

TARGET PRELIMS 2024

BOOKLET-14; ENVIRONMENT-4

ENVIRONMENTAL POLLUTION-3

1. TABLE OF CONTENTS

1. Table of Contents	0
2. Air Related Current Updates	2
1) World Air Quality Report, 2023	2
2) Swatch Vayu Survekshan, 2023	2
3) Cloud Seeding	2
4) Coal Fired Power Plants.....	4
A) Flue Gas Desulfurization (FGD)	5
B) Circulating Fluidized Bed Combustion (CFBC)	6
C) Centre for Research on Energy and Clean Air	6
3. Nitrogen Pollution.....	6
A) UNEP's Colombo Declaration on Sustainable Nitrogen Management (Oct 2019)	7
4. Solid Waste.....	8
5) Treatment and Disposal of Solid Waste	8
A) Open Dumping, Landfills and Sanitary Landfills	8
B) Thermal Treatment	9
C) Biological Treatment Methods - Use of microorganisms	9
D) Biomining	10
6) Landfills in Delhi and Key Concerns	10
7) Landfill Fire – Causes	11
8) Solid Waste management Rules, 2016	11
5. Domestic Hazardous Waste	12
6. Plastic Pollution	13
A) Global Plastic Outlook: Policy Scenario to 2060	14
1) Microplastics	14
2) Single Use Plastics	14
3) harmful Impact of Plastic Pollution.....	15

4)	Plastic Waste Management Rules 2016 (and 2021 amendments)	16
5)	Plastic Waste Management Rules, 2021 and other changes	16
A)	The MoEF&CC has notified the guidelines on EPR for plastic packaging under Plastic Waste Management Rules, 2016, in the Gazette of India on 16th Feb 2022.	17
6)	Other Steps being taken	18
A)	International Efforts.....	19
B)	Global Plastic Treaty Negotiations:	19
7)	Promoting ALternate Use of Plastics	19
A)	Use of Plastic Waste in Steel Manufacturing (Dec 2022: Source: PIB).....	20
B)	Roads Made up of Plastic Waste.....	20
7.	E-Waste	20
1)	E-waste Management RULES, 2022 notified by MoEF&CC in Nov 2022	21
A)	Management of solar PV modules/cells has been added in Chapter V of the said rules.	22
8.	Battery Waste Management Rules, 2022	22
9.	Radioactive waste in Scrap	23
10.	Construction and Demolition Waste	23
11.	Biomedical Waste Management Rules, 2016	23
1)	Sequential Production of Bio-Diesel, Bio-Ethanol, Bio-Hydrogn, and Methane from Leather Solid Wastes, and effluent Treatment Sludges.....	24
12.	Some other technologies	25
1)	Hydrothermal Carbonization	25
13.	Noise Pollution	25
14.	Light Pollution	27
15.	Environmental Impact Assessment – EIA Rules Amended	28

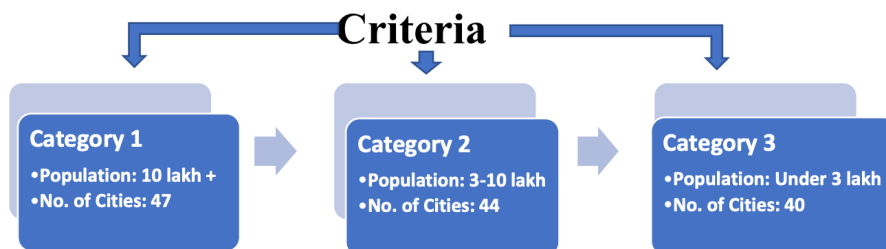
2. AIR RELATED CURRENT UPDATES

1) WORLD AIR QUALITY REPORT, 2023

- Published by a Swiss Air Purifier Company IQAIR.
- **Key Highlights** (March 2023)
 - » Delhi ranked 4th out of 50 of the world's most polluted cities in terms of PM 2.5 in 2022.
 - » India ranked 8th with a population weighted average of PM2.5 level of 53.3 micrograms/m3 in 2022.
 - » Chad, Iraq, Pakistan, Bahrain and Bangladesh are the most polluted countries in 2022.
- **Situation after Diwali 2023**
 - » The Day after Diwali (13h Nov 2023), Delhi was the most polluted city in the world with an AQI of 287.
- **Live Situation:** <https://www.iqair.com/in-en/world-air-quality-ranking>

2) SWATCH VAYU SURVEKSHAN, 2023

- "Swatch Vayu Survekshan" is an initiative by MoEF&CC to rank cities on the basis of implementation of activities approved under city action plan and air quality in 131 NCAP cities.
- **Objectives:**
 - **Create Awareness; Inform citizens** about the health impacts related due to exposure; comparing air quality conditions at different locations/cities; to achieve the goal of NCAP "Clean Air for All".



- All 131 cities covered under NCAP are assessed based on ranking framework submitted by cities/ULBs on PRANA portal (Dashboard to capture progress of NCAP program).
- **Air Quality** is improving on the basis of **PM10** data.

AIR QUALITY	2019-20	2020-21	2021-22	2022-23	2023-24
▫ Reduction in annual PM10 levels vis a vis base year 2017	Improvement in 85 cities	Improvement in 102 cities	Improvement in 95 cities	Improvement in 90 cities	Calculated on Financial Year basis so the data is awaited

3) CLOUD SEEDING

- **Understanding Cloud Seeding:**
 - » **How clouds are formed naturally?**

- Clouds are made up of tiny water droplets or ice crystals that form when water vapor in the atmosphere cools and condenses around a tiny particle of dust or salt floating in the atmosphere. Without these tiny particles raindrops or snow flakes can't form and precipitation will not occur.

» **What is cloud seeding?**

- It is a weather modification technique aimed at **enhancing precipitation from clouds**. The idea of cloud seeding was first conceived during WW-II and has since then become a much practiced activity in different dry regions of the world.

» **How does it work?**

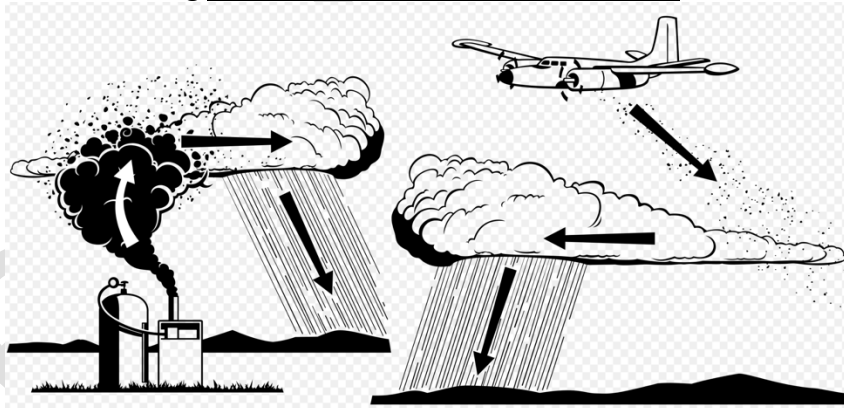
- In cloud seeding, clouds are injected with salts like silver iodide, potassium iodide, or sodium chloride which act as seed. These salts provide additional nuclei around which more cloud droplets would form.

» There are **two principal cloud seeding techniques**:

- Hygroscopic Cloud Seeding:** It aims at speeding up droplet coalescence in liquid clouds, leading to production of large droplets that start to precipitate. Here seeding material is generally large salt particles.
- Glaciogenic Cloud Seeding:** In this method the idea is to trigger ice production in supercooled clouds, leading to precipitation. It is usually done by dispersing efficient ice nuclei, such as **silver iodide** particles or **dry ice** (solid carbondioxide) into the cloud, causing heterogeneous ice nucleation.

» **How is cloud seeding done?**

- It is done using **ground based generators or aircraft**.



» **What are the conditions required for cloud seeding to be done?**

- **Moisture laden clouds:** Cloud seeding can only happen if there is sufficient cloud and sufficient depth of cloud.
- **Wind speed below a certain level**
- **Temperature** - cloud should be cold enough to contain supercooled liquid water

- **Application/advantages**

- » **Fighting water scarcity:** Rainfall in drought prone areas.
- » **Increasing winter snowfall** - which can supplement the natural water supply for communities in the surrounding area.

- » It can also be done to **prevent hailstorm**, dissipate fog etc.
 - » **Increasing hydro power generation** (for e.g. in Tasmania, Australia)
 - » **Fighting air pollution and Water pollution**
 - Rainfall can wash off pollution from air
 - More rainfall can also ensure ecological flow in rivers leading to reduced scope of pollution.
 - » **Controlling forest fires**
 - » **Atmospheric studies** - Studying cloud seeding can help scientists understand how normal cloud formation would occur.
- **Could cloud seeding be used to fight air pollution in Delhi?**
 - » In India, cloud seeding hasn't been tried for fighting pollution.
 - **China** has tried this option.
 - » In winters, cloud from over Delhi due to Western Disturbances and thus some experts suggested cloud seeding for rainfall to occur.
 - **Has Cloud seeding been done before in India, and has it been successful?**
 - » It has been attempted in Monsoon, in places such as Karnataka, Maharashtra, and Tamil Nadu.
 - » A recent experiment, the fourth phase of the **Cloud Aerosol Interaction and Precipitation Enhancement Experiment (CAIPEEX-IV)** that took place in monsoon seasons of 2018 and 2019. It was conducted in drought-prone Solapur in Maharashtra. It pointed to **relative enhancement of 18% in rainfall**.
 - The approx. cost of producing water through this method was 18 paisa per litre, the cost will drop by more than 50% if we use indigenous seeding aircraft.

4) COAL FIRED POWER PLANTS

- **Why in news?**
 - » Only 5% of India's coal-based thermal power capacity meets SO₂ emission norms: CSE report (June 2023)
- **Introduction:**
 - » Coal is the most important and abundant fossil fuel in India. It accounts for 55% of India's energy needs. Infact, India's industrial heritage was built upon Indigenous coal.
- **Environmental Impacts of Coal Based Thermal Power Plants:**
 - » **Air Pollution:** Burning of coal produces air pollutants like NO₂, SO₂, CO, PM, Mercury etc. which are primary air pollutants in the world.
 - » **Acid Rain:** Pollutants like **NO₂, SO₂ etc.** are primary contributor of Acid rain. It can harm forests, aquatic ecosystems, and buildings and it can also lead to soil and water acidification.
 - » **Climate Change due to global warming**
 - » **Excessive water Extraction:** Coal based thermal power plants require huge quantities of water which is often drawn from nearly rivers, lakes, or groundwater sources.
 - » **Water Pollution:** Leakage of **heavy metals and acids** from the exposed coal seams may cause water pollution. They can leach into the groundwater and nearby waterbodies, posing risks to

drinking water source and health of aquatic ecosystem. In addition, the release of warm water from the thermal power plant also causes **thermal pollution**.

» **Other issues created by mining of coals**

- **Emission Norms:**

- » The MoEF&CC had notified the emission norms for coal-based power plants in Dec 2015.
- » In 2021, **MoEF&CC divided the power plants on the basis of distance from polluted cities** to enforce deadlines and extended the **deadlines**.
 - i. **Category A** - coal based power plants within 10 kms radius of NCR and of cities with million+ population. (deadline changed from 31st Dec 2022 to 31st Dec 2024)
 - ii. **Category B** - power plants within 10 kms radius of critically polluted areas or non-attainment cities. (deadline changed from 31st Dec 2023 to 31st Dec 2025)
 - iii. **Category C** - remaining plants throughout the country. (deadline changed from 31st Dec 2024 to 31st Dec 2026)
 - This has the longest deadline and most of the country's coal based power plants fall in this category.
- » Even after **multiple extension**, only 5% of the coal fired power plants have installed FGD (Flu Gas Desulfurization) systems, which are air pollution control devices for SO₂ emissions (June 2023 : CSE Analysis)
- » Similarly, another analysis by the Centre for Research on Energy and Clean Air (CREA) has found less than 8% of India's coal based power plants have installed the SO₂ emission reduction technology recommended by MoEF&CC (Dec 2023)

- **Problems caused by Coal Based power plants**

- » **Older technology** -> Larger emissions of CO, NO_x, SO_x, Ozone etc.
- » **Lesser Fly ash Utilization** due to weak fly ash guidelines and poor implementations.
- » **Difficulty** in achieving the **Paris Agreement Targets**.

- **Why moving away from coal based power plants may be difficult?**

- » Very large dependency -> 75% of India's annual power output.
- » **Phasing in renewable energy sources and phasing out conventional sources rapidly** may lead to instability in the electricity grid which may potentially cause blackout.
- » **Political Economy Risk:** Aggressive early retirement of coal based capacity, without detailed analyses, could result in real or perceived electricity shortage in some states.

A) FLUE GAS DESULFURIZATION (FGD)

- FGD is a set of technologies that remove SO₂ from exhaust flu gases of fossil fuel power plants, and from the emissions of other sulfur dioxide emitting processes such as waste incineration, petroleum refineries, cement and lime kilns.
- FGD systems use a scrubbing solution to absorb SO₂.
 - » The most common type of FGD is wet scrubber which uses a limestone slurry or seawater to absorb SO₂.
 - The SO₂ reacts with the scrubbing solution to form sulfate particles which can then be removed.
 - The removal efficiency is upto 99%.

- » **Drug scrubbers** can also be used. It uses sorbent such as sodium bicarbonate or calcium oxide to absorb SO₂,
- » **Regenerative scrubbers**, use a chemical solvent to absorb SO₂ and then regenerate the solvent for reuse.

B) CIRCULATING FLUIDIZED BED COMBUSTION (CFBC)

- **CFBC** is a type of combustion technology used in thermal power plants to increase the efficiency of combustion and reduce emissions.
- It works by suspending a bed of inert particles (like sand or limestone) in a stream of air, creating a fluid like state. Fuel is injected in the bed and burned, with the heat transferred to the particles and then to a heat exchanger to produce steam or hot water.

C) CENTRE FOR RESEARCH ON ENERGY AND CLEAN AIR

- It is an independent organization focused on revealing trends, causes, and health impacts as well as the solutions to air pollution.
- It uses scientific data, research and evidence to support the efforts of government, companies and campaigning organizations worldwide in their efforts to move towards clean energy.
- It is **registered in Finland** with staff across Asia and Europe.
- It is funded by philanthropic grants and revenue from commissioned research

3. NITROGEN POLLUTION

- Introduction

- » While nitrogen is the dominant gas in the atmosphere, it is inert and doesn't react. However, when it is released as part of compounds from agriculture, sewage and biological waste, nitrogen is considered 'reactive' and may be polluting and causing greenhouse effect.
- » The release of these reactive nitrogen compounds in the atmosphere have increased over the years because of increased use of **fertilizers for agriculture** and increased **industrial pollution**. NO_x emissions grew at 52% from 1991 to 2001 and 69% from 2001-2011.
- » In fact, a study in 2017 showed that we have **breached the planetary boundary of N (Nitrogen)**. This planetary boundary is set at 44 Tg (Tera-grams) per year globally. But currently we use 150 Tg N per year, primarily through fertilizer usage.

» Key Forms of Nitrogen

N₂ - Un-reactive di-nitrogen; forms 78% of the air we breathe

N_x - Reactive nitrogen; fixed in soil by microbes; reacts to form different compounds with various impacts

NH₃ - Ammonia; used for making fertilisers; can escape into the air as a pollutant

NH₄NO₃ - Ammonium nitrate, acts as fertiliser; when synthesised in

the atmosphere, contributes to particulate matter, water pollution and results in eutrophication

N₂O - Nitrous oxide, a greenhouse gas; depletes ozone layer

NO_x - Mixture of NO and NO₂; a major air pollutant

NO₃ - Nitrate; the form in which nitrogen gets fixed in soil; can pollute water sources; forms ozone, which adds to particulate matter load

- » **More Details about N₂O**: It is a greenhouse gas 300 times more potent than CO₂. It has the third highest concentration - after CO₂ and methane - in our atmosphere among greenhouse gases. It can live in our atmosphere for upto 125 years.

- **2020 Study about N₂O published in Nature:**
 - » **Human emission** of N₂O increased 30% in 36 years.
 - » 43% of the total emissions came from human sources.
 - » The increase means that climate burden from non-carbon sources is also increasing.
 - » Dichotomy between Climate Crisis and Food Security - Major proportion of the N₂O emissions in the last four decades came from the agricultural sector, mainly because of the use of nitrogen-based fertilizers.
 - » **Most of the emission** have come from **developing countries** like China, India and Brazil.
- **Key causes of Nitrogen Pollution**
 - » **Emission from chemical fertilizer –**
 - About 50% of the nitrogen used in global agri sector is released in environment (atmosphere, water bodies etc.).
 - Most important source.
 - Difficult to control (non-point source, food security concerns etc.)
 - » **Sewage and organic solid wastes** (second largest source):
 - » **Burning of fossil fuels:** Vehicular pollution, mostly from road transport is another major NO_x producer.
 - » **Industries**
- **Key threats due to nitrogen pollution**
 - **Air Pollution:** Emissions of Ammonia, nitrogen oxide and nitrous oxide contribute to **particulate matter and acid rain.** These cause respiratory problems and cancers for people and damage to forests and buildings.
 - **Water Pollution - Eutrophication**
 - **Negatively hampers soil health** -> brings down the yield of agri-land.
 - **Climate Change:** Nitrous Oxide (N₂O) -> GWP: 300 times of CO₂; Also contributes to Ozone depletion.
 - **Negative impact on Health, economy and livelihood**
 - Deteriorating soil quality impacts Agri output and livelihood. Further, particulate matter and acid rains have adverse impact on health.

A) UNEP'S COLOMBO DECLARATION ON SUSTAINABLE NITROGEN MANAGEMENT (OCT 2019)

- Sri Lanka, with support from the UNEP, convened an event at which member states came together to adopt what is called the "**Colombo Declaration**".
- **Key Highlights**
 - Halve nitrogen waste by 2030.
 - The member countries also endorsed UN's plan for a sustainable nitrogen management called "**Nitrogen for Life**", which stems from the Sustainable Nitrogen Management Resolution which was adopted during the fourth session of the UN environment Assembly held from 11-15th March 2019, at the UNEP headquarter in Nairobi.
- **Analysis**

- This is the first-time governments have agreed to work together on a major quantitative global goal for improved nitrogen management.

4. SOLID WASTE

- **Introduction**
 - » Solid waste is the unwanted or useless solid materials generated from human activities in residential, industrial or commercial areas.
- Solid waste may be **categorized in three ways**:
 - » **Origin** (domestic, industrial, commercial, construction or institutional)
 - » **Contents** (organic material, glass, metal, plastic, paper, hazardous chemical)
 - » **Hazard Potential** (toxic, non-toxin, flammable, radioactive, infectious)
- As per **Indiawaterportal.org** the total MSW generated in urban India has been estimated at **68.8 million tons per year (TPY).**
 - » This is expected to go to 165 million tonnes by 2030.
- But the Solid waste collection efficiency in India is around 70% at present, while it is 100% in many developed countries.
- Therefore, around 30% of MSW is not collected and thus lies littered around in Indian cities. Even the waste which is collected is not treated and thus is highly hazardous.
- **Problems of unscientific MSW disposal** -> Untreated, unprocessed and indiscriminately dumped waste causes air, water and soil pollution which have adverse impact on health situation. Further, this type of dumping goes against the **4Rs** principle of environment Protection.
- **Factors for increasing Solid Waste in India**
 - **Population, Urbanization, Increasing Per-Capita Income**
 - Increased Consumerism, Use and throw culture.
 - **Plastic waste** -> non availability of good alternative
 - **Technology change** -> Increasing electronic waste.
 - **COVID-19** also led to shooting up of domestic hazardous waste.
- **Proper Solid waste management**
 - SWM reduces or eliminates the adverse impact on the environment & human health. It includes a number of processes including **segregation, collection and treatment and disposal in an environmentally sound manner.**
 - The local authorities are responsible for the development of infrastructure for collection, storage, segregation, transportation, processing and disposal of MSW

5) TREATMENT AND DISPOSAL OF SOLID WASTE

A) OPEN DUMPING, LANDFILLS AND SANITARY LANDFILLS

- **Advantage:** Waste limited to well defined area; Reduces contact between waste and environment.
- **Disadvantages** - Open dumps get exposed to natural elements, stray animals and birds and may cause air pollution, water pollution and soil pollution.

B) THERMAL TREATMENT

- **Incineration plants (Waste to Energy Method)**
 - Incineration is combustion of waste in the presence of oxygen. Waste gets converted in CO₂, Water Vapor and Ash along with heat.
 - **Advantages** - reduction in volume; kills many diseases causing germs.
 - **Limitations** - Air pollution -> Health issues; Climate Change
- **Pyrolysis**
 - Here material is exposed to **very high temperatures** in an **inert (oxygen less) environment**. The material decomposes due to the limited thermal stability of chemical bonds of material, which disintegrates.
 - Pyrolysis is thus a **thermo-chemical** treatment, which can be applied to any organic (carbon-based) product. It produces volatile products and leaves a solid residue enriched in carbon, char.
- **Plasma Arc Gasification (PAG) process**
 - It is a waste treatment technology that uses a **combination of electricity and high temperature** to turn municipal waste (garbage or trash) into **usable by-products without combustion**.
 - » It **shouldn't be confused with incineration**. This technology doesn't combust the waste as happens in incinerators. It converts the organic waste into gas that contains all its chemical and heat energy and converts the inorganic waste into an inert vitrified glass called slag.
 - » This process reduces the volume of waste reaching the landfills and also generate electricity.

C) BIOLOGICAL TREATMENT METHODS - USE OF MICROORGANISMS

- **Bio-Gasification**
 - » It is a waste-to-Energy technique where biological decomposition of organic matter of biological origin under un-aerobic condition is done to produce **methane** and other secondary gases.
- **Composting**
 - » In this process, the **organic waste is converted into compost through decomposition**. Compost is rich in nutrients and can be used as soil conditioner, a fertilizer, addition of vital humus and humic acids and as a natural pesticide in soil.
 - » It can also be used for erosion control, land and sea reclamation, wetland construction, and as landfill cover.

- **Vermiculture/Vermicomposting:** It is the process of making compost through decomposition process. But here, decomposition is done by using various species of worms, usually red wigglers, white worms, and other earthworms.
- **Bioremediation**
 - » It involves use of bio-culture or microorganisms to degrade organic waste and contaminants that pose environmental and human risks. Here the environment is altered to stimulate the growth of micro-organisms and degrade pollutants. The organic waste is eventually converted into soil.
 - » **Various approaches** - Biostimulation; Bioaugmentation; a combination of both etc.

D) BIOMINING

- Biomining involves use of separator machines or large sieves to separate waste material of different sizes, thereby obtaining soil, plastic, wood and metal components in isolation for appropriate processing.

6) LANDFILLS IN DELHI AND KEY CONCERNS

- **Why in news?**
 - » Our target is to clear all three landfill sites in Delhi by December 2024: CM Kejriwal (March 2023)
- Chronic negligence of sustainable and scientific treatment has resulted in an ever-growing mass of municipal solid waste (MSW) making its way into dumpsites in India.
- There are **three main landfills** in Delhi - **Bhalswa** in north, **Ghazipur** in east and **Okhla** in south with total estimated waste of 20 million tonnes (as of Oct 2022)
 - » Note: In 2019, the total legacy waste at these three sites totaled to 28 million tonnes.
- **Present Situation of Landfills:**
 - » **Bhalswa** (36 acres): **8 million tonnes**.
 - » **Gazipur** (70 acres): **14 million tonnes**
 - » **Okhla** (46 acres): Currently the site contains around 4 million tonnes of legacy waste. In last few years, around 2.5 lakh tonnes have been removed from it. (at its peak it contained around 6.5 million tonnes of waste)
- **Harmful Impacts of landfills:**
 - » **Ground Water and River Water** Pollution: Leachate from these landfills are not only contaminating ground water but are also reaching Yamuna River.
 - » **Other concerns due to landfills** -> Air Pollution (methane); Odour Pollution; Wastage of Resources; breeding ground for diseases.
 - » **Prolonged exposure** to compounds such as **dioxins** which are carcinogenic.

Dioxin:

Dioxins are a group of chemically-related compounds that are persistent environmental pollutants. They are found throughout the world in environment and they accumulate in the food chain, mainly in the fatty tissue of animals.

More than 90% of human exposure is through food, mainly meat and dairy products, fish, and shellfish. Many national authorities have programs in place to monitor the food supply.

They are highly toxic and can cause reproductive and developmental problems, damage the immune system, interfere with hormones and also cause cancer.

Due to omnipresence of dioxins, all people have background exposure, which is not expected to affect human health. However, due to the highly toxic potential, efforts need to be undertaken to reduce current background exposure.

Prevention or reduction of human exposure is best done via source-directed measures, i.e., strict control of industrial processes to reduce the formation of dioxins.

- **Ecological Loss:** A study conducted by experts from the NEERI, CPCB and IIT Delhi assessed that ecological damage due to these three landfill sites is 450 crore rupees per annum.

7) LANDFILL FIRE – CAUSES

Methane Gas; Sabotage; collection of scrap metals; difficult to extinguish.

8) SOLID WASTE MANAGEMENT RULES, 2016

- In 2016, The Environment ministry had revised the solid waste management rules after 16 years.
- **Salient Features**
 - » **Extended Beyond Municipal Areas** - Covers urban agglomerations, census towns, notified townships, areas under control of railways, airports, airbases, port and harbour, SEZ etc.
 - » **Source Segregation** of waste has been mandated to channelize the waste to wealth by recovery, reuse, and recycle.
 - Waste generators have to segregate the waste in **three streams** - Wet (biodegradable; Dry (plastic, paper, glass, metal etc.) and Domestic Hazard wastes (diapers, napkins, empty containers etc.)
 - They should handover the waste to authorized rag pickers or waste collector or local bodies.
 - **Street vendors** to keep separate containers for separate wastes.
 - **Sanitary napkins and diapers** manufacturers or brand owners explore the possibility of using recyclable material in the product and shall provide a **pouch or wrapper** for disposal of each napkin or diapers along with packet of their sanitary products.
 - Educate masses in wrapping and disposal of their products.

- » The rules emphasized on integration of waste pickers/ rag pickers and waste dealers in the formal system by state governments, SHGs or any other group to be formed.
- » **Ban on open throwing burning or burying; Provisions for User Fee** for waste collectors and 'Spot Fine' for Littering and non-segregation.
- » **Provisions for Bulk and institutional generators** -> directly responsible for segregation and sorting the waste and manage in partnership with local bodies.
- » **The developers of SEZs, Industrial estate, industrial parks etc.** to earmark 5% of the total area of the plot or minimum 5 plots/sheds for recovery and recycling facility.
- » **All manufacturers of disposable products such as tin, glass, plastics packaging etc. or brand owners who introduce such products** in the market should provide necessary financial assistance to local authorities for the establishment of waste management system.
- » **The Biodegradable waste** -> processed through composting, bio-methanation etc.
- » **Promoting Waste to Energy**
 - Industrial units within 100 km of Solid waste RDF plants should get at least 5% of their fuel from them.
 - Non-recyclable waste with high calorific value (1500 K/cal/kg or more) should not be disposed of and should only be utilized for refuse-derived fuel or by giving away the feedstock for preparing refused derived fuel.
 - **High calorific wastes** shall be used for co-processing in cement or thermal power plants.

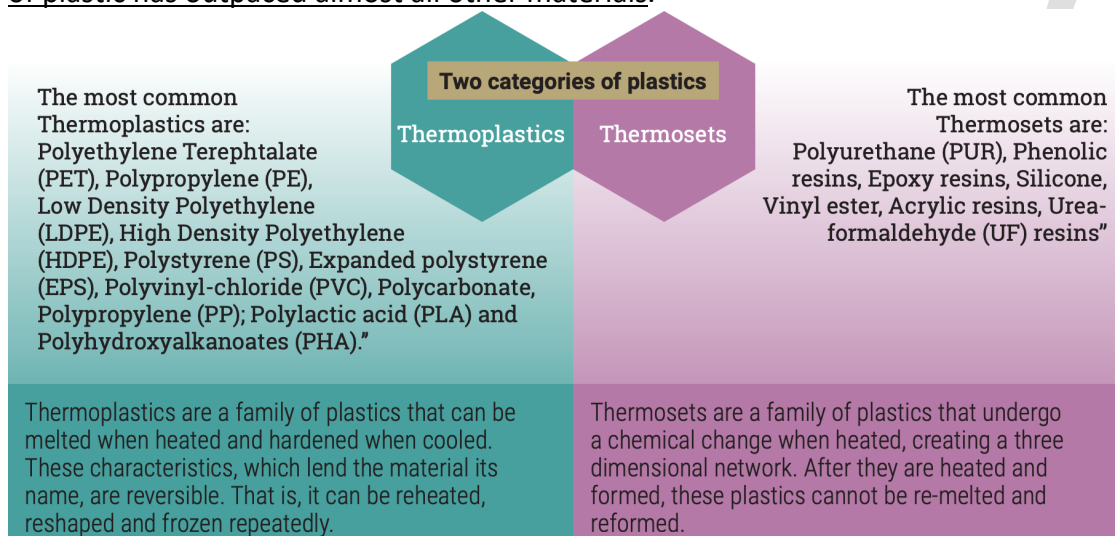
5. DOMESTIC HAZARDOUS WASTE

- **Details**
 - **A lot of harmful chemicals are used for domestic purposes**
 - » Chemicals to sanitize houses.
 - » Power bulbs, CFLs, Tube lights
 - » Medicines, ointments etc.
 - Caution is not applied while they are thrown in garbage.
 - **Current Concerns:**
 - » India hasn't estimated how much domestic hazardous waste do we generate.
 - » Traces of toxic waste can be found in most landfills.
 - » Absence of robust framework and infrastructure
 - » Segregation of domestic hazardous waste remains a distant dream for most cities.
- **Indore Municipal Corporation has shown the way:**
 - It has introduced a 3-way source segregation in 2018-19: **Wet, Dry and Domestic Hazardous.** Later, it has asked its residents to follow a five-way source segregation (wet, dry, hazardous, e-waste, and sanitary) to improve the purity levels of waste that can be recycled.
 - In Jan 2021, they added plastic waste as the sixth category.
 - The municipal corporation has taken an authorization of sending 1,000 tonnes of domestic hazardous waste to a treatment facility every year.

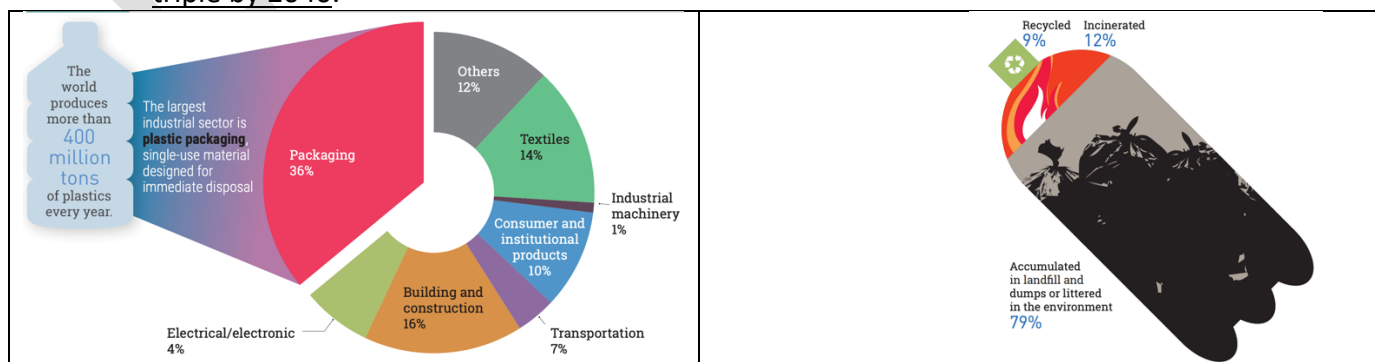
- **Bhopal has brought similar initiatives** and is making citizens segregate wastes into 4 categories (wet, dry, hazardous and sanitary)

6. PLASTIC POLLUTION

- Plastic is a lightweight, hygienic and resistant material which can be molded in wide range of applications and is cheaply manufactured. Because of these reasons, since the 1950s, the production of plastic has outpaced almost all other materials.



- **Negative Impact on Humans:** A study published by **World Wildlife Foundation** in 2019 estimates that an **average human may be ingesting as much as 5 gram of plastic every week**. This is because almost 1/3rd of the plastic waste that is getting generated ends up in nature, especially water, which is the largest source of plastic ingestion.
- **Extent of Plastic Pollution:**
 - » Globally, plastic production stands at about 400 million tonnes, and could double by 2040.
 - » **Global Plastic Production by Industrial Sector, 2015**
- **How is plastic disposed off?**
 - According to the UNEP, as of 2015, of the 9 billion tonnes of Plastic that the world has ever produced, only 9% has been recycled and 12% has been incinerated, the balance 79% has accumulated in landfills or in the natural environment. About 11 million tonnes of plastic is dumped into the ocean each year, and this figure is projected to double by 2030 and nearly triple by 2040.



- » **India** produces around **10 million tonnes of plastic** per year of which **around 5 million tonnes** is rendered waste every year. Therefore, it's crucial that this waste is properly managed.

A) GLOBAL PLASTIC OUTLOOK: POLICY SCENARIO TO 2060

- Recently released by OECD
- It is 2nd of the two reports, and provides a set of coherent projections on plastics to 2060, including plastic use and waste as well as the environmental impacts.
- **Key Projections:**
 - Tripling of the use of plastic and plastic waste by 2060
 - Largest increase will come from emerging economies in Africa and Asia
 - This is expected to double GHG emission, ozone depletion, acidification and human toxicity.

1) MICROPLASTICS

- Plastic never truly biodegrade, but simply breaks up into smaller and smaller pieces. These tiny fragments are called **micro** (1 micro meter - 5 micro meter) and **nano** (less than 1 micro meter) plastics.
- The world sea floor is littered with an estimated 14 million tonnes of microplastics. They contribute to about 80% of the ocean debris. As per the UNEP, in the last four decades, the concentration of microplastics is supposed to have increased drastically in the sea surface water.
- **Microplastics** are divided into **two categories**:
 - i. **Primary Microplastics**: They enter the environment directly as tiny particles. They may be tiny particles designed for industrial use or microfibers shed from clothing and other textiles like fishing nets. Example of microplastics include micro beads found in personal care products, plastic pellets used in industrial manufacturing, and plastic fibers used in synthetic textiles.
 - ii. **Secondary Microplastics** form from the breakdown of larger plastics such as water bottles. This happens when larger plastics undergo weathering through exposure to sea waves, UV rays of sun, wind abrasion etc.
- **Impact of Microplastics**
 - **Introduction in food chain**
 - They can also alter the functioning of important habitats, impact hatching, growth rates and food consumption of multiple different animals and cause mass death in coral species.
 - A study in March 2022, found micro-plastics in nearly 80% of the individual blood samples.
 - In **June 2022**, for the first time microplastics have been found in freshly fallen snow in Antarctica. Samples from 19 sites showed that all of them contained micro-plastics.
 - **Nano plastics** can cross over cellular membranes into the brain, where it can cause Behavioural and neurological problems.

2) SINGLE USE PLASTICS

- **What is Single use plastic?**

- » Single use plastics (SUP) are disposable plastics intended to be used only once before they are thrown away or recycled.
 - They include grocery bags, food packaging, bottles, straws, containers, cups and cutlery.
 - These are the waste products of a **throwaway culture** that treats plastic as disposable material rather than a valuable resource to be harnessed.
- Plastic Waste Management Amendment Rules 2021 defined SUP as "a plastic commodity intended to be used once for the same purpose before being disposed of or recycled".
 - » The rules also provides for phasing out of single use plastics.
- **Ban on several forms of Single Use Plastics from July 1, 2022:**
 - » As per the Plastic Waste Management Rules, 2016, there is a complete ban on sachets using plastic material used for storing, packing, or selling **Gutkha, tobacco and Pan Masala**.
 - » As per the PWM (Amended) Rules, 2021:
 - Carry bags made up of virgin or recycled materials and of less than 75 microns is banned wef 30th Sep 2021.
 - Import, stocking, manufacture, distribution, sale **and** use of the following identified SUP items, which have low utility and high littering potential is banned **from 1st July 2022**.
 - ear buds with plastic sticks, plastic sticks for balloons, plastic flags, candy sticks, ice- cream sticks, polystyrene [Thermocol] for decoration.
 - plates, cups, glasses, cutlery such as forks, spoons, knives, straw, trays, wrapping or packing films around sweet boxes, invitation cards, and cigarette packets, plastic or PVC banners less than 100 microns, stirrers.
 - » **Why ban these items?**
 - "difficulty of collection and therefore recycling".

3) HARMFUL IMPACT OF PLASTIC POLLUTION

- **Physical Pollution:** Pieces of plastics, the polymers themselves, interact with bodies and ecosystems.
- **Chemical Pollution:** Added chemicals escape plastics and interact with bodies and ecosystems;
 - A number of chemicals used in the plastic are toxic and problematic. These chemicals, in lab settings, have been shown to be associated with infertility, recurrent miscarriages, feminization of male fetuses, early onset of puberty, **cancer** etc.
- **Environmental Impacts:** Plastics take upto thousands of year to decompose and thus contaminate soil and water.
- **Plastisphere:** Sometimes called the 'Plastisphere', **bacteria, viruses and other life colonize the surface of plastic waste**, creating distinct communities and population structure.
 - They may also contribute in growth of **invasive species**. For e.g., more than 80% of invasive species in the Mediterranean may have arrived on floating plastic waste.
- **Health and Social Impact:** Health losses, welfare losses -> unusable parks, Sewage Blocking -> Malaria, Dengue etc.
- **Economic Impact**
 - **Visual pollution** negatively impacts the tourism sector.
 - Further, **future cost** of removing these plastics from nature is higher than the cost of preventing the littering today.
- **Exacerbate disasters like floods** - an important cause of urban floods.

- **Even the biodegradable plastics** have many **unintended consequences**.
- **Exacerbates Climate Change:** Plastics are 80% carbon and more than 99% of plastics use crude oil, fossil gas or coal as feedstock. Manufacturing also involves burning of large quantities of fossil fuels to provide high energy demands of the industrial processes.
 - By 2015, the total estimated lifecycle emissions from plastics were **1.78 billion tonnes** of CO2 equivalent (GtCO2e). For context, if the whole plastics lifecycle were a country, it would be fifth largest emitter of greenhouse gases in the world.

4) PLASTIC WASTE MANAGEMENT RULES 2016 (AND 2021 AMENDMENTS)

- **Key Provisions of the 2016 Rules**
 - **Min thickness** of plastic carry bags has been increased to 75 microns by 30th Sep 2021 and **120 microns by 31st Dec 2022** (after the 2021 amendment to the rules)
 - **Expand the coverage to rural areas.** The earlier regulations only covered urban municipal areas.
 - **Phasing out of non-reusable Multi-layered Plastic.**
 - **Introduces Extended Producer Responsibility** for producers and generators of Plastic Waste
 - **Note:** India first introduced EPR to manage electronic-waste in 2012.
 - EPR was extended to Plastic manufacturers after the notification PWMR, 2016.
 - **Shopkeepers and Vendors** can only use plastic carry bags which have been properly labelled and marked for use or else there will be imposition of fines.
 - **ULB and Panchayats** have been provided with the responsibility of establishing and operating waste management systems.
 - The **Land Department** (or any department with business allocation of land allotment with state governments) should allocate land for establishing waste management facilities.
 - **Gainful usage of Plastic waste** has also been promoted in road construction, waste to oil conversion etc

5) PLASTIC WASTE MANAGEMENT RULES, 2021 AND OTHER CHANGES

- **Key provisions of 2021 amendment rules:**
 - The **min thickness of plastic carry bags** has been increased from 50 microns to **75 microns from 30th Sep 2021** and to **120 microns** with effect from the 31st Dec 2022.
 - **Note:** Advantage of increased thickness - Higher cost -> more reuse; less mobile -> less pollution; less chances of being consumed by stray animals.
 - The manufacture, import stocking, distribution, sale and use of following single-use plastic, including polystyrene and expanded polystyrene, commodities shall be prohibited with effect from 1st July 2022.
 1. Ear buds with plastic sticks, plastic sticks for balloons, plastic flags, candy sticks, ice-cream sticks, polystyrene [Thermocol] for decoration;
 2. Plates, cups, glasses, cutlery such as forks, spoons, knives, straw, trays, wrapping or packing films around sweet boxes, invitation cards, and cigarette packets, plastic or PVC banners less than 100 micron, stirrers.

Note: It doesn't cover compostable plastic.

Note: The CPCB and the SPCBs have issued notification asking manufacturers, suppliers and consumers of single use plastic items to scrap and phase them out and switch to greener and sustainable alternatives.

- **Plastic Packaging Waste**, which is not covered under the phase out of identified single use plastic items, shall be collected and managed in an environmentally sustainable way through the **EPR** of producer, importer and Brand Owner (PIBO), as per the Plastic Waste Management Rules, 2016.
 - For effective implementation of EPR, the Guidelines for EPR being brought out have been given legal force through the Plastic Waste Management Rules, 2021.

A) THE MOEF&CC HAS NOTIFIED THE GUIDELINES ON EPR FOR PLASTIC PACKAGING UNDER PLASTIC WASTE MANAGEMENT RULES, 2016, IN THE GAZETTE OF INDIA ON 16TH FEB 2022.

- **Key Highlights of the guidelines:**
 - It **promotes development of new alternatives** to plastics and **provide further next steps for moving towards sustainable plastic packaging by businesses**.
- **Obligated entities that fall under the category of EPR (Producer of Plastic Packaging; Importer of all imported packaging, Brand Owners including online platforms, Plastic Waste Processors)** have to get **registered in the centralized portal developed by CPCB**.
- **The amendment categorizes SUPs in 4 categories:**
 - Category 1:** Rigid plastic packaging.
 - Category 2:** **Flexible plastic packaging with single layer or multilayer** (more than 1 layer of plastic), plastic sheets, covers made of plastic sheets, carry bags, plastic sachets, or pouches.
 - Category 3:** Multi-layered plastic packaging where at least one layer is non-plastic, such as tetra pack cartons etc.
 - Category 4:** Plastic Sheet or like used for packaging as well as carry bags made of Compostable Plastics
- The **targets for minimum level of recycling** (excluding end of life disposal) as per Guidelines, are given below:

Plastic Packaging Category	2024-25	2025-26	2026-27	2027-28 onwards
Category I	50	60	70	80
Category II	30	40	50	60
Category III	30	40	50	60
Category IV	50	60	70	80

- **Environmental Compensation** shall be levied based upon polluter pay principle, with respect to non-fulfilment of EPR targets by Producers, Importers & Brand Owners, for the purpose of protecting and improving the quality of the environment and preventing, controlling, and abating environmental pollution.
- **Implementation of EPR** will be done through a **Customized Online Platform** which would act as the **Digital backbone of the system**.
 - It will allow tracking and monitoring of EPR obligations and will reduce the compliance burden for companies through online registration and filing of annual returns.

- Producers, Importers and brand-owners shall have to provide the details of recycling certificates only from registered recyclers along with detailed quantity sent for end-of-life disposal, by June 30, 2022 of next financial year while filing annual return on online portal.
- **Sale and Purchase of surplus EPR certificates are allowed** -> this has thus set up **market mechanisms** for plastic waste management.
- **Levy of environmental compensation** based upon polluter pay principle, with respect to non-fulfilment of EPR targets by the producers, importers & brand owners. The funds collected shall be utilized for collection, recycling, and end of life disposal of uncollected plastic waste in an environmentally sound manner.
 - **CPCB** shall charge compensation on default producers, importers & brand-owners that operate in more than two states.
 - **SPCB** shall levy compensation on the default producers operating within their jurisdiction.
- Producers, importers, & brand owners, may operate schemes such as deposit refund system or buy back or any other model.
- CPCB shall **constitute a committee under chairpersonship of Chairman, CPCB** that shall be responsible for recommending measures to MoEF&CC for the effective implementation of EPR that shall included amendments to the EPR guidelines.

6) OTHER STEPS BEING TAKEN

- Strengthening of waste management infrastructure through the **Swatch Bharat Mission**.
- **Promotion of Alternatives:**
 - CPCB has already issued one-time certificate to around 200 manufacturers of **compostable plastics**.
 - India Plastic Challenge - Hackathon 2021 is launched to develop innovative alternatives to SUP.
 - It calls upon start ups/ entrepreneurs and students of HEIs to develop innovative solutions to mitigate plastic pollution and develop alternative to single use plastic.
- **Strengthening of Institutional Framework at State/National level** to better implement 2016 rules:
 - States/Uts have been asked to develop a comprehensive action plan for elimination of SUP.
 - States have been requested to form a Special Task Force for elimination of SUP and effective implementation of 2016 rules.
 - A National Level Task force has been constituted by the ministry to take coordinated efforts to ban SUP and to implement 2016 rules.
- **Awareness Generation:**
 - **Mascot 'Prakriti'** has been launched to spread mass awareness about how adoption of small changes in our lifestyle can play a big role in environmental sustainability. It also teaches about various efforts and initiatives that the MoEF&CC and CPCB have taken in order to ensure effective Plastic Waste Management in the country (2022)
- **Promoting Alternative uses of plastic waste:**
 - For e.g. in 2021, MoRT&H issued guidelines for use of plastic waste in road construction.
 - Indian oil is also using technology to convert plastic waste into bitumen.

- **Promoting Reduce, Reuse and Recycling:**
 - World-Wide Fund for Nature - India (WWF India) and the Confederation of Indian Industry (CII) have **joined hands to develop a platform to promote a circular system for plastics**. The new platform is called, the '**India Plastic Pact**'

A) INTERNATIONAL EFFORTS

- a. **Steps towards Plastic Pollution Treaty:** In 2022, the UN member states agreed to start negotiating new global treaty to end plastic pollution. Now its is crucial that the treaty that is finalized is ambitious and effective enough to truly address the plastic crisis.
 - As of July 2023, 2 negotiation meetings, for the new treaty has taken place.
- b. **Awareness and Education:**
 - The theme of **World Environment Day, 2018** was "**Beat Plastic Pollution**" and it focused on increasing awareness related to plastic pollution across the world.
- c. **EU Parliament bans 10 single use Plastics** with effect from 3rd July 2021

B) GLOBAL PLASTIC TREATY NEGOTIATIONS:

- **Why in news?**
 - 2nd Session of Intergovernmental negotiation Committee (INC) on plastic pollution was held in Paris in June 2023.
- **Background:** In 2022, the UN member states agreed to start negotiating new global treaty to end plastic pollution. Now it is crucial that the treaty that is finalized is ambitious and effective enough to truly address the plastic crisis.
 - The Intergovernmental Negotiation Committee (INC) on Plastic Pollution is in the process of developing "an international legally binding instrument on plastic pollution, including in the marine environment"
 - As of July 2023, 2 negotiation meetings, for the new treaty has taken place.
- **Why is a global Treaty on Plastic Pollution required?**
 - i. **Plastic Pollution is a global problem** which requires global solution. Most of the plastic is being dumped into oceans. This is eventually converting into micro-plastics, entering food chain and affecting everyone.
 - ii. Plastic pollution is harmful to wildlife and biodiversity which is impacting everyone.
 - iii. **Increased International Cooperation** will be feasible through a global treaty.
 - iv. The treaty may set global target for reduction
 - v. A global treaty may make the fight against plastic pollution more fair -> by giving higher responsibility to developed economies and giving more time to under developed countries.

7) PROMOTING ALTERNATE USE OF PLASTICS

A) USE OF PLASTIC WASTE IN STEEL MANUFACTURING (DEC 2022: SOURCE: PIB)

- Waste Plastic can be used as replacement of coking coal (by upto 1%) in coke making.
- Waste plastic can also be added in marginal quantities in Electric Arc Furnace (EAF) as replacement of pet coke.
- As per Plastic Waste Management Rules (PWM-2016) and subsequent amendment vide gazette notification G.S.R. 522(E) dated 06th July 2022, issued by the MOEF&CC, **only "End-of-Life Disposal" plastic is allowed for co-processing in the steel industry** and other waste plastic which can be recycled has been mandated for recycling only.
 - Presently, availability of "End-of-Life Disposal" waste plastic is a major constraint.
- Under the aforesaid Plastic Waste Management Rules, the municipalities/ local bodies are responsible for the creation and establishment of the plastic waste segregation, collection, storage, transportation, processing, and disposal system either on their own or by engaging agencies or manufacturers.

B) ROADS MADE UP OF PLASTIC WASTE

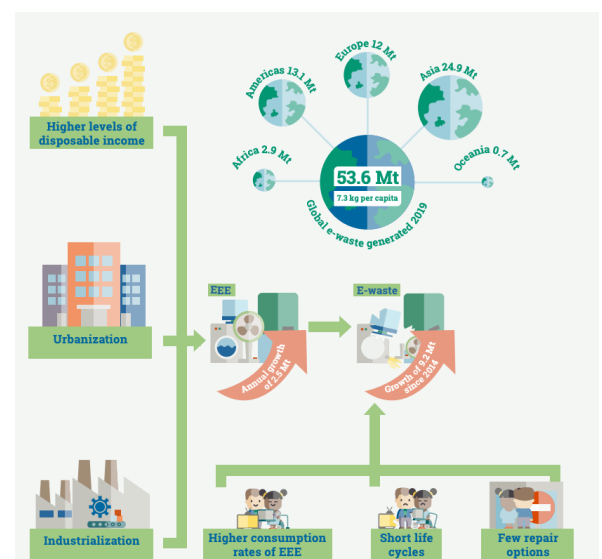
- **Why in news?**
 - MoRTH has issued guidelines for use of plastic waste in Road construction (July 2021)
- **Details**
 - Mandatory use of waste plastic in periodic renewal coat of pavement on National Highways and also in wearing course of service road within 50 km periphery of urban areas having population of 5 lakhs or more.
 - Indian Roads Congress (IRC) has formulated guidelines for the use of waste plastic in hot bituminous mixes for wearing courses.

7. E-WASTE

- E-waste is a popular name for electrical and electronic equipment (EEE) discarded after their end of life'. Discarded laptops, desktops, cellphones, and their batteries, air conditioners and television sets, cables, and wires, tube-lights and CFLs which contain mercury, are some examples of e-waste.
- It is one of the fastest growing waste stream in the world.

- Annual waste Output

- Global E-waste monitor (published by UN University) estimates that **53.6 million tonnes (7.3 kg per capita)** of e-waste was generated world over in 2019.
 - This is an increase of 21% in just five years.
 - This is expected to go to **74.7 Mt** by 2030.
- **E-waste generation in India is expected to grow rapidly in the coming future** (income, urbanization, changing technology, import (legal or illegal), poor quality equipment, power surge issues etc.)
- **India** is already the third largest e-waste generator.



- **Harmful effects of e-waste: -**

- Hazardous and toxic heavy metals - mercury, cadmium etc;
- Ozone Depleting Substances;
- High Global Warming Potential gases;
- Unscientific extraction - Air Pollution, Water Pollution and Soil Pollution;
- Severe negative health impacts - hampers central and peripheral nervous system, brain development, kidney, reproductive system etc.

1) E-WASTE MANAGEMENT RULES, 2022 NOTIFIED BY MOEF&CC IN NOV 2022

- It will replace E-Waste (Management) Rules, 2016 and will be effective from 1st April 2023. These rules will have new EPR regime for e-waste recycling.
- **Key Features:**
 - Applicable to every manufacturer, producer, refurbisher, dismantler and recycler.
 - All the manufacturer, producer, refurbisher and recycler are required to register on portal developed by CPCB.
 - No entity shall carry out any business without registration and also not deal with any unregistered entity.
 - Authorization has now been replaced by Registration through online portal and only manufacturer, producer, refurbisher and recycler require Registration.
 - Schedule I expanded and now 106 EEE (Electrical and Electronic Equipment) has been include under EPR regime.
 - Producers of notified EEE, have been given annual E-Waste Recycling targets based on the generation from the previously sold EEE or based on sales of EEE as the case may be.
 - Target may be made stable for 2 years and starting from 60% for the year 2023-2024 and 2024-25; 70% for the year 2025-26 and 2026-27 and 80% for the year 2027-28 and 2028-29 and onwards.
 - Management of solar PV modules /panels/ cells added in new rules.
 - The quantity recycled will be computed on the basis of end products, so as to avoid any false claim.
 - Provision for generation and transaction of EPR Certificate has been introduced.
 - Provisions for environment compensation and verification & audit has been introduced.
 - Provision for constitution of Steering Committee to oversee the overall implementation of these rules.
 - Provision for reduction of hazardous substances in manufacturing of Electrical and Electronic Equipment (EEE) has been provided.
 - It mandates that every producer of EEE and their components shall ensure that their products do not contain lead, mercury and other hazardous substances beyond the maximum prescribed concentration.
 - The E-Waste (Management) Rules also provide for recognition and registration, skill development, monitoring and ensuring safety and health, of workers involved in dismantling and recycling of e-waste.

A) MANAGEMENT OF SOLAR PV MODULES/CELLS HAS BEEN ADDED IN CHAPTER V OF THE SAID RULES.

- As per these rules, every manufacturer and producer of solar photo-voltaic modules or panels or cells shall:
 - i. Ensure registration on the portal;
 - ii. store solar photo-voltaic modules or panels or cells waste generated up to the year 2034-2035 as per the guidelines laid down by the Central Pollution Control Board in this regard.
 - iii. file annual returns in the laid down form on the portal on or before the end of the year to which the return relates up to year 2034-2035.
 - iv. ensure that the processing of the waste other than solar photo-voltaic modules or panels or cells shall be done as per the applicable rules or guidelines for the time being in force;
 - v. ensure that the inventory of solar photo-voltaic modules or panels or cells shall be put in place distinctly on portal; and
 - vi. comply with standard operating procedure and guidelines laid down by the Central Pollution Control Board in this regard.

8. BATTERY WASTE MANAGEMENT RULES, 2022

- MoEF&CC, Government of India published the Battery Waste Management Rules, 2022 on 24th August, 2022 to ensure environmentally sound management of waste batteries.
- New rules will replace Batteries (Management and Handling) Rules, 2001.
- The rules cover **all types of batteries**, viz. Electric Vehicle batteries, portable batteries, automotive batteries and industrial batteries.
- The rules function based on the concept of **Extended Producer Responsibility (EPR)** where the producers (including importers) of batteries are responsible for collection and recycling/refurbishment of waste batteries and use of recovered materials from wastes into new batteries
 - EPR mandates that all waste batteries to be collected and sent for recycling/refurbishment, and its prohibits disposal in landfills and incineration. To meet the EPR obligations, producers may engage themselves or authorize any other entity for collection, recycling or refurbishment of waste batteries
 - The rules will enable setting up a mechanism and centralized online portal for exchange of EPR certificates between producers and recyclers/refurbishers to fulfil the obligations of producers.
- The rules promote **setting up of new industries and entrepreneurship in collection and recycling/refurbishment** of waste batteries.
- **Mandating the minimum percentage of recovery of materials from waste batteries** under the rules will bring new technologies and investment in recycling and refurbishment industry and create new business opportunities.
- Prescribing the **use of certain amount of recycled materials in making of new batteries** will reduce the dependency on new raw materials and save natural resources.

9. RADIOACTIVE WASTE IN SCRAP

- **Radioactive materials or contaminated devices are entering into the booming scraps recycling chain,** posing a grave health hazard, according to the annual data on illicit trafficking of nuclear and other radioactive material released by IAEA
- **Details**
 - » The latest data has been extracted from the IAEA Incident and Trafficking Database (ITDB), where some 143 member states and international agencies report incidents of illicit trafficking of nuclear and other radioactive material under or out of regulatory control. This is part of IAEA's nuclear security plan.

10. CONSTRUCTION AND DEMOLITION WASTE

- In **2016**, government for the first time came up with **Construction and Demolition Waste Management Rules, 2016**. These rules are aimed at promoting recovering, recycling and reuse of the waste generated through C&D.
 - **Mandatory segregation** of C&D waste into four types - concrete, soil, steel and wood, plastics, bricks and mortars.
 - Deposit it at **collection centers** or hand it over to **processing facilities**.
 - It makes all stakeholders responsible for waste disposal (be it small scale generators, the municipal body or the government)
 - It makes debris recycling mandatory
 - **Illegalizes the dumping** of waste outside designated areas.
 - **Waste processing authorities** -> should have authorization from SPCB and should be located far away from habitation.
 - For **effective monitoring** of the rules, specific roles have been allocated to **CPCB**, the **Bureau of Indian Standards (BIS)**, the **Indian Road Congress (IRC)** and Central Ministries.
 - **Land Department** - Provide land for storage processing and recycling of C&D waste

11. BIOMEDICAL WASTE MANAGEMENT RULES, 2016

- The rules are applicable for wastes from vaccination camps, blood donation camps, surgical camps or other healthcare activity.
- **Main Provisions**
 - **Pretreatment** of laboratory waste, microbiological waste, blood samples and blood bags through disinfection or sterilization on site should be carried out as prescribed by WHO or NACO (National Aids Control Organization).
 - **Waste classification in four categories instead of 10** to improve the segregation of waste sources.
 - The BMW have to be collected by the health care facilities in colored bags - yellow, red, blue/white and black according to the category of biomedical waste.

Red Bin	Yellow Bin	Blue Bin	Black Bin
---------	------------	----------	-----------

Plastic Waste such as syringes bottles etc	Infectious waste - Bandages, Cotton, Placenta etc	Glass bottles, discarded medicines etc	Needles without syringes, metal articles etc.
--	---	--	---

- **Phased discontinuation of chlorinated plastic bags**, gloves and blood bags
- **Bar-code system to classify disposal of bags of containers having BMW**
 - It can be used to track and identify bags better.
- **More Stringent standards** have been prescribed for incinerators to reduce the pollution to environment.
- **States to provide land** for setting up common biomedical waste treatment and disposal facility.
- **2018 Amendment** to the rules provided for:
 - **Extension of dates** to phase out chlorinated bags to March 27, 2019.
 - **Establishing** of barcode system by both generators and operators by March 27, 2019
 - **Institute GPS** in vehicles of CBMWTF

1) SEQUENTIAL PRODUCTION OF BIO-DIESEL, BIO-ETHANOL, BIO-HYDROGN, AND METHANE FROM LEATHER SOLID WASTES, AND EFFLUENT TREATMENT SLUDGES

- MoEF&CC had approved the lab-cum-demonstration project titled *Sequential production of Bio-Diesel, Bio-Ethanol, Bio-Hydrogen and Methane from leather solid wastes and effluent treatment sludges* in 2015.
 - The project was approved for Central Leather Research Institute, Chennai with the total project outlay of Rs 77.11 lakh.
- The Project envisaged delivery of environmental benefits like:
 - a. Effective solid waste management techniques for tanneries
 - b. Better pollution abatement techniques
 - c. Avoidance of groundwater contamination
 - d. Efficient greenhouse emission control techniques
- **CAG Report** for financial year 2020-21 (released in Dec 2022)
 - » Only one unit of a biodiesel recovery had been established in March 2018 against the expected physical output of four distinct fuel recovery units.
 - The unit produced 80 litres of bio-diesel and none of the other three units achieved fruition by May 2022.
 - » The deliverables of 10 international publications in high-impact factored journals and three PhD degrees had also not been achieved.
 - » Key deficiencies observed by CAG Report:
 - **Inaction in processing the request** of Central Leather Research Institute, Chennai (CLRI) to revise the number of project fellowships. Due to this, CLRI was unable to retain the project fellows who were engaged in the project.
 - **Failure to obtain formal commitment from the industry partners**, which resulted in limited participation by the industry partner;
 - A lack of regular monitoring of the progress of the project, which affected the timely implementation of the project.

12. SOME OTHER TECHNOLOGIES

1) HYDROTHERMAL CARBONIZATION

- The Hydrothermal Carbonization (HTC) is a (pre)treatment of lignocellulosic biomass in hot (180 degree - 280 degree) water at saturated pressure of 2-10 MPa and residence time varying from minutes to hours. It is carried out mainly to produce solid product similar to coal. The energy density is much higher for this solid product. They can be either combusted to produce energy or disposed for soil nourishment as fertilizer (also sequestration of carbon)

13. NOISE POLLUTION

- Intro

- » Noise pollution refers the presence of such levels of noise or sound in the environment that are disturbing, irritating and annoying to living beings. It causes discomfort and harm to living being's mental and physical health. It is one of the major causes of deafness and other health hazards. Even animals suffer from excessive environmental noise.

- **Causes of Noise Pollution** - Vehicles, factories, industries, construction sites, fire crackers, loud speakers, domestic appliances; TV/Radio etc.
- **Effects of Noise Pollution**
 - Loud and prolonged noise can cause physiological and psychological damage.
 - a. **Loss of hearing and deafness** : Noise above the tolerable threshold is the leading cause for loss of hearing and deafness.
 - b. **Cardiac Disturbance** : Noise increase the risk of cardiac disturbance including coronary artery disease or ischemic heart disease
 - c. **Sleeplessness** : Noise may make people restless. It may keep people away from sound sleep
 - d. **Headache** : Human mind can tolerate sound only to a limited extent. Excess noise cause headache.
 - e. **Stress, tension and aggressiveness**
 - f. **Mental Imbalance and nervous debility**
 - g. **Psychological imbalance**
 - h. **Difficulty in talking**
 - i. **Diabetes and Hypertension:**
 - Two 15 year long studies for long-term resident of Toronto, Canada found that exposure to road traffic noise elevated risks of acute myocardial infarction and congestive heart failure, and increased incident of Type 2 diabetes by 8% and hypertension by 2%.
 - j. **Affects biodiversity:** For instance a recent study published in the Conservation Biology journal noted that chicks of the birds which were exposed to noise were smaller than the ones in quiet nests.

- **How sound is measured?**

- » The faintest sound that our ears can detect is known as the Threshold of Hearing (TOH). The most intense sound that our ears can detect without suffering any physical damage is one billion times more intense than TOH. This large hearing range makes a linear scale of sound measurement inappropriate.
- » Hence, we use **logarithmic scale** to measure the sound. The unit is a **decibel (dB)** and TOH is assigned zero dB.
 - So 10 dB means a sound that is 10 times more intense than TOH. 20 dB refers to an intensity of sound that is 100 times more than a TOH sound, 30 dB means an intensity that is 1000 times more than TOH, and so on.
 - $10 \cdot \log_{10} (P_1/P_0)$
- » **What is dbA?**
 - Frequency and pitch of the noise also determines whether it is harmful or not. A **modified scale called decibel-A (dbA)** takes pitch into account.
 - **A-weighted decibels**, abbreviated dBA, or dba or dB(a), are an expression of the relative loudness of sounds in air as perceived by the human ear. In the A-weighted system, the decibel values of sounds at low frequencies are reduced, compared with the unweighted decibels, in which no correction is made for audio frequency.

- **What is the safe limit for noise?**

- » The latest 2018 WHO guidelines established a health-protective recommendation for road traffic noise levels of **53 dB**.
- » Hearing loss begins if a person is exposed more than 8 hours a day to a noise level of 80-90 dbA.
- » A level of 140 dbA is painful and 180 dbA could even kill a person.
 - Examples of noise levels

Source	dbA	Source	dbA
Threshold of hearing	0	Food Blender	90
Rustling of leaves	20	Diesel Truck (1m)	100
Quiet whisper (1 m)	30	Power Mower (1m)	107
Quiet Home	40	Jet Plane (30 m)	130
Normal Conversation	60	Rocket Launch	180
Loud Singing (1 m)	75		
Alarm clock	80		

- **What is being done to curb the noise pollution?**

- » The **CPCB** is mandated to track noise levels, set standards as well as ensure, via their State Units, that sources of excessive noise are controlled.
- » In 1980s and 1990s there were several court judgements in India restricting the generation of noise by industries, fire crackers, electric horns etc.
- » Finally in 2000, Indian government notified the **Noise Regulation Rules**, which were amended in 2010.
 - Noise Regulation Rules were notified under the Environment (Protection) Act of 1986.

- **Two types** of noise level standards are Prescribed
 - Ambient noise level standards
 - Noise levels for designated types of machinery, appliances, and fire crackers.

- **Ambient Noise Levels have been defined as follows:**

Category of Area/Zone	Limits in dB(A) (Day) (6 am - 10 PM)	Limits in dB(A) (Night)
Industrial Area	75 dbA	70 dbA
Commercial Area	65 dbA	55 dbA
Residential Area	55 dbA	45 dbA
Silence zone	50 dbA	40 dbA

- **Silence zone** - zones of silence (100 meters) near schools, courts, hospitals etc.
- The rules specify that no permission could be granted by any authority for use of public address (PA) system in the open after 10. 00 pm and before 6 am. Even after permission has been procured, the sound level must fall within the limits prescribed in the Noise rules.
- **National Ambient Noise Monitoring Network (NANMN)** was launched in 2011
 - Central government set up a National Ambient Noise Monitoring Network (NANMN) through **CPCB** and **the state pollution control boards (SPCBs)** to monitor noise on a 24X7 basis in **India's seven largest city**.
 - Under NANMN, during Phase 1 and Phase 2, **70 monitoring stations** have been set up in seven cities - each in Delhi, Bengaluru, Kolkata, Chennai, Hyderabad, Lucknow, and Mumbai. - which are operated by SPCBs.
 - Phase 3 plan was to launch 90 stations in 80 other cities.
- **2015 Supreme Court Judgements:** In 2015, the Supreme Court, acting on a petition filed by four infants (all aged between six months and 14 months) seeking curbs on air and sound pollution, banned the bursting of sound-emitting crackers between 10 pm and 6 am during Diwali.
- **In June 2020**, the CPCB has proposed a new set of fines between **Rs 1,000 to Rs 1,00,000** for those who violate norms restricting noise pollution under the **Noise Pollution (Regulation and Control) Rules, 2000**.
 - This was submitted in a report filed with National Green Tribunal in response to a set of ongoing cases over noise pollution.

- **Under the new norms:**

- **Violations related to norms over:**

Use of loudspeakers/PA systems etc.	Confiscation of system and a fine of upto Rs 10,000
Diesel generator sets	Sealing of the sets and a fine between Rs 10,000 to 1 lakh.
Sound Emitting Construction Equipment	Seizures, sealings and a fine of Rs 50,000

14. LIGHT POLLUTION

- **Why in news?**

- » International Dark Sky Week is an annual event hosted by International Dark Sky Association (IDA).
 - Astronomers and Sky enthusiasts marked the 2022 International Dark Sky Week from April 22-30. Hundreds of events were conducted across the globe where participants came together to learn astrophotography, take night walks, and observe the night sky without light pollution and learn how it negatively impacts our ecosystem.

- Introduction

- » Light pollution, also known as photo-pollution or luminous pollution, is the **excessive, misdirected or invasive use of artificial outdoor lighting**.
- » **Harmful Impact**
 - **Disturbs circadian rhythm** (the 24 hour cycle of many organisms) including humans and induces sleep disorder, and other health risks like obesity, depression, and diabetes.
 - **Unhealthy:**
 - Light pollution may cause damage to the retina in the eyes.
 - Some lights such as blue LED lights may be harmful for health.
 - **Impacts biodiversity:** It affects insects as they are drawn towards these lights. This affects their food chain and reduces pollinating activities. Other animals such as turtle are also affected as they get attracted towards these lights and thus are snapped by predators.
 - **Wastage of light** is also a reason for overuse of fuel and thus a factor behind climate change.
 - **Impacts astronomy:** Mismanaged lighting alters the color and contrast of the nighttime sky and eclipses natural starlight. It hinders study of the universe as proper study becomes difficult from areas where these artificial lights hinder celestial light. It makes stargazing difficult.



The city of Las Vegas dumps an enormous amount of light into its environment, turning the night sky above into a seemingly blank canvas.

- Light Pollution and Satellites

- » A new study published in *Monthly Notices of the Royal Astronomical Society: Letters* shows that satellites that orbit the Earth can increase the overall brightness of the night sky by 10% above natural levels.
 - This additional light pollution has an impact over a larger part of the globe than ground-based sources

15. ENVIRONMENTAL IMPACT ASSESSMENT – EIA RULES AMENDED

- Environmental Impact Assessment

- EIA can be defined as the study to predict the environmental, socio-economic, cultural and human-health impacts of proposed project/activity. The global environmental law for the EIA

is the "**precautionary principle**". Environmental harm is often irreparable so there should be a focus on prevention.

- It is a **decision making tool** which **compares various alternatives** for a project and chooses the one which ensures best combination of economic and environmental costs and benefits.

- **Advantages of EIA:** By considering the environmental effects of the project and their mitigation early in the project planning cycle, environmental assessment has many benefits:
 - Promotes environmentally safe and sustainable development.
 - Optimum utilization of resources
 - Saving of time and cost of the project
 - Properly conducted EIA also **lessens conflict** by promoting community participation, informing decision makers, and helping lay the base for environmentally sound project.

- **History of EIA in India**

- » The Indian experience of EIA started in 1976-77 when the Planning Commission asked the Department of Science and Technology to examine the river valley project from an environmental angle.
- » Till 1994, EIA was an administrative decision and lacked statutory backing.
- » In 1994, the Ministry of Environment and Forest, under the EPA, 1986, promulgated an **EIA notification making environmental clearance mandatory** for expansion or modernization of any activity or for setting up new projects listed in Schedule 1 of the notification.

- **EIA Notification, 2006**

- » Notified by MoEF&CC under the Environmental (Protection) Act, 1986.
- » It makes it **mandatory for various projects** such as mining, thermal power plants, river valley, infrastructure (road, highway, ports, harbors and airports) and industries including very small electroplating or foundry units to get environmental clearance. This clearance is given only after the environmental requirements are fulfilled.
- Unlike, the 1994 notification, it has put the **responsibility of clearing certain projects on the state government**:
 - **Category A** (National Level Appraisal): This category project mandatory require clearance and thus they don't undergo the screening process.
 - **Category B** (State level Appraisal) undergo screening process.
 - **Category B1** (mandatorily requires EIA)
 - **Category B2** (Don't require EIA)

- **Process of EIA**

- » After 2006, EIA in India involves **four steps**:
 - Screening
 - Scoping
 - Public Hearing
 - Appraisal
- » However, EIA process is cyclical with considerable interaction between various steps.

- The **assessment** is carried out by an **Expert Appraisal Committee (EAC)**, which consists of scientists and project management experts.
 - The EAC frames the scope of EIA study and a preliminary report is prepared.
 - The report is published and a **public consultation** process takes place, where objections can be heard including from project-affected people.
 - The EAC then makes a final appraisal of the project and forward it to MoEF&CC. The Ministry is ordinarily obliged to accept the decision of the EAC.

- **Amendment to EIA Rules notified (July 2022)**

- » It has exempted highway projects of strategic and defence importance, which are 100 km from the LoC, among other locations, from an environmental clearance before construction.
- » Thermal power plants upto 15 MW based on biomass or non-hazardous municipal waste using auxiliary fuel such as coal, lignite or petroleum products up to 15% have also been exempted - as long as the fuel mix is eco-friendly.
- » Increasing the threshold of ports which exclusively deal in fish handling and caters to small fisherman, which are exempted from environment clearance.
 - This is taking into account issues of livelihood security of fishermen involved at fish handling ports and harbors, and less pollution potential of these ports and harbors.
- » **Toll plazas** that need more width for installation of toll collection booths to cater to a large number of vehicles, and **expansion activities in existing airport related to terminal building expansion** without increase in airports existing area, rather than expansion of runways, etc., are two other exempted projects.