POLLUTION

Introduction

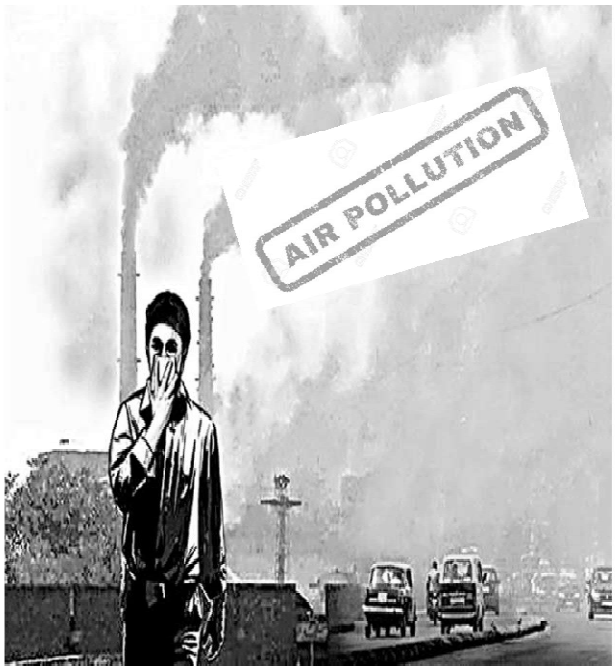
- Undesirable change in the *physical, chemical or biological* characteristics of *air, water and soil* that may affect the life or create a potential health hazard of any living organism..

Pollutants

- Any substance which causes pollution
- Released intentionally by main into the environment
- In such a concentration that may have adverse harmful or unpleasant effects.

Kinds of Pollution

- ✓ ***Air pollution***
- ✓ ***Water pollution***
- ✓ ***Noise pollution***
- ✓ ***Soil/Land contamination/Pollution***



Air pollution

- The accumulation of hazardous substances into the atmosphere that danger human life and other living matter.
- Air pollution - comes from both ***natural*** and ***man made*** sources.

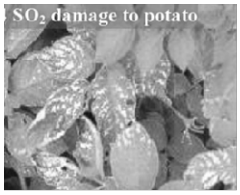
Primary pollutants

1. **SO_2 (Sulphur Dioxide) -** *toxic gas, pungent, irritating smell*

Sources

- Burning of fossil fuels like coal in thermal power plants
- Processing of ***sulphide ores*** (like *Pyrite, Sphalerite and Cinnabar)*

- Industries manufacturing of ***sulphuric acid*** and ***fertilisers***
- Burning of crop/biomass residue
- Stacks of industries, automobile exhausts, combustion engines and petroleum refineries



Effects

- Cause ***acid rain***
- Produce acute leaf injury,
- Necrosis
- Brownish coloration of pine needles
- Lichen vegetation affected

2. Nitrogen Oxides

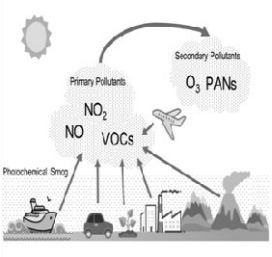
<u>Sources</u>

❑Nitrogen oxides

- *Vehicular exhausts, combustion in air, factories stacks*

❑Nitric Oxide

- *Combustion of O_2 and N_2 during lightening discharges and bacterial oxidation of NH_3 in soil, industries manufacturing HNO_3 etc.,*



Effects

- Causes ***acid rain***
- Creates Photochemical smog
- Formation of secondary pollutants like Ozone and PAN (Peroxy Acetyl Nitrate)
- Bleaching and bronzing of plants

3. Carbon-di-oxide (CO_2)

Sources

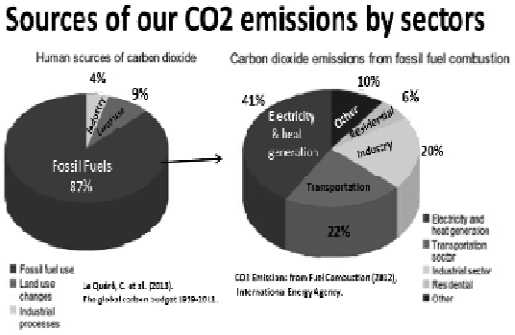
- ❑Burning of fossil fuels like coal for domestic cooking, heating,
- ❑Fuel consumed in furnaces and industries
- ❑Thermal power plants
- ❑Burning of crop/biomass residue

Effects

- Greenhouse effect, Global warming. Ocean acidification
- It is an ***asphyxiant gas*** – causes
  - Deprivation of oxygen
  - Dizziness,
  - Headache
  - Unconsciousness.

Carbon foot print

- It is the amount of carbon dioxide released into the atmosphere by a particular human activity.



4. Carbon Monoxide (CO)

Colourless, odourless, tasteless, Highly toxic, Slightly less dense than air, Short-lived

Sources

- ❑Incomplete combustion of fossil fuels like coal in defective furnaces etc.
- ❑Vehicular and automobile exhausts
- ❑***Hemoglobin breakdown in higher animals***
- ❑Burning of crop/biomass residue
- ❑Breakdown of photosynthetic pigments in Algae

Effects

- Combines with hemoglobin of blood to form **carboxyhaemoglobin**.
- Formation of this reduces the overall O_2 carrying capacity of blood to cells resulting in *oxygen deficiency* (hypoxia) ultimately leading to death.
- Also causes impaired reaction timing, headaches, light headedness, nausea, vomiting, weakness, clouding of consciousness and coma.

5. Fluorocarbons

Sources

- Active volcanoes
- Fluorides come from industrial processes of phosphate fertilizers, ceramics, aluminum
- Fluorinated hydrocarbons (refrigerants, aerosol propellants etc.)
- Fluorinated plastics, uranium and other metals

Effects

- Burns the tip of plant leaves
- Impairs growth of plants
- Excessive dropping of blooms and small fruits
- Partial or complete formation of seedless fruits
- Chlorophyll breakdown
- Damage of young plants of conifers

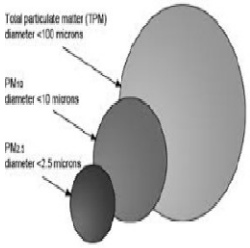
6. **Hydrocarbons (Ethylene, methane, benzene and benzpyrene)**

Sources

- ❑Incomplete combustion of fossil fuels (including wood)
- ❑Automobile exhausts and tobacco
- ❑Petroleum refineries
- ❑Manufacture of explosives
- ❑Cracking of natural gas in petrochemical plants.
- ❑ Formaldehyde release from carpets and varnishes
- ❑Plastic precursors or additives like polyurithene etc,.

Effects

- Combine with NO_x under UV light to form *PAN (Peroxy Acetyl Nitrate)*
- Combines with O_3 and causes *photochemical smog.*
- It has mutagenic, carcinogenic and immunotoxic effect
- Causes cancer, deplete red blood cells, damage bone marrow.
- Inhibit respiratory function in animals and humans



7. Aerosols (SPM)

- Tiny liquid or solid particles floating in the air viz. soot, organic carbon, dust and biogenic aerosols like pollen and microbial particles
- size ranges from **0.001 to 500 micrometres** (μm) in diameter
- <10 μm - float in air; >10 μm - settle down.
- < 0.02 μm - **persistent aerosols**.

Sources

- ***Inorganic Dust*** – Silica from mining, quarrying and stone cutting operation.
- ***Organic Dust*** – cotton textile mills, ginning plants, coir retting and processing, saw mills and plywood industries etc.
- ***Smoke*** from forest fires
- ***Soot*** from burning fossil fuels in industries, vehicles, trains, aeroplanes, airborne dust and
- Sea salt particles
- ***Biogenic aerosols*** arising from vegetation and algae, bacteria and plant debris

Effects

- Harmful to human health in the form of allergy
- Alteration in temperature and climate, affecting rainfall and monsoon patterns
- ***Pneumoconiosis Silicosis, Asbestosis, Lung cancer, Bronchitis*** etc.,
- Reduced agricultural yield by reducing photosynthesis (settle down on leaves disrupting sunlight)

8. Fly ash

Contents

- Oxide rich and consist of silica, alumina, oxides of iron, calcium, and magnesium and toxic heavy metals like mercury, lead, arsenic, cobalt, and copper.
- Major oxides are present - Aluminium silicate, Silicon dioxide (SiO_2) and Calcium oxide (CaO).
- Indian coal contains high amount of ash

Sources

- Ejected mostly by **thermal power plants**
- By-products of coal burning operations

Effects

- Direct deposition on leaf surfaces
- crops and vegetation affected – reduced growth

Uses

- Replacement for cement - up to 35%- reducing the cost of construction, making roads, etc.
- Preparation of bricks – *light weight + high strength + durability.*
- Better fill material for road embankments and in concrete roads.
- Reclamation of wastelands + enhances the water holding capacity of the land
- Filling up of abandoned mines
- Increase crop yield when added to the soil

9. Heavy metals

Sources

- **Zn** – Exists in air around zinc smelters and scrap zinc refineries.
- **Hg** – Use of mercury compounds in production of fungicides, paints, cosmetics, paper pulp etc.
- **Pb** – Automobile exhausts as lead is used as ***anti-knock agent*** in gasoline, petrol, diesel, lead batteries, paints, hair dye
- **Cd** – Electroplating and welding of cadmium containing materials, industries producing pesticides and phosphate fertilizers.

Effects

- **Zn** – toxic for health
- **Hg** – affects nervous system, liver, eyes. Infants deformed, Effects children, developing fetus, wildlife and ecosystems
- **Pb** – Reduced hemoglobin production, leading to anemia. Damage RBCs, infection of liver and kidney
- **Cd** – hypertension, emphysema and kidney damage, carcinogenic

10.Ozone (O3) – ground level

Sources

- Vehicles and industries
- It is chiefly formed by CO and NO_X under UV radiations – convert O_2 to O_3

Effects

- Pollution, Photochemical smog
- Adverse effects on human health - eyes itchy, lowers our resistance to cold and pneumonia
- Reduces crop yields.

11.Nanoparticles

- Particles with dimensions comparable to $1/10^9$ of a meter
- Heterogeneous in size - transported over thousands of kilometres and remain suspended in the air for several days.

Sources

- **Natural** - *forest fires, volcanic eruptions, weathering, dust storms from desert*
- **Man made** - Various industrial and mechanical processes.

Effects

- ***Enters food chain***
- ***Decrease insolation***
- Carry soot and black carbon -***Asian brown cloud impact***
- ***Reduce albedo***
- Results in increased production of reactive oxygen species (ROS) and ***free radicals*** (Cl) – ***destroy ozone***
- Interact with ***molecular hydrogen –*** stratospheric clouds – cause ***Ozone hole***

Prevention of Air pollution

Industrial

- Employing environment-friendly industrial processes so that emission of pollutants and hazardous waste is minimized.
- Installing devices which reduce the release of pollutants.
- Use filters, electrostatic precipitators, inertial collectors, scrubbers, gravel bed filters or dry scrubbers
- Increasing the height of chimneys.

Indoor pollution

- Use of solar cookers
- Using cleaner fuels such as biogas, LPG or electricity
- Use of Charcoal in place of wood (safer)
- Decay of exposed kitchen waste - reduced by covering the waste properly.
- Segregation of waste - into wet and dry
- Sterilisation of rooms.
- Use air purifiers

Vehicular pollution

- Setting emission standards
- Phasing out of old vehicles
- Usage of alternative fuels like **CNG in public transport vehicles is made mandatory**
- Compulsory Pollution Under Control (PUC) certificates
- Pricing policy of fuels
- Banning addition of lead in petrol
- Adoption of Bharat stage norms

By Law

- In our country there have been several legislative measures both at state and central government levels to prevent and control different types of air pollutions
  - *Bengal Smoke Nuisance Act, 1905*
  - *The Motor Vehicles Act, 1938*
  - *The Gujarat Smoke Nuisance Act, 1953*
  - *The Air (Prevention of and Control of Pollution) Act, 1981,*
  - *The Environment (Protection) Act, 1986*
  - *The Motor Vehicles Act, 1988*
  - *Delhi odd-even rules*

National Air Quality Monitoring Programme

- Nation wide program of ambient air quality executed by ***Central Pollution Control Board (CPCB)***

Objectives

1. *To determine status and trends of ambient air quality.*
2. *To ascertain whether the prescribed air quality standards are violated*
3. *To identify nonattainment cities*
4. *To obtain knowledge and understanding necessary for developing preventive and corrective measures.*

National Air Quality Index (AQI)

Gaseous pollutants

- **CO**
- **O_3**
- **NH_3**
- **SO_2**
- **NO_2**

Particulate pollutants

- **Pb**
- **PM 10**
- **PM 2.5**

- IIT (Kanpur) + AIIMS
- Operation – 2015
- Measure air quality based on – ***Human health***
- Display of boards – Colour indications

Grades

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
When the AQI is in this range:	*..air quality conditions are:*	*..as symbolized by this color:*
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Marcon

Introduction

- Sound without value
- Any sound that is undesired by the recipient
- Deleterious to human health and efficiency,
- Effects on the sense organs, cardiovascular, glandular and nervous systems.

Sources

- Industrial plants and machineries within them produces indoor noise pollution for workers
- Private and public transport system (railways and aeroplanes, trucks etc.)
- Street loudspeakers, loud rock concerts, public meetings and rallies
- Domestic sources such as mixies, grinders, television etc.
- Stone crushers, dynamite explosions, rocket launches etc.

Effects

- ✓Prolonged exposure to high levels of music leads to loss or impairment of hearing in recipients
- ✓Permanent loss of hearing on chronic exposure
- ✓Delay or interference with sleep and results in frequent fatigue
- ✓High levels of stress, hypertension and peptic ulcer
- ✓Reproductive and physiological disorders in animals

Control Measures

- At source control
- Transmission Control
- To protect the exposed persons
- To create vegetation cover
- Through Law

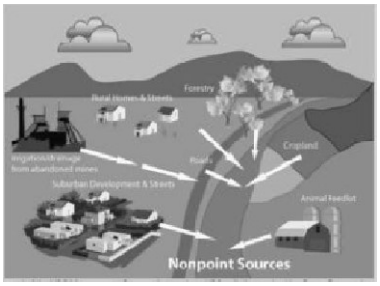
Introduction

"addition of any substance to water or changing of water's physical and chemical characteristics in any way which interferes with its use for legitimate purposes"

- Generally water - **never pure** in a chemical sense.
- Includes - dissolved gases, dissolved minerals, salts, suspended matter and even microbes - natural impurities- very low amounts -potable
- Polluted waters - *turbid, unpleasant, bad smelling* and *unfit* for drinking, bath and other purposes.

Pollutants

- **Point source**
- **Non Point source**



Pollutants

1. Sewage and other wastes

Sources

- Water borne waste derived from home or food processing industries
- Domestic water from kitchen and toilets - containing human excreta, soap and detergents (*Phosphates*)
- Faecal bacterial and other pathogenic organisms are introduce
- Sludge - waste material resulting due to water treatment plants, containing toxic metals and other organic substances.

Effects

- Increasing **BOD**
- ***Algae blooms***
- ***Ageing of Lakes***
- Disrupt the self regulatory capability of water bodies.
- Sludge - heavy metals

2. Industrial Effluents

Sources

- *Breweries, tanneries, dying textiles, paper & pulp industry*
- Pollutants - oil greases, phenols, suspended wastes, toxins, dyes, salts, acids, DDT etc.
- Heavy metals -***Na, Cu, Cr, Cd, Hg, Pb***

Effects

- ***Hardness*** of water
- BOD
- Water becomes toxic
- Death of fish and other aquatic life.
- Long term effect on environment

3. Agricultural Fertilizers

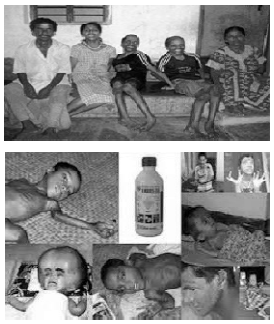
- Modern agriculture - heavy use of fertilizers
- Chemical fertilizers - Nitrogenous fertilizers, Superphosphate fertilizers and nitrate fertilizers enter well and ponds.

Effects

- Hardness
- unfit for consumption
- Nitrate - ***nitrites - Methemoglobinemia or blue baby syndrome***

4. Pesticides and Herbicides

- Include pesticides, bactericides, fungicides, insecticides and herbicides.
- Non degradable or degrade very slowly
- Toxic pesticides : ***Endosulfon, DDT, BHC, chlordane, heptachlor, Aldrin and PCBs.***



Effects

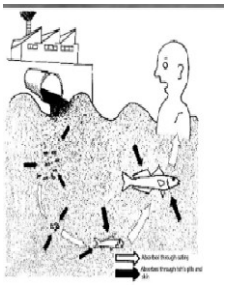
- DDT - pond - plants
- Follows food chain - ***Bioaccumulation*** and ***Biomagnification***
- Disturb **calcium metabolism in birds - decline in bird populations**.
- Carcinogenic (BHC)
- These are fat soluble
- ***Endosulfon*** – endocrine disruption, reproductive and developmental damage

5. Industrial Wastes (Physical)

- Heat and radioactive substances chiefly from thermal and nuclear power plants which use large quantities of water.
- Nuclear power plants are sources of radionuclides
- Waste water from thermal power plants are very high in temperature

Effects

- Kill aquatic life
- Early hatching of fish eggs
- Failure of ***salmon to spawn***
- BOD
- Shift in algal forms
- Decrease in species diversity
- Migration of aquatic forms.



6. Heavy Metals

a) Mercury

Sources

- Roasting of cinnabar (ore), Mercuric catalysts, Pulp and paper industry, Mining and refining processes.

Effects

- Methyl mercury causes **Minamata disease (**contagious meningitis, numbness in limbs, cause due to consumption of fish polluted with Hg.
- Alkyl mercury causes mental retardation

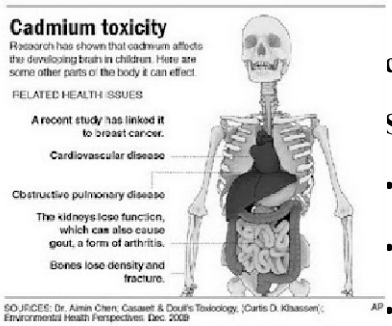
b) Lead

Sources

- Petrol, automobile exhausts
- Industries – smelters, battery industries, chemical and pesticide industry, lead - used as insecticides, food and beverages and ointments

Effects

- Damage to liver, kidney, mental retardation, abnormalities in pregnancy etc.
- It may affect CNS leading to coma and death



c) Cadmium

Sources

- Metal industries,
- Welding and electroplating
- Pesticide and phosphate industries

Effects

- Renal damage
- Hypertension
- Damage to liver
- ***Itaiitai (ouch-ouch disease)***

d) Arsenic

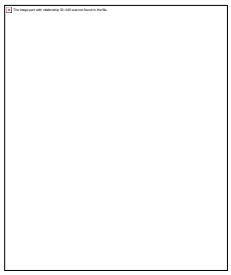
- Mainly pollute underground water
- In Ganges Delta, millions of people are exposed

Sources

- Seepage of industrial and mine discharges
- fly ash ponds of thermal power plants

Effects

- Chronic exposure causes ***black foot disease, diarrhoea, lung and skin cancer.***



e) Fluoride

• Non-biodegradable and relatively persistent pollutant

Sources

• Industrial waste water

• Aluminium, steel and superphosphate production

Effects

• Pain in bones and joint and outward bending of legs from the knees is called ***Knock-Knee syndrome***.

• Causes ***neuromuscular disorders, gastrointestinal problems, teeth deformity, hardening of bones and stiff and painful joints*** (skeletal fluorosis).

Marine pollution

• Oceans -ultimate sink of all natural and manmade pollutants.

Sources

• Discharge of oil and grease

• Detergents

• Sewage and garbage of coastal cities

• Radioactive wastes

• Plastics - microbeads

• Oil mining and oil spills – ***Underground storage tank leak + marine transport + offshore oil production***

UPSC 2019

Q) Why is there a great concern about the 'microbeads' that are released into environment?

a. They are considered harmful to marine ecosystems.

b. They are considered to cause skin cancer in children.

c. They are small enough to be absorbed by crop plants in irrigated fields.

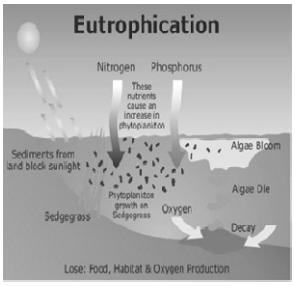
d. They are often found to be used as food adulterants.

Microbeads

- Plastic - most prevalent type of marine debris found in ocean and Great Lakes.
- Those that are ***< 5 mm*** in length– ***microplastics or microbeads.***
- They ***do not degrade*** or ***dissolve in water***.
- ***Cosmetics, personal care and cleaning products.***
- ***impossible to remove***.

Effects of marine pollution

- Phytoplanktons and fishes – die – oil spill – Birds and sea mammals – poisoning – food chain
- Cut off oxygen to floating plants and other aquatic organisms
- Decrease BOD
- Causes Eutrophication
- Elimination of aquatic species - ecological imbalance
- Migration of fishes and other marine organisms

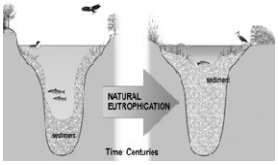


Eutrophication

- Response to the addition of nutrients such as ***nitrates*** and ***phosphates*** naturally or artificially- ***fertilising*** the aquatic ecosystem.

➢**Algal blooms**

➢**Ageing of lakes**



- Species composition
- Loss of coral reefs
- Creates water treatment problems
- Increases turbidity and affects navigation.

Prevention of water pollution

- **Bioremediation**
- ***Phytoremediation***
  - Example: **TERI** - '***Oilzapper and Oilivorous-S***'

Bioremediation – two types

1. ***In situ*** **bioremediation**

- **Bioventing**
- **Biosparging**
- **Bioaugmentation**

2. ***Ex situ*** **bioremediation**

- **Landfarming**
- **Bioreactors**
- **Composting:**

- **Reversing of Eutrophication**
- **Reutilization and Recycling of Waste**
- **Treatment of Agricultural Discharges**
- **Removal of Pollutants**
- **By Law**
  - ***Water (Prevention and Control) Act, 1974.***
  - ***The Central Board for Prevention and Control of Water Pollution (CBPCWP)***
  - ***Environment (Protection) Act, 1986***
  - ***Central / State Pollution Control Boards***
  - ***The Water (Prevention and Control of Pollution) Cess Act, 1977***

LAND / SOLID WASTE/ SOIL POLLUTION

Introduction

- It is the addition of *substances* to the soil, which adversely affects *physical, chemical and biological* properties of soil and reduces its productivity
- Solid wastes and chemicals - *glass containers, crockery, plastic containers, polythene, and other packing materials*.
- adverse effects on plant growth, human and animal health.

Sources

- Slag heaps from mines
- Breakdown of lubricating oils, vehicle tyres, galvanised metals and fertilisers
- Industries such as pulp and paper industries, sugar mills, oil refineries, power and heating plants, iron and steel industries, plastic and rubber industries and so on.

- Domestic wastes
- *Construction and Demolition waste*
- Wastes from *slaughter houses and chicken farms*
- Biomedical wastes comprising *cotton, syringes, blades, flesh and others* from hospitals

Effects

✓Contaminating the environment

✓Non biodegradable - plastic become persistent Smell and other effects like germs breeding leads to several health hazards

✓Reduces the aesthetic value of land

✓Reduced soil fertility

✓Reduced nitrogen fixation

✓Increased erosion

✓Deposition of silt in tanks and reservoirs

CONTROL

• Solid wastes can be ***recovered, recycled and reused***.

• Most treatment methods follow the three steps

Collection, Disposal and Recovery

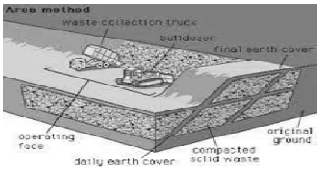
Collection

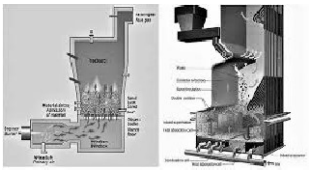
• Source ***segregation*** into degradable and non degradable.

• ***Garbage grinders***

• ***Compactors***

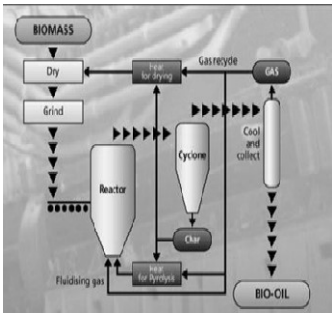
• ***Transfer Stations***





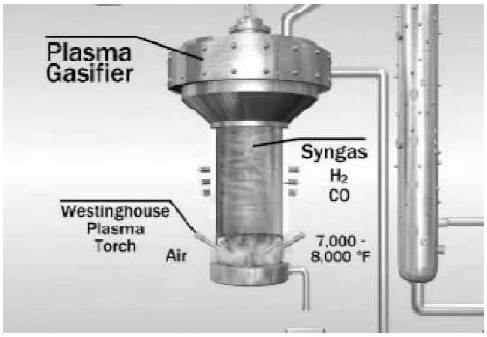
Disposal

- Dump yards
- Sanitary Landfills
- **Incineration**
- **Shredding**



Pyrolysis

Plasma gasification



Recovery

- a.k.a - recycling ; Two basic reasons for recycling
  1. Conservation of resources
  2. Volume reduction-of refuse to be disposed off
- ***Paper***
- ***Glass***
- ***Composting***

Solid Waste Management Rules, 2016

Salient features

- All waste generators shall segregate and store the waste generated by them in ***three separate streams*** namely
  - ***Bio-degradable***
  - ***Non bio-degradable***
  - ***Domestic hazardous wastes***

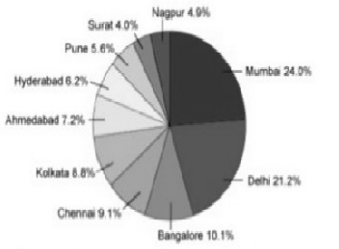
- Shall wrap securely the used sanitary waste like diapers, sanitary pads etc., in the pouches provided by the manufacturers or brand owners - dry waste/non- bio-degradable waste
- Shall *store separately construction and demolition waste* as per the **Construction and Demolition Waste Management Rules, 2016**
- Organizing an event or gathering of ***more than 100 persons***
- **Horticulture waste and garden waste**
- Street vendor shall keep *suitable containers*

- *Separate space for segregation, storage, decentralized processing* of solid waste
- Identification of sites for landfills and waste processing facilities - *suitable land for setting up processing and disposal*
- *Flexibility in fertilizer control order for manufacturing and sale of compost*
- Special Economic zone Industrial Estate Industrial park earmark at least *5% of the total area of the plot or minimum 5 plots/sheds for recovery and recycling facility.*
- *Registration of waste pickers* and waste dealers.

E- waste

- Abbreviation of "*electronic and electrical waste*"
- Includes almost any household or business item
- The discarded and end-of-life electronic products ranges from:

  TV appliances, computers, laptops, tablets, mobile phones, fridges, washing machines, dryers, home entertainment and stereo systems, toys, toasters and kettles, audio and video products and all of their peripherals



City-wise E-waste Generation in India (Tonnes/year)

E-waste in India

- India generates – 2 million metric tonnes (MT) of electronic waste every year (Global rank -5)
- Mumbai and Delhi-NCR accounting for the biggest chunk.
- Other important cities - Bangalore, Chennai, Kolkata, Ahmadabad, Hyderabad, Pune, Surat and Nagpur

Components of e-waste

- **Lead**
- **Cadmium**
- **Mercury**.
- **Barium**
- **Chromium**
- **Beryllium**
- **Toners**
- **Phosphor**

E-Waste (Management & Handling) Rules, 2011

- Effective from ***1st May, 2012***
- Contains ***6 Chapters and 3 Schedules***
- Rules shall **apply to**

  *Every **producer, consumer or bulk consumer**, **collection centre, dismantler and recycler** of e-waste involved in the manufacture, sale, purchase and processing of electrical and electronic equipment or components*

  As specified in schedule – I the regulatory agencies involved are SPCBs/PCCs and CPCB.

Objective

To put in place an effective mechanism to regulate the generation, collection, storage, transport, import, export, environmentally sound recycling, treatment and disposal of the e-waste

Mandatory provisions

- ***Extended Producer Responsibility (EPR)***
- ***Collection System***
- ***Registration of Dismantlers***
- ***Recyclers and Reduction of the hazardous substances (RoHS).***

E-Waste (Management) Amendment Rules 2016

- The new rules - brought producers of electronic goods under "***extended producer responsibility***", - collection and exchange of e-waste with targets.
- CFL and other mercury lamp - e-waste
- Producers' obligation
  - 30% in the first year ; 70% in the seventh year.
- Citizen - buy
  - ***Least toxic material***
  - ***Recycle and reuse capable***
  - ***Certified by regulatory authority.***

E-Waste (Management) Amendment Rules 2018

- The e-waste collection targets under EPR - been revised
- Phase-wise collection targets - 10% - 2017-18, with a 10% increase every year until 2023.
- Target from 2023 onwards – 70%
- Separate e-waste collection targets - new producers,

R2 code of practices

- It is - set of activities that needs to be done by an ***Electronics Company*** related to Recycling.
- Follows all the required steps - Company becomes R2 Certified.
- Benefit - higher profit margins and additional market share through improvements in its operating systems and processes, and the status bestowed by certification.
- ***Environmentally responsible practices in the electronics recycling industry*** are compiled under R2 Code of Practices.
- able to assure its upstream **clients** and **customers** that it takes **appropriate measures** at its facility to protect the environment, worker and public health, and data security.

ENVIRONMENTAL LEGISLATION

ENVIRONMENTAL PROTECTION ACT, 1986

- Enacted by the parliament in the year **1986**
- Made under ***Article 253*** of the Constitution (*to implement the decisions of the United Nations Conference on the Human Environment of 1972*)
- The Act is very small one framed with **4 chapters** containing a total **26 sections**.

Chapters

- **Chapter 1** deals preliminary aspects like scope of the Act, definitions of certain important terms.
- **Chapter 2** contains the provisions which given **general power to the central government** to take all measures to improve the quality of environment.
- **Chapter 3** lays out the **substantive provisions** relating to *prevention, control and abatement of environmental pollution* and also contains the ***penal provisions.***
- **Chapter 4 -** deals with miscellaneous aspects.

Definitions Under The Act

- **Section 2** of the Act lays down meaning for different important terms.
- **Section 2(e)** of the Act defines the term **'environment'** as that which include *water, air and land and the inter- relationship which exists among and between water, air and land and human beings, other living creatures, plants, micro-organism and property*.
- In a way the definition also gives out a scope of the act

- ✓ **Section 2(b)** defines **'environmental pollutant'** under the Act means *any solid, liquid or gaseous substance present in such concentration as may be, or tend to be, injurious to environment and the environment is said to be polluted when these pollutant are present in it.*

General Powers of the Central Government under the Act

- **Section 3 to 6** of the Act lays down the *general powers of the central government* relating to the protection of the environment.
- **Section 3** of the Act contains provisions as to the *powers of central government* to **take measures to protect and improve environment**.

- ✓ The Act confers ***sweeping powers*** in the hands of central government to *take all such measures* as it deems necessary or expedient for the purpose of protecting and improving the quality of the environment and preventing, controlling and abating environmental pollution.

- ✓ The Environment Act confers on the Central Government the power to
  - ❑ restrict areas where certain industries processes and operations shall not be carried out or shall be carried out subject to certain safeguards.
  - ❑ establish and recognize environment laboratories and to appoint and recognize government analysts.
  - ❑ constitute one or more authorities to implement the Act [Subsection 3(3)]

- ✓ **Section 5** of the Act the central government has a tremendous power of issuing directions to any person, officer or any authority like
  - ✓ Closure, prohibition or regulation of any industry, operation or progress
  - ✓ Stopping or regulation of the supply of electricity of water or any other services.

Penalty under the Act

- ✓ **Section 15** of the EP Act prescribes ***penalty for contravention*** of the provisions of the EPA, the EP rules, orders and directions.
- ✓ Anyone **fails** – *punishable* - with imprisonment for a term which may extend ***to 5 years or with fine which may extend to Rs. 1 lakh or with both***.
- ✓ Citizen - ***right to move the court*** complaining of an offence under the Act (*provided that notice of not less than 60 days is given to the government of his intention to complain*)

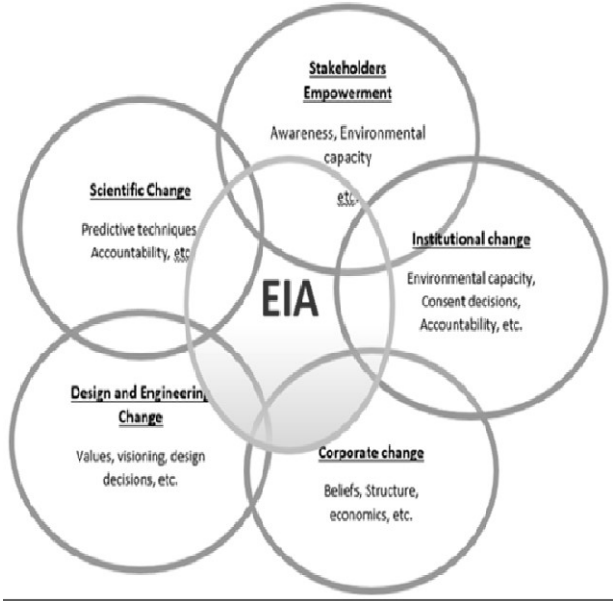
The Environment Protection Rules, 1986

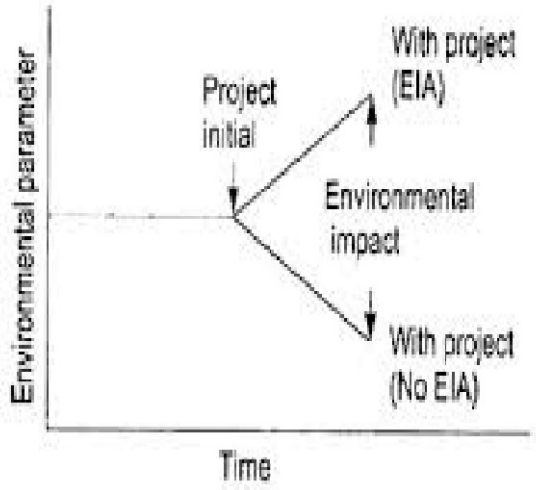
- ✓ The Central Government in exercise of the powers conferred by **Section 6** and **25** of the EPA made the Environment Protection Rules in the year 1986.
- ✓ This consists of **14 rules** and **7 schedules.**

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

EIA

- ✓ It is a **formal process** used to **predict** the *environmental consequences* of any developmental project.
- ✓ It is the **tool** through which *potential threat of project* on the environment are **foreseen and addressed** at an earlier stage in the project planning and design.
- ✓ It helps is identifying the environmental, social and economic impacts of a project prior to decision making.

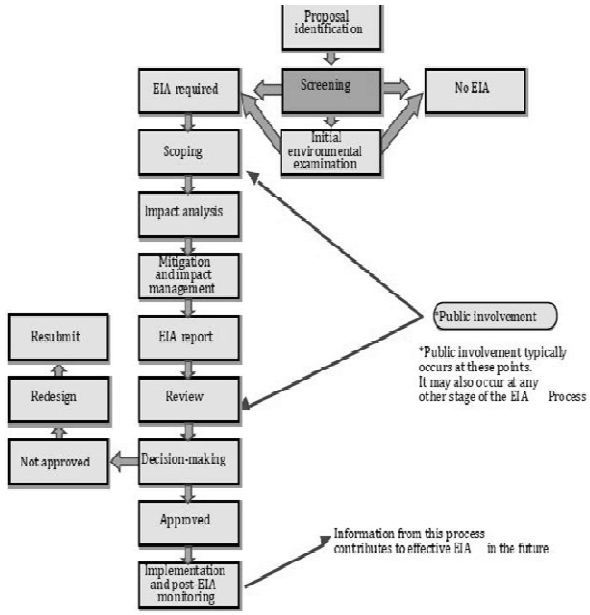




Steps in the EIA

Screening	Is an Environmental Impact Assessment necessary?
Scoping	What should be included in the study?
Impact ID & prediction	What aspects of the project will cause impacts on the environment?
Impact mitigation	How can the design be changed to reduce the predicted impacts?
Reporting	What are the key issues to be taken into account by decision makers?
Decision making	Do the benefits of the project (social and economic) outweigh the environmental costs?
Monitoring & evaluation	Were the environmental impacts correctly predicted?

In October 2012, add biodiversity conservation as a new criterion



Draft EIA notification 2020

- Re- Categorization of Projects
- *Post facto clearance*
- Exemption of projects (*Strategic*)
  - Inland waterways and National highways
- *Inadequate time* allotted for public comments
- Public consultation – *20 instead of 30*
- Violation reported **only by Govt rep**
- **Exemption** to Construction Projects up to **1,50,000 sq m**

BIOLOGICAL DIVERSITY ACT, 2002

- Earth summit – CBD
- Contracting countries – required to integrate consideration of conservation and sustainable use of biological diversity into relevant legal procedures, programs and policies
- India – formulated BDA in 2002 –passed in parliament in Dec, 2002

Objectives

- To provide for
  1. Conservation of biodiversity
  2. Sustainable use of its components
  3. Equitable sharing of benefits arising out of the utilization of biological resources

Salient features

- Conservation and sustainable use of biological diversity
- Conservation and development of areas important from the standpoint of biological diversity by declaring them as biological diversity heritage sites
- Protection and rehabilitation of threatened species
- To respect and protect the knowledge of local communities related to biodiversity

- Regulation of access to biodiversity resources of the country with the purpose of securing equitable share in benefits arising out of the use of biological resources and associated knowledge related to biological resources
- To secure sharing of benefits with local people as conservers of biological resources and holders of knowledge and information relating to the use of biological resources
- Involvement of institutions of self-government in the broad scheme of the implementation of the ac through constitution of committees

Institutional mechanism

- For effective implementation of the act, BDA provides for establishment of three statutory bodies
  - ❑***National Biodiversity Authority (NBA)***
  - ❑***State Biodiversity Boards (SBB)***
  - ❑***Biodiversity Management Committee (BMC)***
- It also provides setting up Biodiversity Funds at National, State and Local levels

National Biodiversity Authority (NBA)

- Established - **2003**; HQ – **Chennai**
- Composition
  - **One** chairman
  - **Seven** Ex-officio members
  - **Five** non-official members
- All to be appointed by central government.

Powers and functions

- Protection of indigenous and traditional genetic resources
- Deals with the matters relating to *foreign individuals, institutions and those relating to transfer of results of research* to any foreigner.
- Protection of ***indigenous and traditional*** genetic resources
- Imposition of terms and conditions to secure fair and equitable sharing of benefits arising out of utilization of biological resources
- Prior approval of NBA is needed before applying for any kind of ***IPR based on research*** conducted on biological material and or associated knowledge obtained from India.

State Biodiversity Boards (SBB)

- Constituted in every state (not UT's)
- Advises state governments on matters of biodiversity conservation
- Deals with matters relating to access by Indians for commercial purposes and restrict any activity which violates the objectives of conservation, sustainable use and equitable sharing of benefits

Biodiversity Management Committee (BMC)

- Constituted by a institutions of self - government in their respected areas for the purpose of
  - Promoting conservation, sustainable use and documentation of biological diversity
  - Includes preservation of habitats
  - Conservation of land races, folk varieties and cultivars, domesticated stocks and breeds of animals and microorganisms
  - Chronicling of knowledge relating to biological diversity.

INDIAN FOREST ACT, 1927

- **86 sections** – divided into **13 chapters**

Objective

1. Consolidate laws relating to forests
2. Regulation of transit (forest products)
3. Levy duty on timber and other forest products

Salient features

- Act – ***does not define forest*** but demarcates forest area (definition of forest –cleared in 2006 – ***Area measuring 10 ha or more + Avg no of 200 trees/ha*****)**
- State govt – *notify any land/waste land as reserve and protected*

Procedure for clearance

Declare particular land as RF (situation and limits specified)

⇩

Forest settlement officer (FSO) –enquire and settle disputes

⇩

Take action – Exclude/agreement/ acquire

⇩

Provisions for appeal against FSO order

⇩

After amicably settle – notification published - exact limits (state – levy duty on timber & other products)

Classification

1. **Reserve forests** (*Human activity banned*)
2. **Protected forests** (*activity allowed*)
3. **Village forests** (*people welfare –NTFP*)
4. **Un-classed forests**

Activities banned/regulated

- Act –regulates movement of products –in & out (stop/examine/issue permits)
- Other activities
  - × *Felling*
  - × *Girdling*
  - × *Lopping*
  - × *Tapping*
  - × *Stone quarrying*
  - × *Shooting fishing*
  - × *Fire*
  - × *Setting traps*
  - × *Fishing*

Limitations

1. Except village forests – no community inclusion
2. Govt can notify any area –protected – irrespective of vegetational status
3. Bamboo – declared as tree (botanically-grass) – not covered under NTFP

Recent amendments

- The **Indian Forest (Amendment) Bill, 2017**
- Replaces Indian Forest (Amendment) Ordinance, 2017 and replaces IFA,1927
- Original act : Definition of trees includes - *palms, bamboos, stumps, brush-wood, and canes*
- **Amendment** - ***remove the word bamboos***.

Benefits

- Before amendment - inter-state movement of bamboo require permit when in transit in other states
- Post amendment - felling or transportation of bamboos growing in ***non-forest areas*** will not require any permits.

Indian Forest (amendment) Act,2019 (draft)

Need for the change

- Recommendations of committees
  - ***MB Shah report*** of 2010
  - ***TSR Subramanian report*** of 2015
- Recommendations of core committee headed by Inspector General of Forests (Forest Policy) **Noyal Thomas**

Amendments

- Defines **community** as "*a group of persons specified on the basis of government records living in a specific locality and in joint possession and enjoyment of common property resources, without regard to race, religion, caste, language and culture*"

Forest is defined to include:

"any government or private or institutional land recorded or notified as forest/forest land in any government record and the lands managed by government/community as forest and mangroves, and also any land which the central or state government may by notification declare to be forest for the purpose of this Act."

- increased the focus to- conservation, enrichment and sustainable management of forest resources and matters connected therewith
- to safeguard ecological stability to ensure provision of ecosystem services in perpetuity
- to address the concerns related to climate change and international commitments".

- Increased role of states – if rights under FRA in hampering conservation efforts – states can commute such rights by
  - *paying such persons a sum of money in lieu thereof, or grant of land, or in such other manner as it thinks fit*
  - *maintain the social organization of the forest dwelling communities or alternatively set out some other forest tract of sufficient extent*

- Introduces a new category of forests — ***production forest (*** *forests with specific objectives for production of timber, pulp, pulpwood, firewood, non-timber forest produce, medicinal plants or any forest species*)
- Mainly to increase production in the country for a specified period.

FOREST CONSERVATION ACT, 1980

- Act- regulate **indiscriminate conversion** of Forest – non forestry purpose
- provides for **prior approval** of the Central Government for diversion of forest lands
- Maintain *balance between Development needs of the country and conservation of nature*
- Constitute – Advisory committee

Procedure for Forest Clearance

- **Up to 5 hectare**
  - Regional Offices of the MOEFCC at *Bangalore, Bhopal, Bhubaneswar, Lucknow, Shillong and Chandigarh* are empowered to grant approvals
  - Except for mining and regularization of encroachments
- **Cases between 5 hectare and 40 hectare**
  - Regional Offices of the Ministry make recommendations to the Ministry in consultation with the State Advisory Committee

- **Diversion of areas more than 40 ha**
  - Proposals - submitted directly by the State Governments to the Ministry - examined by the Forest Advisory Committee (FAC), constituted under the Act.
- **Forest area which are notified as part of national parks/ sanctuaries**
  - Allowed to be diverted only with the expressed approval of the Supreme Court of India.

Compensatory Afforestation

- Central Government while according approvals under the FCA, 1980 for diversion of forest land - stipulates appropriate conditions.
  - User Agency provides land in compensation, at prescribed scales,
  - provide compensatory levies which are in the nature of funds for Compensatory Afforestation

- Funds are held in the name of the respective State **CAMPA**s [**Compensatory Afforestation Fund Management and Planning Authorities**].
- The funds are being kept outside the Consolidated Fund of India and the Public Account of India in accordance with the specific orders of the Apex Court.
- CAMPA funds are utilized for afforestation programmes in the States.

The Compensatory Afforestation Fund Bill, 2016

- Passed by the Parliament in July 2016.
- Bill establishes the **National Compensatory Afforestation Fund** under the Public Account of India, and a **State Compensatory Afforestation Fund** under the Public Account of each state.
- These Funds will receive payments for:
  - (i) compensatory afforestation,
  - (ii) net present value of forest (NPV), and
  - (iii) other project specific payments.

- The National Fund will receive 10% of these funds, and the State Funds will receive the remaining 90%.
- These Funds will be primarily spent on afforestation to compensate for loss of forest cover, regeneration of forest ecosystem, wildlife protection and infrastructure development.
- The Bill also establishes the National and State Compensatory Afforestation Fund Management and Planning Authorities to manage the National and State Funds.

FOREST RIGHTS ACT, 2006

- ***Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.***
- Passed - December 2006,
- Notified - December 2007.
- Force - January 1, 2008 (followed by the notification of the Rules framed by the ***Ministry of Tribal Affairs***)

- **Aim**
  - to establish the rights of forest-dwelling communities to land and other resources.
  - Such rights have never been available to these communities before
- **Need**
  - India's forests are home to millions of people, including many Scheduled Tribes, who live in or near the forest areas of the country.
  - frequent harassment + forceful eviction

Objectives

Provide **four types** of rights

1. ***Title rights*** –
   - ownership to land that is being cultivated by tribals or forest dwellers as on ***December 13, 2005***, subject to a maximum of **4 hectares.**
   - **no new lands** are to be granted
   - cannot be sold or transferred

2. ***Use rights***
   - To minor forest produce (also including ownership) , to grazing areas, to pastoralist routes, etc.
3. ***Forest management rights***
   - To protect forests and wildlife.
4. ***Relief and development rights***
   - To rehabilitation in case of illegal eviction or forced displacement and to basic amenities, subject to restrictions for forest protection.

Beneficiaries

- **Eligibility** - confined to those who *primarily reside in forests* and who *depend on forests and forest land for a livelihood*.
- Must be a *member of the Scheduled Tribes* scheduled in that area or must have been residing in the forest for **75 years** or **three generations** as on **December 13, 2005.**

Section 6

- Provides a transparent three step procedure for deciding on who gets the rights.
- Act provides a **transparent three step procedure** for deciding on who gets the rights.
  1) **The gram sabha** - makes a recommendation
  2) goes through screening committees at the **taluk level** (6 mem)
  3) the **district level** committee makes the final decision (6 mem)

WILDLIFE PROTECTION ACT, 1972

History

- 1960's – Wild life – bad shape in India
- PM – set up task force – **Dr. Karan Singh**
- Report – GOI – agreed with the perception
- Urgent measure needed to be taken
- **Wildlife Protection Act** – enacted by parliament in 1972
- 1973 – Project Tiger

Objectives

- Protection of wild life - needed for the protection of environment
- Purpose - to protect wild animals, birds and plant
- Objectives

1. Provide **protection** to the wild animals, birds and plants
2. Empowers the Central Govt. to declare certain areas as **Sanctuaries & National Parks**
3. Prohibits hunting of wild animals; birds etc. and ***impose punishment*** for violating the same.

Overview

- **7 chapters, 66 sections and 6 schedules**
- **A Wild life Advisory Board** - set up in at center and state levels
  - ❑ Select areas as sanctuaries, national parks and closed areas
  - ❑ Formulation of the policy for protection and conservation of wild life and specified plants

National board for Wild life

- (Chair- PM; Deputy chair – MoEFCC)

State board for Wild life

- (Chair – CM; Deputy chair – State MoEFCC)

Salient features

- ✓ Protects – Wild animals and Rare plants – from destruction and trade
- ✓ Establish conservation Areas – **PAN and Zoo's**
- ✓ ***Hunting*** of animals = *killing + capturing + trapping+ poisoning+ injuring+ destroying+taking away any part of the body*
- ✓ Demands from the wildlife trader = prevented and punished
- ✓ Keeps eyes on use of wildlife resources by individuals and organizations
- ✓ Stops the over exploitation of wild life commodities+ illegal trade

Schedules

Schedule -1			Schedule - II		Schedule –III	Schedule - IV	Schedule –V	Schedule VI
Mammals	Amphibians and reptiles	Birds	Part-I	Part-II				
Tiger Lion Wolf Cheetah Chinkara Dugong Elephant Black buck Kashmiri stag Rhino	Gharial Pythons Water lizard Green sea turtle	Andamantial Bengal florican GIB Mountain quail	Assamese macaque Bengal porcupine Wild dog Chemeleon	Common fox Jackal Pole cat Sloth bear Indian cobra King cobra Russels viper	Chital Hog deer Hyaena Sambhar Wild pig Ghorals	Hares Falcons King fisher Doves Swans Pigeons Owls	Common crow Rat Mice Fruit bat	Beddomes cycad Blue Vanda Red Vanda Kuth Pitcher plant Red slipper orchid

Chapters

- ***Chapter -1*** : Definitions – acts, terms, boundaries
- ***Chapter-2*** : Authorities to be appointed
  - *Directorate of wild life preservation + officers*
  - *NTCA*
  - *WCCA*
  - *CWW*
  - *NBWL and SBWL*
  - *Duties, Procedures, Functions etc.,*

Chapter-3

- **Hunting of animals**
  - **Secton-9**
    - ✓ Prohibit hunting of any animals enlisted in its schedules (I to IV) (***except provisions of Sec-11 &12***)
  - **Section-12**
    - ✓ Grant permit - Collection and capturing by CWW (*education, scientific, research, management – translocation and population management*)
  - **Secton-17**
    - ✓ Protects specific plants (*picking, uprooting, damaging, possession, sale*)

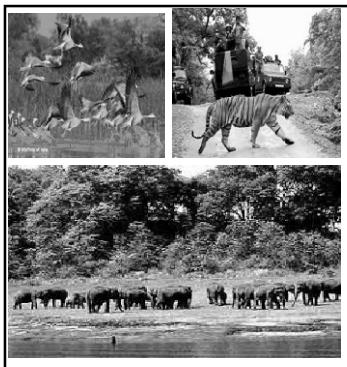
Section 11

- The CWW can order hunting of animals listed in Schedule-I- if
  - ❖ ***The animal – turned dangerous to human life***
  - ❖ ***Diseases***
  - ❖ ***Disabled***
  - ❖ ***Animal – cannot be captured or translocated***

- CWW can order hunting of animals in Schedule – II, III and IV
  - ***Dangerous to human property – Standing crops, buildings, cattle etc.,***
- Killing or wounding any wild animal in defense of oneself or any other person – not an offence

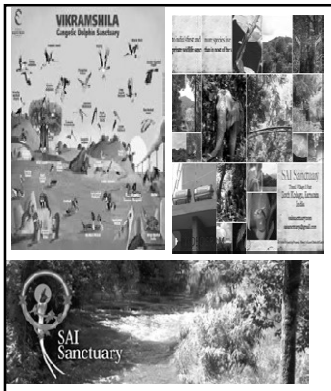
Chapter-4: PAN

- ***In situ* conservation** of wildlife and rare flora in India is supported by a **comprehensive system of protected areas.**
- There are different categories - managed with different objectives for the larger objectives for **conservation** and also for **bringing benefits to the society**.
- WPA –establishes- **4 types of protected areas**
  1. ***Sanctuaries***
  2. ***National Parks***
  3. ***Conservation Reserves***
  4. ***Community Reserves***



Wild Life Sanctuaries

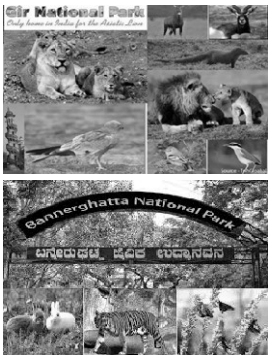
- Established under ***Section -18*** of WPA, 1972
- Any area *other than area comprised with any reserve forest or the territorial waters*
- IUCN ***Category IV type protected area***
- *Proposed* and *Notified* by **State government**
- Adequate ecological, faunal, floral, geo-morphological, natural. or zoological significance.
- Purpose - protecting, propagating or developing wildlife or its environment
- Some **restricted human activities** are allowed



- Generally **species-oriented**
- Boundaries may not be clearly defined or fenced
- CWW - grant to any person a permit to enter or reside in a sanctuary for all or any of the following purposes:
- *Investigation or study of wildlife, photography; scientific research; tourism, fodder collection, access to water resources* etc.,
- Not allowed - light fire, carry fire-arms or hazardous substance, remove any wild animal or plant, cattle grazing, making noise etc.,
- No core and buffer principle
- Can be ***privately owned***
- **Can be** upgraded to NP's
- **551** Sanctuaries in India

National parks

- Established under ***Section -35*** of WPA, 1972
- An area, whether within a sanctuary or - constituted as a National Park
- IUCN ***Category II type protected area***
- *Proposed* and *established* by **State government** but their notification is done by **Central governments**
- **Cannot be** de-notified by the State Government.
  Reason - ecological, faunal, floral, geo-morphological, or zoological association or importance
- Purpose - protecting & propagating or developing wildlife
- More stringent control – **No human interference** (except allowed by NP administration)



- Hitched to the habitat for particular wild animal
- Boundaries **clearly defined** and **circumscribed by legislation**.
- No alteration of the boundaries Status cannot be revoked - without approval of NBWL
- **Cannot** degrade to WLS
- Organized on **Core-Buffer** principle
- No person can destroy, exploit or remove any wildlife or destroy or damage the habitat, no livestock, no grazing.
  Funding - central government & has separate administration
- Land cannot be diverted under FRA, 2006 (Under FCA, 1980 – SC approval needed)
- **Cannot be owned privately**
- Core ares of all Tiger reserves – enjoy status of NP
- **104** national parks

Conservation Reserves
Tiruppadaimarathur (TN)
Hornbill (KAR)
Bir Bara Ban (HAR)
Shri Naina Devi (HP)
Ajas (J & K)

Community Reserves
Kokkare Bellur (KAR)
Kadalundi Vallikkunnu (KER)
Aruakgre (MEG)
Bonchu (NAG)
Keshopur Chhamb (PUJ)

Conservation Reserve and Community Reserves

- Protected areas which act as **buffer zones** to or **connectors and migration corridors** between established National Parks, Wildlife Sanctuaries and reserved and protected forests of India
- Added - because of reduced protection **in and around** existing or proposed protected areas due to private ownership of land, and land use.
- Land ownership – does not change; land use pattern gets restricted
- **Conservation reserves** - if they are uninhabited and completely **owned by the Government.** (**88** in India)
- **Community reserves** - used for *subsistence* by communities and community areas or lands which are **privately owned.**
- Introduced in **2002 (127 in India)**




Other Chapters…

- ***Chapter-5***:Trade and Commerce in Wild life
- ***Chapter-6*** : Prevention and detection of offence
- ***Chapter-7***: Miscellaneous
  - ***Section – 62*** of WPA, 1972
    - Allows the central government - declare - any animal as vermin in a specific region for a specific period of time.

Eg: *Monkeys (HP)*
Wild Pig (Uttarakhand)
Neelgai (Bihar)


Amendments to WPA, 1972

- **1991** (chapter-3, CZA)
- **2002** (NBWL, SBWL, Cons R and Comm. R)
- **2006** (NTCA)
- **2007** (WCCB)
- **2013** (Traps, Hunting rights, international trade regulation)
- **2017** (NRCA)?