



UNIVERSITY GRANTS COMMISSION

NET BUREAU

SYLLABUS

Subject: GENERAL PAPER ON TEACHING & RESEARCH APTITUDE

Code No. : 00

PAPER-I

The main objective is to assess the teaching and research capabilities of the candidates. The test aims at assessing the teaching and research aptitude as well. Candidates are expected to possess and exhibit cognitive abilities, which include comprehension, analysis, evaluation, understanding the structure of arguments, deductive and inductive reasoning. The candidates are also expected to have a general awareness about teaching and learning processes in higher education system. Further, they should be aware of interaction between people, environment, natural resources and their impact on the quality of life.

The details of syllabi are as follows:

Unit-I Teaching Aptitude

- Teaching: Concept, Objectives, Levels of teaching (Memory, Understanding and Reflective), Characteristics and basic requirements.
- Learner's characteristics: Characteristics of adolescent and adult learners (Academic, Social, Emotional and Cognitive), Individual differences.
- Factors affecting teaching related to: Teacher, Learner, Support material, Instructional facilities, Learning environment and Institution.
- Methods of teaching in Institutions of higher learning: Teacher centred vs. Learner centred methods; Off-line vs. On-line methods (Swayam, Swayamprabha, MOOCs etc.).

- Teaching Support System: Traditional, Modern and ICT based.
- Evaluation Systems: Elements and Types of evaluation, Evaluation in Choice Based Credit System in Higher education, Computer based testing, Innovations in evaluation systems.

Unit-II Research Aptitude

- Research: Meaning, Types, and Characteristics, Positivism and Post-positivistic approach to research.
- Methods of Research: Experimental, Descriptive, Historical, Qualitative and Quantitative methods.
- Steps of Research.
- Thesis and Article writing: Format and styles of referencing.
- Application of ICT in research.
- Research ethics.

Unit-III Comprehension

- A passage of text be given. Questions be asked from the passage to be answered.

Unit-IV Communication

- Communication: Meaning, types and characteristics of communication.
- Effective communication: Verbal and Non-verbal, Inter-Cultural and group communications, Classroom communication.
- Barriers to effective communication.
- Mass-Media and Society.

Unit-V Mathematical Reasoning and Aptitude

- Types of reasoning.
- Number series, Letter series, Codes and Relationships.
- Mathematical Aptitude (Fraction, Time & Distance, Ratio, Proportion and Percentage, Profit and Loss, Interest and Discounting, Averages etc.).

Unit-VI Logical Reasoning

- Understanding the structure of arguments: argument forms, structure of categorical propositions, Mood and Figure, Formal and Informal fallacies, Uses of language, Connotations and denotations of terms, Classical square of opposition.
- Evaluating and distinguishing deductive and inductive reasoning.
- Analogies.
- Venn diagram: Simple and multiple use for establishing validity of arguments.
- Indian Logic: Means of knowledge.
- Pramanas: Pratyaksha (Perception), Anumana (Inference), Upamana (Comparison), Shabda (Verbal testimony), Arthapatti (Implication) and Anupalabddhi (Non-apprehension).
- Structure and kinds of Anumana (inference), Vyapti (invariable relation), Hetvabhasas (fallacies of inference).

Unit-VII Data Interpretation

- Sources, acquisition and classification of Data.
- Quantitative and Qualitative Data.
- Graphical representation (Bar-chart, Histograms, Pie-chart, Table-chart and Line-chart) and mapping of Data.
- Data Interpretation.
- Data and Governance.

Unit-VIII Information and Communication Technology (ICT)

- ICT: General abbreviations and terminology.
- Basics of Internet, Intranet, E-mail, Audio and Video-conferencing.
- Digital initiatives in higher education.
- ICT and Governance.

Unit-IX People, Development and Environment

- Development and environment: Millennium development and Sustainable development goals.
- Human and environment interaction: Anthropogenic activities and their impacts on environment.
- Environmental issues: Local, Regional and Global; Air pollution, Water pollution, Soil pollution, Noise pollution, Waste (solid, liquid, biomedical, hazardous, electronic), Climate change and its Socio-Economic and Political dimensions.
- Impacts of pollutants on human health.
- Natural and energy resources: Solar, Wind, Soil, Hydro, Geothermal, Biomass, Nuclear and Forests.
- Natural hazards and disasters: Mitigation strategies.
- Environmental Protection Act (1986), National Action Plan on Climate Change, International agreements/efforts -Montreal Protocol, Rio Summit, Convention on Biodiversity, Kyoto Protocol, Paris Agreement, International Solar Alliance.

Unit-X Higher Education System

- Institutions of higher learning and education in ancient India.
- Evolution of higher learning and research in Post Independence India.
- Oriental, Conventional and Non-conventional learning programmes in India.
- Professional, Technical and Skill Based education.
- Value education and environmental education.
- Policies, Governance, and Administration.

NOTE:

- (i) Five questions each carrying 2 marks are to be set from each Module.
- (ii) Whenever graphical/pictorial question(s) are set for sighted candidates, a passage followed by equal number of questions and weightage be set for visually impaired candidates.

SYLLABUS

Sub Unit – 1: Development and Environment: Millennium Development Sustainable Development Goals

SL. NO	TOPICS
1	1.1. Meaning
2	1.2. Types of environment
3	1.3. Components of Environment
4	1.4. Approaches to Environmental Study
5	1.5. Physical Environment
6	1.5.1. Abiotic Environment
7	1.5.1.1. About the Earth
8	1.5.1.1.1. Structure of the Earth
9	1.5.1.1.2. Types of rocks and minerals
10	1.5.1.1.3. Geological Time Scale
11	1.5.1.1.4. Plate Tectonic and Volcano and eruption types Lahar
12	1.5.1.1.5. Earthquake, Richter's scale and Tsunami
13	1.5.1.1.6. Weathering
14	1.5.1.1.7. Soil
15	1.5.1.3. Hydrospheric Environment
16	1.5.1.3.1. Water Cycle
17	1.5.1.3.2. Ocean Temperature, Currents, Salinity and Density
18	1.5.1.4. Atmospheric Environment
19	1.5.1.4.1. Composition, Layering and heat budget
20	1.5.1.4.2. Planetary wind system
21	1.5.1.4.3. Cyclone and anticyclone
22	1.5.1.4.4. Types of rain
23	1.5.2. Biotic Environment
24	1.5.2.1. Biome
25	1.5.2.2. Habitat, Ecology, Ecosystem and Ecological foot prints
26	1.6. Cultural Environment
27	1.6.1. Cultural Region
28	1.6.2. Cultural Diffusion
29	1.7. Environmental Impact Assessment
30	1.8. Evolutions
31	1.9. Millennium Development Goals (MDGs)
32	1.10. Sustainable Development Goals (SDGs)

Sub Unit – 2: Human and Environment Interaction: Anthropogenic Activities and Their Impacts on Environment

SL. NO	TOPICS
33	2.1. Pollution
34	2.2. Population growth and food production
35	2.3. Global Warming
36	2.4. Ocean acidification
37	2.5. Deforestation
38	2.6. Soil Erosion
39	2.7. Acid Rain
40	2.8. Ozone Depletion
41	2.9. Desertification
42	2.10. Environment in Indian Context
43	2.10.1. Geography of India: at a glance
44	2.10.1.1. State wise Dams
45	2.10.1.2. State wise Reservoirs
46	2.10.1.3. Wildlife sanctuaries
47	2.10.1.4. List of national parks in India
48	2.10.1.5. Biosphere Reserves of India
49	2.11. Environmental Movements in India
50	2.11.1. Bishnoi Movement
51	2.11.2. Chipko Movement
52	2.11.3. Save Silent Valley Movement
53	2.11.4. Jungle Bachao Andholan
54	2.11.5. Appiko Movement
55	2.11.6. Narmada Bachao Andholan (NBA)
56	2.11.7. Tehri Dam Conflict

Sub Unit – 3: Environmental issues: Local, Regional and Global; Air pollution, Water pollution, Soil pollution, Noise pollution, Waste (solid, liquid, biomedical, hazardous, electronic), Climate change and its Socio-Economic and Political dimensions. Local Environmental issues

SL. NO	TOPICS
57	3.1. Regional and Global Environmental issues
58	3.2. Air Pollution
59	3.3. Water Pollution
60	3.4. Soil Pollution

61	3.5. Noise Pollution
62	3.6. Wastes
63	3.6.1. Solid Waste
64	3.6.2. Liquid Waste
65	3.6.3. Biomedical Waste
66	3.6.4. Hazardous Waste
67	3.6.5. Electronic Waste
68	3.7. Climate change and socio-economic dimension
69	3.8. Climate change and Socio-Political dimension

Sub Unit – 4: Impacts and Pollutants on Human Health

SL. NO	TOPICS
70	4.1. Air pollution diseases
71	4.2. Water pollution
72	4.3. Organism causing the infection
73	4.4. Lead, Arsenic, Mercury and Chromium affected diseases and Poisoning
74	4.5. Some Internationally Celebration days

Sub Unit – 5: Natural and Energy Resources: Solar, Wind, Soil, Hydro, Geothermal, Biomass, Nuclear and Forests

SL. NO	TOPICS
75	5.1. What is Resource?
76	5.2. Types of Resources
77	5.3.1. Natural Vegetation
78	5.3.1.1. Natural Vegetation in India
79	5.4. What is Energy
80	5.5. Different sources of Energy
81	5.5.1. Solar Energy
82	5.5.2. Wind Energy
83	5.5.3. Geothermal Energy
84	5.5.4. Hydrogen Energy
85	5.5.5. Tidal Energy
86	5.5.6. Wave Energy
87	5.5.7. Hydroelectric Energy
88	5.5.8. Biomass Energy
89	5.5.9. Biogas Energy
90	5.5.10. Nuclear Power
91	5.5.11. Fossil Fuels (Coal, Oil and Natural Gas)
92	5.5.12. Electricity generation by source in India in FY 2017-18
93	5.4.12. Installed Capacity and Target of Electricity generation in 2022

Sub Unit – 6: Natural Hazards and Disasters: Mitigation Strategies

SL. NO	TOPICS
94	6.1. Introduction
95	6.2. Types of Hazards and Disasters
96	6.3. Hazards and Disasters
97	6.3.1. Volcanic eruption
98	6.3.2. Earthquake
99	6.3.3. Landslide
100	6.3.4. Flash floods
101	6.3.5. Flood
102	6.3.6. Drought
103	6.3.7. Cyclone
104	6.3.8. Nuclear Reactor accident
105	6.4. Mitigation strategies include

Sub Unit – 7: Environment Protection Act (1986), National Action Plan on Climate change, International agreements/efforts-Montreal Protocol, Rio Summit, Convention on Biodiversity, Kyoto Protocol, Paris Agreement, International Solar Alliance

SL. NO	TOPICS
106	7.1. Environment Protection Act, 1986
107	7.2. National Action Plan on Climate Change
108	7.3. International Agreements
109	7.3.1. Montreal Protocol
110	7.3.2. Rio summit or Earth Summit or Agenda 21
111	7.3.3. Convention on Biological Diversity
112	7.3.4. Kyoto Protocol
113	7.3.4.1. Rwanda Meeting
114	7.3.5. Paris Agreement
115	7.3.6. International Solar Alliance
116	7.3.8. Blue Revolution
117	7.3.9. Nagoya Protocol

Section – 1: At a Glance

Sub Unit – 1: Development and Environment: Millennium Development and sustainable Development Goals

TYPES OF ENVIRONMENT: Generally, environment can divide into two types- a) Physical Environment and b) Cultural Environment. The physical and cultural environments are divided into following types.

APPROACHES TO ENVIRONMENTAL STUDY: The approaches are as follows: Deterministic, Teleological, Possibilistic, Economic Deterministic, Ecological, Essentialist etc. A very popular Quotation by an Environmental Determinists:

“Man is a product of the earth’s surface. This means not merely that he is a child of the earth, dust of her dust; but that the earth has mothered him, fed him, set him tasks, directed his thoughts, confronted him with difficulties that have strengthened his body and sharpened his wits, given him problems of navigation or irrigation, and at the same time whispered hints for their solution. She has entered into his bone and tissue, into his mind and soul.”

-by Ellen Churchill Semple

PHYSICAL ENVIRONMENT: The Physical environment is divided into two broad groups. Those are a) abiotic and b) biotic environment. Earth has lithosphere, atmosphere and hydrosphere. It sustains life (biosphere). The living beings are present on Lithosphere and hydrosphere; and a little amount in atmosphere.

LITHOSPHERIC ENVIRONMENT: Surface to Upper Mantle, the solid outer part of the earth is called Lithosphere. Plates are also present in this sphere. Lithosphere is divided into two groups – i) Oceanic lithosphere and ii) Continental lithosphere.

HYDROSPHERIC ENVIRONMENT: Near about 2/3 of earth surface is covered by Water. Only 3% of water on the surface is fresh. Of freshwater, 69% resides in glaciers and polar ice caps, 30% underground, and less than 1% is located in lakes, rivers, and swamps

ATMOSPHERIC ENVIRONMENT: It is spread near upto 10,000 kilometers from the earth surface. The atmosphere of Earth is composed of nitrogen (about 78%), oxygen (about 21%), argon (about 0.9%), carbon dioxide (0.04%) and other gases in trace amounts. Except those gases aerosols and water vapor plays a vital role to form clouds, and controls atmospheric temperature.

BIOTIC ENVIRONMENT: This environment consists with plant and animal community. The biomes are as follows- a) Tundra b) Taiga c) Deciduous forest d) Grasslands e) Desert f) High plateaus g) Tropical forest h) Minor terrestrial biomes. Except those marine biomes are as follows- a) Litoral zone b) Pelagic zone c) Abyssal zone. A habitat is the type of natural environment in which a particular species of organism lives.

CULTURAL ENVIRONMENT: The environment built up the man called Cultural or built-up environment. Example – Urban environment, Political Environment etc.

MILLENNIUM DEVELOPMENT GOALS (MDGS): The Millennium Development Goals (MDGs) were eight international development goals for the year 2015-

1. To eradicate extreme poverty and hunger
2. To achieve universal primary education
3. To promote gender equality and empower women
4. To reduce child mortality
5. To improve maternal health
6. To combat HIV/AIDS, malaria, and other diseases
7. To ensure environmental sustainability
8. To develop a global partnership for development

SUSTAINABLE DEVELOPMENT GOALS (SDGs): The Sustainable Development Goals (SDGs) are a collection of 17 global goals set by the United Nations General Assembly in 2015 for the year 2030.

The Sustainable Development Goals are: 1) No Poverty, 2) Zero Hunger, 3) Good Health and Well-being, 4) Quality Education, 5) Gender Equality, 6) Clean Water and Sanitation, 7) Affordable and Clean Energy, 8) Decent Work and Economic Growth, 9) Industry, Innovation, and Infrastructure, 10) Reducing Inequality, 11) Sustainable Cities and Communities, 12) Responsible Consumption and Production, 13) Climate Action, 14) Life Below Water, 15) Life on Land, 16) Peace, Justice, and Strong Institutions, 17) Partnerships for the Goals.

Sub Unit – 2: Human and Environment Interaction: Anthropogenic Activities and Their Impacts on Environment

POLLUTION: Air, water, soil are polluting day by days.

POPULATION GROWTH AND FOOD PRODUCTION: According to Malthus, population growth happens in geometric progression and food production occurs in arithmetic progression.

GLOBAL WARMING: Global warming is the increase in the average temperature of the Earth's near-surface air and the oceans ever since the mid-twentieth century. The temperature is rising day by day. Between 1880 and 2012, the global average surface temperature increased by 0.85°C. Since 1979 the rate of warming has approximately doubled.

Urban Heat island (UHI) is an urban area or metropolitan area that is significantly warmer than its surrounding rural areas due to human activities, concrete construction bitumen road etc.. It creates local low pressure zone. Wind flow in urban region is heavier rather than rural areas. Asphalt, also known as bitumen is a sticky, black, and highly viscous liquid or semi-solid form of petroleum. It may be found in natural deposits or may be a refined product, and is classed as a pitch. The primary use (70%) of asphalt is in road construction.

OCEAN ACIDIFICATION: Ocean water is slightly basic in nature. Due to increase of atmospheric carbon dioxide, it dissolves with water and increase pH value of ocean water. As a result calcium carbonate related plant and animals are in danger.

pH: pH is a scale of acidity from 0 to 14. It tells how acidic or alkaline a substance is. More acidic solutions have lower pH. More alkaline solutions have higher pH. Substances that aren't acidic or alkaline (that is, neutral solutions) usually have a pH of 7.

DEFORESTATION: Deforestation causes problems like soil erosion, fewer crops, flooding, water cycle disruption, increase greenhouse gas emissions, changes in the climatic conditions, and loss of biodiversity.

SOIL EROSION: Soil erosion is the displacement of the upper layer of soil. It is one form of soil degradation. This natural process is caused by the dynamic activity of erosive agents, that is, water, ice, snow, air, plants, animals, and humans.

ACID RAIN: Adding of carbon dioxide with rain water droplets creates slightly carbonic acid. It can damage soil property or calcium carbonate related heritages.

OZONE DEPLETION: CFCs and halons gases are released into atmosphere. It reacts with stratospheric ozone layer and makes ozone layer thinner. UV ray from sun can easily reach to the earth surface and cause skin cancer of man and disturbs plant growth.

DESERTIFICATION: CAUSE: 'Climatic variations' and 'Human activities' can be regarded as the two main causes of desertification. Removal of the natural vegetations, agricultural activities in the vulnerable ecosystems of arid and semi-arid areas, which are thus strained beyond their capacity. 319 million hectares of **Africa** are vulnerable to **desertification** due to sand movement. The assessment is done by FAO and UNEP. They suggest that the desert is moving at an annual rate of 5 km in the semi-arid areas of West **Africa**.

GEOGRAPHY OF INDIA: AT A GLANCE:

CAPITAL: New Delhi

TOTAL AREA: 3287263 sq kms.

POPULATION (2011): 1210854977

POPULATION DENSITY: 401.5/sq kms.

STATES: 28 states and 9 union territories (including Jammu & Kashmir and Ladakh)

SMALLEST STATE: Goa

LARGEST STATE: Rajasthan

SMALLEST STATE IN EAST: Tripura

NUMBER OF COASTAL STATES: Nine states- 1) Gujarat 2) Maharashtra 3) Goa, 4) Karnataka, 5) Kerala, 6) Tamil Nadu, 7) Andhra Pradesh, 8) Odisha, 9) West Bengal. Two Union Territories-1) Daman & Diu, 2) Pondicherry

LONGEST RIVER: Ganges- Brahmaputra

GEOGRAPHICAL REGIONS: a) Himalaya, b) Indo-Gangetic plains, c) Thar Desert, d) Central Highlands and Deccan Plateau, e) East Coast, f) West Coast, g) Bordering seas and islands.

MOUNTAINS: 1) Aravalli, 2) Eastern Ghats, 3) Himalayas, 4) Patkai, 5) Vindhyas, 6) Sahyadri or Western Ghats, 7) Satpuras, 8) Karakoram.

All major rivers of India originate from one of the three main watersheds. They are:

1. The Himalaya and the Karakoram ranges
2. Vindhya and Satpura range in central India
3. Sahyadri or Western Ghats in western India

Most of the major rivers of the Indian subcontinent such as the Indus, Ganga and Brahmaputra, Kaveri, Krishna, Godavari and Mahanadi flow eastwards and empties into the Bay of Bengal after forming deltas.

MAJOR CLASSIFICATION OF INDIAN SOILS: Alluvial soil [43%], Red soil [18.5%], Black / regur soil [15%], Arid / desert soil, Laterite soil, Saline soil, Peaty / marshy soil, Forest soil, Sub-mountain soil

ENVIRONMENTAL MOVEMENTS IN INDIA: The environmental movement including conservation and green politics is a diverse scientific, social, and political movement for addressing environmental issues. Some of them are as follows- **Bishnoi Movement, Chipko Movement, Save Silent Valley Movement, Jungle Bachao Andholan, Appiko, Narmada Bachao Andholan (NBA), Tehri Dam Conflict** etc.

Sub Unit – 3: Environmental issues: Local, Regional and Global; Air pollution, Water pollution, Soil pollution, Noise pollution, Waste (solid, liquid, biomedical, hazardous, electronic), Climate change and its Socio-Economic and Political dimensions

PAN: Peroxyacetyl nitrate is a toxic chemical that is an important component of smog. It effects in the human body such as reduced respiratory function and eye irritation.

SOOT: Maximum soot is released from Thermal Power Plants. It helps to increase global temperature.

CFCS: chlorofluorocarbon basically generates from air-conditioning, refrigeration, blowing agents in foams, insulations and packing materials, propellants in aerosol cans etc.

SMOG: Smog is a type of severe air pollution. Smog is primarily associated with the photochemical formation of ozone and sulfur dioxide. An erupting volcano can emit high levels of sulfur dioxide. Beijing is most-worst affected by the smog calamities.

SURFACE OZONE: Ozone is produced in the troposphere by photochemical oxidation of CO, CH₄ and non-methane volatile organic carbons (NMVOCs) in the presence of oxides of nitrogen.

CNG: to reduce carbon emission Compressed Natural Gas (Methane, Ethane etc.) is introduced in New Delhi. As a result 20% of pollution is controlled by introducing CNGs. Actually the originated hydrogen cell gives energy to move the vehicle.

DIOXINS: The toxicity of other dioxins and chemicals like PCBs that act like dioxin are measured in relation to TCDD. Dioxin is formed as an unintentional by-product of many industrial processes involving chlorine such as waste incineration, chemical and pesticide manufacturing and pulp and paper bleaching.

AIR QUALITY INDEX BY INDIA: The National Air Quality Index (AQI) was launched in New Delhi on September 17, 2014 under the Swachh Bharat Abhiyan. AQI will consider eight pollutants PM₁₀ ie particulate matter upto 10 micrometers, PM_{2.5} i.e. particulate matter 2.5 micrometers, NO₂, SO₂, CO, O₃, NH₃, and Pb

Total dissolved solids (TDS) comprise inorganic salts (principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides, and sulfates) and some small amounts of organic matter that are dissolved in water. TDS should not exceed 500mg/lts. Presently TDS increased in drinking water specially served by Municipalities.

METHANE: it is generated from- (1) natural wetlands, (2) paddy rice fields, (3) emission from livestock, (4) biomass burning (5) anaerobic decomposition of organic waste etc.

Human ear is most sensitive in 1-2 KHz.

Wastes are unwanted and unusable matter. It can be solid, liquid, or gaseous and each type has different methods of disposal and management.

Sub Unit – 4: Impacts and pollutants on Human Health

Air pollution diseases, Water pollution, Organism causing the infection, Lead, Arsenic, Mercury and Chromium affected diseases and Poisoning, Some Internationally Celebration days

Sub Unit – 5: Natural and Energy Resources: Solar, Wind, Soil, Hydro, Geothermal, Biomass, Nuclear and Forests.

WHAT IS RESOURCE? The utility or usability of materials is called resource.

TYPES OF RESOURCES: A renewable resource is a resource which can be used repeatedly and replaced naturally (example: water, sun –rays, air etc.) and non-renewable resource is a resource which cannot be used repeatedly and replaced naturally (example: coal, LPG, CNG, salt etc.).

NATURAL VEGETATION: Vegetation regions can be divided into **five** major types: forest, grassland, savana, desert, and ice sheet.

WHAT IS ENERGY: The capacity of doing work is called energy. It may exist in potential, kinetic, thermal, electrical, chemical, nuclear, or other various forms.

DIFFERENT SOURCES OF ENERGY: Solar Energy, Wind Energy, Geothermal Energy, Hydrogen Energy, Tidal Energy, Wave Energy, Hydroelectric Energy, Biomass Energy, Biogas Energy, Nuclear Power, Fossil Fuels (Coal, Oil and Natural Gas).

Sub Unit – 6: Natural Hazards and Disasters: Mitigation Strategies.

INTRODUCTION: A hazard is a situation where there is a threat to life, health, environment or property. A disaster is an event that completely disrupts the normal ways of community. It brings on human, economical and commercial losses to the community cannot bear on its own. It may recover, taking a long time and with the help of Govt. and other NGOs. National disaster management authority (NDMA) functions under the Ministry of Home Affairs in India.

TYPES OF HAZARDS AND DISASTERS: Those are: a) Natural, b) Manmade hazards and disasters.

HAZARDS AND DISASTERS: Volcanic eruption, Earthquake, Landslide, Flash floods, Flood, Drought, Cyclone, Nuclear Reactor accident

Sub Unit – 7: Environment Protection Act (1986), National Action Plan on Climate change, International agreements/efforts-Montreal Protocol, Rio Summit, Convention on Biodiversity, Kyoto Protocol, Paris Agreement, International Solar Alliance

Environment Protection Act, 1986, National action plan on climate change, International Agreements, Montreal Protocol, Rio summit or Earth Summit or Agenda 21, Convention on Biological Diversity, Kyoto Protocol, Rwanda Meeting, Paris Agreement, International Solar Alliance, Blue Revolution, Nagoya Protocol

Section – 2: Key Statements

Every candidates appearing for NET/SET examination should follow these key (main) points those can help them a better understanding regarding this unit very quickly.

Key Statements:

Environment (1.1), Types of environment(1.2), Components of Environment (1.3), Approaches to Environmental Study (1.4), Abiotic Environment (1.5.1.), Lithosphere (1.5.1.2), atmosphere (1.5.1.4), hydrosphere (1.5.1.3), biosphere (1.5.2), Plate tectonic (1.5.1.2.4), Earthquake (1.5.1.2.4), Volcano (1.5.1.2.4), Richter's scale (1.5.1.2.5), Tsunami (1.5.1.2.5), seismic waves (1.5.1.2.5), Weathering (1.5.1.2.6), Epicenter (1.5.1.2.5), Planetary wind system (1.5.1.4.2), cyclone (1.5.1.4.3), types of rain (1.5.1.4.4), Biome (1.5.2.1), Cultural Diffusion (1.6.2), EIA (1.7), MDGs (1.9), SDGs (1.10), Pollution (2.1), Global Warming (2.3), Heat island (2.3), rising sea level (2.3), ocean acidification (2.4), pH (2.4), acid rain (2.7), ozone depletion (2.8), Desertification (2.9), national park (2.10.1.4), biosphere reserve (2.10.1.5), Environmental movements (2.11), PAN (3.3), Soot (3.3), CFCs (3.3), Smog (3.3), Surface ozone (3.3), CNGs (3.3), Dioxins (3.3), Air Quality Index (3.3), TDS (3.4), e-waste (3.7.5), Hazardous Waste (3.7.4), resource (5.1,5.2), energy (5.4), hazard (6.1), disaster (6.1), NAPCC (7.2),

[N.B. – Values in parenthesis are the reference number]

Section – 3: Key Facts and Figures

Sub Unit – 1

Development and environment: Millennium development sustainable development goals

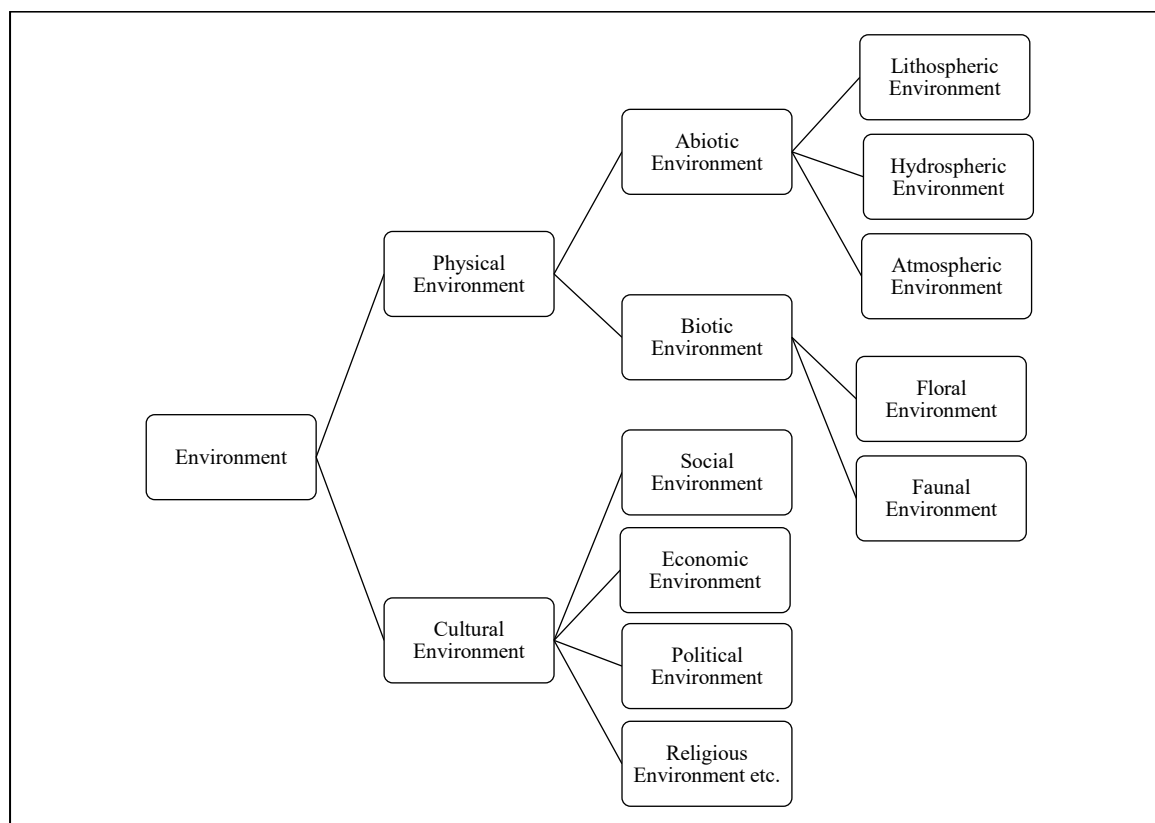
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1.1 Meaning

Environment is everything that is around us. It can be living or non-living things. It includes physical, chemical and other natural forces.

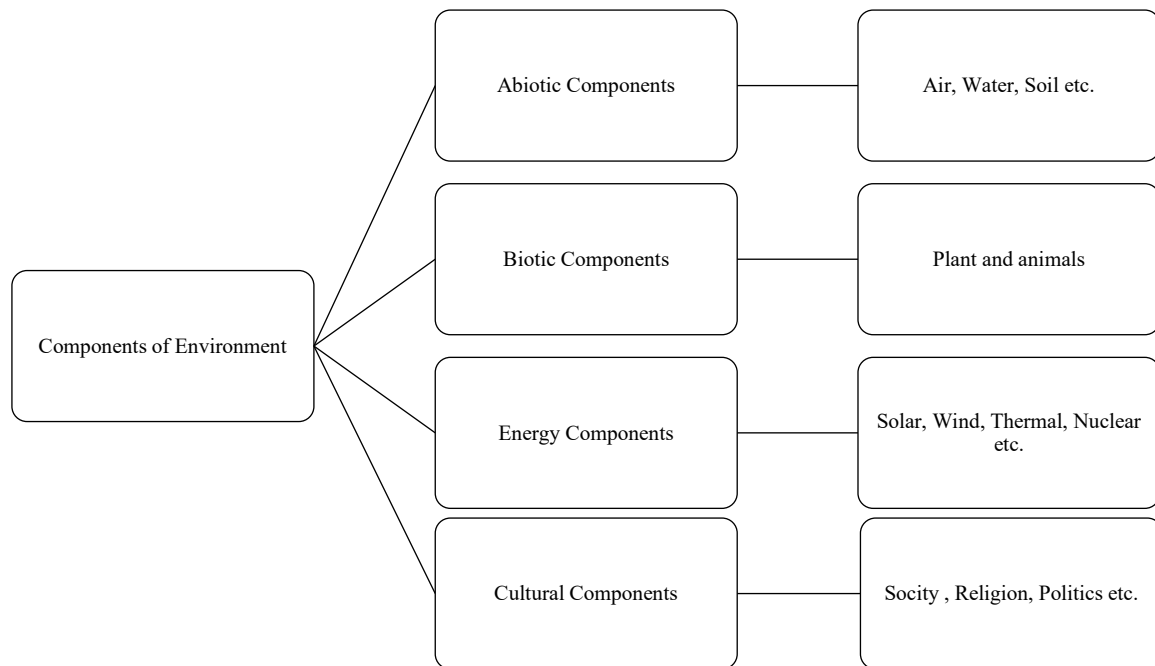
1.2 Types of environment

Generally, environment can divide into two types- a) Physical Environment and b) Cultural Environment. The physical and cultural environments are divided into following types.



1.3 Components of Environment

Components are as follows:



1.4 Approaches to Environmental Study

The approaches are as follows:

Approaches	Core Philosophy or Faith
Deterministic	Nature made Man
Teleological	Everything is created by God
Possibilistic	Man can free to select options given by Nature
Economic Deterministic	Economic and industrial expansion through the application of modern technologies.
Ecological	Interaction between living organisms and the environment
Essentialist	Women are closer to nature than man.

Avery popular Quotation by an Environmental Determinists:

“Man is a product of the earth’s surface. This means not merely that he is a child of the earth, dust of her dust; but that the earth has mothered him, fed him, set him tasks, directed his

thoughts, confronted him with difficulties that have strengthened his body and sharpened his wits, given him problems of navigation or irrigation, and at the same time whispered hints for their solution. She has entered into his bone and tissue, into his mind and soul.”

-by Ellen Churchill Semple

1.5 Physical Environment

The Physical environment is divided into two broad groups. Those are a) abiotic and b) biotic environment.

1.5.1 Abiotic Environment:

This component of the environment is non-living being particals.

1.5.1.1 About the Earth:

The earth is third planet from the Sun in our solar system. The earth crust (Lithosphere) is harder; the inner part of the earth is semi liquid to liquid. Earth has atmosphere and hydrosphere. It sustains life (biosphere). The living beings are present on Lithosphere and hydrosphere; and a little amount in atmosphere.

1.5.1.2 Lithospheric Environment:

Surface to Upper Mantle, the solid outer part of the earth is called Lithosphere. Plates are also present in this sphere. Lithosphere is divided into two groups – i) Oceanic lithosphere and ii) Continental lithosphere.

1.5.1.2.1 Structure of the Earth:

Layers: The five layers are the lithosphere, asthenosphere, mesospheric mantle, outer core, and the inner core.

Depth from Surface Kilometres	Layer
0–60	Lithosphere (locally varies between 5 and 200 km)
0–35	... Crust (locally varies between 5 and 70 km)
60–210	Asthenosphere
35–60	... Uppermost part of mantle
35–2,890	Mantle
210–270	... Upper mesosphere (upper mantle)
660–2,890	... Lower mesosphere (lower mantle)
2,890–5,150	Outer core
5,150–6,360	Inner core

Discontinuities:

- 1) Conrad Discontinuity- Upper Crust and Lower Crust.
- 2) Moho Discontinuity – Crust and Mantle.
- 3) Repetti Discontinuity – Upper Mantle and lower Mantle.
- 4) Gutenberg Discontinuity – Mantle and Core
- 5) Lehmann Discontinuity – Outer Core and Inner Core

1.5.1.2.2 Types of Rocks and Minerals:

The outer part of earth is formed by solid components are called rocks. There are three types of rocks - i) igneous ii) sedimentary and iii) metamorphic rocks.

Rocks are formed by the components are called minerals.

1.5.1.2.3 Geological Time Scale:

Geological Time Scale deals with the chronological order of evolution of life and landforms.

Era	Period	Epoch	Plant and Animal Development
Cenozoic	Quaternary	Holocene (.01)	Humans develop "Age of mammals" Extinction of dinosaurs and many other species.
		Pleistocene (1.8)	
	Tertiary	Pliocene (5.3)	
		Miocene (23.8)	
		Oligocene (33.7)	
		Eocene (54.8)	
		Paleocene (65.0)	
Mesozoic	Cretaceous (144)	"Age of Reptiles"	First flowering plants First birds Dinosaurs dominant.
	Jurassic (206)		
	Triassic (248)		
Paleozoic	Permian (290)		

	Carboniferous: Pennsylvanian (323)	"Age of Amphibians"	Extinction of trilobites and many other marine animals
	Carboniferous: Mississippian (354)		First reptiles Large coal swamps Large Amphibians abundant.
	Devonian (417)	"Age of Fishes"	First insect fossils Fishes dominant First land plants
	Silurian (443)		
	Ordovician (490)	"Age of Invertibrates"	First fishes Trilobites dominant First organisms with shells
	Cambrian (540)		
Precambrian - comprises about 88% of geologic time (4500)			First multicelled organisms First one-celled organisms Origin of Earth

The numbers are in millions of years.

1.5.1.2.4 Plate Tectonic and Volcano and Eruption types Lahar:

Lithosphere is formed by seven large and many medium to small plates. Plate Tectonic is a scientific concept. Plate can float on asthenosphere. Asthenosphere is in semi liquid to liquid state.

Volcano is a weak place, where liquid or semi liquid magma (asthenospheric material) can come out (i.e. lava) and make a cone shaped landform in crust.

Volcanic eruption can damage all three spheres (Lithosphere, Hydrosphere and Atmosphere) of the earth.

Some volcanoes are covered with snow and ice. If they erupt, melted snow and ice mixes with mud and volcanic ash and flows down mountain. This type of volcanic flow is called Lahar.

1.5.1.2.5 Earthquake, Richter s scale and Tsunami:

An earthquake is shaking of earth, resulting of sudden release of energy stored in Lithosphere. It releases seismic waves (P,S,L waves).

Focus is the location where the earthquake originates.

Epicenter is a point on the Earth's surface just above the focus.

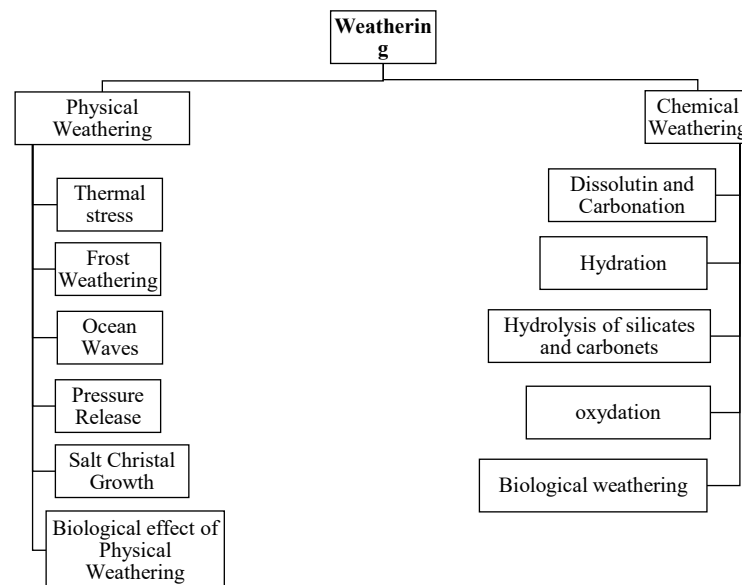
The Richter magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismometer. In seismograph reading difference between 5 and 4, it gives 10 times greater reading from 4. At the same time it releases 31.6 times larger energy from 4. A series of waves in a water body caused by the displacement of a large volume of water, generally in an ocean caused by Earthquakes, volcanic eruptions and other underwater explosions is called Tsunami.

1.5.1.2.6 Weathering:

The process of deformation of rocks by atmospheric agents (temperature, Rainfall, humidity, chemical reaction etc.) is called Weathering.

Physical weathering depends upon temperature, pressure etc.

Chemical weathering depends upon low temperature, rainfall, humidity etc.



1.5.1.2.7 Soil:

The soft earth surface of deformed, granular weathered rock is called soil.

1.5.1.3 Hydrospheric Environment:

Near about 2/3 of earth surface is covered by Water.

1.5.1.3.1 Water Cycle:

Evaporation of water occurred by temperature. After evaporation it forms cloud. After saturation (with the help of aerosols) of cloud it creates precipitation.

1.5.1.3.2 Ocean Temperature, Currents, Salinity and Density:

Ocean temperature directly depends upon distance from the sun.

The **currents** are generated from the forces acting upon the water like the earth's rotation, the wind, the temperature and salinity differences and the gravitation of the moon etc.

Weathering produces minerals and salt to the ocean. Evaporation of ocean water and sea ice both increase the salinity.

Ocean water density varies throughout the globe. it depends upon temperature. Polar water is much denser than equatorial water. Generally, fresh water achieves great density in 4°C

Absorption and decomposition of CO₂ in ocean water beyond desired level, there will be growth of Phytoplankton.

1.5.1.4 Atmospheric Environment:

It is spread near up to 10,000 kilometers from the earth surface.

1.5.1.4.1 Composition, Layering and Heat budget:

The atmosphere of Earth is composed of nitrogen (about 78%), oxygen (about 21%), argon (about 0.9%), carbon dioxide (0.04%) and other gases in trace amounts.

Except those gases aerosols and water vapor plays a vital role to form clouds, and controls atmospheric temperature.

There are five layers - troposphere, stratosphere, mesosphere, thermosphere and exosphere. Tropopause is the divider between troposphere and stratosphere. Stratopause is the divider between Stratosphere and mesosphere. Mesopause divides mesosphere and thermosphere.

The earth receives solar energy as short wave and radiate excess energy as long wave (34% albedo) into the space. The cloudy nights are warmer compared to clear nights (Without clouds) during winter days. This is because clouds prevent escaping the heat.

1.5.1.4.2 Planetary Wind System:

There are seven wind belts are present on our Planet. Those are –

- 1) Equatorial low pressure belt (1)
- 2) Mid longitudinal high pressure belts (2,3)
- 3) Sub polar low pressure belts (4,5)
- 4) Polar high pressure belts (6,7)

Wind always flow high pressure region to low pressure region.

The planetary wind circulation cells are-

- 1) Hadly Cell – in between Equatorial low pressure belt and mid longitudinal high pressure belt.
- 2) Ferrel Cell - in between Mid longitudinal high pressure belt and Sub polar low pressure belt.
- 3) Polar Cell - Sub polar low pressure belt and Polar high pressure belt.

1.5.1.4.3 Cyclone and Anticyclone:

A **cyclone** is a large scale air mass that rotates around a strong center of low atmospheric pressure. In the Northern and Southern hemisphere it rotates anti-clockwise and clockwise respectively.

Anticyclone is a large-scale circulation of winds around a high pressure zone.

In the northern and southern hemisphere it rotates clockwise and anti-clockwise respectively.

1.5.1.4.4 Types of Rain:

There are three types of rainfall.

- 1) Relief Rainfall/Orographic
- 2) Conventional Rainfall
- 3) Frontal Rainfall/Cyclonic

1.5.2 Biotic Environment

This environment consists with plant and animal community.

1.5.2.1 Biome:

The biomes are as follows- a) Tundra b) Taiga c) Deciduous forest d) Grasslands e) Desert f) High plateaus g) Tropical forest h) Minor terrestrial biomes. Except those marine biomes are as follows- a) Littoral zone b) Pelagic zone c) Abyssal zone.

1.5.2.2 Habitat, Ecology, Ecosystem and Ecological foot prints:

A **habitat** is the type of natural environment in which a particular species of organism lives.

Ecology is the branch of biology which studies the interactions among organisms and their environment.

An **ecosystem** is a community of living organisms in conjunction with the nonliving components of their environment, interacting as a system. The **ecological footprint** measures human demand on nature, i.e., the quantity of nature it takes to support human or an economy. It tracks this demand through an ecological accounting system.

1.6 Cultural Environment:

The environment built up the man called Cultural or built-up environment. Example – Urban environment, Political Environment etc.

1.6.1 Cultural Region:

It is based on common cultural characteristics, such as language, religious beliefs, customs, and art forms.

1.6.2 Cultural Diffusion:

Cultural diffusion is the spread of *cultural* beliefs and social activities from one group of people to another. Example: Shalwar Shute of Punjab spreads all over in India.

1.7 Environmental Impact Assessment

Environmental impact assessment (EIA) is the assessment of the environmental consequences (positive and negative) of a plan, policy, programme, or actual projects prior to the decision to move forward with the proposed action.

It may take time a whole year or year after years.

1.8 Evolutions

EVOLUTION	
Years ago	event

PLANET AND LIFE EVOLUTION	
14,700,000,000	formation of universe
4,500,000,000	formation of earth
3,800,000,000	first recorded life on Earth, single-celled Prokaryotes like cyanobacteria
65,000,000	dinosaur extinctions, Tertiary radiation of mammals (late Cretaceous period)

1.9 Millennium Development Goals (MDGs)

The **Millennium Development Goals (MDGs)** were eight international development goals for the year 2015 that had been established following the Millennium Summit of the United Nations in 2000, following the adoption of the United Nations Millennium Declaration.

All 191 United Nations member states at that time, and at least 22 international organizations, committed to help achieve the following Millennium Development Goals by 2015

1. To eradicate extreme poverty and hunger
2. To achieve universal primary education
3. To promote gender equality and empower women
4. To reduce child mortality
5. To improve maternal health
6. To combat HIV/AIDS, malaria, and other diseases
7. To ensure environmental sustainability
8. To develop a global partnership for development

1.10 Sustainable Development Goals (SDGs)

The **Sustainable Development Goals (SDGs)** are a collection of 17 global goals set by the United Nations General Assembly in 2015 for the year 2030.

The Sustainable Development Goals are: 1) No Poverty, 2) Zero Hunger, 3) Good Health and Well-being, 4) Quality Education, 5) Gender Equality, 6) Clean Water and Sanitation, 7)

Affordable and Clean Energy, 8) Decent Work and Economic Growth, 9) Industry, Innovation, and Infrastructure, 10) Reducing Inequality, 11) Sustainable Cities and Communities, 12) Responsible Consumption and Production, 13) Climate Action, 14) Life Below Water, 15) Life On Land, 16) Peace, Justice, and Strong Institutions, 17) Partnerships for the Goals.

The goals are broad based and interdependent. The 17 Sustainable Development Goal's each have a list of targets that are measured with indicators.

Sub Unit – 2

Human and environment interaction: Anthropogenic activities and their impacts on environment

.....

Ancient civilization develops along the fertile river banks. **Human** activity is causing **environmental** degradation, which is the deterioration of the **environment** through depletion of resources such as air, water and soil; the destruction of ecosystems; habitat destruction; the extinction of wildlife; and pollution. There are several bad impacts on environment are done by human from ancient civilization. Improvement of human civilization awarded us pollution like environmental problem. Some of them are as follows- 1) Pollution, 2) Overpopulation, 3) Global Warming, 4) Climate Change, 5) Genetic Modification, 6) Ocean Acidification, 7) Water Pollution, 8) Deforestation, 9) Acid Rain, 10) Ozone Depletion, 11) Biodiversity loss etc.

2.1 Pollution

Air, water, soil are polluting day by days. The first ten countries of carbon dioxide emissions are listed below:

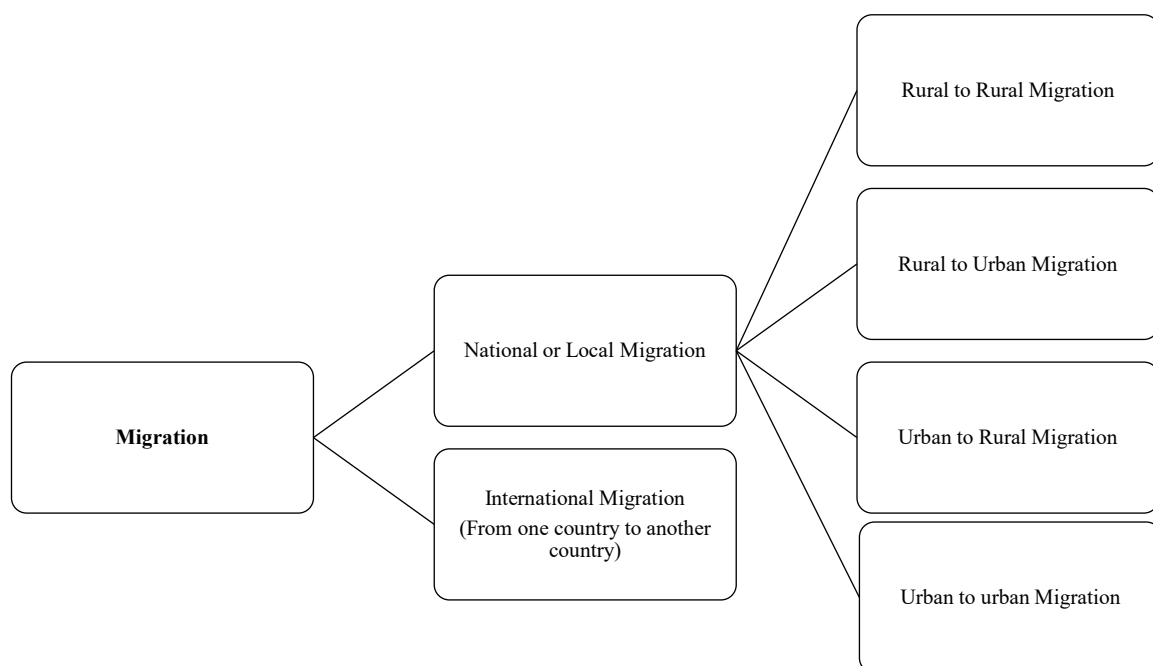
country rank	Country	2015 total carbon dioxide emissions from fuel combustion (million metric tons)
1	China	9040.74
2	United States	4997.50
3	India	2066.01
4	Russia	1468.99
5	Japan	1141.58
6	Germany	729.77
7	South Korea	585.99
8	Iran	552.40
9	Canada	549.23
10	Saudi Arabia	531.46

2.2 Population growth and food production

According to Malthus, population growth happens in geometric progression and food production occurs in arithmetic progression.

People can move one place to another. They change their primitive primary activity to modern quaternary activity. They classify rural and urban regions. For their needs they move one place to another place (migration) for their better life.

Slums in metropolitan cities are the result of rural to urban migration.



Food production and agriculture consume near about 70% of water. The rest remains domestic and industrial use of water is 10% and 20% respectively.

2.3 Global Warming

Global warming is the increase in the average temperature of the Earth's near-surface air and the oceans ever since the mid-twentieth century. The temperature is rising day by day.

Causes: Human activity since the Industrial Revolution has increased the amount of greenhouse gases in the atmosphere, leading to increased radioactive forcing from CO₂, methane, tropospheric ozone, CFCs, and nitrous oxide. It causes greenhouse effect.

Effects: Ongoing effects include **rising sea levels** due to thermal expansion and melting of glaciers and ice sheets, and warming of the ocean surface, leading to increased temperature

stratification. Other possible effects include large-scale changes in ocean circulation. Global climate change is also an effect.

Urban Heat island (UHI) is an urban area or metropolitan area that is significantly warmer than its surrounding rural areas due to human activities. It creates local low pressure zone. Wind flow in urban region is heavier rather than rural areas.

2.4 Ocean Acidification

Ocean water is slightly basic in nature. Due to increase of atmospheric carbon dioxide, it dissolves with water and increase pH value of ocean water. As a result calcium carbonate related plant and animals are in danger.

2.5 Deforestation

Deforestation causes problems like soil erosion, fewer crops, flooding, water cycle disruption, increase greenhouse gas emissions, changes in the climatic conditions, and loss of biodiversity.

2.6 Soil Erosion

Soil erosion is the displacement of the upper layer of soil. It is one form of soil degradation. This natural process is caused by the dynamic activity of erosive agents, that is, water, ice, snow, air, plants, animals, and humans.

2.7 Acid Rain

Adding of carbon dioxide with rain water droplets creates slightly carbonic acid. It can damage soil property or calcium carbonate related heritages. P^H . 5.65

2.8 Ozone Depletion

CFCs and halons gases are released into atmosphere. It reacts with stratospheric ozone layer and makes ozone layer thinner. UV ray from sun can easily reach to the earth surface and cause skin cancer of man and disturbs plant growth.

2.9 Desertification

Cause: 'Climatic variations' and 'Human activities' can be regarded as the two main causes of desertification. Removal of the natural vegetations, agricultural activities in the vulnerable

ecosystems of arid and semi-arid areas, which are thus strained beyond their capacity. 319 million hectares of **Africa** are vulnerable to **desertification** due to sand movement. The assessment is done by FAO and UNEP. They suggest that the desert is moving at an annual rate of 5 km in the semi-arid areas of West **Africa**.

2.10 Environment in Indian Context

2.10.1 Geography of India: at a glance:

Capital: New Delhi

Total area: 3287263 sq kms.

Population (2011): 1210854977

Population Density: 401.5/sq kms.

States: 28 states and 9 union territories including Jammu & Kashmir and Ladakh.

Smallest state: Goa

Largest State: Rajasthan

Smallest state in East: Tripura

Number of Coastal States: Nine states- 1) Gujarat 2) Maharashtra 3) Goa, 4) Karnataka, 5) Kerala, 6) Tamil Nadu, 7) Andhra Pradesh, 8) Odisha, 9) West Bengal. **Two Union Territories-** 1) Daman & Diu, 2) Puducherry.

Longest river: Ganges- Brahmaputra

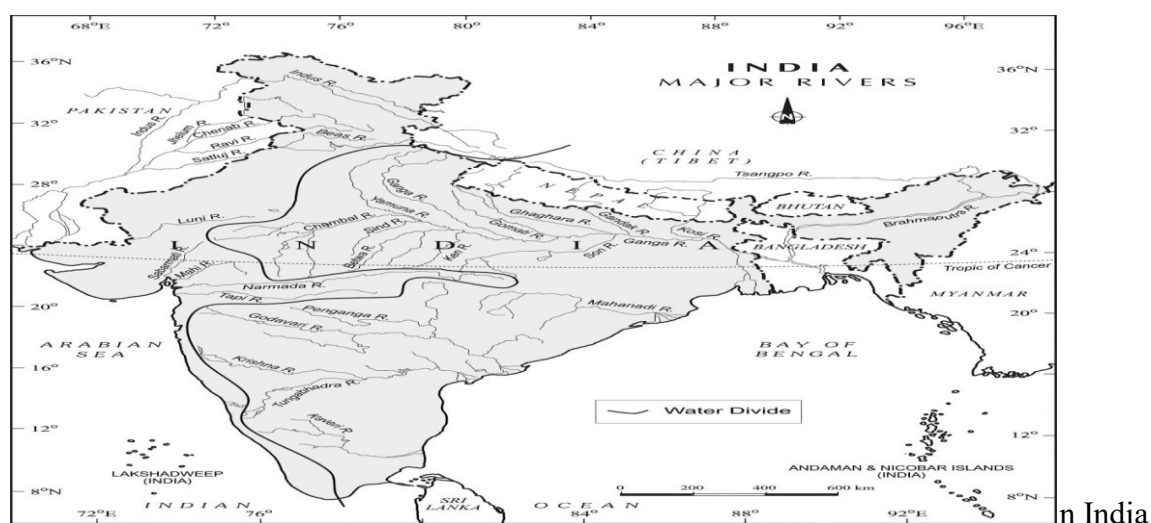
Geographical regions: a) Himalaya, b) Indo-Gangetic plains, c) Thar Desert, d) Central Highlands and Deccan Plateau, e) East Coast, f) West Coast, g) Bordering seas and islands.

Mountains: 1) Aravalli, 2) Eastern Ghats, 3) Himalayas, 4) Patkai, 5) Vindhyas, 6) Sahyadri or Western Ghats, 7) Satpuras, 8) Karakoram.

All **major rivers** of India originate from one of the three main watersheds. They are:

1. The Himalaya and the Karakoram ranges
2. Vindhya and Satpura range in central India

3. Sahyadri or Western Ghats in wester



Most of the major rivers of the Indian subcontinent such as the Indus, **Ganga** and **Brahmaputra**, **Kaveri**, **Krishna**, **Godavari** and **Mahanadi** flow eastwards and empties into the Bay of Bengal after forming deltas.

2.10.1.1 State wise Dams:

Name of Dam	State	River
Nizam Sagar Dam	Telangana	Manjira River
Somasila Dam	Andhra Pradesh	Pennar River
Srisaillam Dam	Andhra Pradesh	Krishna River
Singur dam	Telangana	Manjira River
Ukai Dam	Gujarat	Tapti River
Dharoi Dam	Gujarat	Sabarmati River
Kadana dam	Gujarat	Mahi River
Dantiwada Dam	Gujarat	Banas River
Pandoh Dam	Himachal Pradesh	Beas River
Bhakra Nangal Dam	Himachal Pradesh and Punjab	Sutlej River
Nathpa Jhakri Dam	Himachal Pradesh	Satluj River
Chamera Dam	Himachal Pradesh	Ravi River
Baglihar Dam	Jammu and Kashmir	Chenab River
Dumkhar Hydroelectric Dam	Jammu and Kashmir	Indus River
Uri Hydroelectric Dam	Jammu and Kashmir	Jhelum River
Maithon Dam	Jharkhand	Barakar River
Chandil Dam	Jharkhand	Swarnarekha River
Panchet Dam	Jharkhand	Damodar River
Tunga Bhadra Dam	Karnataka	Tungabhadra River
Linganamakki dam	Karnataka	Sharavathi River

Kadra Dam	Karnataka	Kalinadi River
Alamatti Dam	Karnataka	Krishna River
Supa Dam	Karnataka	Kalinadi or Kali river
Krishna Raja Sagara Dam	Karnataka	Kaveri River
Harangi Dam	Karnataka	Harangi River
Narayanpur Dam	Karnataka	Krishna River
Kodasalli Dam	Karnataka	Kali River
Malampuzha Dam	Kerala	Malampuzha River
Peechi Dam	Kerala	Manali River
Idukki Dam	Kerala	Periyar River
Kundala Dam	Kerala	Kundala Lake
Parambikulam Dam	Kerala	Parambikulam River
Walayar Dam	Kerala	Walayar River
Mullaperiyar Dam	Kerala	Periyar River
Neyyar Dam	Kerala	Neyyar River
Rajghat Dam	Uttar Pradesh and Madhya	Betwa River
Barna Dam	Madhya Pradesh	Barna River
Bargi Dam	Madhya Pradesh	Narmada River
Bansagar Dam	Madhya Pradesh	Sone River
Gandhi Sagar Dam	Madhya Pradesh	Chambal River
Yeldari Dam	Maharashtra	Purna river
Ujani Dam	Maharashtra	Bhima River
Pawna Dam	Maharashtra	Maval River
Mulshi Dam	Maharashtra	Mula River
Koyna Dam	Maharashtra	Koyna River
Jayakwadi Dam	Maharashtra	Godavari River
Bhatsa Dam	Maharashtra	Bhatsa river
Wilson Dam	Maharashtra	Pravara River
Tansa Dam	Maharashtra	Tansa river
Panshet Dam	Maharashtra	Ambi River
Mula Dam	Maharashtra	Mula river
Kolkewadi Dam	Maharashtra	Vashishti River
Girna Dam	Maharashtra	Girana river
Vaitarna Dam	Maharashtra	Vaitarna river
Radhanagari Dam	Telangana	Bhogawati River
Lower Manair Dam	Telangana	Manair River
Mid Manair Dam	Telangana	Manair River and SRSP
Upper Manair Dam	Telangana	Manair River and Kudlair
Khadakwasla Dam	Maharashtra	Mutha River
Gangapur Dam	Maharashtra	Godavari river
Jalaput Dam	Andhra Pradesh and Odisha	Machkund River
Indravati Dam	Odisha	Indravati River

Hirakud Dam	Odisha	Mahanadi River
Vaigai Dam	Tamil Nadu	Vaigai River
Perunchani Dam	Tamil Nadu	Paralayar River
Mettur Dam	Tamil Nadu	Kaveri River
Govind Ballabh Pant Sagar	Uttar Pradesh	Rihand River
Tehri Dam	Uttarakhand	Bhagirathi River
Dhauri Ganga Dam	Uttarakhand	Dhauri Ganga River

2.10.1.2 State wise Reservoirs:

Reservoir in India		
Dindi Reservoir	Telangana	Krishna River
Lower Manair Reservoir	Telangana	Manair River
Tatipudi Reservoir Project	Andhra Pradesh	Gosthani River
Gandipalem Reservoir	Andhra Pradesh	Manneru River
Himayat Sagar Reservoir	Telangana	Osman Sagar
Shriram Sagar Reservoir	Telangana	Godavari River
Gobind Sagar Reservoir	Himachal Pradesh	Sutlej River
Maharana Pratap Sagar Reservoir	Himachal Pradesh	Pong Dam Lake
Ghataprabha Reservoir	Karnataka	Ghataprabha River
Hemavathi Reservoir	Karnataka	Hemavati River
Tawa Reservoir	Madhya Pradesh	Tawa River
Balimela Reservoir	Odisha	Sileru River
Aliyar Reservoir	Tamil Nadu	Aliyar River
Chittar Reservoir	Tamil Nadu	Chittar River
Krishnagiri Reservoir	Tamil Nadu	Thenpennai River
Manimuthar Reservoir	Tamil Nadu	Tamirabarani River
Pechiparai Reservoir	Tamil Nadu	Kodayar River
Shoolagiri Chinnar Reservoir	Tamil Nadu	Chinnar River
Thunakadavu Reservoir	Tamil Nadu	Thunakadavu River
Varattu Pallam Reservoir	Tamil Nadu	
Vidur Reservoir	Tamil Nadu	
Amaravathi Reservoir	Tamil Nadu	Amaravathi River
Gundar Reservoir	Tamil Nadu	Berijam Lake
Kullursandai Reservoir	Tamil Nadu	Arjuna Nadi
Pambar Reservoir	Tamil Nadu	Pambar River
Periyar Reservoir	Tamil Nadu	Periyar River
Stanley Reservoir	Tamil Nadu	Kaveri River
Uppar Reservoir	Tamil Nadu	
Vattamalaikarai Odai Reservoir	Tamil Nadu	Odai River
Willingdon Reservoir	Tamil Nadu	Periya Odai River

Bhavanisagar Reservoir	Tamil Nadu	Bhavani River
Kodaganar Reservoir	Tamil Nadu	Kodagananar River
Manimukthanadhi Reservoir	Tamil Nadu	
Parambikulam Reservoir	Tamil Nadu	Parambikulam River
Sholayar Reservoir	Tamil Nadu	
Thirumurthi Reservoir	Tamil Nadu	Parmabikulam and Aliyar
Varadamanadhi Reservoir	Tamil Nadu	
Vembakottai Reservoir	Tamil Nadu	Vaippar River
Manjalar Reservoir	Tamil Nadu	
Salal Project	Jammu and Kashmir	Chenab River
Chutak Hydroelectric Project	Jammu and Kashmir	
Indirasagar Project	Madhya Pradesh	Narmada River
Narmada Dam Project	Madhya Pradesh	Narmada River
Rihand Project	Uttar Pradesh	Rihand River and Son River

2.10.1.3 Wildlife sanctuaries:

There are 543 **wildlife sanctuaries** in the country. It covers 118,918 sq km of the area.

2.10.1.4 List of national parks in India:

Name	State	Established	Area (in	Notability
Anamudi Shola	Kerala	2003	7.50	under consideration of
Anshi National Park	Karnataka	1987	417.34	The great Indian hornbill, tiger,
Balphakram	Meghalaya	1986	220	Wild water buffalo, red panda,
Bandhavgarh	Madhya	1968	446	1336 species of endemic plants
Bandipur National	Karnataka	1974	874.20	Chital, Bengal tiger, gray
Bannerghatta	Karnataka	1986	104.3	Tiger, sloth bear, peacock,
Betla National Park	Jharkhand	1986	1135	tiger, Indian bison, elephant,
Bhitarkanika	Odisha	1988	145	Mangroves, saltwater crocodile,
Bison (Rajbari)	Tripura	2007	31.63	
Blackbuck National	Gujarat	1976	34.08	Hunting cheetahs, Blackbuck
Buxa Tiger Reserve	West Bengal	1992	760	
Campbell Bay	Andaman and	1992	426.23	
Chandoli National	Maharashtra	2004	317.67	
Clouded Leopard	Tripura	2003	5.08	
Dachigam National	Jammu and	1981	141	Only area where Kashmir stag is
Desert National Park	Rajasthan	1980	3162	Greatest attraction of the park is
Dibru-Saikhowa	Assam	1999	340	Feral horse
Dudhwa National	Uttar Pradesh	1977	490.29	Tiger, Sambar deer, hog deer
Eravikulam National	Kerala	1978	97	Nilgiri tahr, Strobilanthes
Galathea National	Andaman and	1992	110	
Gangotri National	Uttarakhand	1989	2390	

Gir Forest National	Gujarat	1965	1412	Asiatic lion
Gorumara National	West Bengal	1994	79.45	
Govind Pashu Vihar	Uttarakhand	1990	472.08	
Great Himalayan	Himachal	1984	754.40	UNESCO World Heritage Site
Gugamal National	Maharashtra	1987	361.28	
Guindy National	Tamil Nadu	1976	2.82	
Gulf of Mannar	Tamil Nadu	1980	6.23	
Guru Ghasidas	Chhattisgarh	1981	1440.71	
Hemis National Park	Jammu and	1981	4400	Largest National park in India
Inderkilla National	Himachal	2010	104	
Indra Gandhi	Tamil Nadu	1989	117.10	
Indravati National	Chhattisgarh	1981	1258.37	Wild Asian buffalo, tiger
Jaldapara National	West Bengal	2012	216	Indian rhinoceros
Jim Corbett National	Uttarakhand	1936	1318.5	First national park in India
Kalesar National	Haryana	2003	100.88	
Kanha National Park	Madhya	1955	940	
Kanger Ghati	Chhattisgarh	1982	200	
Kasu Brahmananda	Telangana	1994	1.42	
Kaziranga National	Assam	1974	858.98	Highest known tiger density in
Keibul Lamjao	Manipur	1977	40	Only floating park in the world
Keoladeo National	Rajasthan	1981	28.73	UNESCO World Heritage Site
Khangchendzonga	Sikkim	1977	1784	UNESCO World Heritage Site
Khirganga National	Himachal	2010	710	
Kishtwar National	Jammu and	1981	400	
Kudremukh	Karnataka	1987	600.32	
Kuno National Park	Madhya	2018	748.76	Asiatic Lion Reintroduction
Madhav National	Madhya	1959	375.22	
Mahatma Gandhi	Andaman and	1983	281.50	
Mahavir Harina	Telangana	1994	14.59	
Manas National	Assam	1990	950	UNESCO World Heritage Site
Mandla Plant Fossils	Madhya	1983	0.27	
Marine National	Gujarat	1980	162.89	
Mathikettan Shola	Kerala	2003	12.82	elephants
Middle Button	Andaman and	1987	0.44	
Mollem National	Goa	1978	107	
Mouling National	Arunachal	1986	483	
Mount Abu Wildlife	Rajasthan	1960	288.84	
Mount Harriet	Andaman and	1987	46.62	Important bird area as attributed
Mrugavani National	Telangana	1994	3.60	
Mudumalai National	Tamil Nadu	1940	321.55	
Mukundra Hills	Rajasthan	2006	200.54	
Mukurthi National	Tamil Nadu	2001	78.46	Nilgiri tahr

Murlen National	Mizoram	1991	100	
Nagarhole National	Karnataka	1988	643.39	
Namdapha National	Arunachal	1974	1985.24	
Nameri National	Assam	1978	137.07	
Nanda Devi	Uttarakhand	1982	630.33	UNESCO World Heritage Site,
Navegaon National	Maharashtra	1975	133.88	
Neora Valley	West Bengal	1986	88	
Nokrek National	Meghalaya	1986	47.48	UNESCO World Biosphere
North Button Island	Andaman and	1979	0.44	
Ntangki National	Nagaland	1993	202.02	
Orang National Park	Assam	1999	78.81	
Pambadum Shola	Kerala	2003	1.32	Nilgiri marten, Nilgiri wood
Panna National Park	Madhya	1981	542.67	
Papikonda National	Andhra	2008	1012.85	
Pench National	Madhya	1977	758	
Periyar National	Kerala	1982	305	Malabar parakeet, Malabar grey
Phawngpui Blue	Mizoram	1992	50	
Pin Valley National	Himachal	1987	807.36	
Rajaji National Park	Uttarakhand	1983	820	Mainly known for elephants,
Rajiv Gandhi	Andhra	2005	2.4	
Rani Jhansi Marine	Andaman and	1996	256.14	
Ranthambore	Rajasthan	1981	392	
Saddle Peak	Andaman and	1979	32.54	
Salim Ali National	Jammu and	1992	9.07	
Sanjay National	Madhya	1981	466.7	
Sanjay Gandhi	Maharashtra	1969	104	Asiatic Lion, Indian Leopard,
Sariska Tiger	Rajasthan	1955	866	
Satpura National	Madhya	1981	524	
Silent Valley	Kerala	1980	237	Absence of noisy cicadas, hence
Simbalbara National	Himachal	2010	27.88	
Sirohi National Park	Manipur	1982	41.30	
Simlipal National	Odisha	1980	2750	Tiger, leopard, Asian elephant,
Singalila National	West Bengal	1986	78.60	
South Button Island	Andaman and	1987	0.03	Dugong, dolphin, water monitor
Sri Venkateswara	Andhra	1989	353	
Sultanpur National	Haryana	1989	1.43	
Sundarbans National	West Bengal	1984	1330.12	UNESCO World Heritage Site
Tadoba National	Maharashtra	1955	625	Tiger
Valley of Flowers	Uttarakhand	1982	87.50	UNESCO World Heritage Site
Valmiki National	Bihar	1976	898.45	
Vansda National	Gujarat	1979	23.99	
Van Vihar National	Madhya	1983	4.48	

2.10.1.5 Biosphere Reserves of India:

Biosphere reserves of India							
	Year	Name	Location	State	Type	Key	Area
1	1986	Nilgiri Biosphere	Part of Waynad,	Tamil Nadu,	Western	Nilgiri	5520
2	1988	Nanda Devi Biosphere	Parts of Chamoli	Uttarakhand	Western	Snow	5860
3	1989	Gulf of Mannar	Indian part of	Tamil Nadu	Coasts	Dugong	10500
4	1988	Nokrek	In west Garo	Meghalaya	Eastern	Red panda	820.00
5	1989	Sundarbans	Part of delta of	West	Gangetic	Royal	9630
6	1989	Manas	Part of	Assam	Eastern	Asiatic	2837
7	1994	Simlipal	Part of	Odisha	Deccan	Gaur,	4374
8	1998	Dihang-Dibang	Part of Siang and	Arunachal	Eastern	Mishmi	5112
9	1999	Pachmarhi Biosphere	Parts of Betul	Madhya	Semi-Arid	Giant	4981.72
10	2005	Achanakmar-	Part of Annupur,	Madhya	Maikala	Four-	3835
11	2008	Great Rann of Kutch	Part of Kutch,	Gujarat	Desert	Indian	12454
12	2009	Cold Desert	Pin Valley	Himachal	Western	Snow	7770
13	2000	Khangchendzonga	Parts of	Sikkim	East	Snow	2620
14	2001	Agasthyamalai	Neyyar, Peppara	Kerala,	Western	Nilgiri	3500.08
15	1989	Great Nicobar	Southern most	Andaman	Islands	Saltwater	885
16	1997	Dibru-Saikhowa	Part of Dibrugarh	Assam	Eastern	white-	765
17	2010	Seshachalam Hills	Seshachalam Hill	Andhra	Eastern	Slender	4755
18	2011	Panna	Part of Panna	Madhya	Catchment	Tiger,	

2.11 Environmental Movements in India

The environmental movement including conservation and green politics, is a diverse scientific, social, and political movement for addressing environmental issues. Some of them are as follows-

2.11.1 Bishnoi Movement:

Year: 1700s

Place: Khejarli, Marwar region, Rajasthan state.

Leaders: Amrita Devi along with Bishnoi villagers in Khejarli and surrounding villages.

Aim: Save sacred trees (Dates) from being cut down by the king's soldiers for a new palace.

What was it all about: Amrita Devi, a female villager could not bear to witness the destruction of both her faith and the village's sacred trees. She hugged the trees and encouraged others to

do the same. 363 Bishnoi villagers were killed in this movement. The Bishnoi tree martyrs were influenced by the teachings of Guru Maharaj Jambaji, who founded the Bishnoi faith in 1485 and set forth principles forbidding harm to trees and animals. The king who came to know about these events rushed to the village and apologized, ordering the soldiers to cease logging operations. Soon afterwards, the maharajah designated the Bishnoi state as a protected area, forbidding harm to trees and animals. This legislation still exists today in the region.

2.11.2 Chipko Movement:

Year: 1973

Place: In Chamoli district and later at Tehri-Garhwal district of Uttarakhand.

Leaders: Sundarlal Bahuguna, Gaura Devi, Sudesha Devi, Bachni Devi, Chandi Prasad Bhatt, Govind Singh Rawat, Dhoom Singh Negi, Shamsheer Singh Bisht and Ghanasyam Raturi.

Aim: The main objective was to protect the trees on the Himalayan slopes from the axes of contractors of the forest.

What was it all about: Mr. Bahuguna enlightened the villagers by conveying the importance of trees in the environment which checks the erosion of soil, cause rains and provides pure air. The women of Advani village of Tehri-Garhwal tied the sacred thread around trunks of trees and they hugged the trees, hence it was called 'Chipko Movement' or 'hug the tree movement'. The main demand of the people in these protests was that the benefits of the forests (especially the right to fodder) should go to local people. The Chipko movement gathered momentum in 1978 when the women faced police firings and other tortures. The then state Chief Minister, Hemwati Nandan Bahuguna set up a committee to look into the matter, which eventually ruled in favor of the villagers. This became a turning point in the history of eco-development struggles in the region and around the world.

2.11.3 Save Silent Valley Movement:

Year: 1978

Place: Silent Valley, an evergreen tropical forest in the Palakkad district of Kerala, India.

Leaders: The Kerala Sastra Sahitya Parishad (KSSP) an NGO and the poet-activist Sughatha Kumari played an important role in the Silent Valley protests.

Aim: In order to protect the Silent Valley, the moist evergreen forest from being destroyed by a hydroelectric project.

What was it all about: The Kerala State Electricity Board (KSEB) proposed a hydroelectric dam across the Kunthipuzha River that runs through Silent Valley. In February 1973, the Planning Commission approved the project at a cost of about Rs 25 crores. Many feared that the project would submerge 8.3 sq km of untouched moist evergreen forest. Several NGOs strongly opposed the project and urged the government to abandon it. In January 1981, bowing to unrelenting public pressure, Indira Gandhi declared that Silent Valley will be protected. In June 1983 the Center re-examined the issue through a commission chaired by Prof. M.G.K. Menon. In November 1983 the Silent Valley Hydroelectric Project was called off. In 1985, Prime Minister Rajiv Gandhi formally inaugurated the Silent Valley National Park.

2.11.4 Jungle Bachao Andholan:

Year: 1982

Place: Singhbhum district of Bihar

Leaders: The tribals of Singhbhum.

Aim: Against government's decision to replace the natural **sal forest** with **Teak**.

What was it all about: The tribals of Singhbhum district of Bihar started the protest when the government decided to replace the natural sal forests with the highly-priced teak. This move was called by many as "Greed Game Political Populism". Later this movement spread to Jharkhand and Orissa.

2.11.5 Appiko Movement:

Year: 1983

Place: Uttara Kannada and Shimoga districts of Karnataka State

Leaders: Appiko's greatest strengths lie in it being neither driven by a personality nor having been formally institutionalized. However, it does have a facilitator in Pandurang Hegde. He helped launch the movement in 1983.

Aim: Against the felling and commercialization of natural forest and the ruin of ancient livelihood.

What was it all about: It can be said that Appiko movement is the southern version of the Chipko movement. The Appiko Movement was locally known as "Appiko Chaluvali". The locals embraced the trees which were to be cut by contractors of the forest department. The Appiko movement used various techniques to raise awareness such as foot marches in the interior forest, slide shows, folk dances, street plays etc. The second area of the movement's

work was to promote afforestation on denuded lands. The movement later focused on the rational use of ecosystem through introducing alternative energy resource to reduce pressure on the forest. The movement became a success. The current status of the project is – stopped.

2.11.6 Narmada Bachao Andholan (NBA):

Year: 1985

Place: Narmada River, which flows through the states of Gujarat, Madhya Pradesh and Maharashtra.

Leaders: Medha Patkar, Baba Amte, adivasis, farmers, environmentalists and human rights activists.

Aim: A social movement against a number of large dams being built across the Narmada River.

What was it all about: The movement first started as a protest for not providing proper rehabilitation and resettlement for the people who have been displaced by the construction of Sardar Sarovar Dam. Later on, the movement turned its focus on the preservation of the environment and the eco-systems of the valley. Activists also demanded the height of the dam to be reduced to 88 m from the proposed height of 130m. World Bank withdrew from the project.

The environmental issue was taken into court. In October 2000, the Supreme Court gave a judgment approving the construction of the Sardar Sarovar Dam with a condition that height of the dam could be raised to 90 m. This height is much higher than the 88 m which anti-dam activists demanded, but it is definitely lower than the proposed height of 130 m. The project is now largely financed by the state governments and market borrowings. The project is expected to be fully completed by 2025.

Although not successful, as the dam could not be prevented, the NBA has created an anti-big dam opinion in India and outside. It questioned the paradigm of development. As a democratic movement, it followed the Gandhian way 100 per cent.

2.11.7 Tehri Dam Conflict:

Year: 1990's

Place: Bhagirathi River near Tehri in Uttarakhand.

Leaders: Sundarlal Bahuguna

Aim: The protest was against the displacement of town inhabitants and environmental consequence of the weak ecosystem.

Tehri dam attracted national attention in the 1980s and the 1990s. The major objections include, seismic sensitivity of the region, submergence of forest areas along with Tehri town etc. Despite the support from other prominent leaders like Sunderlal Bahuguna, the movement has failed to gather enough popular support at national as well as international levels.

Sub Unit – 3

Environmental issues: Local, Regional and Global; Air pollution, Water pollution, Soil pollution, Noise pollution, Waste (solid, liquid, biomedical, hazardous, electronic), Climate change and its Socio-Economic and Political dimensions.

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Environmental issues are harmful effects of human activity on the biophysical environment. Environmental protection is a practice of protecting the natural environment on individual, organizational or governmental levels, for the benefit of both the environment and humans.

3.1 Local Environmental issues

- a) Fresh Water scarcity
- b) Desertification
- c) Increase in Population
- d) Disturbance in Carbon Cycle
- e) Soil pollution
- f) Air Pollution
- g) Noise pollution
- h) Water Pollution
- i) Distinction of endangered species etc.

3.2 Regional and Global Environmental issues

- a) Fresh Water scarcity
- b) Global warming
- c) Agricultural problems
- d) Polar melting
- e) Ocean acidification
- f) Air pollution
- g) Soil pollution
- h) Decade wise increasing carbon dioxide.

- i) Acid rain
- j) Ozone depletion
- k) Water borne diseases etc.

3.3 Air Pollution

Cause: Most of this air pollution we cause results from the burning of fossil fuels, such as coal, petroleum, natural gas, and gasoline to produce electricity and power our vehicles. It produces carbon dioxide, carbon monoxide and other greenhouse gases. At the same time it also increase amount of aerosols in atmosphere. Most of them are Polycyclic aromatic hydrocarbons (PAHs).

Effects:

- a) Global temperature is rising
- b) Respiratory disease of human
- c) Heart disease etc.

PAN: Peroxyacetyl nitrate is a toxic chemical that is an important component of smog. It effects in the human body such as reduced respiratory function and eye irritation.

Soot: Maximum soot is released from Thermal Power Plants. It helps to increase global temperature.

CFCs: chlorofluorocarbon basically generates from air-conditioning, refrigeration, blowing agents in foams, insulations and packing materials, propellants in aerosol cans etc.

Smog: Smog is a type of severe air pollution. Smog is primarily associated with the photochemical formation of ozone and sulfur dioxide. An erupting volcano can emit high levels of sulfur dioxide. Beijing is worst affected by the smog calamities.

Surface Ozone: Ozone is Produced in the troposphere by photochemical oxidation of CO, CH₄ and non-methane volatile organic carbons (NMVOCs) in the presence of oxides of nitrogen.

CNG: to reduce carbon emission Compressed Natural Gas (Methane, Ethane etc.) is introduced in New Delhi. As a result 20% of pollution is controlled by introducing CNGs. Actually the originated hydrogen cell gives energy to move the vehicle.

Dioxins: The toxicity of other dioxins and chemicals like PCBs that act like dioxin are measured in relation to TCDD. Dioxin is formed as an unintentional by-product of many industrial processes involving chlorine such as waste incineration, chemical and pesticide manufacturing and pulp and paper bleaching.

Air Quality Index by India: The National Air Quality Index (AQI) was launched in New Delhi on September 17, 2014 under the Swachh Bharat Abhiyan. AQI will consider eight pollutants PM₁₀ ie particulate matter upto 10 micrometers, PM_{2.5} i.e. particulate matter 2.5 micrometers, NO₂, SO₂, CO, O₃, NH₃, and Pb

3.4 Water Pollution

The largest source of water (both rivers and seas) pollution in India is untreated sewage. Ganga Action Plan is introduced in the year of 1986.

Cause: Industrial waste and other harmful chemicals are contaminated with water.

Effects: a) water-borne diseases are Typhoid, Cholera, Paratyphoid Fever, Dysentery, Jaundice, Amoebiasis and Malaria.

b) Chemicals like pesticides – can damage the nervous system and cause cancer.

Total dissolved solids (TDS) comprise inorganic salts (principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides, and sulfates) and some small amounts of organic matter that are dissolved in water. TDS should not exceed 500mg/lts. Presently TDS increased in drinking water specially served by Municipalities.

Per capita use of water may trouble to the human society. European countries use water rather than others.

Annual water consumption per capita worldwide in 2016, by select country (in cubic meters)

	Per capita water consumption in cubic meters
Spain	708.4
Australia	696.9
Mexico	678.8
Turkey	674.7

Methane: it is generate from- (1) natural wetlands, (2) paddy rice fields, (3) emission from livestock, (4) biomass burning (5) anaerobic decomposition of organic waste etc.

3.5 Soil Pollution

Cause: Contamination of toxic components into the soil. Heavy use of chemical fertilizers and pesticides cause soil pollution.

Effects: It have a number of harmful effects on ecosystems and human, plants and animal health.

3.6 Noise Pollution

Cause: It merely occurs when sound waves of intense pressure reach the human ears and may even affect the body muscles due to sound vibrations.

Effects: The effects of noise pollution on the health include hypertension, annoyance, high stress levels, aggression, hearing loss, tinnitus, sleep disturbance and many such health problems. Apart from traffic and industrial machinery, poor urban planning is also one of the causes of noise pollution.

Effects of Noise at different decibel levels:

Sl No	Range in Desibel(db)	Effects
1	<65 db	Tolerable
2	80 db	Annoying/ irritating
3	88 db	Hearing disorder
4	110 db	Discomfort
5	135 db	Painful

Human ear is most sensitive in 1-2 KHz.

3.7 Wastes

Wastes are unwanted and unusable matter. It can be solid, liquid, or gaseous and each type has different methods of disposal and management.

3.7.1 Solid Waste:

Source: Crop farms, orchards, dairies, vineyards and feedlots are also sources of solid wastes. Among the wastes they produce include agricultural wastes, spoiled food, pesticide containers and other hazardous materials.

3.7.2 Liquid Waste:

Source: a) Industrial drainage materials, residential drained materials.

3.7.3 Biomedical Waste:

Source: It is a type waste containing infectious materials. It generally generated from Hospitals, Nursing Home and Laboratories.

3.7.4 Hazardous Waste:

Source: Hazardous waste is waste that has substantial or potential threats to public health or the environment. It is the product generates from Chemical Industry.

3.7.5 Electronic Waste:

Source: **Electronic waste**, or **e-waste**, is a term for **electronic** products that have become unwanted, non-working state. Deactivate Computers; Radio etc. are removed from office and residence. The inner part is prepared by harmful materials such as lead, cadmium, beryllium, or brominated flame retardants.

3.8 Climate change and socioeconomic dimension

1. a framework for the assessment of impacts resulting from climate changes and weather shocks in food security at household level;
2. the use of two methodological tools that are able to assess the vulnerability to food insecurity as well as the resilience of farming households to the incidence of climate change and extreme events;
3. preliminary evidence on the welfare losses measured by increases in poverty, food insecurity breakthroughs or health-related impacts as are discussed in this relatively nascent literature, and;
4. an outline of key policy messages for successful adaptation options at household level and particularly for farmers.

3.9 Climate change and Socio-Political dimension

1. Knowledge market
2. Knowledge Competition

Sub Unit – 4

Impacts and pollutants on human health

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Environmental diseases are a direct result from the environment. This includes diseases caused by substance abuse, exposure to toxic chemicals, and physical factors in the environment, like UV radiation from the sun, as well as genetic predisposition. Meanwhile, pollution-related diseases are attributed to exposure to toxins in the air, water, and soil. Use of pesticides can cause cancer. Basically suspended fine particles cause respiratory problems. Chromium (Cr+6) dissolves in water, causing cancer in the human body. Therefore, all pollution-related diseases are environmental diseases, but not all environmental diseases are pollution-related diseases.

4.1 Air pollution diseases

Outdoor air pollution	Indoor air pollution
40% – ischaemic heart disease	34% - stroke
40% – stroke	26% - Coronary artery disease ischaemic heart disease
11% – chronic obstruction pulmonary disease	22% - COPD (chronic obstruction pulmonary disease)
6% - lung cancer	12% - acute lower respiratory infections in children
3% – acute lower respiratory infections in children	6% - lung cancer

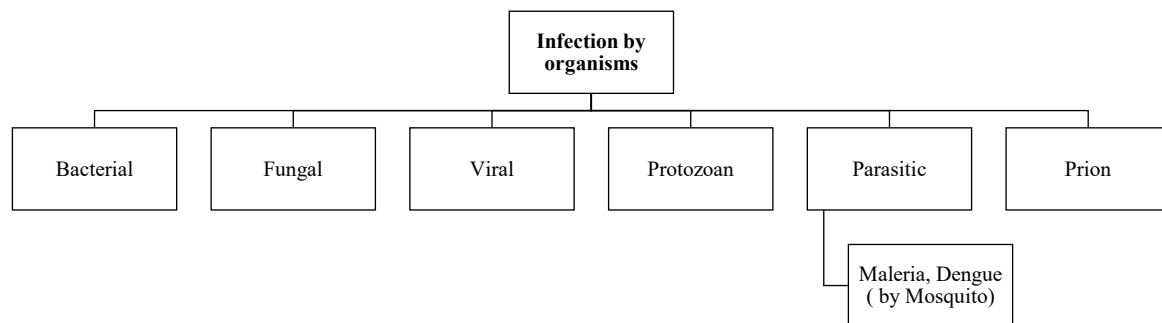
4.2 Water pollution

Waterborne diseases are caused by pathogenic microbes that can be directly spread through contaminated water. Most waterborne diseases cause diarrheal illness. Most cases of diarrheal illness and death occur in developing countries because of unsafe water, poor sanitation, and

insufficient hygiene. Waterborne diseases are 1) Amoebiasis, 2) Buruli ulcer, 3) Campylobacter, 4) Cholera, 5) Typhoid, 6) Hepatitis.

4.3 Organism causing the infection

Types of infection include bacterial, fungal, viral, protozoan, parasitic, and prion disease.



4.4 Lead, Arsenic, Mercury and Chromium affected diseases and Poisoning

Lead (Pb)	Arsenic (Ar)	Mercury (Hg)	Chromium (Cr)
Cardiovascular disease	Arsenicosis	Minamata disease	Kidney and liver failure.
Cerebrovascular disease	Cancers (lung, bladder, and skin)	Cerebellar ataxia	
Chronic Kidney disease	Cardiovascular disease	Kidney and autoimmune dysfunction	
Hemorrhagic stroke	Chronic kidney disease	Acrodynia	
Hypertensive heart disorder	Neurobehavioral impairment	Dysarthria	
Ischemic heart disease		Arthritis	
Ischemic stroke		Respiratory failure	

Biomagnification:

The biomagnification is the concentration of the persistent toxins increases higher up in the food chain. It is also occurred by using pesticides in green vegetation.

4.5 Some Internationally Celebration days

Date	Celebration	Date	Celebration
24 January	International Day of Education	23 August	International Day for the Remembrance of the Slave Trade and its Abolition
27 January	International Day of Commemoration in Memory of the Victims of the Holocaust	8 September	International Literacy Day
11 February	International Day of Women and Girls in Science	15 September	International Day of Democracy
13 February	World Radio Day	16 September	World Ozone Day
21 February	International Mother Language Day	20 September	International Day of University Sport
8 March	International Women's Day	21 September	International Day of Peace
20 March	International Francophonie Day	28 September	International Day for the Universal Access to Information
21 March	World Poetry Day	5 October	World Teachers' Day

21 March	International Day for the Elimination of Racial Discrimination	11 October	International Day of the Girl Child
22 March	World Day for Water	13 October	International Day for Disaster Reduction
6 April	International Day of Sport for Development and Peace	17 October	International Day for the Eradication of Poverty
7 April	World Health Day	27 October	World Day for Audiovisual Heritage
23 April	World Book and Copyright Day	2 November	International Day to End Impunity for Crimes against Journalists
30 April	International Jazz Day	5 November	World Tsunami Awareness Day
3 May	World Press Freedom Day	10 November	World Science Day for Peace and Development
5 May	African World Heritage Day	3rd Thursday in November	World Philosophy Day
16 May	International Day of Light International Day of Living Together in Peace	16 November	International Day for Tolerance
21 May	World Day for Cultural Diversity for Dialogue and Development	25 November	International Day for the Elimination of Violence against Women

22 May	International Day for Biological Diversity	29 November	International Day of Solidarity with the Palestinian People
5 June	World Environment Day	1 December	World AIDS Day
8 June	World Oceans Day	3 December	International Day of Persons with Disabilities
17 June	World Day to Combat Desertification and Drought	10 December	Human Rights Day
11 July	World Population Day	18 December	International Migrants Day
18 July	Nelson Mandela International Day		
26 July	International Day for the Conservation of the Mangrove Ecosystem		
9 August	International Day of the World's Indigenous People		
12 August	International Youth Day		

Sub Unit – 5

Natural and energy resources: Solar, Wind, Soil, Hydro, Geothermal, Biomass, Nuclear and Forests

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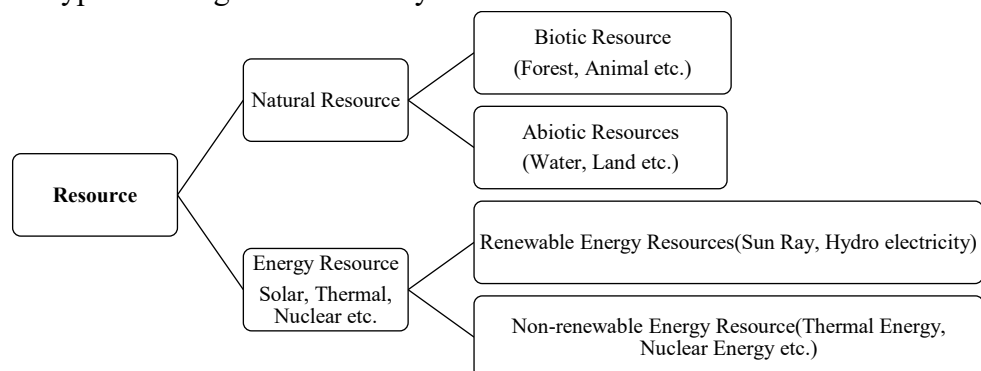
5.1 What is Resource?

The utility or usability of materials is called resource.

The **tragedy of the commons** is a situation in a shared-resource system where individual users acting independently according to their own self-interest behave contrary to the common good of all users by depleting or spoiling that resource through their collective action. The theory originated in an essay written in 1833 by the British economist William Forster Lloyd, who used a hypothetical example of the effects of unregulated grazing on common land (also known as a "common") in Great Britain and Ireland. The concept became widely known as the "tragedy of the commons" over a century later due to an article written by the American ecologist and philosopher Garrett Hardin in 1968. In this modern economic context, commons is taken to mean any shared and unregulated resource such as atmosphere, oceans, rivers, fish stocks, roads and highways, or even an office refrigerator.

5.2 Types of Resources

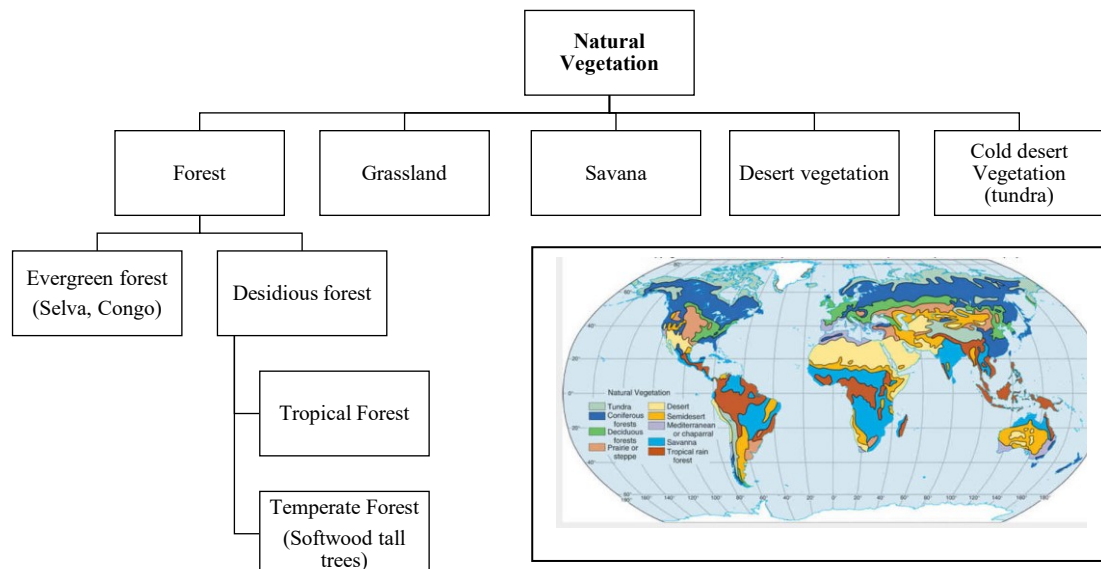
There are several types or categories to classify resource. It can be classified as follows-



A **renewable resource** is a resource which can be used repeatedly and replaced naturally (example: water, sun –rays, air etc.) and **non-renewable resource** is a resource which cannot be used repeatedly and replaced naturally (example: coal, LPG, CNG, salt etc.).

5.3.1 Natural Vegetation

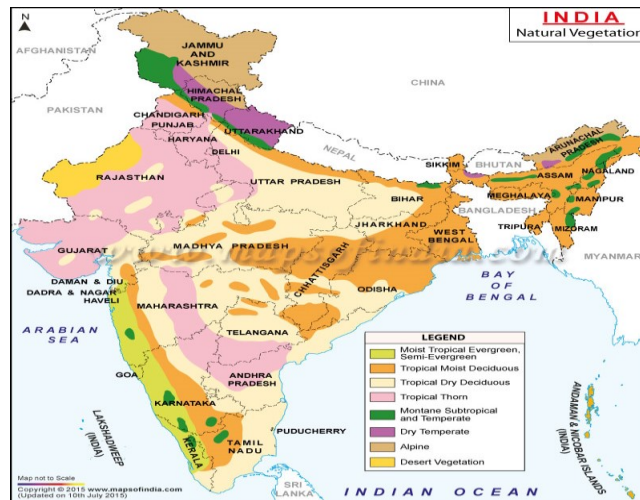
Vegetation regions can be divided into **five** major types: forest, grassland, tundra, desert, and ice sheet.



5.3.1.1 Natural Vegetation in India:

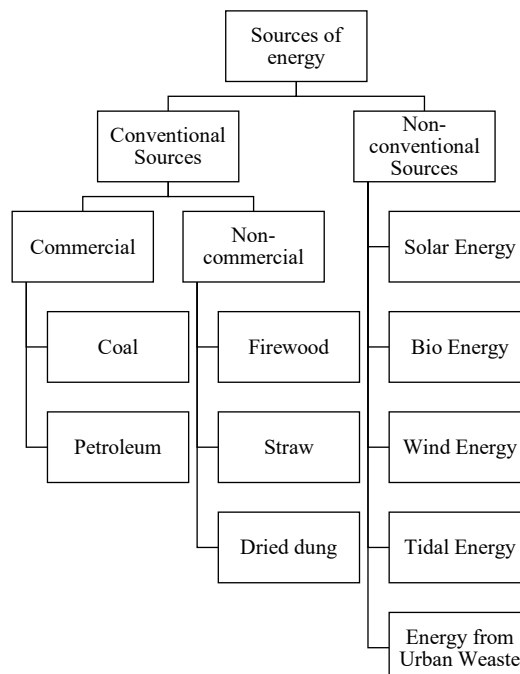
The total **forest** cover is 708,273 square km, which is 21.54 percent of the total **area** of the country. Between 2015 and 2017, **India** has added 6,778 square km of **forest** cover and extended 1, 243 square km of tree cover. Basically, the reason of forest loss is agriculture.

The vegetations are: a) Tropical evergreen forest, b) tropical moist deciduous forest, c) Tropical Thorny Forest, d) sub-tropical mountain forest, e) dry deciduous forest, f) Himalayan moist forest, g) Himalayan dry temperate forest, h) mountain wet temperate forest, i) Alpine and sub-alpine forest.



5.4 What is Energy?

The capacity of doing work is called energy. It may exist in potential, kinetic, thermal, electrical, chemical, nuclear, or other various forms. In 1917, renewable energy sources accounted for 17.5 percent of all power generated in India. The country's total installed power generation capacity was 326,848.54 MW .Sources of energy are as follows.



5.5 Different sources of Energy

5.5.1 Solar Energy:

Solar power harvests the energy of the sun through using collector panels to create conditions that can then be turned into a kind of power. This energy source is exploited most economically.

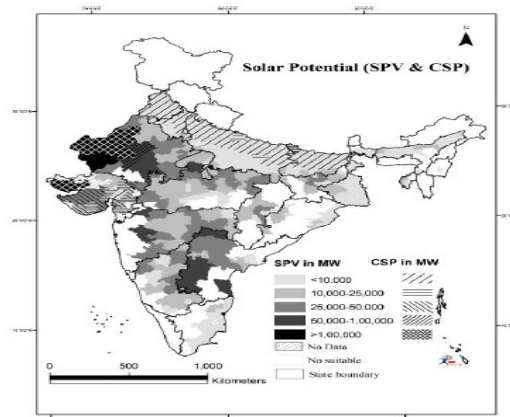


Fig. 5. Map showing solar potential area for only PV technology and common areas for both SPV and CSP technologies.

5.5.2 Wind Energy:

Wind power is becoming more and more common. The new innovations that are allowing wind farms to appear are making them a more common sight. By using large turbines to take available wind as the power to turn, the turbine can then turn a generator to produce electricity.

Installed wind capacity by state as of 31 March 2018	
State	Total Capacity (MW)
Tamil Nadu	8,197
Gujarat	5,613
Maharashtra	4,784
Karnataka	4,509
Rajasthan	4,298
Andhra Pradesh	3,963
Madhya Pradesh	2,520
Telangana	101

Installed wind capacity by state as of 31 March 2018	
State	Total Capacity (MW)
Kerala	53
Others	4
Total	34,043

5.5.3 Geothermal Energy:

Geothermal energy is the energy that is produced from beneath the earth. It is clean, sustainable and environment friendly. High temperatures are produced continuously inside the earth's crust by the slow decay of radioactive particles. Hot rocks present below the earth heats up the water that produces steam. The steam is then captured that helps to move turbines. The rotating turbines then power the generators. The largest group of geothermal power plants in the world is located at The Geysers, a geothermal field in California, United States.



5.5.4 Hydrogen Energy:

Water contains two-thirds of hydrogen and can be found in combination with other elements. Once it is separated, it can be used as a fuel for generating electricity. Hydrogen is a tremendous source of energy and can be used as a source of fuel to power ships, vehicles, homes, industries and rockets. It is completely renewable, can be produced on demand and **does not leave any toxic emissions in the atmosphere.**

5.5.5 Tidal Energy:

Tidal energy uses rise and fall of tides to convert kinetic energy of incoming and outgoing tides into electrical energy. The generation of energy through tidal power is mostly prevalent in coastal areas.

5.5.6 Wave Energy:

Wave energy is produced from the waves that are produced in the oceans. Wave energy is renewable, environment friendly and causes no harm to atmosphere. It can be harnessed along coastal regions of many countries. Producing wave energy can damage marine ecosystem and can also be a source of disturbance to private and commercial vessels. It is highly dependent on wavelength and can also be a source of visual and noise pollution.

5.5.7 Hydroelectric Energy:

What many people are not aware of is that most of the cities and towns in the world rely on hydropower, and have for the past century. Every time you see a major dam, it is providing hydropower to an electrical station somewhere. The power of the water is used to turn generators to produce the electricity that is then used. The problems faced with hydropower right now have to do with the aging of the dams.

5.5.8 Biomass Energy:

Biomass energy is produced from organic material and is commonly used throughout the world. Chlorophyll present in plants captures the sun's energy by converting carbon dioxide from the air and water from the ground into carbohydrates through the process of photosynthesis. When the plants are burned, the water and carbon dioxide is again released back into the atmosphere. Biomass generally include crops, plants, trees, yard clippings, wood chips and animal wastes. Biomass energy is used for heating and cooking in homes and as a

fuel in industrial production. This type of energy produces large amount of carbon dioxide into the atmosphere.

5.5.9 Biogas Energy:

Biogas can be produced from raw materials such as agricultural waste, manure, municipal waste, plant material, sewage, green waste or food waste. **Biogas** is a renewable energy source. The main component of it is Methane and Carbon dioxide.

5.5.10 Nuclear Power:

The energy is created through a specific nuclear reaction, which is then collected and used to power generators. While almost every country has nuclear generators, there are moratoriums on their use or construction as scientists try to resolve safety and disposal issues for waste. Almost little pollution happens in power generator. Nuclear power is our future.

India's operating nuclear power reactors

Reactor	State	Type	MWe net (each)	Commercial operation	Safeguards status*
Tarapur 1&2	Maharashtra	GE BWR	150	1969	Item-specific, Oct 2009
Kaiga 1&2	Karnataka	PHWR	202	1999, 2000	nil
Kaiga 3&4	Karnataka	PHWR	202	2007, 2012	nil
Kakrapar 1&2	Gujarat	PHWR	202	1993, 1995	December 2010 under new agreement
Madras 1&2 (MAPS)	Tamil Nadu	PHWR	202	1984, 1986	nil
Narora 1&2	Uttar Pradesh	PHWR	202	1991, 1992	From Jan 2015 under new agreement
Rajasthan 1&2	Rajasthan	Candu PHWR	90, 187	1973, 1981	Item-specific, Oct 2009
Rajasthan 3&4	Rajasthan	PHWR	202	1999, 2000	March 2010 under new agreement
Rajasthan 5&6	Rajasthan	PHWR	202	Feb & April 2010	Oct 2009 under new agreement
Tarapur 3&4	Maharashtra	PHWR	490	2006, 2005	nil
Kudankulam 1&2	Tamil Nadu	PWR (VVER)	917	December 2014, April 2017	Item-specific, Oct 2009

Reactor	State	Type	MWe net (each)	Commercial operation	Safeguards status*
Total (22)			6219 MWe		

5.5.11 Fossil Fuels (Coal, Oil and Natural Gas):

Fossil fuels provide the power for most of the world, primarily using coal and oil. Oil is converted into many products, the most used of which is gasoline. Natural gas is starting to become more common, but is used mostly for heating applications although there are more and more natural gas powered vehicles appearing on the streets. The issue with fossil fuels is twofold. To get to the fossil fuel and convert it to use there has to be a heavy destruction and pollution of the environment.

5.5.12 Electricity Generation By Source In India in FY 2017-18:

Source of Energy	Production	Percent Production
Coal	986,591 GWh	75.9%
Large Hydro	126,123 GWh	9.7%
Small Hydro	5,056 GWh	0.4%
Wind Power	52,666 GWh	4.0%
Solar Power	25,871 GWh	2.0%
Biomass	15,252 GWh	1.2%
Nuclear	38,346 GWh	2.9%
Gas	50,208 GWh	3.9%
Diesel	386 GWh	0.0%

Electricity generation (utility sector) by source in India in FY 2017-18

5.5.13 Installed Capacity and Target of Electricity generation in 2022:

Source	Total Installed Capacity (MW)	2022 target (MW)
Wind power	35,626	60,000
Solar power	28,181	100,000
Biomass power (Biomass & Gasification and Bagasse Cogeneration)	9,103	*10,000
Waste-to-Power	138	
Small hydropower	4,593	5,000
TOTAL	77,641	175,000
Installed grid interactive renewable power capacity (excluding large hydropower) as of 31 March 2019 (RES MNRE)		

Sub Unit – 6

Natural hazards and disasters: Mitigation Strategies

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6.1 Introduction

A hazard is a situation where there is a threat to life, health, environment or property.

A disaster is an event that completely disrupts the normal ways of community. It brings on human, economical and commercial losses to the community cannot bear on its own. It may recover, taking a long time and with the help of Govt. and other NGOs.

National disaster management authority (NDMA) functions under the Ministry of Home Affairs in India.

6.2 Types of Hazards and Disasters

Those are –a) Natural, b) Manmade hazards and disasters.

- a. **Geological and Atmospheric Hazards :** Geological process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. These disasters include landmass related disasters like earthquakes, landslides, volcanoes etc, Water and climatic Hazards (Hydro meteorological hazards). These include storms, cyclones, floods etc. it cause maximum number of deaths. WMO reduces 50% death by this type of disaster applying warning system.
- b. **Chemical Hazards:** By their nature, the manufacture, storage, and transport of chemicals are accidents waiting to happen. Chemicals can be corrosive, toxic, and they may react, often explosively. The impacts of chemical accidents can be deadly, for both human beings and the environment.
- c. **Industrial/ Technological Hazards :** A hazard originating from technological or industrial conditions, including accidents, dangerous procedures, infrastructure failures or specific human activities, that may cause loss of life, injury, illness or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. These include industrial pollution, nuclear radiation, toxic wastes, dam failures, transport accidents, factory explosions, fires, and chemical spills.

- d. **Biological Hazards:** It refers to biological substances that pose a threat to the health of living organisms, primarily that of humans. This can include medical waste or samples of a microorganism, virus or toxin (from a biological source) that can affect human health. It can also include substances harmful to animals. Examples: anthrax, smallpox, plague, tularemia, brucellosis and botulinism toxin, bird flu.

6.3 Hazards and Disasters

6.3.1 Volcanic Eruption:

Seismic prone zone face this type of natural hazards or disaster. There has not any warning system.

6.3.2 Earthquake:

Seismic prone zone face this type of natural hazards or disaster. The hazard is responsible for causing highest human deaths. There has not any warning system.

6.3.3 Landslide:

Mountain and hill regions are often face this type of problem. It happens by water surplus/less in soil. It causes death, traffic jam like problem.

6.3.4 Flash floods:

Flash flood is cause of Cloud Burst by frontal rainfall and vertical circulation of wind. It causes heavy rainfall in mountain region. Kedarnath, Uttarakhand faced flash flood in 16-17 June 2013. 5748 people died and near about 4500 villages are affected by the incident.

6.3.5 Flood:

Flood is caused by heavy rainfall in monsoon. River channels are unable to carry all water, as a result it causes flood. Generally, India facing that type of problem every year.

6.3.6 Drought:

Drought is caused by lack of rainfall in a year. Agricultural practice is disturbed by this incident.

6.3.7 Cyclone:

It is a natural disaster. It can be forecast.

6.3.8 Nuclear Reactor Accident:

In 26th April, 1986, Chernobyl (Ukrainian Soviet Socialist Republic) faced this type of problem.

6.4 Mitigation Strategies Include

1. Study Landscape and environment.
2. To create legal framework.
3. Essential incentives for hazard/disaster mitigation.
4. Create concerned insurance.
5. Provide training, education and public education.
6. Select institution building for rescue.
7. Warning system may require etc.

Sub Unit – 7

Environment Protection Act (1986), National Action Plan on Climate change, International agreements/efforts- Montreal Protocol, Rio Summit, Convention on Biodiversity, Kyoto Protocol, Paris Agreement, International Solar Alliance

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7.1 Environment Protection Act, 1986

The Environment Protection Act, 1986 19th November, and 26 sections is an Act of the Parliament of India. In the wake of the Bhopal Tragedy, the Government of India enacted the Environment Protection Act of 1986 under Article 253 of the Constitution. Passed in March 1986, it came into force on 19 November 1986. It has 26 sections.

7.2 Sections

This act has five Chapters and 26 Sections. Chapter one consists of Preliminary information such as Short Title, Extend, Date of Commencement and Definitions. The definitions are given in the second section of the Act. Chapter two describes general powers of Central Government section 3 gives the Central Government the power to take action to protect the environment. Section 4 allows the government to appoint officers to achieve these objectives. It also gives the government the power to give direction to closure, prohibition or regulation of industry, pollution. The act has provisions for penalties for contravention of the provisions of the act and rules, orders and directions. It also gives detail if the offence is done by a company or government department. It says for such offence the in-charge and head of department respectively would be liable for punishment.

7.2 National Action Plan on Climate Change

Climate change is one of the most critical global challenges of our times. Recent events have emphatically demonstrated our growing vulnerability to climate change. Climate change impacts will range from affecting agriculture – further endangering food security – to sea-level rise and the accelerated erosion of coastal zones, increasing intensity of natural disasters,

species extinction, and the spread of vector-borne diseases. The National Action Plan on Climate Change (NAPCC) encompasses a range of measures. It focuses on eight missions, which are as follows:

1. National Solar Mission
2. National Mission for Enhanced Energy Efficiency
3. National Mission on Sustainable Habitat
4. National Water Mission
5. National Mission for Sustaining the Himalayan Ecosystem
6. Green India Mission
7. National Mission for Sustainable Agriculture
8. National Mission on Strategic Knowledge for Climate Change

The NAPCC also describes other ongoing initiatives that are as follows-

1. Power generation with create less pollution.
2. Concentrate on renewable energy.
3. Create India as Energy efficient.
4. Public health care services and assessment of increased burden of diseases due to climate change.

7.3 International Agreements

7.3.1 Montreal Protocol:

Signed	26 August 1987
Location	Montreal, Canada
Effective	26 August 1989 if 11 states have ratified by then.
Condition	ratification by 20 states
Signatories	46
Ratifiers	The two ozone treaties have been ratified by 197 parties (196 states and the European Union)
Core agenda	on Substances that Deplete the Ozone

7.3.2 Rio summit or Earth Summit or Agenda 21:

Signed	3 to 14 June 1992.
Location	Rio de Janeiro, Brazil.
Core agenda	Sustainable Development

The issues addressed included:

- Systematic scrutiny of patterns of production — particularly the production of toxic components, such as lead in gasoline, or poisonous waste including radioactive chemicals
- Alternative sources of energy to replace the use of fossil fuels which delegates linked to global climate change
- New reliance on public transportation systems in order to reduce vehicle emissions, congestion in cities and the health problems caused by polluted air and smoke
- The growing usage and limited supply of water.

List of Earth Summits:

1. 1972 - The United Nations Conference on the Human Environment (UNCHS) in Stockholm
2. 1982 - The 1982 Earth Summit in Nairobi (Kenya). An Earth Summit was held in Nairobi, Kenya, from 10 to 18 May 1982. The events of the time (Cold War) and the disinterest of US President Ronald Reagan (who appointed his delegated daughter Of the United States) made this summit a failure. It is not even mentioned as an official Earth Summit.
3. 1992 - The United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro (Brazil)
4. 2002 - The World Summit on Sustainable Development (WSSD) in Johannesburg (South Africa)
5. 2012 - The United Nations Conference on Sustainable Development (UNCSD) or Rio+20, also took place in Rio de Janeiro (Brazil)

7.3.3 Convention on Biological Diversity (CBD):

Signed	5 June 1992
Location	Rio de Janeiro, Brazil
Effective	29 December 1993
Condition	30 ratifications
Signatories	168
Parties	196
Core Agenda	Conservation on Biological Diversity(CBD)

7.3.4 Kyoto Protocol:

Signed	11 December 1997
Location	Kyoto, Japan
Effective	16 February 2005
Condition	Ratification by at least 55 states to the Convention
Expiration	In force (first commitment period expired 31 December 2012)
Signatories	84
Parties	192 (European Union, Cook Islands, Niue, and all UN member states except Andorra, Canada, South Sudan, and the United States)
Depositary	Secretary-General of the United Nations
Core Agenda	Convention on Climate Change (increasing of greenhouse gases causes Global Warming.)

7.3.4.1 Rwanda Meeting:

At a meeting in **Rwanda**, Africa, world leaders have agreed controls on hydro fluorocarbon (HFC) consumption and production that could potentially help avoid over 0.4°C of global warming.

7.3.5 Paris Agreement:

Drafted	30 November – 12 December 2015 in Le Bourget, France
Signed	22 April 2016
Location	New York City, United States
Sealed	12 December 2015
Effective	4 November 2016
Condition	Ratification and accession by 55 UNFCCC parties, accounting for 55% of global greenhouse gas emissions
Signatories	195
Parties	185
Depositary	Secretary-General of the United Nations

7.3.6 International Solar Alliance:

Founded at	Paris, France
Purpose	Bring together a group of nations to endorse clean energy, sustainable environment, public transport and climate
Headquarters	Gwal Pahari, Gurugram, Haryana, India
Region served	All members of UN
Fields	Renewable energy
Membership	All members of UN
Official language	English
Head	H.E. Upendra Tripathy
Website	International Solar Alliance

7.3.7 Blue Revolution:

Blue Revolution, the Neel Kranti Mission has the vision to achieve economic prosperity of the country and the fishers and fish farmers as well as contribute towards food and nutritional security through full potential utilization of water resources for fisheries development in a sustainable manner, keeping in view the bio-security and environmental concerns.

The Blue Revolution scheme has the following components:

1. National Fisheries Development Board (NFDB) and its activities.
2. Development of Inland Fisheries and Aquaculture.
3. Development of Marine Fisheries, Infrastructure and Post-Harvest Operations.
4. Strengthening of Database & Geographical Information System of the Fisheries Sector.
5. Institutional Arrangement for Fisheries Sector.
6. Monitoring, Control and Surveillance (MCS) and other need-based Interventions.
7. National Scheme of Welfare of Fishermen.

7.3.8 Nagoya Protocol:

Type	Environmental
Signed	29-Oct-10
Location	Nagoya, Japan
Effective	12-Oct-14
Condition	50 ratifications
Signatories	105
Parties	114
Depositary	Secretary-General of the United Nations
Core agenda	Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity