

JSR IAS ACADEMY

GENERAL SCIENCE

BIOLOGY

Environment

முயற்சி - பயிற்சி - தேர்ச்சி

IUCN (International Union for Conservation of Nature and Natural Resources)

IUCN is the global authority on the status of the natural world and the measures needed to safeguard it.

Vision of IUCN

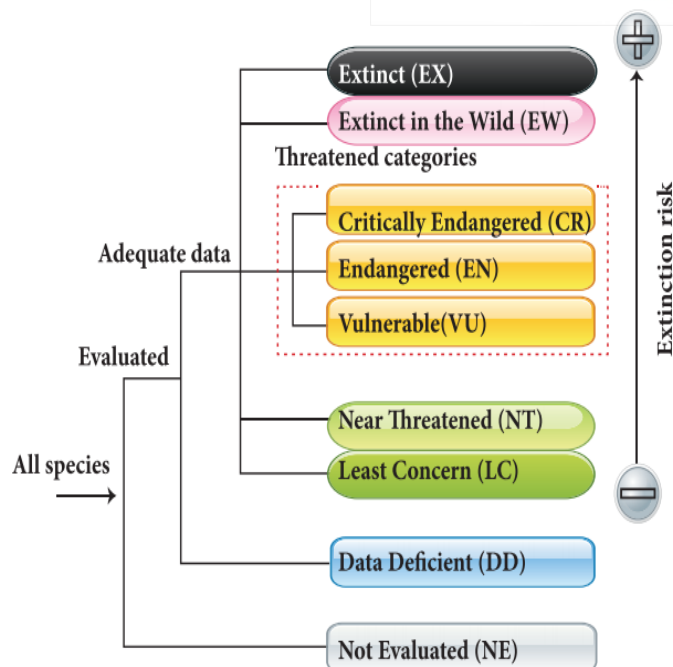
- 'A just world that values and conserves nature'.
- The organization is best known to the wider public for compiling and publishing the IUCN red list of threatened species, which assesses the conservation status of species worldwide.
- India, a mega diverse country with only 2.4 % of world's land area, accounts for 7-8% of all recorded species.
- It includes over 45,000 species of plants and 91,000 species of animals.

Four of 36 globally identified biodiversity hotspots are found in India.

1. Himalaya (the entire Indian Himalayan region)
2. Western Ghats
3. Indo-Burma: includes entire North-eastern India, except Assam and Andaman group of Islands (and Myanmar, Thailand, Vietnam, Laos, Cambodia and Southern China)
4. Sundalands: includes Nicobar group of Islands (and Indonesia, Malaysia, Singapore, Brunei, Philippines)

India became state member of IUCN in 1969, through the Ministry of Environment, Forest and Climate change (MoEFCC).

DO YOU KNOW? IUCN was founded on 5th October 1948 at Gland, Switzerland.



DO YOU KNOW? India is the third largest consumer of crude oil in the world, after the United States and China.

The Taj Mahal is one of the seven wonders of the world and is located in Agra, Uttarpradesh. It is built with white marble. The Mathura oil refinery owned by Indian Oil Corporation present around this area produce sulphur and nitrogen oxides. The white marble became yellow due to air pollution. The Government of India has set up emission standards around the monument to protect it from the damage.

DO YOU KNOW? A capacity of 100 litres solar heater can save upto 1500 units of electricity per year.

Biogas

- Biogas is the mixture of methane (nearly 75 %), hydrogen sulphide, carbon dioxide and hydrogen.
- It is produced by the decomposition of animal wastes (cow dung) and plant wastes in the absence of oxygen.
- It is also commonly called as 'Gobar gas' since the starting material used is cow dung which means gobar in Hindi.

Shale gas

- Shale refers to the soft finely stratified sedimentary rock that is formed from the compaction of small old rocks containing mud and minerals –
- such as quartz and calcite, trapped beneath earth's surface.
- These rocks contain fossil fuels like oil and gas in their pores.
- The fuel is extracted by a technique called hydraulic fracturing (drilling or well boring of sedimentary rocks layers to reach productive reservoir layers).

India has identified six basins as areas for shale gas exploration: Cambay (Gujarat), Assam-Arakan (North East), Gondwana (Central India), Krishna Godavari onshore (East Coast), Cauvery onshore and Indo-Gangetic basins.



- ◆ The world's largest and tallest wind turbine is situated in Hawaii.

- ◆ One wind turbine can produce electricity for 300 homes.



E-wastes include

Computer components	- 66%
Telecommunication components	- 12 %
Electronic components	- 5 %
Biomedical components	- 7 %
Other components	- 6 %

Health Effects of E- Wastes

Lead: Damages central and peripheral nervous system; affect brain development in children

Chromium: Asthmatic bronchitis

Cadmium: Accumulates in kidney and liver; neural damage

Mercury: Chronic damage to brain and respiratory system

Plastics including Polyvinyl Chloride (PVC): Burning produces dioxin which can cause developmental and reproductive problems, damages the immune system.



Mean Sea Level (MSL) is an average level of the surface of one or more of Earth's oceans (or seas) from which heights such as elevations may be measured.

As we travel by train we notice names of stations on big yellow signboards on which is usually written how much elevated that place is compared to MSL. For example, Erode junction is about 171 meters above MSL.



Existence of two climatic communities under the influence of same climatic conditions are found in higher mountain hill tops, above 7000 feet MSL (Mean sea level) of Nilgiris. Example: Sholas and grasslands.

Biodiversity

The term biodiversity was introduced by **Walter Rosen (1986)**.

Levels of biodiversity

Edward Wilson popularized the term 'Biodiversity'

There are three levels of biodiversity –

1. Genetic diversity,
2. Species diversity
3. Community/Ecosystem diversity

The three indices of diversity are –

1. Alpha,
2. Beta
3. Gamma

Biogeographical regions of India

- Trans-Himalaya
- Himalaya
- Semi arid
- Gangetic plains
- Desert
- North east
- Deccan peninsula
- Coastal
- Western ghats
- Island

Extinction: There are three types of Extinctions

- Natural extinction
- Mass extinction:
- Anthropogenic extinctions

The most dramatic example of habitat loss comes from the tropical rainforests 14% of the earth's land surface once covered by these tropical forests, is not more than 6% now.

Biodiversity and its conservation**There are two aspects of conservation strategies**

- In-situ conservation
- Ex-situ conservation

Protected Areas:

India has about 771 protected areas covering 162099 km² comprising of

- National Parks (104),
- Wild Life Sanctuaries (544),
- biosphere reserves (18)

There are 18 Biosphere Reserves in the country.

- Agasthyamalai (Karnataka - Tamil Nadu - Kerala),
- Nilgiri (Tamil Nadu - Kerala),
- Gulf of Mannar (Tamil Nadu)

are the BRs notified in Tamil Nadu

National Parks in Tamil Nadu	Year of establishment	District(s)
Guindy NP	1976	Chennai
Gulf of Mannar Marine NP	1980	Ramanathpuram and Tuticorin
Indira Gandhi (Annamalai) NP	1989	Coimbatore
Mudumalai NP	1990	Nilgiris
Mukurthi NP	1990	Nilgiris

Prominent WLS in Tamil Nadu	Year of establishment	Districts
Vedanthangal Lake Birds WLS	1936	Chengalpeta
Mudumalai WLS	1942	Nilgiris
Point Calimere WLS	1967	Nagapattinam
Indira Gandhi (Annamalai) WLS	1976	Coimbatore
Mundanthurai WLS	1977	Tirunelveli

World Wild Fund for Nature (WWF)

- An international non-governmental charitable trust founded in 1961, with headquarters at Gland, Vaud, Switzerland.
- The living planet report is being published every two years by WWF since 1998.

ZOOLOGICAL SURVEY OF INDIA

The Zoological Survey of India (ZSI) was established in 1916 to promote survey, exploration and research leading to the advancement in our knowledge of various aspects of biodiversity of our country.

CITES:

- The Convention on International Trade in Endangered Species (CITES) of wild fauna and flora, also known as the Washington Convention, is a multilateral treaty to protect endangered plants and animals.
- It was drafted from a resolution adopted from a meeting of members of the IUCN in 1963 and opened for signature in 1973. It came into force during July 1975.
- The Forestry Research Education and Extension Project FREEP (A World Bank Initiative) in India is employing a strategy called 'eco development' FREEP is conducting pilot ecodevelopment programmes in the KalakadMundanthurai Tiger Reserve (KMTR) in Tamil Nadu.

Biodiversity Act (BDA)

- The convention was held in 1992 at the 'Earth Summit' in Brazil. India is a signatory of the CBD.
- The Biological Diversity Act, 2002 is an Act of the Parliament of India
- The National Biodiversity Authority (NBA) was established by the Central Government in 2003 to implement India's Biological Diversity Act (2002).
- The Headquarters of the NBA is situated in Chennai.



Sameer, an App provides hourly updates on the National Air Quality Index (AQI) published by CPCB.

Green House effect and Global Warming

Green House Effect is a process by which radiant heat from the sun is captured by gases in the atmosphere that increase the temperature of the earth ultimately.

Greenhouse gases (GHG)

- water vapour,
- carbon dioxide,
- methane,
- nitrous oxide,
- ozone

some artificial chemicals such as chlorofluorocarbons (CFCs)

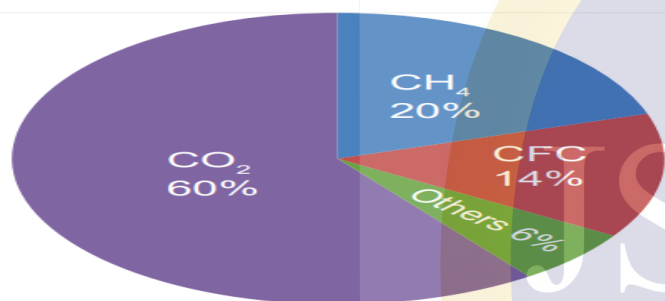


Figure 8.2: Relative contribution of green house gases

DO YOU KNOW? Clouds and Dust particles can also produce Green House effect. That is why clouds, dusts and humid nights are warmer than clear dust free dry nights.

Methane is 20 times as effective as CO₂ at trapping heat in the atmosphere.

Acid rain:

Acid rain is a form of precipitation that contains acidic components, such as sulfuric acid or nitric acid.

Air Quality Index		
AQI	Air Pollution Level	Colour
0-50	Good	Green
51-100	Moderate	Yellow
101-150	Unhealthy for Sensitive Groups	Orange
151-200	Unhealthy	Red
201-300	Very Unhealthy	Dark Red
301+	Hazardous	Black



Green House Effect Albedo Effect

Gases let out to atmosphere causes climatic change.

Emission of dust and aerosols (small solids or liquid particles in suspension in the atmosphere) from industries, automobiles, forest fire, SO₂ and DMS (dimethyl sulphur) play an important role in disturbing the temperature level of any region. Aerosols with small particles is reflecting the solar radiation entering the atmosphere. This is known as **Albedo effect**. So it reduces the temperature (cooling) limits, photosynthesis and respiration. The sulphur compounds are responsible for **acid rain** due to acidification of rain water and destroy the ozone.

On January 28, 2017, two cargo ships collided off the Ennore coast in Chennai causing oil to spill into the sea. Due to wave action and the southern current, the spill spread over to 34 km down south affecting the coast. Beach sand also got spoiled by the oil sludge. It took more than a thousand volunteers to clean the oil sludge.

Assessment by CPCB

The number of polluted stretches in India's rivers has increased to 351 from 302 (in 2006), and the number of critically polluted stretches – where water quality indicators are the poorest – has gone up to 45 from 35 (Source: The Hindu, 17 September, 2018).



The Three Mile Island (Pennsylvania, United States), Chernobyl (Pripyat, Ukraine) and Fukushima Daiichi (Ōkuma, Japan) are nuclear disasters the world has seen in the recent period.

- Remedies: '4R'- Refuse, Reduce, Reuse and Recycle mantra is the best available remedy for plastic waste pollution.
- Tamil Nadu State government successfully implemented the ban on single use plastics from 1st January 2019.

Ozone Depletion

- At about 15 and 30 kilometers from the ground level, the earth's atmosphere has a thin layer of ozone, which absorbs ultraviolet sunlight.
- Ozone is found in the layer of the atmosphere called the Stratosphere.
- It acts as a protective covering that absorbs ultraviolet (UV) radiation from the sun.
- The ozone molecule (O₃) consists of three oxygen atoms.

World Ozone Day

September 16 has been designated by the United Nations as the International Day for the Preservation of the Ozone Layer.

The ozone layer was discovered in 1913 by the French physicists Charles Fabry and Henri Buisson.

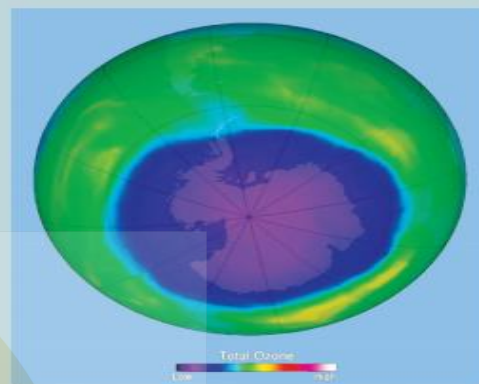
Ozone layer depletion mainly occurs by anthropogenic actions.

The excessive release of chlorine and bromine from man-made compounds such as

- ❖ CFCs,
- ❖ methyl chloroform,
- ❖ carbon tetrachloride,
- ❖ hydrochlorofluorocarbons,
- ❖ hydrobromofluorocarbons
- ❖ methylbromide

are found to have direct impact on the depletion of the ozone layer

Ozone hole (in purple colour), is the area above Antarctica, where the ozone layer is the thinnest.



Ozone depletion around Polar region

Ozone thickness is given in Dobson unit (see carefully the scale shown in colour from violet to red). The ozone hole over Antarctica develops each year between late August and early October.

Courtesy: NASA

Effects of Ozone depletion

- Increases the incidence of cataract
- In plants, photosynthetic chemicals will be affected
- Decreased photosynthesis will result in increased atmospheric CO₂ resulting in global warming

People's Participation in Conservation of Forests

The Chipko movement

Later on it transformed into Chipko Movement by Sundarlal Bahuguna in Mandal village of Chamoli district in 1974.

Sunderlal Bahuguna was the leader of this movement.

The 'Forest man of India', Jadav Payeng who created 1,360 acres of dense and defiant forest was born in Arunasapori (a river island on the Brahmaputra).

Main aim of Chipko movement was to give a slogan of five F's – Food, Fodder, Fuel, Fibre and Fertilizer, to make the communities self sufficient in all their basic needs.

Chipko movement

The Chipko movement was a non-violent agitation in 1973 that was aimed at protection and conservation of trees. The name of the movement 'Chipko' comes from the word 'embrace', as the villagers hugged the trees and encircled them to prevent them from being cut. The movement originated in the Chamoli district of Uttar Pradesh (now Uttarakhand). The protest of Chipko movement achieved a major victory in 1980 with a 15 year ban on cutting trees in the Himalayan forests.

Appiko Movement

- The famous Chipko Andolen of Uttarakhand in the Himalayas inspired the villagers of Uttarakhand to launch a similar movement to save their forests.
- This movement started in Gubbi Gadde a small village near Sirsi in Karnataka by Panduranga Hegde.



■ Jim Corbett National Park was the first to be established in 1936 in Uttarakhand, India.

- There are 15 biosphere reserves in India.
- The Nilgiris is a biosphere reserve in Tamil Nadu.

Project Tiger: The Government of India launched the 'Project Tiger' in 1973 to protect our national animal. From 9 tiger reserves since its inception, the Project Tiger coverage has increased to 50 at present. Project Tiger is an ongoing Centrally Sponsored Scheme of the Ministry of Environment and Forests, providing central assistance to the states for tiger conservation in designated tiger reserves. Project Tiger was launched in the Jim Corbett National Park, Uttarakhand in 1973. The project ensures a viable population of Bengal tigers in their natural habitats, protecting them from extinction and preserving areas of biological importance as a natural heritage.

The National Tiger Conservation Authority (NTCA) is a statutory body of the Ministry, created under the Wildlife (Protection) Act, 1972. India holds over half the world's tiger population. According to the latest tiger census report released on 20th January 2015 by NTCA, the current tiger population is estimated at 2,212. There are 50 tiger reserves in the country.



Rathika Ramasamy, a native of Venkatachalapuram village, Theni District

in Tamil Nadu was the first Indian woman to strike an International reputation as wildlife photographer.



Her passion is towards bird photography. A photobook on wildlife titled "The best of wildlife moments" was published in November 2014.

Wildlife Conservation Initiatives In India.

- ◆ Project Tiger and Project Elephant has been launched in 1973 and 1992 respectively
- ◆ Crocodile Conservation Project was launched in 1976.
- ◆ Sea Turtle Conservation Project was launched in 1999.
- ◆ Indian Rhino Vision 2020 is to conserve at least 3000 greater one-horned rhinos in Assam, India by 2020.

CONVENTION ON BIOLOGICAL DIVERSITY (CBD)

The United Nations convention on Biological Diversity, known as CBD in short, was signed by India and 172 other nations on December 29, 1993. The CBD was an attempt to establish an international program for conserving and using the world's biological resources. This historical treaty recognizes the "sovereign right of nation over their genetic resources" and considers "appropriate access to genetic resources." The treaty also takes into account the "fair and equitable sharing" of benefits arising from the use of genetic resources.