

Introduction to Environmental Studies

UNIT – I (1 -2 Weeks)

Introduction to Environmental Studies (1 lectures and 1 practical/ outreach activities)

- Multidisciplinary nature of environmental studies; components of environment: atmosphere, hydrosphere, lithosphere, and biosphere
- Scope and importance; Concept of sustainability and sustainable development; Brief history of environmentalism

UNIT – II (3-7 Weeks)

Ecosystems (5 lectures and 7 practical/ outreach activities)

- Definition and concept of Ecosystem
- Structure of ecosystem (biotic and abiotic components); Functions of Ecosystem: Physical (energy flow), Biological (food chains, food web, ecological succession), and Biogeochemical (nutrient cycling) processes. Concepts of productivity, ecological pyramids and homeostasis
- Types of Ecosystems: Tundra, Forest, Grassland, Desert, Aquatic (ponds, streams, lakes, rivers, oceans, estuaries); importance and threats with relevant examples from India
- Ecosystem services (Provisioning, Regulating, Cultural, and Supporting); Ecosystem preservation and conservation strategies; Basics of Ecosystem restoration

UNIT – III (8-11 Weeks)

Natural Resources (5 lectures and 6 practical/ outreach activities)

- **Land resources:** Minerals, soil, agricultural crops, natural forest products, medicinal plants, and forest-based industries and livelihoods; Land cover, land use change, land degradation, soil erosion, and desertification; Causes of deforestation; Impacts of mining and dam building on environment, forests, biodiversity, and tribal communities
- **Water resources:** Natural and man-made sources; Uses of water; Over exploitation of surface and ground water resources; Floods, droughts, and international & inter- state conflicts over water
- **Energy resources:** Renewable and non-renewable energy sources; Use of alternate energy sources; Growing energy needs; Energy contents of coal, petroleum, natural gas and bio gas; Agro-residues as a biomass energy source
- **Case studies:** Contemporary Indian issues related to mining, dams, forests, energy, etc (e.g., National Solar Mission, Cauvery River water conflict, Sardar Sarovar dam, Chipko movement, Appiko movement, Tarun Bharat Sangh, etc)

UNIT – IV (12-15 Weeks)

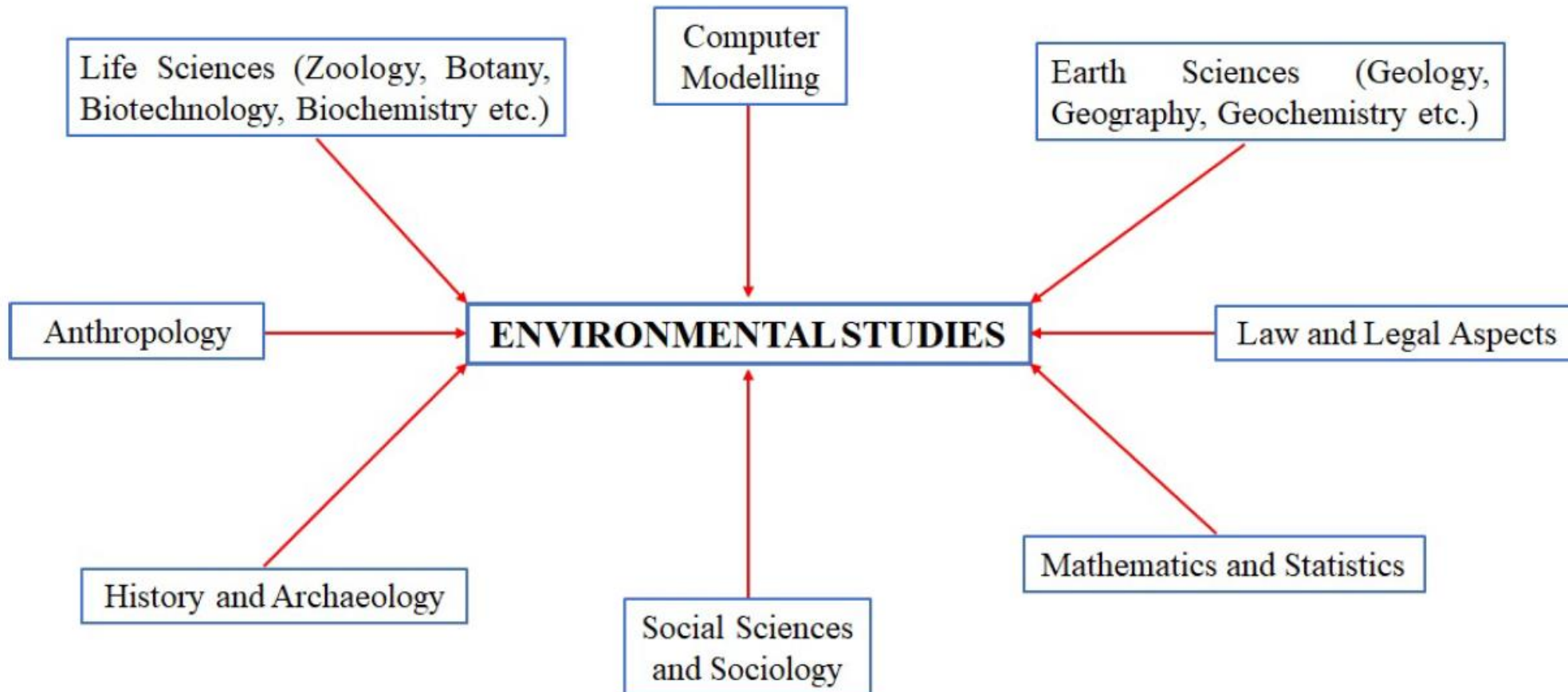
Environmental Pollution and Control (4 lectures and 6 practical/ outreach activities)

- **Environmental pollution** (Air, water, soil, thermal, and noise): causes, effects, and controls; Primary and secondary air pollutants; Air and water quality standards
- **Nuclear hazards and human health risks**
- **Solid waste management:** Control measures for various types of urban, industrial waste,
Hazardous waste, E-waste, etc; Waste segregation and disposal
- **Pollution control measures:** Introduction to legal, biological, and physico-chemical methods; Role in sustainability
- **Pollution case studies:** Ganga Action plan (GAP), Delhi air pollution and public health issues, Plastic waste management rules, Bhopal gas tragedy, etc

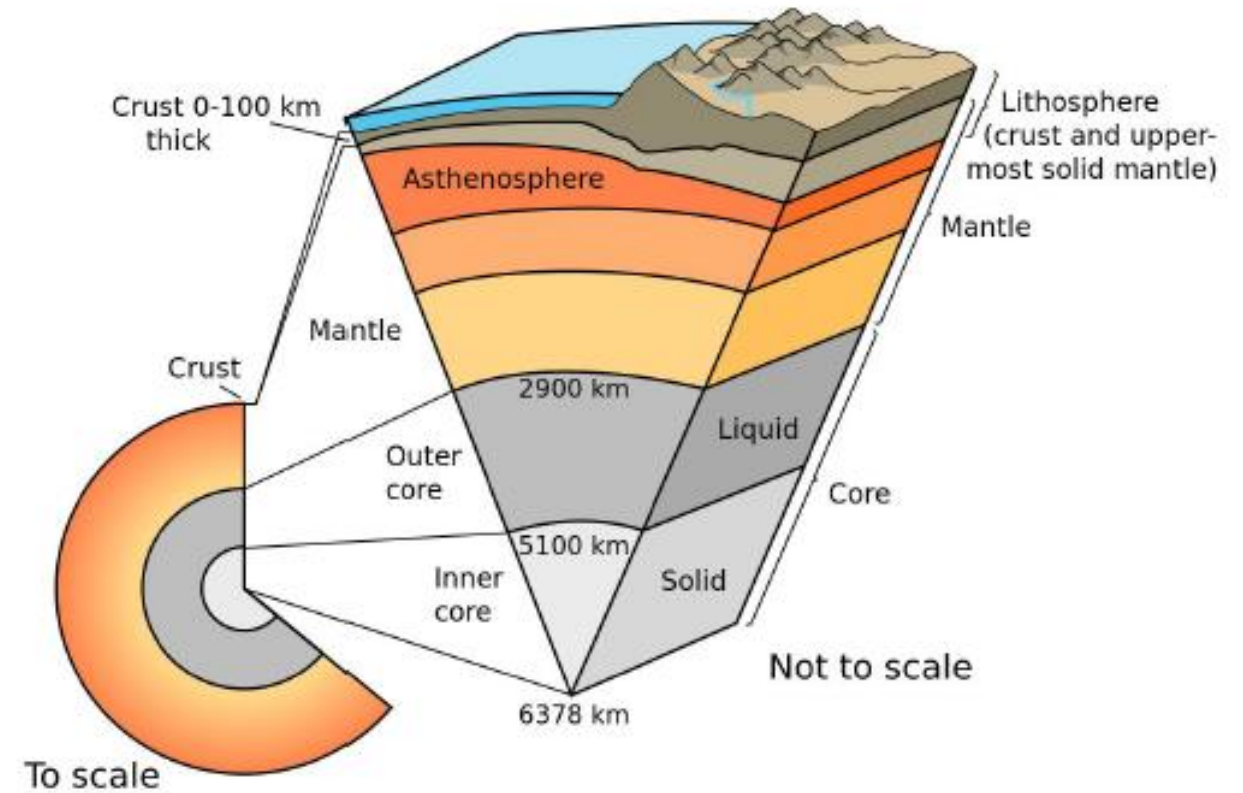
*The word “**Environment**” is originated from French environ means ‘around’ or ‘to surround’
This means that environment includes things or objects or events that surround us.*

Multidisciplinary Nature of Environmental Studies

The science of Environment studies is a multidisciplinary science because it comprises various branches of studies like **chemistry, physics, medical science, life science, agriculture, public health, sanitary engineering etc.**



Components Of Environment

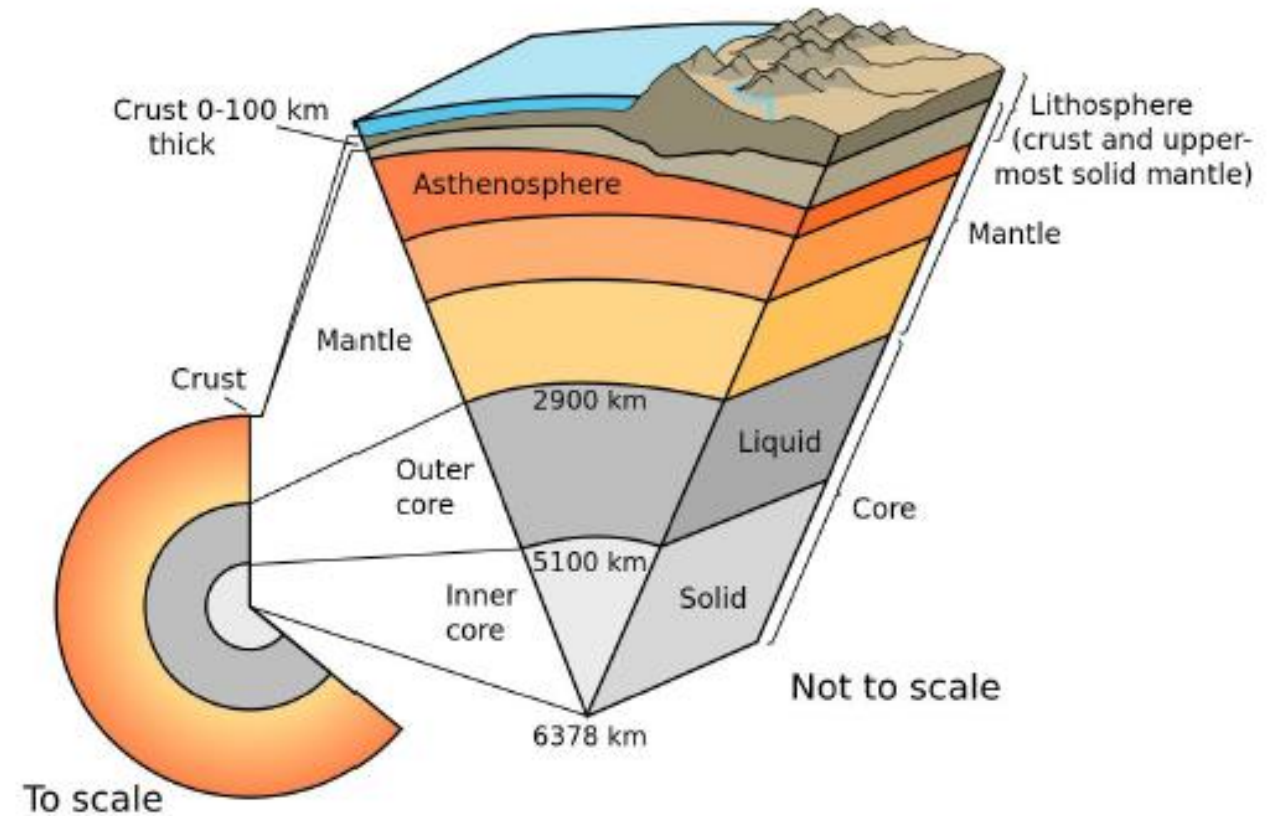


The planet earth is categorized into different spheres which represent **solid (rock/soil), liquid (water) and gaseous (air) phases.**

The overlapping zone of the three spheres, where life is available, is called the **biosphere.**

Lithosphere

- The term lithosphere refers to the **Earth's rigid, rocky outer layer**.
- It is made up of the crust and the uppermost solid layer of the mantle. Furthermore, it extends to a depth **of about 60 miles**.
- It disintegrates into a dozen separate, **rigid blocks or plates**.
- Various geological structures or landforms like high mountains, plateau, deep valleys and sea beds make the surface of lithosphere uneven.
- **Mount Everest** is the highest point on the lithosphere.



Hydrosphere

- The hydrosphere is the combined mass of water found on, under, and above the surface of the earth.
- It has been estimated that there are 1386 million cubic kilometres of water on earth.
- This includes water in liquid and frozen forms in groundwater, oceans, lakes and streams.
- Approximately 75% of Earth's surface, an area of some 361 million square kilometres, is covered by ocean.

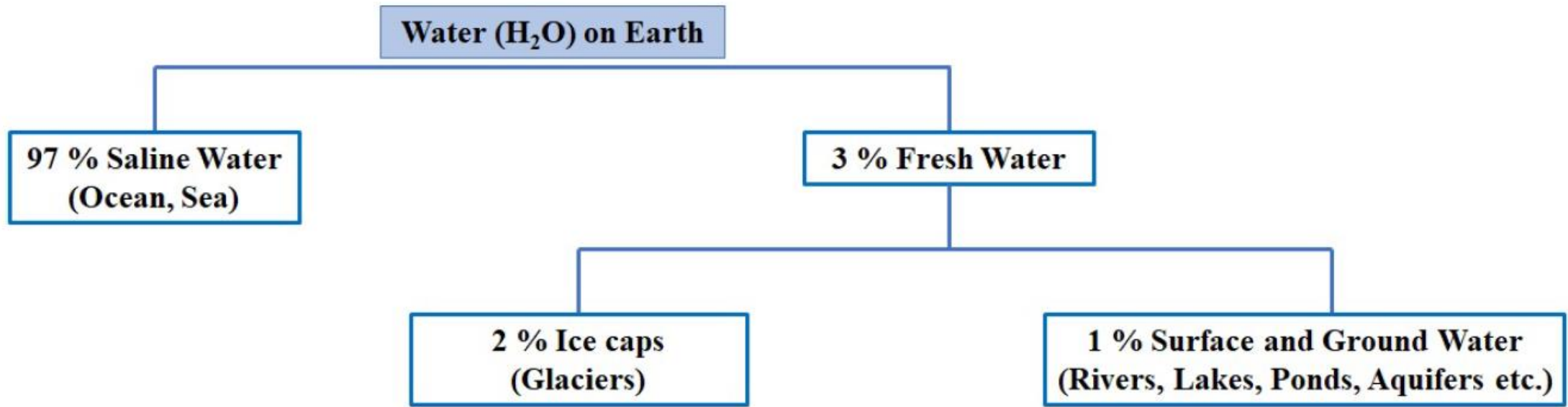


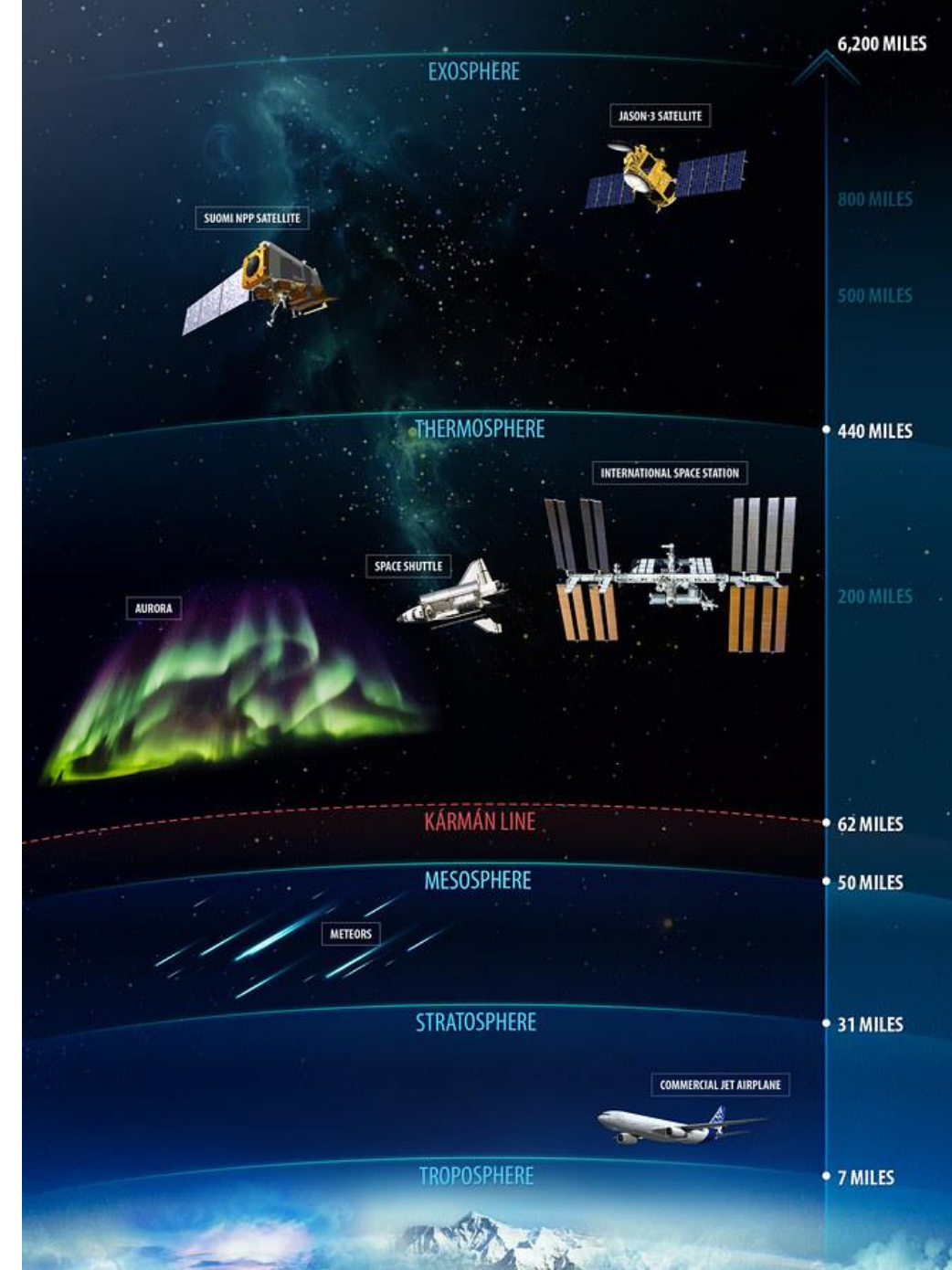
Figure 2: Distribution of Water Resources on the Earth

Atmosphere

- An atmosphere is a blanket of gases that surrounds Earth.

Troposphere

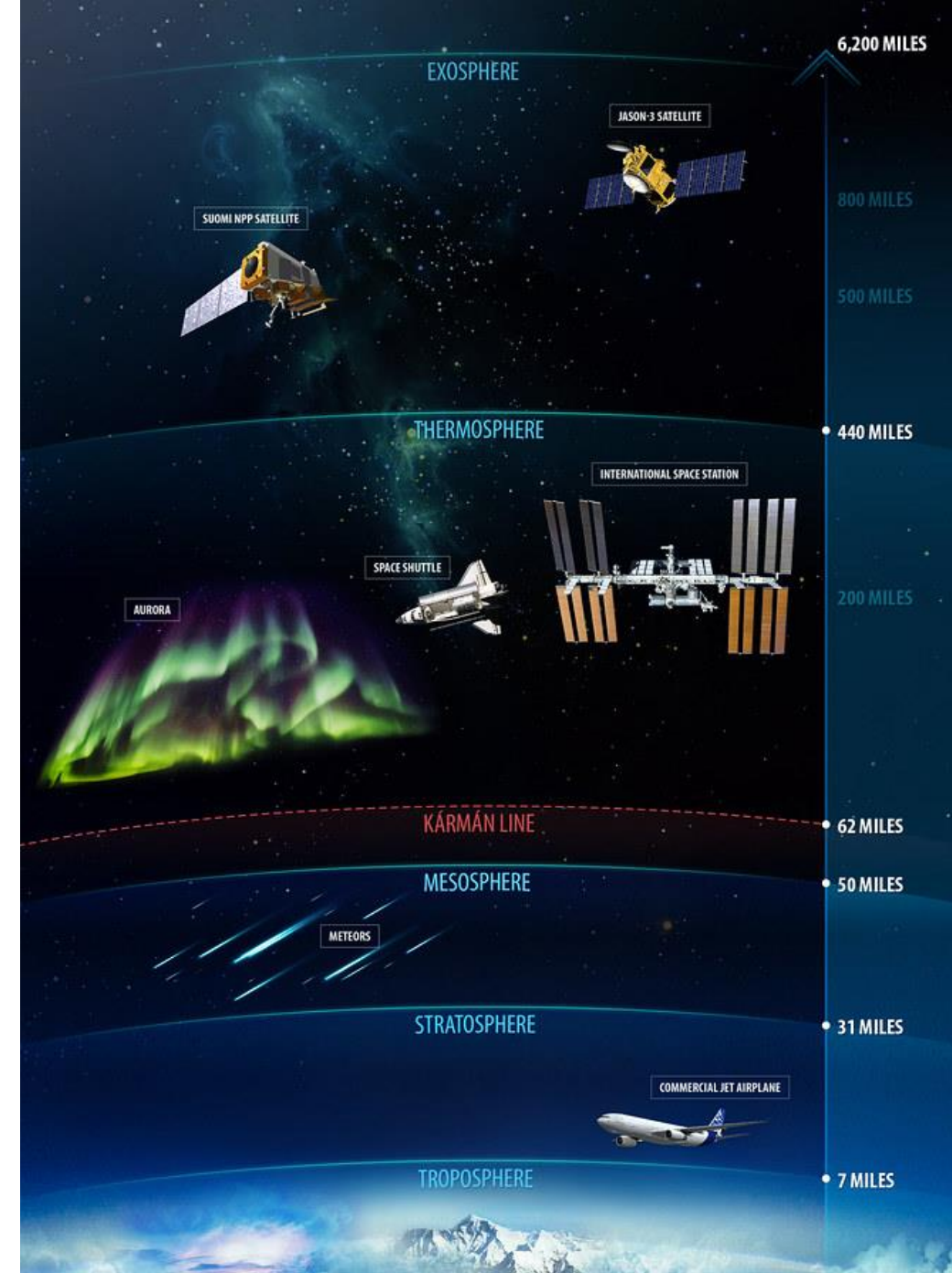
- Lowest layer
- Temperature decreases with increase in altitude (-6.4 °C per km) in this layer
- The troposphere contains 75% of all air in the atmosphere. Most clouds appear in this layer because 99% of the water vapour in the atmosphere is found here.



Atmosphere

Stratosphere

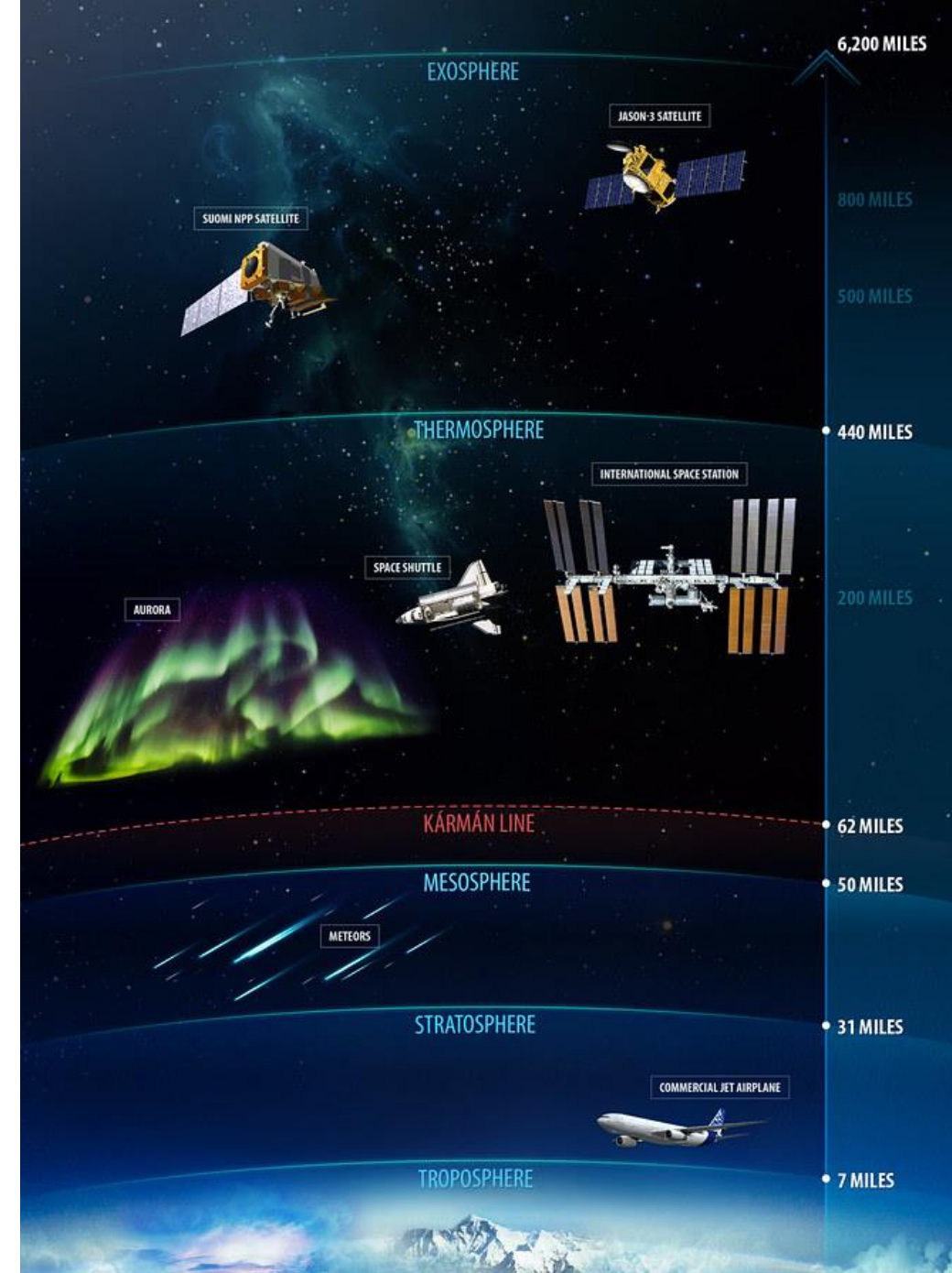
- Above troposphere
- Ozone layer
- Ozone molecules in this layer absorb high-energy ultraviolet (UV) light from the Sun and convert it into heat.



Atmosphere

Mesosphere

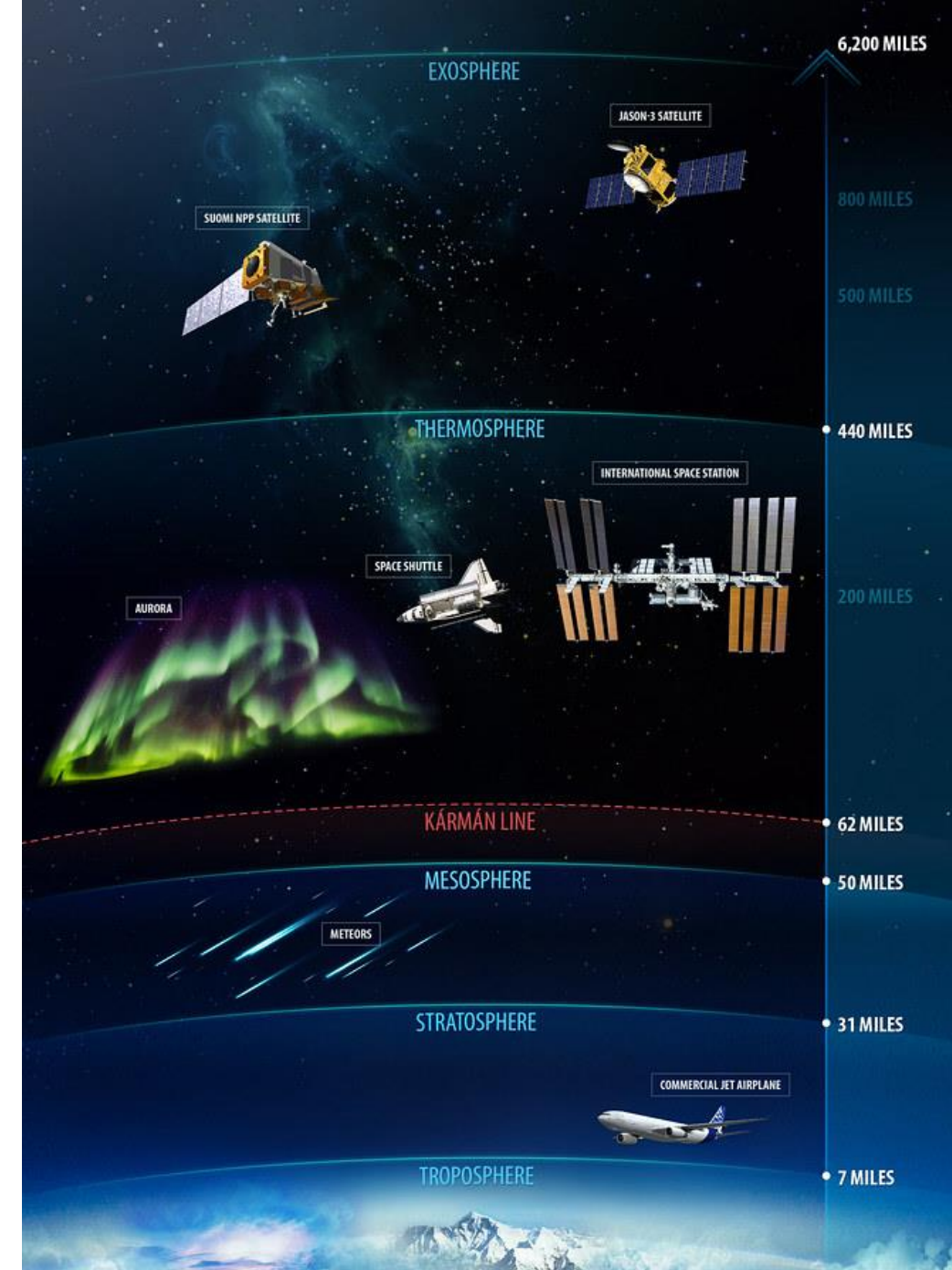
- Above stratosphere
- it extends to a height of about 85 km (53 miles) from the ground.
- the temperature grows colder as you rise up through the mesosphere. The coldest parts of our atmosphere are located in this layer and can reach -90°C .



Atmosphere

Thermosphere

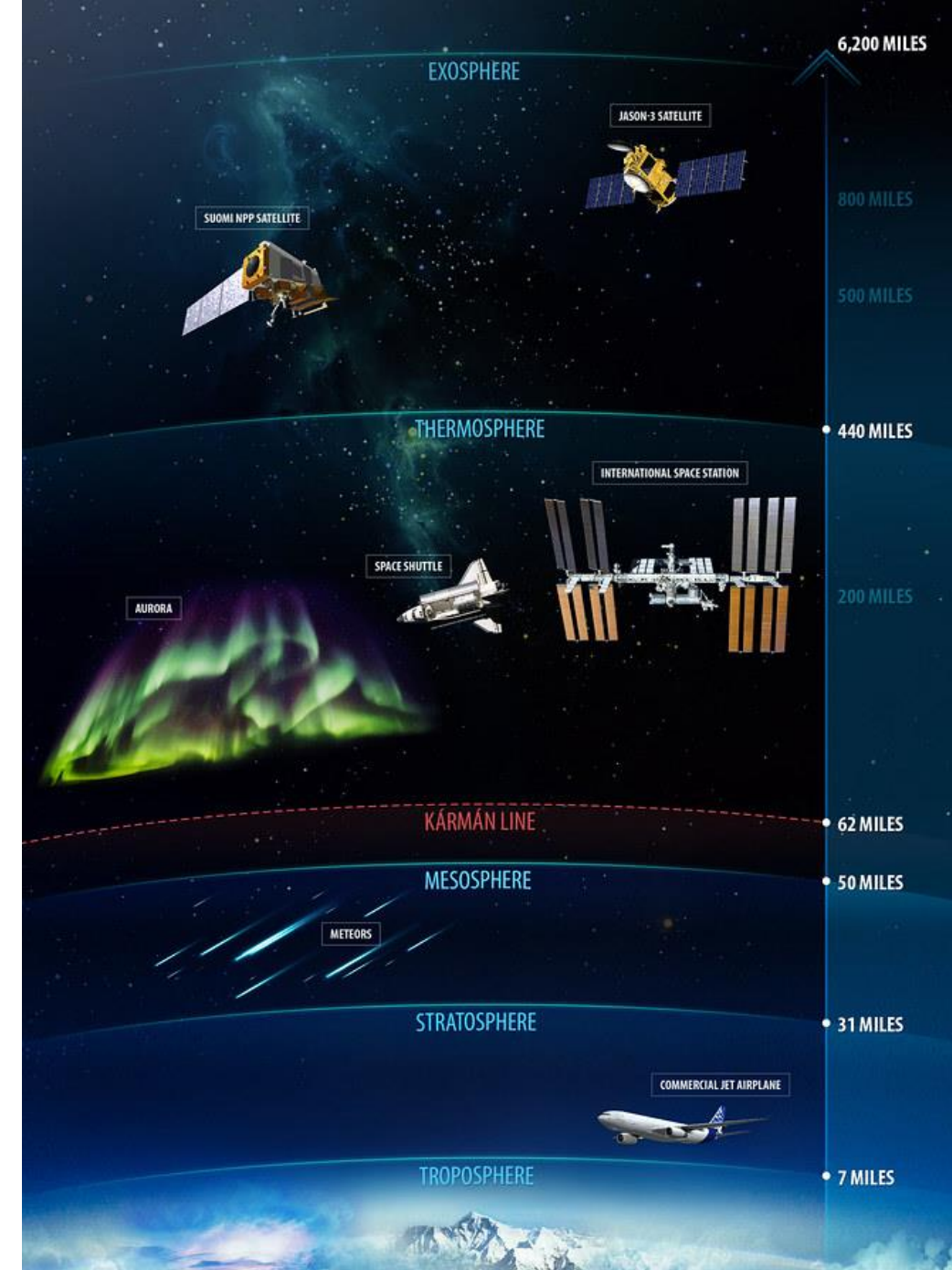
- Above mesosphere
- The temperature increase is caused due to the absorption of energetic ultraviolet and X-ray radiation from the sun
- Temperatures in the upper thermosphere can range from about 500° C to 2,000° C or higher. The aurora, the Northern Lights and Southern Lights, occur in the thermosphere.



Atmosphere

Exosphere

- Exosphere is the final frontier of the Earth's gaseous envelope.
- The air in the exosphere is constantly but gradually leaking out of the Earth's atmosphere into outer space.
- There is no clear cut upper boundary where the exosphere finally fades away into space.



Scope

- the subject has a **vast scope** and the expert of the subject can serve in numerous ways in different spheres of the society.
- Students may opt the subject and make a professional career in **Environmental Studies or Environmental Science**

Academics: as discussed above, the subject has been introduced in numerous schools, colleges and universities in India and abroad, at school, under-graduation and postgraduation levels. The student may pursue the subject.

- Worldwide, large number of dedicated departments, centers, universities and institutions have been established for the subject.
- An interested professional may join the teaching and academics and make the next generation aware about the environmental issues

Research & Development: research and post-doctoral works have been going on worldwide to understand the environmental mechanisms and to get cost-effective cutting-edge technologies to mitigate environmental issues and challenges.

Industries: in order to effectively implement the environmental guidelines and technologies and to mitigate the environmental degradation directly or indirectly caused by the industries, a large number of industries have been recruiting **environmental engineers/scientists/experts.**

Ministries and Agencies: ministry of environment and various environmental agencies & conventions of national and international repute frequently create vacancies for the environmental experts. Few of the examples of such agencies are **UNEP, IPCC, CITES, RAMSAR, USEPA etc.**

Non-governmental Organizations (NGOs) and Consultancy: a large number of national and international NGOs and consultancies are working as an extended hand to conserve the environment and its various components.

Most of the NGOs and consultancies are old and have an experienced workforce. Some of the examples are **Bombay Natural History Society, IUCN, Conservation International, World Wide Fund for Nature, Wildlife Trust of India, Centre for Environmental Education, Centre for Science and Environment, Kalpavriksha, Madras Crocodile Bank Trust** etc.

Green Journalism:

environmental awareness is indispensable for the environmental conservation and media (print, electronic and social media) is the strongest medium to propagate the awareness.

Environmental legislation and Green Advocacy:

Legal experts specialized in environmental law may act **significantly in environmental conservation.**

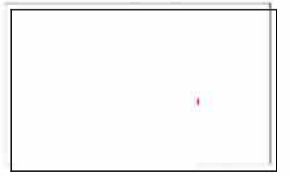
Importance

- **In the last five decades, Environmental Studies or Environmental Science has emerged as an important multidisciplinary subject** dealing with all the aspects of issues and challenges of the environment and it also suggests practical solutions to the environmental problems.
- The subject is still evolving as the environmental problems are also growing in intensity and magnitude at a fast pace.

- Environmental Studies has given tangible solutions to the environmental problems.
- Some of the prominent fields, which the subject addresses may be summarized as **Environmental Education and Ethics, Ecosystem and ecology, Natural Resources Management, Energy Efficiency and Audit, Renewable sources of energy, Global warming-climate change, Biodiversity Conservation, Pollution monitoring and mitigation, Population and Environment, Waste management** etc.
- Hence, it is necessary to make the newer generations aware about the basics and details of the subject.

Concept Of Sustainable Development

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.



Environmental Sustainability: it means that we should consume the environmental goods and services in a sustainable manner. Mahatma Gandhi, once rightly said “Earth provides enough to satisfy every man’s need but not everyone’s greed”. The present rate of over-exploitation of natural resources exceeds manifold the rate of replenishment of the same, which is causing environmental degradation at an exponential rate. Therefore, the natural resources should be utilized sustainably. Sustainable Development Goals 6 (Clean Water and Sanitation), 7 (Affordable and Clean Energy), 13 (Climate Action), 14 (Life below Water) and 15 (Life on Land) indicates environmental sustainability.



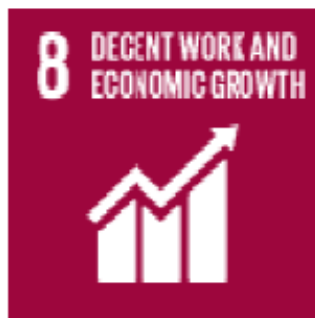
- **Social Sustainability:** it defines a society having fair and equal opportunities for its population with gender equality, good health and education facilities and people's participation in nation building. Sustainable Development Goals 3 (Good Health and Well-Being), 4 (Quality Education), 5 (Gender Equality), 7 (Affordable and Clean Energy), 16 (Peace, Justice and strong Institutions) and 17 (Partnerships for the Goals) indicates social sustainability.

Economic Sustainability: economic sustainability means the equitable distribution of the resources. No one should be deprived of the basic needs to sustain a healthy life.



SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD



Important landmarks in Environmentalism

- In the western world, first ever concern about the environmental degradation was raised after publication of the book **'Silent Spring' by Rachael Carson in 1962.**
- This book raised the issue of excessive use of chemical fertilizers and pesticides in the U.S.
- **In 1970, book 'Limit to Growth' by the Club of Rome** attracted the global attention.
- Ramsar Convention came into existence on **02nd February 1971** with the aim to conserve wetlands globally.
- Hence, **World Wetlands Day** is observed every year on 02nd February.

- In 1972, **United Nations Conference on Human Environment** was organized at Stockholm between 5th June – 16th June where India also presented its view on environmental degradation.
- In the remembrance of this conference, **World Environment Day** is celebrated every year on **05th June**.
- **India started Project Tiger in 1973** to save its national animal of India

In between, India and the world witnessed worst industrial disasters, **Bhopal Gas Tragedy (02nd and 03rd December, 1984)** and **Chernobyl Nuclear Disaster (26th April, 1986)**, which taught many lessons to globe.

Vienna Convention (1985) and **Montreal Protocol (16th September 1987)** were signed to **protect the Ozone layer** from getting depleted by the ozone depleting substances (ODS).

The concept of **Sustainable Development** was introduced to the world by **Brundtland Commission Report (Our Common Future)** in **1987**.

- The **Agenda 21** was adopted in the Earth Summit at **Rio de Janeiro in 1992**.
- **UN trio sister conventions (UNFCCC, UNCBD and UNCCD)** were also signed in 1992.
- **In 1997, Kyoto Protocol was signed** to curb down the emission of greenhouse gases responsible for the global warming.
- **The World Summit on Sustainable Development (Rio + 10) was conducted** in 2002 at Johannesburg.

