned to carry this missile**
  - » Su-30 MKI, Mirage 2000 multi-role combat fighters, and Mig-29 and MiG-21 Bison fighter jet platforms, as well as Indian Navy's Sea Harrier jet fighter.
  - » In Aug 2023, it was successfully test-fired from the LCA Tejas off the coast of Goa during which the missile was released from the aircraft at an altitude of about 20,000 feet.
- **IAF is expected to induct ASTRA missile by end-2023 (Oct 2023)**
  - » In May 2022, the Defence Ministry signed a contract with BDL for the supply of ASTRA Mk-1 missiles and associated equipment for the IAF and the NAVY at a cost of Rs 2,971 crores.
  - » Bharat Dynamics Limited (BDL) has already received Bulk Production Clearance from the manufacturers of the Astra-Mk1 missiles from the Centre for Military Airworthiness and Certification (CEMILAC) and IAF will complete proof firing and induction this financial year.
  - » The IAF plans to arm its frontline fighters with the Astra-MK1 and officials have said that the Astra-2 would become the mainstay of the IAF's BVR missile arsenal, reducing import dependency.

## 8) METEOR, SCALP AND MICA MISSILES

- **The Indian Navy** is set to acquire Meteor and Scalp missiles for its Rafale-M fighter jets, which are currently being negotiated with the French Dassault group.



### About Meteor Missile

- It is a beyond visual range air-to-air missile (BVRAAM) which is considered to be the best in its class and can take out enemy aircraft at a range of more than 100 km, outranging the American origin AMRAAMs being used by Pakistan.
- Meteor missiles are powered by Ramjet engines and fly at Mach 4 speed.

- These are arguably the best in the world for air combat duels, with 'a greater **no-escape zone**' for hostile fighters than any comparable BVR weapon.
- SCALP Missiles:**
  - It is a long-range air-launched cruise missile (ALCM). It has a range of 300 km and are designed to hit high-value and strongly protected targets deep inside the enemy territory. They are already deployed on Rafale fighter jets of the Indian Air Force. Rafale-M is also expected to get them.
- MICA**
  - It is a multi-mission air to air missile system for the Rafale. It has a high level of tactical flexibility in order to meet the most demanding operational requirements.
    - » **Beyond Visual Range (BVR)** multi-target / multi shoot
    - » **Enhanced Short Range (SR)** performance
    - » Maximum Flexibility for multi-role / swing role aircraft
  - It has a dual role and is able to cope with BVR and SR combat situation and exhibits very high performance in both situations.

## 9) ARTILLERY GUNS

- Artillery is a class of large military weapons built to fire munitions far beyond the range of power of infantry's small arms.
- Early artillery development focused on the ability to breach fortification, and led to heavy, fairly immobile siege engines.

### A) DHANUSH GUNS

- Why in news?**
  - Army likely to complete inducting 114 Dhanush gun by 2026 (Sep 2023)

Dhanush is an upgraded version of Swedish Bofors gun design. It's indigenous development is aided by transfer of technology clause signed with the Swedish company.

It is developed by DRDO in collaboration with private sectors.

Dhanush is a 155 mm, 45-Calibre towed artillery gun with a range of 36 km and it has demonstrated a range of 38 km with specialized ammunitions.

It has several significant features like all electric drive; quick deploy ability; high mobility; auxiliary power mode etc.

**Manufacturer:** The Advanced Weapons and Equipment India Limited, carved after



corporatization of the Ordnance Factory Board, is now manufacturing the Dhanush guns.

#### - Introduction in Army

- Army has ordered a total of 114 Dhanush artillery gun.
  - It already has one regiment operational since 2022.
- It expects to receive all 114 guns by 2026.
- The **first regiment of 18 guns** will be in place with Army by March 2020. The entire order of 114 guns will be completed by 2022.

## B) PINAKA GUNS

#### - Why in news?

- Defence Ministry Defence Acquisition Council has approved a Rs 2,800 crore proposal for buying around 6,400 rockets for Pinaka multi-barrel rocket launcher system. (Dec 2023)

Pinaka is a multiple rocket launcher produced in India and developed by DRDO for the Indian Army.

- The system can launch 12 rockets in 44 seconds.
  - The army generally deploys a battery that has a total of 72 rockets. All of the 72 rockets can be fired in 44 seconds, taking out an area of 1 km2.
- It is mounted on a Tatra truck for mobility.
- The launcher has been named after Lord Shiva's Bow and was first developed in the 1980s.
- During Kargil war Pinaka MBRL was effectively employed to eliminate enemy forces and their positions atop mountains.

#### Capabilities:

- Range:
  - Original Pinaka rockets had a range of 37 km. In Mk-1 it was enhanced to 45 km.
  - The guided Pinaka has a range of 75 km.



**Private Manufacturers:** Private sector companies involved in the project include Larsen & Toubro, Tata Defence and Economic Explosives Limited. They have set up production line for Pinaka system that are being supplied in bulk to the armed forces.

**Export:** This is one of the first weapon systems of India to have been exported to foreign countries, including Armenia.

**Note:** Among other MRLS, the Army has five Grad rocket regiments and three Smerch regiments both of Russian-origin. Smerch is the longest range rocket system in the Army's inventory with a range of 90 kms. Pinaka will eventually become mainstay of multi-rocket systems.

- Next, Pinaka with a range of 120 km is also under the development phase.

**Current Situation:**

- The army has four Pinaka regiment and six more on order. They are expected to be inducted in the next few years.

**Future:**

- The Indian Army has approved the development of two longer-range Pinaka Multi-Barrel Rocket Launcher (MBRL).
- The DRDO subsidiary - Armament Research and Development Establishment will develop the rockets with ranges of 120 kms and 300 kms.
- Once developed, state owned rocket manufacturer Munitions India Limited will produce the rockets under a transfer of technology agreement with the DRDO.

## 10) CYBER SECURITY IN DEFENCE SECTOR

### A) MAYA OPERATING SYSTEM

- **Background/Concerns:** Increasing cyber and malware attacks on defence as well as critical infrastructure across the country.
- **Decision:** Defence Ministry has decided to replace the Microsoft Operating System (OS) in all computers connected to the Internet with a new OS, Maya, based on open-source Ubuntu developed locally.
  - » As of Aug 2023, Maya OS has reportedly been installed in Defence Ministry systems.
  - » After the Ministry, it will also be installed on the system of the three services.
    - The three services have vetted the system. Navy has already cleared the new OS and the Army, and the Air Force were currently evaluating it.
- **About MAYA:**
  - » **MAYA** is based on Ubuntu and has been developed by a team of experts from various government agencies like DRDO, C-DAC and National Informatics Centre (NIC) in a time period of reportedly six months.
    - **Note:** Maya OS is not the first OS developed by GoI. In 2007, the Centre for Development of Advanced Computing (C-DAC) released the Bharat Operating System Solution (BOSS GNU/Linux), a distribution of GNU/Linux aimed to promote adoption of Swatantra software and was also being used by the Indian Army.

- » It has interface and all functionality like Windows and users will not feel much difference as they transition into it.
- **Chakravyuh:** It is 'an end point detection and protection system' which is shipped with Maya OS.

## 6. NAVY

### 1) AIRCRAFT CARRIERS

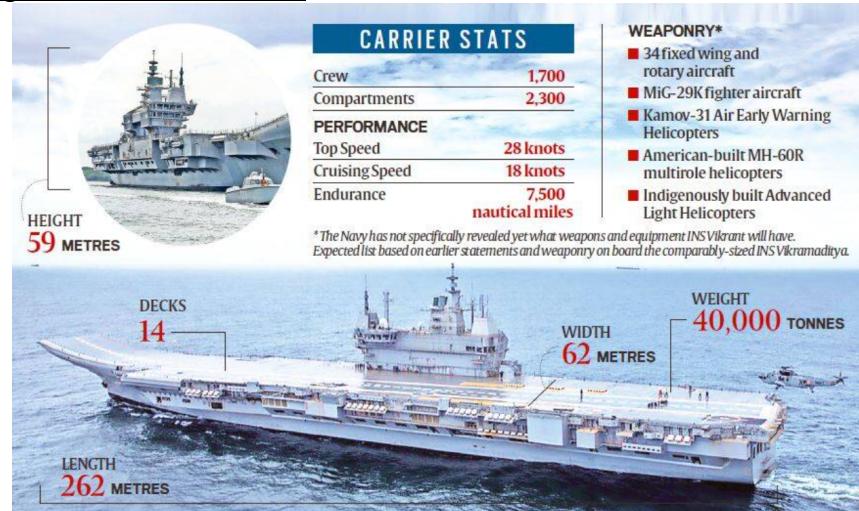
- **Basics: What is an aircraft carrier?**
  - An aircraft carrier is a warship that serves as seagoing airbase, equipped with full length flight deck and facilities for carrying, arming, deploying, and recovering aircraft.
  - It is one of the most potent marine assets for a nation.
  - Many experts consider having an aircraft carrier as essential to be considered a blue water navy - one that has the capacity to project a nation's strength and power across high seas.
  - India presently has two functioning aircraft carriers: INS Vikramaditya which is a Kiev class vessel of Russian origin; and INS Vikrant (IAC) (Vikrant class - Indigenously developed)
    - **In Sep 2022**, India made a historical milestone as it commissioned its first-ever indigenous aircraft carrier (IAC) - Vikrant

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#### A) INS-VIKRANT

- It is India's maiden Indigenous Aircraft Carrier (IAC-1), built by the public sector Cochin Shipyard Ltd (CSL).
  - » IAC-1 has been designed by the Indian Navy's Directorate of Naval Design (DND), and built by Cochin Shipyard Limited (CSL), a public sector shipyard under the Ministry of Ports, Shipping and Waterways. It is the largest ship ever built in the maritime history of India.
  - » The carrier is named after her illustrious predecessor, India's first Aircraft Carrier which played a vital role in the 1971 war.
  - » **Help from Italy and Russia:**
    - Design was done with the help from the Italian Firm Fincantieri, the Russians collaborated in designing and developing the aviation complex.
  - » **Technical Details:**
    - Length: 262 meters
    - Full Displacement: 45,000 tonnes
    - Power: Gas Turbines totaling **88 MW** power which has a maximum speed of 28 Knots.
  - » **Other details:**
    - The ship will be capable of operating air wing consisting of 30 aircrafts comprising of Mig-29K fighter jets, Kamov-31, MH-60R multi-role helicopters, in addition to indigenously manufactured Advanced Light Helicopters (ALH) and Light Combat Aircraft (LCA) (Navy).
    - It uses STOBAR (Short Take-off but arrest landing) and is equipped with a ski-jump for launching aircraft, and a set of "arrester wires" for their recovery onboard.
  - » **Overall cost:** Rs 20,000 crores.

- » With an overall indigenous content of 76%, IAC is a perfect example of nation's quest for "Aatma Nirbhar Bharat" and provides thrust to Government's 'Make in India' initiative.
- » India has now joined the league of USA, Russia, China, France and the UK that can indigenously design, build and integrate an aircraft carrier.



## B) DEFENCE PROCUREMENT BOARD CLEARS INDIAN NAVY'S PROPOSAL ON SECOND INDIGENOUS AIRCRAFT CARRIER (NOV 2023)

- Defence Procurement Board (DPB), a key body of defence ministry, has accorded an in-principle approval to the ambitious proposal signaling the government's readiness to go for the second indigenous aircraft carrier, to be known as IAC II.
- The proposal will now be put before Defence Acquisition Council (DAC), the defence ministry's top body on procurement.
- If approved the 2nd aircraft carrier is expected to cost **Rs 40,000 crores**.

## 2) CORVETTES

### A) INS KIRPAN

- **Why in news?**
  - India gifts missile Corvette INS Kirpan to Vietnam (June 2023)
- **Details:**
  - INS Kirpan is a Khukri class missile corvette displacing 1,350 tonnes and was commissioned into the navy on Jan 12, 1991.
    - The ship is fitted with a medium range gun, 30 mm close range guns, chaff launchers, and surface to surface missiles, enabling it to perform a wide variety of roles, including coastal and offshore patrol, coastal security, anti-piracy, HADR operations etc.
- **Gift to Vietnam**
  - India gifted indigenously built in service missile corvette INS Kirpan to Vietnam to enhance that country's Naval capabilities.

### 3) FRIGATES

Frigates, are naval vessels intermediate between corvettes and destroyers

Class	Type	Ships	Origin	Displacement	Note
<b>Shivalik</b>	Stealth guided missile frigate	INS - Shivalik, INS Satpura, INS Sahyadri	India	6,200	To be succeeded from 2017 by the Project 17A class frigate
<b>Talwar (Krivak)</b>	Stealth guided missile frigate	INS Talwar, Trishul, Tabar, Teg, Tarkash, Trikand	Russia	4,035	Four additional vessels to be built in joint partnership between Russia and India
<b>Brahmaputra</b>	Guided Missile Frigate	INS Brahmaputra, <b>Betwa</b> , Beas	India	3,850	
<b>Godavari Class</b>	Guided Missile Frigate	INS Ganga, INS Gomati	India	3,850	<ul style="list-style-type: none"> <li>Lead vessel INS Godavari decommissioned</li> <li>Remaining two vessels in class scheduled to be decommissioned in the near future</li> </ul>

#### A) PROJECT 17A (ALPHA) FRIGATES (NILGIRI CLASS)

- Project 17A Frigates are follow-on class of the Project 17 (Shivalik Class) Frigates, with improved stealth features, advanced weapons and sensors and platform management systems.
  - Seven Project 17A Frigates are under various stages of construction at MDL and GRSE.
    - INS Nilgiri, Udaygiri, Taragiri, Mahendragiri by MDL
    - INS Himgiri, Dunagiri, Vindhyaagiri by GRSE
- INS Vindhyaagiri**
  - Why in news?**
    - President Murmu launches stealth frigate **INS Vindhyaagiri** (Aug 2023)
- Background:**
  - The first and second ships of the series are INS Himgiri and INS Dunagiri. The three Nilgiri-class frigates were ordered at a cost of approximately 19,200 crore and was the largest ever contract executed by Kolkata based **Garden Reach Shipbuilders and Engineers (GRSE)**.

- **INS VindhyaGiri** is the last in the series of three 17A (Alpha) frigates built by the Indian Navy.
  - It reflects country's commitment to self-reliance and technological advancement as well as indigenous innovation for developing state of art technology.
- **Features:**
  - These ships have length of 149 meters and displacement of over 6,670 tonnes. Their cutting edge propulsion system allows for speeds of over 28 knots.

#### 4) DESTROYERS

- In naval terminology, a destroyer is a fast, maneuverable, long distance warship intended to escort larger vessels in a fleet, convoy or battle group and defend them against smaller short ranged attackers.
- They are also known as Carrier Strike Group.

Class	Type	Ships	Origin	Displacement	Note
Vishakhapatnam Class	Stealth guided missile destroyer	INS Vishakhapatnam; INS Mormugao INS Imphal INS Surat (Not commissioned Yet)	India	74,00 tonnes	Designed by the Indian Navy's in-house warship design entity Warship Design Bureau, and built by MSDL in Mumbai.  The arsenal of Vishakhapatnam class has <u>BrahMos</u> surface-to-surface cruise missile and vertically launched Barak-8 surface to air missile for long range engagement.
Kolkata Class	Stealth guided missile destroyer	INS Kolkata INS Kochi INS Chennai	India	7,500 tonnes	Commissioned between 2014 - 2016 under <u>Project 15A</u> . They were a step ahead of <u>Delhi Class</u> of destroyers.  To be succeeded by <u>Project 15B</u> <u>Vishakhapatnam - class destroyer</u>

					<u>Built at MDSL.</u>
<b>Delhi Class</b>	Guided Missile destroyer	INS Delhi, INS Mysore INS Mumbai	India	6,700 tonnes	Built under <u>Project 15</u> and commissioned between 1997 and 2001.  Built at <u>Mazagon Dock Shipbuilders Limited (MDSL)</u> .
<b>Rajput Class (Kashin Class)</b>	Guided Missile destroyer	INS Rajput, Rana, Ranjit, Ranvir, Ranvijay	Soviet Union	4,974 tonnes	<u>INS Rajput</u> decommissioned in May 2021, after 41 years of service. It was the <u>first destroyer of Indian Navy</u> . It was commissioned on <u>May 4, 1980</u> .

#### A) PROJECT 15B (VISHAKHAPATNAM CLASS)

- The Vishakhapatnam class (Project 15B) is a class of stealth guided missile destroyers currently under the construction of the Indian Navy.
  - » The class comprises of four ships - Vishakhapatnam, Mormugao, Imphal and Porbandar all of which will be built by Mazagon Dock Limited (MDL) in India, and will be the largest destroyers to be operated by the Indian Navy.
- The project is an improved version of the Kolkata-class (Project 15A) and will feature enhanced stealth characteristics.
- **INS Vishakhapatnam** was the lead ship of Project 15B and was commissioned in Indian Navy in Nov 2021 and the second ship INS Mormugao (D67) was commissioned in Dec 2022.
- **INS Imphal** (D68), the third of the four warships under Project 15B got commissioned in Dec 2023.
- The fourth ship, D69, which when commissioned will be christened INS Surat, was launched in May 2022.

#### 5) SUB-MARINES

- A submarine is a watercraft capable of independent operation underwater. They were first widely used during World War 1, and now figure in all important naval forces.
- **Key functions of Submarines** - Military uses; Civilian Uses
- **Indian Navy's submarine arm** completed 50 years on 8th December 2017.

- The Submarine Day is celebrated every year to commemorate the birth of the submarine arm with induction of the first submarine, erstwhile INS Kalvari, into the Indian Navy on 8 Dec, 1967.
- In 1992, India joined exclusive group of submarines constructing nations, with the commissioning of the first Indian-built submarine, INS Shalki.
- Why Submarines are important? (Stealth; assured second strike capability)**
- How submarines operate?**
  - They operate under water and rely on sonar or sound waves for communication and detection.
  - They operate over specific frequencies, their signature, and is highly guarded

#### A) VARIOUS SUBMARINES OF INDIA

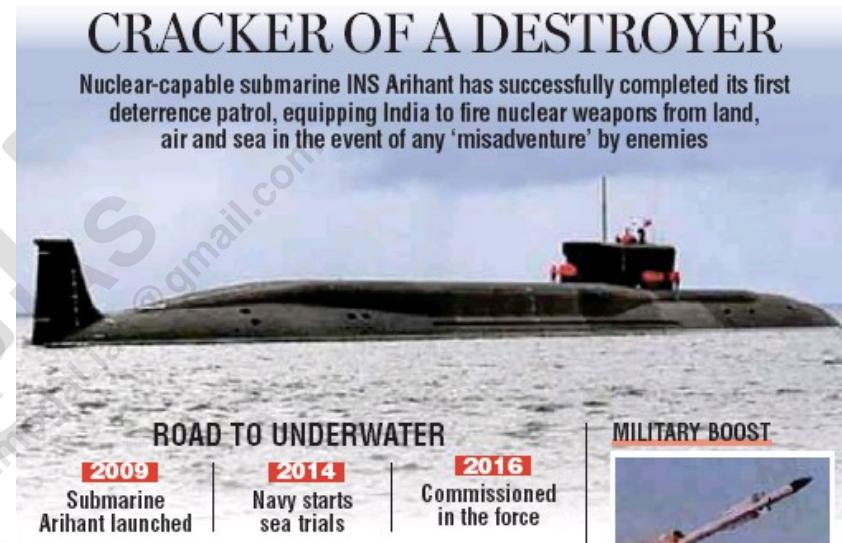
Class	Type	Power	Boats	Origin	Displacement	Notes
<b>Arihant</b>	SSBN (ship submersible ballistic nuclear)	Nuclear Powered	INS Arihant (S73) INS Arighat (launched in Nov-2017)	India	6,000 tonnes	Arihant was commissioned in Aug 2016.  Second SSBN Arighat, now in advanced stage of sea trials, was expected to be commissioned in 2021.
<b>Chakra (Akula II) Class</b>	SSN	Nuclear Powered	INS Chakra (S71)	Russia	12,770 tonnes	Under 10 years lease from Russia since 2012. <b>Returned</b> now.  In 2019, India leased an Akula Class Nuclear Attack submarine for <u>10 years from Russia</u> for a sum of <u>\$3 billion</u> . It is being called <b>(Chakra-III)</b> and is being fitted in Russia. Its delivery was expected by 2025 or 2026, but has been delayed due to ongoing war situation between Russia and Ukraine.
<b>Scorpene Class/ Kalvari class</b>	Attack submarine	Diesel Electric	INS Kalvari, INS Khanderi, INS Karanj, INS Vela,	French (DCNS)		<ul style="list-style-type: none"> <li>5 commissioned</li> <li>The last one <b>Vagsheer has began sea trial.</b></li> </ul>

			<b>INS Vagir</b>			
<b>Sindhughosh Class</b>	Attack Submarine	Diesel Electric Submarine	INS Sindhu* (7 in service)	Soviet Union	3,076	A total of <u>10</u> were commissioned but now only 3 in service.
<b>Shishumar class</b>	Attack submarine	Diesel Electric	INS Shshumar INS Shankush INS Shalki INS SHankul	Germany	1,850 tonnes	They carry <u>anti-sub and anti-ship capabilities</u> . To be upgraded for prolonged service

## B) ARIHANT CLASS SUBMARINES (INS ARIHANT; INS ARIGHAT; S4)

### - Introduction

- » The Arihant class submarines is a class of nuclear-powered ballistic missile submarines being used by Indian Navy. They are designed and developed under the US\$ 2.9 billion **Advanced Technology Vessel (ATV)** project.
- » The lead vessel of this class is **INS Arihant** which was launched in 2009 (code named **S2**), and after extensive sea trials have been commissioned in Indian Navy. In Nov 2018, it completed its first deterrent patrol.



### - More About INS Arihant

- » It is the first ballistic missile submarine to have been built by a country other than one of the P-5 of UNSC.
  - It is capable of carrying nuclear-tipped ballistic missiles, the class referred to as **Ship Submersible Ballistic Nuclear (SSBN)**.
    - It is India's first nuclear powered ballistic missile submarine and is propelled by an 83 MW pressurized light-water reactor at its core.
    - These are designed to cruise the waters carrying nuclear weapons and provides a nation, with an assured second strike capability, which, put simply, is the ability to retaliate after taking a nuclear hit.
    - The vessel is currently armed with K-15 missile which has a range of 750 km.

- It will also be armed with K-4 missile which will have a range of 3,500 km and is being developed by DRDO.
  - Arihant has four vertical launch tubes. It can either carry 12 K-15 missiles or four larger K-4 missiles.
  - The design of Arihant is based on Russian Akula-1 class submarines/ Charlie class (NATO Name), of which the best known example is the INS Chakra.
  - It weighs around 6,000 tonnes.
- Nuclear Triad and its significance (Class discussion)

## C) FUTURE ARIHANT CLASS VESSELS

- » INS Arighat (code named S3) has been launched in 2017. It may have been secretly commissioned in 2021.
- » Third Arihant Class Submarine code named S4 has been quietly launched in Nov 2022 in Vishakhapatnam.
  - It is still a long way from sea trials, weapon trials, and commissioning.

## K-4 MISSILE

- The solid fuelled K-4 missile is being developed by DRDO to arm the country's nuclear powered submarines in the shape of INS Arihant and its under-development sister vessels.
- India tested its nuclear capable K-4 submarine launched ballistic missile (SLBM), designed to have a strike range of 3,500 km, for the second time in six days in Dec 2023.
- **After K-4:**
  - » The K-4 missiles are to be followed by the K-5 missiles and K-6 missiles in the 5,000 - 6,000 km range class.

## D) SCORPENE CLASS SUBMARINES

- **About Scorpene Class Submarine**
  - » Scorpene class submarine is being built at (Mazagon Dock Limited), Mumbai in collaboration with Direction des Constructions Navales Services (DCNS) of France, as part of Project 75 acquisition program of Indian Navy.
  - » DCNS, in 2005, was awarded a \$4.16 billion contract by Indian government to build six SSks for the Indian Navy in cooperation with India's major shipbuilder, Mumbai based Mazagon Dock Limited.
  - » The first five submarines, INS Kalvari (2017), INS Khanderi (2019), INS Karanj, INS Vela and INS Vagir (2023) have been commissioned.
  - » The last one Vagsheer has began sea trial.
- **Engine:** The submarine is powered by diesel electric engine.
  - » It alternates between using Diesel (for functioning on the surface) and electric (for functioning underwater).
  - » However, these electric batteries need to be recharged using diesel engine after prolonged submersion, meaning that the submarine has to periodically come to surface.

- **Key Features of Kalvari class submarines**
  - » Superior stealth features like advanced acoustic silencing techniques, low radiated noise levels, hydro-dynamically optimized shape.
  - » The 66 meter submarine can dive upto 300 meter of water depth to avoid detection.
  - » Ability to launch crippling attack on the enemy using precision guided weapons.
  - » These will be armed with torpedoes as well as tube-launched anti-ship missiles.
  - » Endurance of 50 days (when compared to unlimited endurance of nuclear powered submarines)
- **Key Functions of Kalvari class submarine**
  - » It will be able to conduct different functions including anti-surface warfare, anti-submarine warfare, intelligence gathering, mine laying, area surveillance etc.
- **Why do we need a conventional submarine (like Kalavari) when we have a SSBN like Arihant?**
  - » A diesel electric sub's biggest advantages is that it has a smaller hull i.e. easier to maneuver in shallow waters and harder to detect.
  - » Fractional cost
  - » It is easy to operate
  - » No danger of nuclear leak.
  - » Further Air Independent Propulsion (AIP) system and fuel cells have made it possible for conventional submarines to remain underwater much longer than previously.
  - » Simply put, developing maritime states like India can't afford to overlook the practical utility and effectiveness of an SSK in South Asia's littoral spaces.
  - » It also contributes to modernization of our submarine fleet and increased under water capabilities.

#### E) 3 MORE SCORPENE CLASS SUBMARINES TO BE BOUGHT

- In July 2023, the Defence Acquisition Council (DAC), the apex decision making body for the acquisition of military equipment for India's armed forces has cleared proposals worth thousands of crores to buy three additional Scorpene submarines and 26 Rafale-M fighter jets.
- An MoU has been signed between Mazagon Dockyard Ltd and Naval Group for the construction of three submarines after the success of the first Scorpene submarine construction program (P75-Kalvari).
- It will be bought under Buy (Indian) category and will be built by the Mazagon Dock Shipbuilders Limited (MDL).
- Why?
  - » Indian Navy needs at least 18 submarines to carry out its full spectrum operations.
  - » Currently, it has 16 conventional submarines - 7 of Sindhughosh class (Russian Kilo Class), four of the Shishumar class (modified German Type 209) and five of the Kalavari class (French Scorpene class)
    - Further, at any time, around 30% of the submarines are under refit thus further bringing down the strength of operational submarines.

#### 6) DEEP SUBMERGENCE RESCUE VESSELS (DSRVS)

- **Why in news?**
  - » At Milan-24, Navy offers its submarine rescue capability (Feb 2024)
    - Indian Navy is offering its submarine rescue capabilities to friendly countries, a key highlight of the ongoing **Multilateral naval exercise Milan-24 in Vishakhapatnam** that will further India's defence diplomacy.
    - Navy showcased its DSRV to delegates of 50 countries at the mega naval exercise.
- **What is Deep Submergence Rescue Vehicle**
  - » It is used to rescue officers stranded on a malfunctioning submarine. The DSRV will be used for rescue operations in the Indian Ocean Region and beyond.
  - » **The Indian Navy** has acquired two advanced DSRVs - one each for India's west coast and east coast in Mumbai and Vishakhapatnam, respectively - in 2018 and 2019 from JFD, UK.
    - These are third generation products of **Scotland-based James Fisher Defence**, a part of James Fischer and Sons Plc -- and has the latest technology and capability.
    - JFD had **won contract** for supply of two DSRVs and 25 year maintenance of them.
    - The Navy has given contract to the Hindustan Shipyard for the building of two motherships for DSRVs. Navy is still waiting for its deliveries.
    - DSRVs are permanently deployed on motherships and can be flown away in case of emergencies.
- **Capabilities:** During the trial DSRV dived to 666 m which is a record for deepest submergence by a manned vessel in Indian waters.
  - » It has an operational depth of 650 meters and a capacity to accommodate 15 people.
- **Significance**
  - » Indian navy joins select group of countries having integral submarine rescue capabilities (only 12 countries have this capability out of 40 countries which have submarine services).
  - » It will enhance safety of our ever increasing submarines.

## 7. PROMOTING DEFENCE INDIGENIZATION

### A) 2<sup>ND</sup> INDUS-X SUMMIT (FEB 2024)

## 8. INTERNATIONAL PROJECTS IN DEFENCE

### 1) IRON DOME

- **Why in news?**
  - » The Iron Dome Air Defence Missile System shot down many rockets fired by Hamas on 7th Oct 2023, but some of them landed on populated areas (Oct 2023)

Iron dome is a multi-mission system capable of intercepting rockets, artillery, mortars, and Precision Guided Munitions like very short range air defence (V-SHORAD) systems as well as aircraft, helicopters and UAVs over short range of upto 70 kms.

It is an all-weather system and can engage multiple targets simultaneously and be deployed over land and sea.

It is an effective truck towed mobile air defence system developed by Rafael Advanced Defence Systems Limited. The system was deployed in 2011 and has been in service since then.

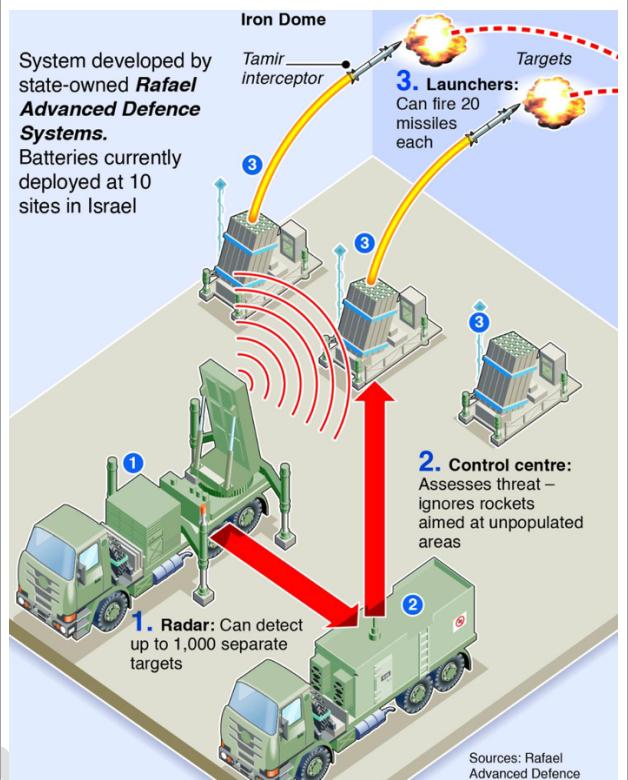
Israel has at least 10 Iron Dome batteries deployed throughout the country, each designed to defend a 60-square-mile populated area and can be moved as threats change.

**Components:** It consist of Radar, Control Center and launchers

#### **How does it work?**

The targeting system and radar first track the trajectory of incoming projectiles. It is designed to fire its Tamir interceptors only at those which are likely to land in populated areas or important areas/targets.

In the past, Israel has put Iron Dome's interception rate at as high as 97%.



Sources: Rafael Advanced Defence

#### **A) USA-ISRAEL COLLABORATION ON IRON-DOME**

- To date (Oct 2023), USA has provided \$3 billion to Israel for Iron Dome batteries, interceptors, co-production costs, and general maintenance.
- A co-production agreement signed between Israel and US in March 2014 enables manufacture of various components of Iron Dome in USA under a joint venture 'Raytheon Rafael Area Protection Systems', set up in 2020 between Rafael and Raytheon of the USA.
- Tamir interceptor (the U.S. version is called Sky Hunter) are manufactured at Raytheon's facility in Tucson, Arizona, and elsewhere, and then assembled in Israel.
- The US Army has procured two Iron Dome batteries from Rafael at a cost of \$373 million.

#### **B) ISRAEL'S LAYERED AIR DEFENCE**

- Israel has a four-layered air defence network to tackle a range of projectile, short ranged mortars, rockets, and long-range ballistic missiles. It comprises of:
  - i. **Iron Dome** (short range)

- ii. **David's Sling** (low to medium range)
- iii. **Arrow II** (Upper atmospheric)
- iv. **Arrow III** (exo-atmospheric)
- In addition to these, US Missile Defence Agency and various private defence contractors are working on next generation defence systems, such as Arrow IV90 and various ground and air-based laser systems, including Iron Beam.



# TARGET PRELIMS 2024

## BOOKLET-55

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## 2. S&T:

### 1) SPACE:

#### A) 55 CANCRI E (OR JANSEN)

- It is an exoplanet discovered recently. It is the first rocky planet outside our solar system which has an atmosphere.
- It is located in our **Milky Way Galaxy** about 41 light years from Earth, in the constellation Cancer.
- It is a 'super earth' – significantly larger than earth – and it orbits perilously close (1/25<sup>th</sup> of AU) to a star dimmer and slightly less massive than Sun, rapidly completing an orbit in about 18 hours.
- It is inhospitable with surface temperature of about 1725 degree Celsius. This is one of the hottest known exoplanets.
- **Why atmosphere is crucial?**
  - » It is essential for any possibility for harboring life.

### 2) HEALTH: FLIRT – THE NEW COVID-19 VARIANT (MAY 2024)

- **FLiRT** is the nickname of the new coronavirus variant called KP.2
  - » **Understanding the connection of KP.2 with Omicron:**
    - **Omicron** was a variant of SARS-COV-2 that took hold in the US in 2021. It spawned many subvariant including JN.1, which was identified in Sep 2023. JN.1 has many descendants, one of them being JN.1.11.1. **FLiRT/KP.2** is a variant/Spinoff of JN.1.11.1.
- **Why this nickname?**
  - » **FLiRT** is based on the letters representing two immune escape mutations that allows virus to evade antibodies.
    - These two mutations on the spike protein disrupt the major sites on the spike protein where antibodies bind and neutralize the SARS-CoV-2 virus. These mutations allow the virus to escape antibodies.
    - The mutations in the Spike Protein of KP.2 are at R346T, F456L, and V1104L.
- It has been linked to rising cases of COVID-19 in the US, UK, and South Korea.
  - » In India, KP.2 sequence made up 29% of Covid-19 sequences uploaded by India to the Global Initiative on Sharing All Influenza Data (GISAID), the world's largest repository of these sequences, over the last 60 days.
- FLiRT is characterized by its ability to evade immunity from vaccines and previous infections.
  - » **Symptoms** are similar to earlier variants.
    - The US Centers for Disease Control and Prevention (CDC) notes that there are currently no indicators suggesting that KP.2 would cause more severe illness than other strains.
  - » **However, KP.2 can drive-up infection:** It has heightened transmission rate, and, like its parent JN.1, it is likely to drive a wave of infections.
- **Can booster shots of Covid-19 vaccines help here?**

- » Most Covid-19 vaccines available in India are aimed at the original variant of virus, so additional shots are unlikely to help.
- » **How vaccine should be modified?**
  - In late April, the WHO's Covid vaccine advisory group advised the use of JN.1 lineage as the antigen for upcoming vaccine formulation, as the FLiRT variants are within JN.1 family. However, vaccines in India are not updated yet.

### 3) COMPUTER AND IT: ARTIFICIAL GENERAL INTELLIGENCE (AGI)

- **Artificial General Intelligence** is a theoretical AI system with capabilities that rival those of a human. It will be able to perform any intellectual task that a human can and perhaps even surpass human abilities in the area.
  - When AI's abilities are indistinguishable from those of a human, it will have passed what is known as Turing Test first proposed by 20<sup>th</sup> century computer scientists Alan Turing. So far, no AI tool has passed Turing Test.
  - **Alan Turing**, widely considered the father of theoretical computer science and artificial intelligence, introduced what is known as Turing Test – a benchmark for machine intelligence. In simple words, if a Machine can engage in a conversation with a human without being detected as a machine, according to the Turing Test, it has demonstrated human intelligence.
- **How is it different from Current AI System?**
  - **Current AI systems** (also known as **narrow AI**) are designed for specific task like image recognition, natural language processing, translation, playing games like chess etc. But this AI remain limited to set parameters.
  - **AGI** envisions a more general and broader form of intelligence, not confined to only limited tasks. They will be able to solve problems, adapt to new situations, and learn new skills in a way that is similar to how humans learn. This would require AGI to possess self-awareness and consciousness, as well as ability to reason, plan, and make decisions.
- **How close are we in achieving AGI?**
  - Scientists believe that we are decades away, if not centuries.
- **How will AGI benefit humans?**
  - By solving some unsolvable problems in the field of:
    - **Health:** By integrating and analyzing vast data it can redefine diagnostics, treatment planning etc. far beyond the capability of humans.
    - **Finance and Business:** AGI could automate various processes and enhance the overall decision making.
    - **Education:** AGI could transform adaptive learning systems that work towards the unique needs of students. This could potentially democratize access to personalized education worldwide.
- **AGI** will also be associated with potential risk:
  - **Environmental Risks** associated with humongous amount of computation power required to develop AGI.
  - **Job displacement** and economic disruption -> increase inequality
  - **Weaponization of AI tech**
  - **Loss of control over AI system**
  - **Existential risk for humans** -> Situation where AGI becomes too independent, so much so that humans simply lose control.

## 4) HEALTH/BIOTECHNOLOGY: XENOTRANSPLANTATION

- **Why in news?**
  - In Jan 2022, doctors replaced the heart of a 57-year-old patient with the heart of a genetically modified altered pig. However, the patient died two months after the transplant. This was an experimental procedure that was done after US FDA granted emergency authorization for it on 31st Dec 2021.
- **Xenotransplantation** is "any procedure that involves the transplantation, implantation, or infusion into a human recipient of either (a) live cells, tissues or organs from a nonhuman animal source, or (b) human body fluids, cells, tissues or organs that have had ex vivo contact with live nonhuman animal cells, tissues or organs.
  - It is seen as an alternative to the clinical transplantation of human organs which is in shortage due to demand-supply issues.
  - It was first tried in 1980s in USA. A well known case is of Baby Fae, who was born with a congenital condition defect and who received a baboon heart in 1984. This baby died in few months after the body's immune system rejected the baboons heart.
  - First kidney transplant from pig to human happened in March 2024 and the patient died in May 2024.
- **Why Xenotransplantation is being explored?**
  - Can provide an alternative supply of organs.
- **Why Pig Heart is being used in several cases of Xenotransplantation?**
  - Pig Heart Valves have been used for replacing damaged valves in humans for over 50 years.
    - There are several advantages of using domesticated or farmed pig as the donor for xenotransplantation.
      - **The Pig's anatomical and physiological** parameters are similar to that of humans.
      - **Breeding** of pigs of different varieties is widespread and cost effective. It provides an opportunity for the size of harvested organ to be matched with the specific needs of human recipient.
      - **Pigs have shorter lifespan** allowing for quick production of new organs when needed.
- **Why are Pigs genetically engineered to use their organ (heart, kidney etc)?**
  - The molecular incompatibility between pigs and humans can trigger several immune complications after the transplant. Therefore, genetic engineering is used to tweak the genome of the pig so as to 'disguise it', so that immune system of the human recipient fails to recognize it, and the reactions that lead to xenograft rejection are not triggered.
    - **For e.g:** Pigs have a gene for Alpha-gal (**a sugar molecule**) which can elicit a devastating immune response in humans. So, the gene which codes for Alpha-gal is removed to make 'GalSafe' pig. These GalSafe pigs are well studied and are approved by USFDA for use in pharmacology.

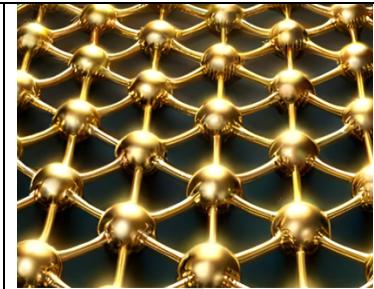
## 5) NANOTECHNOLOGY: GOLDENE – A SHEET OF GOLD WHICH IS ONLY ONE ATOM THICK

For the first time scientists have created a free standing sheet of gold that is only one atom thick. (May 2024)

These sheets of goldene are roughly 100 nanometers thick, approximately 400 times thinner than the thinnest commercially available gold leaf.

It has been developed by scientists from Sweden's Linkoping University.

- » Since the development of Graphene in 2004, scientists have created hundreds of 2D material. But, coming up with atom-thin metallic sheets has been a challenge, due to metal's tendency to cluster together to make nanoparticles instead.
- » **Goldene is the first free-standing 2-D metal.**



- **How was Goldene formed?**

- » Researchers first sandwiched an atomic monolayer of silicon between layers of titanium carbide.
- » Then they deposited gold on top of this sandwich structure, the gold atoms diffuse into the material and replace the silicon atoms, forming a trapped monolayer of gold atoms.
- » Subsequently, scientists etched away the titanium carbide layers to create a free standing, one atom thick layer of gold. This was done with the help of an age-old Japanese technique used to forge Katanas and high-quality knives, using a chemical popularly known as Murakami's reagent.

- **Applications/Advantages:**

- » It can revolutionize electronics industry – Electronics which use gold due to electrical conductivity, can potentially use lesser amounts for the same purpose.
- » **Great Catalyst:** Goldene holds promise of a great catalyst because its much more economically viable than thicker, three-dimensional gold.
- » Method used to make goldene can be used to (theoretically) make other 2-D metal sheets.
- » Other special properties – Like other 2-D materials, goldene will have some other special properties. This is because each gold atom, in this case, has only six neighbouring atoms, compared to 12 in a three-dimensional crystal.
- » These special properties and applications are being explored.

## 6) PHYSICS: MAGNETIC RESONANCE IMAGING (MRI): KEY COMONENTS AND FUNCTIONS

- **What is Magnetic Resonance Imaging?**

- » It is a medical imaging technique that is used to obtain detailed picture of soft tissues within the body. It is a non-invasive diagnostic procedure widely used to image the brain, the cardiovascular system, the spinal cord and joints, various muscles, the liver, arteries, etc. It is particularly important in the observation and treatment of certain cancers including Prostate and rectal cancer, and to track neurological conditions like Alzheimer's, dementia, epilepsy, and stroke.
- » It is also used to observe changes in the blood flow to infer the way the activity of neurons is changing in the brain. In this form the technique is called **functional MRI**.

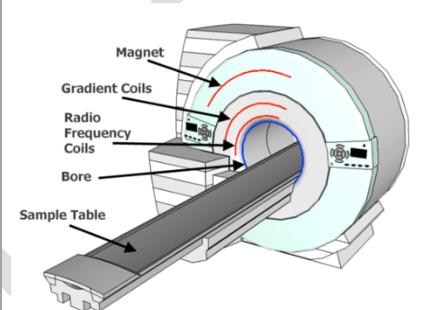
- **2003 Medicine Nobel Prize:**

- » The underlying techniques of MRI was worked in 1970s; In the same decade, Paul Lauterbur and Peter Mansfield refined the techniques to pave the way for their commercial use. For these efforts, they were awarded the Medicine Nobel Prize in 2003.

- **How does MRI work?**

- » MRI scan reveals an image of a body part using the Hydrogen atoms in that part. In normal times, these atoms are all spinning, with axes pointing in random direction.
- » **Four components of MRI Machine:**

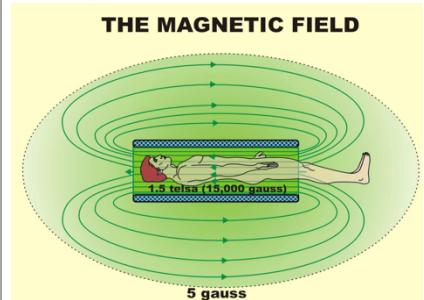
The Machine looks like a giant donut which has a hole in the center called the **bore**. It is where the person whose body is to be scanned is inserted.



**A Powerful Superconducting Magnet:** Its job is to produce powerful and stable magnetic field around the body.

Each hydrogen atom has a powerful magnetic moment, which means in the presence of a magnetic field, the atom's spin axis will point along the field's direction.

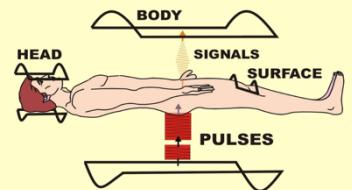
**Other than big powerful magnetic field**, the MRI machine activates three magnets that produce smaller magnetic field that are weaker than the main field by about 80 times. These fields also have gradient i.e. they are not uniform. These fields interfere with the main field at the part to be scanned such that resulting field highlights very specific portions, which can be the focus of the scan.



**Device that emits Radio Frequency Pulse** at the part under the scanner. These radio waves nudge the protons out of alignment.

When the radio pulse go 'off' these hydrogen atoms (protons) realign themselves with the magnetic field, releasing energy in the process. This released energy is detected by the MRI machine detector.

#### THE RF COILS



**Detector:** The detector receives the emissions and converts them to signals, which are sent to a computer that uses them to recreate two- or three-dimensional images of the part of the body.

- **Advantages of MRI:**
  - » **MRI scan** can practically image the body from all useful direction and, if required, in very small increments.
  - » They don't pose any threats; Unlike X-Rays and CT scans, MRI's don't use ionizing radiation.
  - » However, a scan's effect on pregnant ladies are not well studied and therefore many scanning facilities simply refuse such appointments.
- **Limitations:**
  - » **Expensive:** Depending on features, they may cost from a few tens of lakhs to crores of rupees. This leads to high cost of MRI for patients.
  - » **Claustrophobic** people may find it difficult to remain inside (though some 'open bore' MRI machine designs can alleviate this issue)
  - » **High Energy Consumption:** heavy currents are passed through the coil
  - » **A strong magnetic field** prevents individuals with embedded metallic objects, shrapnel, metallic implants, including pacemakers from going for MRI Scan. This magnetic field can wipe the magnetic strip of a credit card.
- **MRIs vs X-Rays:**
  - » **MRIs** are better suited for soft tissues, and they don't show up on X-rays. **X-rays** are better suited for bone fracture detection.
  - » **MRIs** may detect bone fracture, but they are not as clear as X-Rays. Further, X-rays are cheaper, making them ideal for initial fracture diagnosis.
  - » **MRIs are more expensive and time consuming** than X-Rays.
  - » **MRIs** can however be used for detecting hidden fractures which X-rays can't detect. This is especially true for hairline fracture, stress fracture etc.

## 7) DEFENCE: INDIGENOUS TECHNOLOGY CRUISE MISSILE (ITCM)

- In April 2024, **DRDO** conducted a successful **flight test** of Indigenous Technology Cruise Missile (ITCM) from the Integrated Test Range (ITR), Chandipur off the coast of Odisha.
  - » It is a long-range subsonic cruise missile powered by indigenous propulsion.
  - » Missile has been developed by Bengaluru based DRDO laboratory Aeronautical Development Establishment (ADE) along with contribution from other laboratories and Indian industries.
  - » The missile used Indigenous propulsion system developed by Gas Turbine Research Establishment (GTRE), Bengaluru.

## 8) DEFENCE: SUPERSONIC MISSILE ASSISTED RELEASE OF TORPEDO (SMART)

- It is a canister based, long range supersonic anti-submarine missile developed by DRDO for Indian Navy.
  - » It consist of a long range missile carrier (640 km) which can travel at supersonic speed and a lightweight torpedo (50 kg, 20 km) as payload for anti-submarine warfare (ASW) role.
- It can be launched from surface ship or a truck based coastal battery.
- It was launched jointly by Defence Research Development Laboratory (DRDL) and Research Centre Imarat (RCI).
- On 1st May 2024, it was successfully tested from Dr APJ Abdul Kalam Island off the coast of Odisha.

### 3. EB&CC

#### 1) PLANT BIODIVERSITY

##### A) SEMAL TREE (BOMBAX CEIBA L.)

###### - Why in news?

- » Semal trees are disappearing from South Rajasthan because of it being burned during Holi Festival (Holika Dahan) (March/May 2024)

###### - Details

**Semal** (local name in Rajasthan), **cotton tree** (more specifically **Malabar Silk-Cotton Tree**; Red Silk Cotton; Red Cotton Tree;) is an Asian tropical tree.

**IUCN: LC**

###### Significance of the tree:

- It's roots, fruits, seeds, stem, stem bark, and gum are all medicinally significant.
- It also plays a crucial role in forest ecosystem:
  - The rock bees nestle on its branches because the tree's spikes keep its predator, the sloth bears, away.
  - Members of tribal communities consume the tree's reddish root for food during the monsoons.
  - Larvae of the moth *Bucculatrix crateracma* feed on its leaves.
  - The golden-crowned sparrow weaves the lining of its nests with white cotton from its seeds.
  - The *Dysdercus* bugs, the Indian crested porcupine, Hanuman langurs, and some other species feast on the nectar in its flowers

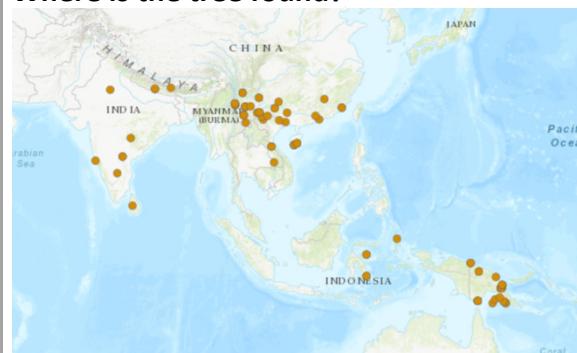
In some parts of Rajasthan, it has been traditionally used for **Holika Dahan** festival.

Traditionally the debarked stem or branch of a semal tree is used as the bonfire's main pillar.

###### Is this cutting not illegal?

The cutting violates a panoply of laws, from Rajasthan Forest Act 1953 to the Forest (Conservation) Act, 1980.

###### Where is the tree found?



Flower



Seeds

## 4. SOCIAL JUSTICE: HEALTH:

### 1) OPERATION AMRITH – TO TACKLE ANTI-MICROBIAL RESISTANCE

- By Kerala Government
- **AMRITH** – (Antimicrobial Resistance Intervention for Total Health)
- Implements the original H1 rule which requires a doctor's prescription for purchase of any class of anti-biotics.
  - **Original H1 Rule of 2011:** It prohibited OTC sales of antibiotics without prescription
  - **Modified H1 Rule of 2013:** It restricts OTC sale of 2<sup>nd</sup> and 3<sup>rd</sup> line of anti-biotics. This modification aims to ensure accessibility to life saving anti-biotics, particularly in remote areas where access to doctors may be limited.
- Under it, surprise raids are being conducted in retail medical shops for detected OTC sale of anti-biotics.
  - Pharmacies must keep an accurate records of anti-biotic sales as per this initiative.
  - A poster mentioning 'anti-biotics not sold without doctor's prescription' should be displayed.
  - **Public can also participate in this initiative by reporting** any pharmacies selling anti-biotics without a prescription to the Drugs Department.
- **Note:** Kerala government, in 2018 became the first state to come up with the state action plan on AMR – Kerala Anti-Microbial Resistance Strategic Action Plan (KARSAP)

### 2) SWATCH BHARAT MISSION (SBM)

- Aligning with the ideals of Mahatma Gandhi, the Swachh Bharat Mission (SBM) was initiated in 2014 to achieve universal sanitation coverage by 2 October 2019.
- It was launched with a **multi-pronged approach** where focus was not only on construction of toilets but also on behavioural change in the communities.
- The mission has **two components** SBM-Gramin (MoDW&S (now Ministry of Jal Shakti)) and SBM-Urban (Ministry of Urban Development (now MoH&UA)) as the requirement of rural and urban areas were different.
  - **The objective of Swatch Bharat Mission (SBM-Gramin)** is to improve the general quality of life in rural areas, accelerate sanitation coverage, adopt sustainable sanitation practices and facilities, encourage use of cost effective and appropriate technologies and development of community managed sanitation systems focusing on solid and liquid waste management for overall cleanliness in rural areas.
  - The **Swatch Bharat Mission-Urban** (SBM-Urban) aimed to eliminate open defecation, eradicate manual scavenging, promote modern and scientific Municipal Solid Waste Management, Effect Behaviour change regarding sanitation practices, generate awareness, augment capacity for ULBs and to create enabling environment for private sector participation in Capital Expenditure, Operation and Maintenance.

### 3) SWATCH BHARAT MISSION (GRAMIN) (UNDER MINISTRY OF JAL SHAKTI)

- Swachh Bharat Mission (Grameen) (SBM(G)) was launched on 2nd Oct 2014 to ensure cleanliness in India and make Indian Open Defecation Free (ODF).
- Having achieved the ODF status in all villages in the country as of 2nd Oct 2019, phase-II of SBM (G) is now being implemented during FY21 and FY25, with the focus to sustain the ODF status of villages and covering all the villages with Solid and Liquid Waste management i.e. to convert the villages from ODF to ODF Plus.
- **Progress:**
  - » More than 1.2 lakh villages have been declared ODF plus till 10th Nov 2022.
  - » Andaman & Nicobar Islands has declared all its villages as ODF Plus, thus becoming the first Swachh, Sujal Pradesh.

#### 4) SWATCHTA SURVEKSHAN, 2023

- Swatchta Survekshan was started in 2016 as a competitive monitoring framework of the progress of SBM in urban areas. It is an annual survey of cleanliness, hygiene, and sanitation in cities and towns across India as part of SBA-U.
  - » It started with evaluation of 73 cities in 2016, but in 2023 it covered 4477 cities.
- It was launched by MoHUA with Quality Council of India its implementation partner:
- **The design** of Swachh Survekshan is based on **three key pillars**:
  - » **Service Level Progress** - Evaluating progress of cities in ODF status, segregated waste collection, processing, disposal of solid waste and sustainable sanitation. Progress claim is validated through citizens and on-field visits.
  - » **Citizens' Voice** - Assessment through direct feedback, engagement with citizens and innovations helmed by citizens.
  - » **Certifications** - Assessing progress of cities in their performance under Ministry's certification protocols such as Star Rating for Garbage Free Cities and ODF/ODF+/ODF++/ Water+.

#### A) SWACHH SURVEKSHAN AWARDS 2023

- The President of India, Smt. Droupadi Murmu conferred Swachh Survekshan Awards 2023 at Bharat Mandapam, New Delhi, hosted by MoH&UA.
- 13 awardees received felicitations under categories of Clean Cities, Cleanest Cantonment, SafaiMitra Suraksha, Ganga Towns, and Best Performing States.
- **All India Clean City Rank-1** (Indore and Surat)
- Cleanest city with population less than 1 lakh – **Sasvad**, MHA
- **Cleanest cantonment board**: Mhow
- **Cleanest Ganga town**: Varanasi and Pryagraj
- **Best performing states**: Mha, MP, Chhattisgarh
- **Best Safaimitra Surakshit Sheher**: Chandigarh

#### 5. SOCIAL JUSTICE: EDUCATION

## 1) ANNUAL STATUS OF EDUCATION REPORT, 2023 – ‘BEYOND BASICS’ (ASER, 2023 – BEYOND BASICS)

- Released in Jan 2024
- It is a nationwide citizen-led household survey that provides a snapshot of the status of Children's schooling and learning in rural India.
- **History:**
  - » ASER reports are being published since 2005.
  - » The 'basic' ASER survey was conducted annually until 2014 and switched to alternate-year cycle in 2016.
    - It collects information about enrolment in preschool and school for children in the age group of 3-16 years.
    - It assesses children in the age group of 5 to 16 year one-on-one to understand their foundational reading and arithmetic abilities.
  - » In the intervening year, ASER dives deeper into different aspects of children's schooling and learning in rural India. The 2023 report is one such report.
- **Who releases the report:**
  - » ASER 2023 was released by ASER Centre, an organization focused on providing reliable data on the status of children's schooling and basic learning in India.
  - » **Note:**
    - **ASER Centre** is an independent research unit, which is responsible for conducting and releasing the ASER reports.
    - **PRATHAM** is an NGO focused on education. It played a key role in establishment of the ASER Centre and continues to collaborate with them. It's a crucial partner which contributes to data collection and dissemination efforts.
  - » **Key Highlights** of 2023 report.
    - The report puts the spotlight on youth aged 14 to 18 years in rural India.
    - **Overall, 86.8% of 14-18 years old** are enrolled in an educational institution.
      - » Small gender gap exists
      - » Notable difference on the basis of age - 3.9% of 14-year-old youth are not enrolled, when compared to 32.6% of 18 years old.
    - **Stream:**
      - » Arts & Humanities (55.7%).
      - » STEM (31.7%)
        - **More Male (36.3%) than Female (28.1%)**
      - » Commerce (9.4%)
    - **Vocational Training** -> Only 5.6% of the surveyed youth
    - **Learning outcome:** The youth were surveyed on four points: Basic Reading, Math and English Abilities; Application of Basic Skills to everyday calculations; Reading and understanding written instructions; and financial calculations that need to be done in real life.
      - » **Basic Reading; Maths and English Abilities:**
        - About 25% cannot read a std II level text fluently in their regional language.
        - Females (76%) do better than males (70.9%).

- 56.7% struggle with division (3 digit by 1 digit) problems.
  - More than 40% couldn't read sentences in English.
- » **Application of Basic Skills to everyday calculations:**
- 15% of the youth are not able to measure length using scale when the starting point is 0 cm.
  - 61% of the youth are not able to measure length using scale if the starting point was not 0 cm.

## 2) ALL INDIA SURVEY ON HIGHER EDUCATION (AISHE)

- **Why in news?**
  - » **Ministry of Education** releases All India Survey on Higher Education 2021-22 (Jan 2024)
- **In Jan 2024**, Ministry of Education, GoI, has released All India Survey on Higher Education (AISHE) 2021-22 covering all HEIs in the country registered with AISHE collecting detailed information on different parameters such as student enrollment, teachers, infrastructure information etc.
- **Key Highlights:**
  - » **Student enrolment** (4.33 crores) is 26% higher than 2014-15.
  - » **Female Enrolment** (2.07 crores) has increased by 32% compared to 2014-15.
  - » There has been substantial increase in the enrolment of SC students, SC female students, ST students, ST female students etc.
  - » **Caste wise breakdown:** SC (15.3%); ST (6.3%); OBC (37.8%); Other communities (40.6%).
  - » **Gross Enrolment Ratio (GER)** has increased to 28.4% in 2021-22 when compared to 23.7% in 2014-15 (for population between 18-23 years of age).
    - **GER caste wise** (SC - 25.9%; ST - 21.2%;
  - » **Gender Parity Index** - the ratio of female GER to Male GER is 1.01 in 2021-22. (Note: GER has continued to remain over 1 since 2017-18). Thus female GER continues to be higher than male GER for fifth consecutive year.
  - » **Distribution of enrolment:**
    - **Government University** (73.7% enrolment) and Private Universities (26.3%) of total enrolment
    - **Graduation** (78.9%), **Post Graduation** (12.1%),
    - **PhD enrolment** in 2021-22 (2.12 lakh) has increased by 81.2%;
    - **Discipline at undergraduate levels:** Arts (34.2%); Science (14.8%); Commerce (13.3%) and Engineering Technology (11.8%)

## 3) SCHEMES UNDER MINISTRY OF EDUCATION

### B) PRADHAN MANTRI SCHOOLS FOR RISING INDIA (PM-SHRI SCHEME)

- It is a Centrally Sponsored Scheme (CSS) launched on 7 September 2022.
- The objective of the scheme is to set up more than 14,500 PM SHRI Schools over a period of FY23 to FY27 by strengthening the existing schools from those managed by central government/ state governments/ Ut government and local bodies.
  - » **Total project cost:** Rs 27,360 crores (central share of 18128 crores)
  - » These schools will showcase the implementation of the NEP and emerge as exemplary schools over a period, while offering leadership to other schools in the neighbourhood.

- » These schools will be equipped with modern infrastructure including labs, smart classrooms, libraries, sports equipment, art room etc. which is inclusive and accessible.
- » They shall also be **developed as green schools** with **water conservation, waste recycling, energy-efficient infrastructure and integration of organic lifestyle in curriculum**.
- » **Pedagogy** of the school will be more **experimental, holistic, inquiry-driven, discovery oriented** etc.
- » More than **20 lakh students** are expected to be direct beneficiaries of the scheme
- » **Quality evaluation** of these schools will be conducted at **regular intervals** to ensure **desired standards**.

#### **C) VIDYANJALI PROGRAM (A SCHOOL VOLUNTEER INITIATIVE)**

- With the aim of **strengthening schools and improving the quality of school education through community, Corporate Social Responsibility (CSR) and private sector involvement** across the country, the Government has initiated Vidyanjali (a school volunteer management program).
- The Vidyanjali portal (<https://vidyanjali.education.gov.in/en>) enables community and volunteers/organisations to interact and **connect directly with the Government and Government aided schools of their choice and share their knowledge and skills** and/or contribute in the form of assets/material/equipment to meet the requirement of the schools.
- As of **20 January 2023**, 3,95,177 schools have been onboarded and **1,14,674 volunteers have registered on the Vidyanjali portal**.

#### **D) EDCIL VIDYANJALI SCHOLARSHIP PROGRAM**

- **Launched in Feb 2024** by Ministry of Education
- **The EdCIL Vidyanjali Scholarship Program**, in alignment with the **National Education Policy, 2020** is a powerful force aimed at **revolutionizing opportunities for quality education and access to higher education institutions**.
  - i. It provides **financial support to meritorious students** from **Navodaya Vidyalayas** who lack means, thereby promoting educational equity and inclusion.
  - ii. It also **encourages involvement of private sector through CSR** initiative, thereby **making way of joining forces between the Government and corporates towards an educated India**.
- It thus represents a **whole of society approach** to empowerment.

#### **E) PARAKH (PERFORMANCE ASSESSMENT, REVIEW, AND ANALYSIS OF KNOWLEDGE FOR HOLISTIC DEVELOPMENT)**

- It was launched **as part of NEP, 2020**.
- It has been set up as an **organization under NCERT**.
- It is envisaged as a **standard setting body** to advise school boards regarding new assessment patterns. It will thus work on **bringing school boards** across the states and UTs on a common platform
- It will also be holding **periodic learning outcome tests** like the **National Achievement Survey, and State Achievement Surveys**.

- It will work on three major assessment areas:
  - i. Large Scale Assessment
  - ii. School Based Assessment
  - iii. Examination Reforms
- **Objectives:**
  - Uniform norms and guidelines
  - Enhanced Assessment patterns - It will help schools boards to shift their assessment patterns towards meeting the skill requirements of 21st century.
  - Reduce disparity in Evaluation - across the states and boards which currently follow different standards of evaluation.
  - Benchmark Assessment

#### **F) BAL VATIKA PROGRAM**

- It is designed as a preparatory class for children before Grade-1. It focuses on developing cognitive, affective, and psychomotor abilities and also early literacy and numeracy for students in the age groups of 3+, 4+, and 5+ years.
- It was launched in Oct 2022 as a pilot project in 49 Kendriya Vidyalayas.

#### **G) PRASHAST: SCREENING TOOL (MOBILE APPS) FOR SPECIFIC LEARNING DISABILITIES**

- **Pre-Assessment Holistic Screening Tool (PRASHAST):**
  - » It is a disability screen mobile app developed by the Central Institute of Educational Technology (CIET), a constituent of NCERT.
  - » It covers all 21 disabilities recognized by Persons with Disabilities Act, 2016.
  - » It is available in 23 languages, including all 22 languages included in the VIII schedule of Indian Constitution.
  - » The app will generate school wise report, for further sharing with authorities for initiating the certification process, as per the guidelines of Samagra Shiksha.
- **Why is it needed?**
  - » **Early identification** of Children with disability
  - » **Facilitation** of timely intervention and support
  - » **Enhancement of inclusivity** in school
  - » Promoting Equitable education for all.

#### **H) PRADHAN MANTRI-UCHCHATAR SHIKSHA ABHIYAN (PM-USHA)**

- **Background:**
  - » **Rashtriya Uchchatar Shiksha Abhiyan (RUSA)** was a centrally sponsored scheme to fund states/UTs institutions, with the vision to attain higher levels of access, equity, and excellence in the State Higher Education system with greater efficiency, transparency, accountability, and responsiveness.
  - » The first phase of the scheme ran from 2013-2018 and the 2nd phase was launched in 2018.

- » Now, in the light of NEP, 2020, RUSA Scheme has been launched as Pradhan Mantri Uchchatar Shiksha Abhiyan (PM-USHA).
- **Details about PM-USHA:**
  - » **Centrally sponsored scheme.**
  - » It covers government, and government aided institutions from the States and Uts.
  - » **Objective:** To enhance the quality of state higher education institutions by ensuring they meet established standards and using accreditation for quality assurance.
  - » **It focuses on the following:**
    1. **Equity, Access and Inclusion**
    2. **Developing Quality Teaching & Learning Processes:**
      - PM-USHA would provide facilities to the institutions for upgrading the physical and digital infrastructure and also for the conversion of single-stream HEIs into multiple stream institutions.
      - Faculty training will be supported specially with the help of Digital infrastructure.
    3. **Accreditation of Non-Accredited Institutions & Improving Accreditation:**
      - Currently, there are limited number of HEIs with NAAC accreditation. These institutions will get handholding under the scheme for getting accreditation as well as enhancing accreditation from NAAC.
    4. **ICT based digital infrastructure:**
      - HEIs should be encouraged to design, develop and roll out MOOCs for learners & teachers as well as institutions and faculties.
      - Under PM-USHA, institutions would be encouraged to provide Wi-Fi facilities, smart classes, and virtual labs on the institute campus.
    5. **Enhancing Employability through Multidisciplinary:**
      - PM-USHA will encourage HEIs to get linked with the industry and market to strengthen skills, innovations and employability.
  - **Other Key focus:**
    - » Rs. 100 crore support to each of 35 state universities for Multidisciplinary Education and Research University (MERU) Transformation.
    - » Establishment of Model Degree Colleges.
    - » Grants for strengthening universities.
    - » Focus on remote, LWE affected, Aspirational and low Gross Enrolment Ratio regions.

## I) SATHEEE (SELF ASSESSMENT, TEST, AND HELP FOR ENTRANCE EXAMINATION) PORTAL

- Ministry of Education
- The Department of Higher Education, Ministry of Education in collaboration with IIT Kanpur has started **SATHEE** (Self-Assessment, Test and Help for Entrance Examination) portal to provide quality education to every student who intend to participate in competitive Education such as JEE, NEET, and various State level engineering and other examination.
  - Ministry of Education has written to all States/Uts to inform educators and students about this facility which can be used for competitive examinations preparation and for knowledge enhancement.
- SATHEE Mitras to increase rural coverage of students appearing for entrance tests, including the JEE and NEET.
- It uses an indigenously-developed AI programme called **Prutor**, which was developed through IIT-Kanpur.
- Learning material is available in Hindi, English and many regional languages

## J) PRERNA PROGRAM

- **Ministry:** Department of School Education & Literacy, Ministry of Education has launched '**Prerana: An Experimental Learning Program**'. **Prerna** is driven by a strong commitment to integrate principles of Indian education system and the philosophy of value-based education which is a corner stone of the NEP, 2020.
- It is a week-long residential program for selected students of class IX to XII.
- It is an experiential and inspirational learning program for students with the best-in-class technology where heritage meets innovation.
- A batch of **20 selected students** (10 boys and 10 girls) will attend the program, every week from various parts of the country.
- **Where?**
  - It will run from a vernacular school established in 1888, Vadnagar, Mehsana, Gujarat.
- The curriculum of Prerna School prepared by IIT Gandhinagar is rooted in nine value-based themes.
- It will feature, Yoga, mindfulness, and meditation. It will help students answer questions like "who am I?", "What is our history and culture", "What can I do for the country" etc.



# TARGET PRELIMS 2024

## BOOKLET-56

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## 2. S&T:

### 1) SPACE: CHANG'E-6: CHINA'S MISSION TO LAND ON FAR SIDE OF THE MOON AND TO COLLECT UNIQUE LUNAR SAMPLES

- In June 2024, China's Chang'e-6 mission lander made a successful soft landing on the far side of the moon and will soon begin collecting unique lunar samples.
  - The lander targeted a southern portion of Apollo crater within the South Pole – Aitken (SPA) Basin on the lunar far side.
- The landing is a critical step towards bringing unique and scientifically invaluable lunar samples to Earth for analysis.
  - The lander will collect 2 kg of samples using a scoop to grab surface regoliths and a drill for subsurface material.
- This is China's fourth successful lunar landing in four attempts. This is also China's second landing on the far side of the moon.
- This is also the third lunar landing in 2024 (Japan's SLIM, Intuitive Machine's Odysseus lander)
- **Future China Lunar Program:**
  - CHANG'E-6 will follow up with two missions to the south pole of the moon. These are Chang'e-7 in 2026 and Chang'e-8 around 2028.
  - By 2030, China wants to send first crewed mission to Moon.

### 2) HEALTH: SURROGACY IN INDIA

- **Definition**
  - » Surrogacy is a practice in which a woman undertakes to give birth to a child for another couple and agrees to hand over the child to them after birth.
- **Two main types of surrogacies**
  - » **Gestation surrogacy** - the pregnancy results from the transfer of an embryo created by in vitro fertilization (IVF), in a manner so the resulting child is genetically unrelated to surrogate.
  - » **Traditional Surrogacy** - the surrogate is impregnated naturally or artificially, but the resulting child is genetically related to the surrogate.
- **Surrogacy in India: A Background**
  - » In 2002, India became the first country to legalize surrogacy. Within 10 years, India had become the surrogacy capital of the world.
  - » **What made India an attractive destination – Class discussion:**
    - But, in 2008, the **Baby Manji Yamada vs. Union of India** Supreme Court highlighted the problems due to lack of proper regulation for surrogacy in India.
- **The Lack of proper regulations had resulted into:**
  - » **Exploitation of surrogate mother**
  - » **No clarity on future of child if the commissioning parents deny taking her/him**.

» Moral issues

- Law Commission of India in its 228th report, 2009 dealt with Surrogacy. It's key recommendations included:
  - Prohibition of Commercial Surrogacy
  - Financial Support for Surrogate child should be provided by surrogacy arrangement.
  - Life insurance cover for surrogate mother should be provided in the surrogacy contract.
  - One of the intended parents should be donor as well , in case of intended parent is single, he or she should be a donor or else go for adoption
  - Legislation itself should recognize a surrogate child to be the legitimate child of the commissioning parent(s) without there being any need for adoption or even declaration of guardian. The birth certificate of surrogate child should contain the name(s) of commissioning parent(s) only
  - Right to privacy of donor as well as surrogate mothers should be protected.
  - Sex selective surrogacy should be prohibited
  - Cases of abortion should be governed by the Medical Termination of Pregnancy Act of 1971 only.
- Government Prohibited foreigners from a renting a Womb in India (2015)

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#### A) THE SURROGACY (REGULATION) ACT 2021

- It prohibited commercial surrogacy and allowed only altruistic surrogacy where no money exchanges hands and where a surrogate mother is genetically related to those seeking a child.
  - » The law also penalizes "not following altruistic surrogacy" for intending couples, intending women and other persons.
- Who can avail surrogacy?
  - » A woman who is a widow or a divorcee between age of 35 to 45 years
  - » A couple, defined as legally married woman and man can available surrogacy is they have a medical condition necessitating surrogacy.
    - The man shall be between ages of 26-55 years and the woman shall be between the ages of 25-50 years, and shall not have previous biological, adopted, or surrogate child.
- Institutions: The law authorizes Centre and State to constitute - National Assisted Reproductive Technology and Surrogacy Board (NSB), and State Assisted Reproductive Technology and Surrogacy Board (SSB).
  - » NSB will advise central government; lay down code of conduct for surrogacy clinics; supervise the functioning of SSBs

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#### B) THE SURROGACY (REGULATION) AMENDMENT RULES, 2024:

- Surrogacy Rules Changed to allow donor gamets for couples with medical conditions (Feb 2024)
  - » The amended rule says "couple undergoing surrogacy must have both gamete from the intending couple. However, in case when the District Medical Board certifies that either husband or wife constituting the intending couple suffers from medical condition necessitating use of

donor gamete then surrogacy using donor gamete is allowed subject to the condition that the child to be born through surrogacy must have atleast one gamete from the intending couple

- This change comes after the Supreme Court Verdict in 2023 which allowed a woman with Mayer-Rokitansky-Kuster-Hauser (MRKH) Syndrome - a rare congenital disorder that affects the reproductive system and can cause infertility - to undergo surrogacy with a donor egg.
- The Feb 2024 amendment also overturned a previous amendment in March 2023 that banned the use of donor gametes.
- » The rule change is not applicable to widowed or divorced women. It reads: "Single woman (widow or divorcee) undergoing surrogacy must use self-eggs and donor sperms to avail surrogacy procedure"

### 3) HEALTH: MENSTRUAL HEALTH RELATED INITIATIVES

#### A) DRAFT MENSTRUAL HYGIENE POLICY, 2023

- MoH&FW has formulated Draft Menstrual Hygiene Policy (MHP)
- It envisages comprehensive support through the entire menstrual journey, recognizing the needs of individuals from menarche to menopause with specific focus on prioritizing underserved and vulnerable population.
- The policy intents to serve as a catalyst to raise awareness, challenge societal norms and foster a society that embraces menstrual hygiene as a natural and normal part of life.

#### B) SCHEME FOR PROMOTION OF MENSTRUAL HYGIENE

- By MoH&FW
- It promotes Menstrual Hygiene among adolescent girls in the age group of 10-19 years.
- The funds are sanctioned based on the proposal received from the States/Uts in their program implementation plan (PIP) under National Health Mission.
- The ASHA workers promote the scheme by distributing the sanitary napkin packs at a subsidized rate of Rs 6/- for a pack of 6 napkins and arranging monthly meetings with the adolescent girls in their area to deliberate on varied health issues including menstrual hygiene management.

#### C) JAN SUVIDHA SANITARY NAPKINS:

- Under Pradhan Mantri Bhartiya Janaushadhi Pariyojna (PMBJP), Government has launched Jan Aushadhi Suvidha Sanitary Napkins at Rs 1 /- per pad for women to ensure easy availability of the menstrual health services at affordable prices.

#### D) MENSTRUAL LEAVES:

- Bihar and Kerala are the only two states in India which have a menstrual leave policy as of April 2024.
- **Note:** In May 2024, the Sikkim High Court, the country's Smallest High Court, has introduced menstrual leave policy for its women employees.
  - Such leave will be granted on the prior recommendations of the medical officer of the High Court. "This leave will not be counted against the employee's overall leave count,".

## 4) DEFENCE: PAKISTAN'S HANGOR CLASS SUBMARINE – BUILT BY CHINA (APRIL 2024)

- News:
  - The first Hangor class submarine, built by China for Pakistan, was launched in April 2024 at a Wuhan shipyard.
- THE Hangor-class, an export variant of the Chinese Type 039A Yuan class, is a diesel electric attack submarine. It is named after the now decommissioned PNS Hangor, which famously sank India's frigate INS Khukri during the 1971 war.
  - It is equipped with an Air Independent Propulsion (AIP) system, which significantly increases the submarines' endurance underwater.
  - It is an attack submarine and has torpedo tubes and capabilities to launch anti-ship missiles, as well as Babur-3 subsonic cruise missile, which has a range of 450 km.
- It is a direct rival of India's Kalvari class (Scorpene class) of diesel electric attack submarine.
  - Note: Hangor is significantly bigger than Kalvari class; but Kalvari is much more manoeuvrable.
  - Note: Kalvari class don't come with AIP but, Navy is currently in the process of installing an indigenously developed AIP system to its Kalvari class submarine.

## 3. ECONOMY

### 1) AGRICULTURE

#### A) NEED OF REFORMING POULTRY INDUSTRY

- Current Context: outbreak of H5N1
- BirdFLu (H5N1): First case of transmission from Chicken to Humans -> in 1997 from HongKong; first case in India was reported in Maharashtra in 2006.
  - Pathogen has crossed many species barrier and has even caused mortality among the polar bears in the Arctic, and seals and seagulls in Antarctic.
  - **Fatality Rate in Humans:** WHO estimate it at 52% (based on 463 deaths recorded since 2003 among the 888 people diagnosed with the virus. Human infections are linked to close contact with bird or its environment.
- Antibiotics are regularly given to birds as a prophylactic and as growth promoters. Many of these antibiotics are classified as critically important and highly important by the WHO and are sold to farmers for preventive use.
- Heavily stocked animals in unsanitary conditions -> detrimental effect on welfare of animals but also negative impact on those who consume the food derived from these animals.
  - **Violation of the Prevention of Cruelty to Animals (PCA) Act, 1960** – Keeping animals in intensive confinement constitutes a crime. Further, operational activities at these industrial facilities cause unnecessary pain and suffering to the animals because of mutilation, starvation, thirst, overcrowding, and other ill-treatment, which is also violation of PCA.

- **Pollution:** The impact of emissions in the atmosphere, effluents in the water system, and the solid waste in the soil is felt by humans, other animals and environment.
  - There is issue of odour pollution, particulate matter and greenhouse gas emissions.
  - **CPCB** has classified poultry units with more than 5,000 birds as a polluting industry that require compliance and regulatory consent to establish and operate.
- **Recommendations of Law Commission of India** in its 269<sup>th</sup> report:
  - Non-therapeutic antibiotic given to poultry causes antibiotic resistance. More open, cleaner, and ventilated living spaces are likely to cause less need of anti-biotics in animals. This will also make their eggs and meat safer to eat.

## A. SOCIAL JUSTICE

### 1) WOMEN: NATIONAL COMMISSION OF WOMEN

- NCW was set up as a statutory body in Jan 1992 under the **National Commission for Women Act, 1990**.
- It consists of a chairperson, five members and a member secretary all to be nominated by Central government.
- Key Functions of the National Commission of Women (NCW) includes:
  - » Reviewing the existing constitutional and legal framework related to women and recommend changes to make them more effective.
  - » Take up violation of rights of women with appropriate authority.
  - » Act on complaints suo motu in relation to issues concerning deprivation of women.
  - » Inspect institutions where women are kept as prisoners or otherwise and if necessary, take up with relevant authorities any remedial action.
- The commission also has powers that are vested in a **Civil Court**.
- It submits an annual report before the central government. Apart from this, it submits other reports which it deems to be fit.

### 2) SCHEDULED TRIBES: PARTICULARLY VULNERABLE TRIBAL GROUPS (PVTGs)

- **Particularly vulnerable tribal group** (PVTG) (earlier: Primitive tribal group) is a government of India classification created with the purpose of enabling improvement in the conditions of certain communities with particularly low development indices
- The **Dhebar Commission (1960-1961)** stated that within Scheduled Tribes there existed an inequality in the rate of development. In 1973, during the fourth Five Year Plan a sub-category was created within Scheduled Tribes to identify groups that considered being at a lower level of development.
- Till now, 75 tribal groups have been categorized by Ministry of Home Affairs as PVTGs. They reside in 18 states and UT of A&N Islands.
- These groups are **characterized by**
  - » A pre-agriculture level of technology
  - » Stagnant and declining population
  - » Extremely low literacy

- » Subsistence level of economy

#### A) PM-PVTG DEVELOPMENT MISSION

- First announced in the 2023-24 budget, the scheme was launched by PM Modi in Nov 2023 from Jharkhand's Khunti district on the occasion of tribal icon Birsa Munda's birth anniversary and the third Janjatiya Gaurav Divas.
- It has a budgetary allocation of Rs 24,000 crores and is dedicated to the holistic development of all 75 PVTGs living in 22,000+ villages of 18 states and UT.
- The objective of the scheme is to improve the socio-economic conditions of PVTGs by providing basic facilities like road and telecom connectivity, electricity, housing, clean water, sanitation, improved education, healthcare, nutrition, and sustainable livelihood to PVTG families and habitations.
- This is an umbrella initiative under which 9 ministries will implement 11 interventions, including PMGSY, PMAY(G), Jal Jeevan Yojna etc.
  - » Note: MoTA is the nodal ministry for overall policy planning and coordination.

#### B) PM JANMAN (PRADHAN MANTRI JANJATI ADIVASI NYAYA MAHA ABHIYAN) (PM-JANMAN)

- Approved by Union Cabinet in Nov 2024.
- Budget: 24,104 crore for three years.
  - » Central share - Rs 15,336 crores
  - » State Share - Rs 8,768 crores
- It is aimed at providing PVTG households and habitations with basic facilities such as safe housing, clean drinking water, sanitation, improved access to education, health and nutrition, road and telecom connectivity, and sustainable livelihood opportunities.
  - » In addition, saturation will also be ensured in PMJAY, Sickle Cell Disease Elimination, TB Elimination, 100% immunization, PM Poshan, PMJDY etc.
- This initiative is part of Pradhan Mantri - PVTG Development Mission.

#### C) 1 WEEK INFORMATION EDUCATION AND COMMUNICATION CAMPAIGN FOR THE PM-JANMAN PACKAGE (DEC 2023)

- In this campaign, the Union government has set a target of one week to achieve Aadhaar, caste certificate, and Jan Dhan account saturation across 15,000 PVTG habitations in 100 districts.
  - » It will cover 100 districts of 18 states and the UT of Andaman and Nicobar Islands.
- Need of this IEC campaign?
  - » After announcing the PM JANMAN package, it was understood that to proceed with any aspect of the PM-JANMAN package, they would first need to ensure intended PVTG beneficiaries are provided with documentation like Aadhaar, caste certificates and Jan Dhan Accounts - essential to sign them for benefits under the package.

## D) SCHEME FOR DEVELOPMENT OF PVTG

- It is a central sector scheme launched in 2008 by MoTA exclusively for PVTGs.
- **Flexibility to state:** Under the scheme, Conservation cum development (CCD)/Annual Plans are to be prepared by each state/UT for their PVTGs based on their need assessment, which are then appraised and approved by the Project Appraisal committee of the Tribal Ministry.
- Activities for development are taken in the fields of education, health, livelihood and skill development, agriculture development, housing & habitat, conservation and culture etc.

## 3) STs: PVTGs – CURRENT SITUATION OF PVTGS IN INDIA:

- **Report by Anthropological Survey of India (AnSI) about PVTGs:** The PVTGs of India – Privileges and Predicaments
  - » **Key Findings**
    - a. **Baseline surveys** exist for only 40 groups out of 75 PVTGs -> displays government's apathy towards PVTGs
    - b. **Regional and state specific variations in welfare schemes for PVTGs**
      - For instance, Odisha has established exclusive micro-projects for PVTGs, there are none such in for the five PVTGs in Gujarat.
      - **Unequal treatment in same state**
    - c. **State wise distribution**
      - Among the 75 listed PVTGs the highest number are found in Odisha (13).
      - Other states
        - Bihar including Jharkhand (9), MP including Chhattisgarh (7), Tamil Nadu (6), Kerala (5), Gujarat (5), WB (3), MHA (3), Kar (2), UK (2), Rajasthan (1), Tripura (1), Manipur (1).
        - All four Tribal groups in Andaman and 1 in Nicobar Islands are recognized as PVTGs.
    - d. **Huge Variation in the number of PVTGs**
      - A few individuals as in case of Great Andamanese (57), Onge(107) and Sentinelese (around 50) to more than 4 lakh population of Sahariyas in MP and Rajasthan.
    - e. **Literacy rate going up**
      - Literacy rate has gone up significantly over the past.
      - From a single digit, the literacy rate has gone upto 30-40% in some PVTGs.
      - **Female literacy rate is still considerably lower compared to male counterparts.**
    - f. **Considerable increase in age of marriage among PVTGs**
      - The incidence of girl child being married while still being a minor, among these tribes have been decreasing.

## A) PVTGs IN DIFFERENT STATES

State / UT Name	PVTGs Name
Andhra Pradesh and Telangana	1. Bodo Gadaba 2. Bondo Poroja 3. Chenchu 4. Dongria Khond 5. Gutob Gadaba 6. Khond Poroja 7. Kolam 8. Kondareddis 9. Konda Savaras 10. Kutia Khond 11. Parengi Poroja 12. Thoti
Bihar and Jharkhand	13. Asurs 14. Birhor 15. Birjia 16. Hill Kharia 17. Konvas 18. Mal Paharia 19. Parhaiyas 20. Sauda Paharia 21. Savar
Jharkhand	Same as above
Gujarat	22. Kathodi 23. Kohvalia 24. Padhar 25. Siddi 26. Kolgha
Karnataka	27. Jenu Kuruba 28. Koraga
Kerala	29. Cholanaikayan (a section of Kattunaickans) 30. Kadar 31. Kattunayakan 32. Kurumbas 33. Koraga
Madhya Pradesh and Chhattisgarh	34. Abujh Macias 35. Baigas 36. Bharias 37. Hill Korbas 38. Kamars 39. Saharias 40. Birhor
Chhattisgarh	Same as above
Maharashtra	41. Katkaria (Kathodia) 42. Kolam 43. Maria Gond
Manipur	44. Marram Nagas
Odisha	45. Birhor 46. Bondo 47. Didayi 48. Dongria-Khond 49. Juangs 50. Kharias 51. Kutia Kondh 52. Lanja Sauras 53. Lodhas 54. Mankidias 55. Paudi Bhuyans 56. Soura 57. Chuktia Bhunjia
Rajasthan	58. Seharias
Tamil Nadu	59. Kattu Nayakans 60. Kotas 61. Kurumbas 62. Irulas 63. Paniyans 64. Todas
Tripura	65. Reangs
Uttar Pradesh and Uttarakhand	66. Buxas 67. Rajis
West Bengal	68. Birhor 69. Lodhas 70. Totos
Andaman & Nicobar Islands	71. Great Andamanese 72. Jarawas 73. Onges 74. Sentinelese 75. Shorn Pens

## B) PVTGS OF ANDAMAN AND NICOBAR ISLANDS

- Great Andamanese
- Jarawas
- Onges
- Sentinelese
- Shompen

## C) TRIBALS OF A&N ISLANDS

- **Four Ancient Negrito Tribe in the Andaman Islands:** The Great Andamanese, Onge, Jarawa, and Sentinelese
- **Two Mongoloid Tribal communities in Nicobar Islands:** the Shompen and Nicobarese (not PVTGs)
  - Except Nicobarese, the population of other tribal groups in A&N islands have decreased drastically over the years

## D) SHOMPEN TRIBE

In April 2024, for the first time, members of the Shompen, one of the PVTGs in the country took part in the election process by casting their votes in A&N Lok Sabha constituencies. 7 members of the tribe exercise their franchise.

- Shompen reside in the dense tropical rain forests of the Great Nicobar island.
- Their estimated population is 229 as per the 2011 census.



#### E) GREAT ANDAMANESE TRIBE

- They inhabit isolated parts of Southeast Asia and the Andaman Islands.
- At present only about 59 members of the community survive - 34 live in the Strait Island, the rest are in Port Blair.
- The language of the Great Andamanese, Sare, has largely been lost, with the last surviving speaker dying a few years back. The tribe now speaks mostly Hindi.
- Major factors contributing to the diminishing population of the Great Andamanese include environmental 'disturbances', contagious diseases as a result of contact with city dwellers, and a high mortality rate assisted by addictions to alcohol, tobacco and opium

### 4) DISABLED:

#### A) RIGHTS OF PERSONS WITH DISABILITIES ACT, 2016

- RPD Act, 2016 replaced the PwD act 1995 and is in accordance with the obligations to UNCRPD to which India is a signatory.
  - » It recognizes Disability as a fluid and shifting concept and incorporates measures towards a full acceptance of people with disabilities ensuring their full participation and inclusion in society.
- Key Provisions
  - » Disability has been defined based on the evolving and dynamic concept
  - » Types of Disabilities have been increased
    - 1995 act: 7 kinds of disability
    - New Act: It recognizes 21 different kinds of disabilities including cerebral palsy, hemophilia, multiple sclerosis, autism and thalassemia, disability from acid attacks and Parkinson's disease etc. which were not recognized earlier.
    - Further, the centre will have the power to add more types of disabilities to the list.
  - » Rights of PwD
    - The act confers several rights and entitlements to disabled persons.
      - » Accessibility: Disabled friendly access to all public buildings, hospitals, modes of transports, polling stations etc.
      - » 4% reservation for disabled in higher education, government jobs, reservation in allocation of land, poverty alleviation schemes etc

- » **Right to Free Education:** Every child with benchmark disabilities will have right to free education between **6 and 18 years.**
- » **Higher penalties for discrimination against disabled**
  - The act stipulates upto 2 years of jail term and a maximum of Rs 5 lakh for discrimination against differently abled persons.
- » **Improved Institutional framework**
  - Central and State Advisory Boards on Disability are to be set up to serve as apex policy making bodies at the central and state levels.
  - Office of chief commissioner of Persons with Disabilities has been strengthened who will be assisted by 2 commissioners and an advisory committee comprising of not more than 11 members drawn from experts in various disabilities.
  - Similarly, Office of state commissioner of disabilities has been strengthened.
  - **Regulatory Body and Grievance Redressal agencies**
    - » Chief Commissioner of PwD and the state commissioners will act as regulatory bodies and grievance redressal agencies and also monitor implementation of act.
  - Provisions for District level committees to be constituted by state governments to address local concerns.
- » **Special Courts**
  - Special courts will be designated in each district to handle cases concerning violation of rights of PwDs.
  - » **Responsibilities has been caste on appropriate governments** to take effective measures to ensure that the persons with disabilities enjoy their rights equally with others

## B) SUGAMYA BHARAT CAMPAIGN (ACCESSIBLE INDIA CAMPAIGN)

- » It is a flagship campaign focused on enhancing accessibility, creating awareness and sensitization for creation of **universal barrier free** environment. This will enable persons with disabilities to gain access for equal opportunities and live independently and participate fully in all aspects of life in an inclusive society.
- » It was launched as an AIC on 3rd Dec 2015.
- » By Department for Empowerment of Persons with Disabilities (Divyangjan), Ministry of Social Justice and Empowerment
- » The campaign **targets 3 different verticals** for achieving this universal accessibility.
  1. **Built up Environment**
  2. **Transportation Ecosystem**
  3. **Information and Communication Eco-system**

## C) SUGAMYA BHARAT APP

- » It is helpful in crowdsourcing grievances of accessibility being faced on ground in infrastructure and services and forwarding for redressal.
- » It also is helpful in sensitization and awareness generations.

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#### D) SCHEME FOR IMPLEMENTATION OF PERSONS WITH DISABILITY ACT (SIPDA)

- It is a central sector umbrella scheme run by DEPwD for implementing various initiatives for socio-economic empowerment of PwDs.
- The scheme provides **financial assistance** for skill development, creation of barrier free environment, running some institutions in the field of other related activities related to implementation of the Act.
  - » For e.g. the scheme provides for ramps, rails, lift, toilets for wheelchair users etc in government buildings.

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#### E) DEENDAYAL DISABLED REHABILITATION SCHEME (DDRS)

- It provides financial assistance to NGOs for projects relating to rehabilitation of persons with disabilities.

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#### F) ANGANWADI PROTOCOL FOR DIVYANG CHILDREN

- **Why in news?**
  - » MoW&CD launches 'Anganwadi Protocol for Divyang Children' at National Outreach Program in New Delhi (Nov 2023)
- **Details**
  - » This protocol embodies a social model for Divyangjan Inclusive Care under the POSHAN Abhiyan, with a step-by-step approach:
    1. **Step-1:** Screening for early disability signs
    2. **Step-2:** inclusion of community events and empowering families
    3. **Step-3:** Referral support via ASHA/ANM & Rashtriya Bal Swasthya Karyakram (RBSK) teams.
  - » Through Divyang protocol, every district administration will be guided in addressing special needs for education and nutrition, providing **Swavlamban cards** for the empowerment of divyang children and their families.

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#### G) COUNTRY'S FIRST HIGH-TECH SPORTS TRAINING CENTRE FOR DIVYANGJAN INAUGURATED

- On 2nd Oct 2023, on the occasion of Mahatma Gandhi's birthday, PM Modi inaugurated the country's first high-tech sports training centre for Divyangjan, named after former PM Shri Atal Bihari Vajpayee.
- **Name:** Atal Bihari Vajpayee Training Centre for Disability Sports

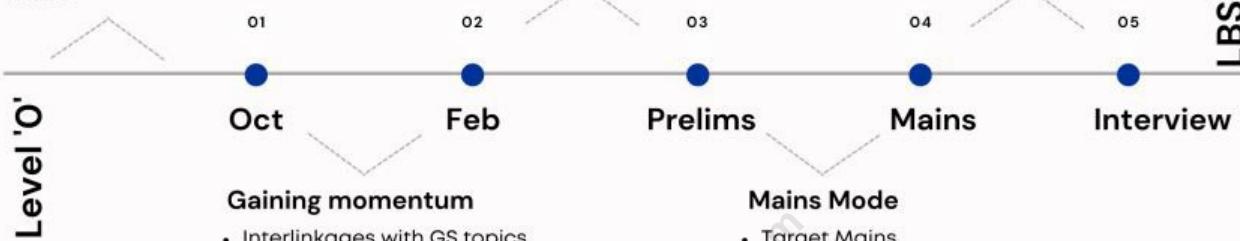
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