

Time: 3 hours

Total marks: 250

SECTION A

10 x 10 = 100

Answer all the questions. Answer not exceeding 150 words each

1. Write in detail about the impact of Environmental pollution on Human Health  
சுற்றுச்சூழல் மாசுபாடு மனிதனின் உடல்நலத்தில் ஏற்படுத்தும் விளைவுகள் பற்றி எழுதுக

- Home Environment and Health
- Slum environment and Health
- Hospital Health and Environment
- Radioactive waste
- Minnamata disease
- Itai Itai Disease
- Blue Babies syndrome
- Sitalcoisis
- Remedial Measures

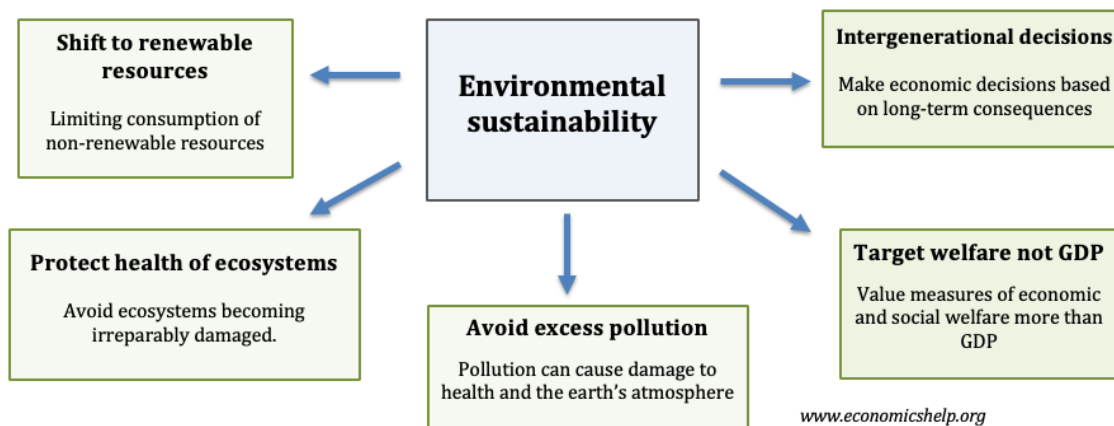
2. What is Environmental Sustainability and discuss the issues related with environmental sustainability?

சுற்றுச்சூழல் நிலைத்தன்மை என்றால் என்ன மற்றும் சுற்றுச்சூழல் நிலைத்தன்மை தொடர்பான பிரச்சனைகள் பற்றி விவாதி

## ENVIRONMENTAL SUSTAINABILITY

Perspectives and approaches towards achieving a sustainable environment.

- a. Poverty Eradication and Sustainable Livelihoods
- b. Changing Unsustainable Patterns of Consumption and Production
- c. Protecting and Managing the Natural Resource Base of Economic and social Development
- d. Sustainable Development in a Globalizing World
- e. Health and Sustainable Development



## Issues of environmental sustainability

Environmental sustainability is concerned with issues such as:

- Long-term health of ecosystems. Protecting the long-term productivity and health of resources to meet future economic and social needs, e.g. protecting food supplies, farmland and fishing stocks.
- Intergenerational decision making. When making economic decisions, we should focus on implications for future generations, and not just the present moment. For example, burning coal gives a short-term benefit of cheaper energy, but the extra pollution imposes costs on future generations.
- Renewable resources: Diversifying into energy sources that do not rely on non-renewable resources. For example, solar and wind power.
- Prevent the consequences of man-made global warming. Policies to ensure the environment of the planet does not deteriorate to a point where future generations face water shortages, extreme weather events, excess temperature. – All factors that could make living in parts of the world very difficult if not possible.
- Protection of species diversity and ecological structure. Sometimes medicines require elements within specific plant species. If some species go extinct, it limits future technological innovation.
- Treating environmental resources as if they have intrinsic rights and value. In other words, we shouldn't just rely on a monetary value, i.e. we should protect rainforests because they deserve to be protected rather than using a cost-benefit analysis of whether we gain financially from protecting rainforests.
- Targetting social welfare/happiness and environmental sustainability above crude measures of progress such as GDP. Measures of economic welfare

### 3. Explain

#### i. Basel convention (4 marks)

#### Basel Convention

The Basel Convention was particularly for the control of trans-boundary Movements of Hazardous Wastes and their Disposal, adopted on 22 March 1989 in Basel which entered into power in 1992. The objective of the Basel Convention is to defend human health and the environment against the unfavourable effects of dangerous wastes.

## **Basel Convention on Trans-boundary Movement of Hazardous Wastes, 1989**

The Basel Convention which came into force in 1992, was a response to NIMBY (Not in My Back Yard) syndrome, that grappled the industrialized world in the 1980s with regard to the heightening concerns about the hazardous wastes and the public resistance to it resulting in an upsurge of disposal costs. It created a market for hazardous wastes particularly in the environmentally-less-conscious Least Developed Countries (LDCs) which offered cheap disposal alternatives. The Convention sought to reduce the trans-boundary movement of hazardous wastes by taking necessary steps to minimize the creation of such wastes along with measures to prohibit the shipment of such substances from the developed world to the LDCs.

### **The convention has the following objectives:**

1. To reduce transboundary movements of hazardous wastes to a minimum level consistent with their environment sound management.
2. To dispose of hazardous wastes as close as possible to their source of generation.
3. To minimize the generation of hazardous wastes in terms of zardousness and harmfulness quantity.
4. Ban on the exports and imports of hazardous goods.

### **ii. Rotterdam convention (3 marks)**

#### **Rotterdam Convention**

The provision of Rotterdam Convention entered into force on 24 February 2004, with the following objective - Human health and environment is a matter of concern and if any individual or organization tries to affect it, can be arrested only by the shared responsibility of concern parties, and govt. The Convention make legally binding obligations for the discharge of the prior informed Consent (PIC) procedure.

**Major Provisions:** The Convention encourages the exchange of information on a very broad variety of chemicals. It does so through:

- The necessity for a Party to inform other Parties of each nation about ban or restriction of a chemical.
- The necessity for a Party that plans to export a chemical that is prohibited or severely restricted for utilization within its territory, to inform the importing Party that such sell abroad will take place, before the first shipment and annually thereafter.
- The necessity for an exporting Party, when exporting chemicals that are to be used for work - related purposes, to make sure that an up-to-date security data sheet is sent to the importer.
- Labeling requirements for exports of chemicals incorporated in the PIC procedure, as well as for additional chemicals that are barred or severely restricted in the exporting country.

iii. Stockholm convention (3 marks)

**Stockholm Convention on Persistent Organic Pollutants (2001):**

Signed: 22 May 2001

Signatories: 152

Effective: 17 May 2004

Condition: Ninety days after the ratification by at least 50 signatory states

Depositary: Secretary-General of the United Nations

விளக்குக:

i. பசல் மாநாடு

ii. ரோட்டர்டாம் மாநாடு

iii. ஸ்டாக்ஹோம் மாநாடு

4. Divide India into Earthquake zones with Diagram.

இந்தியாவை நிலநடுக்க மண்டலங்களாக வரைப்படத்துடன் பிரிக்கவும்.

**Seismic Zones of India**

India is divided into four seismic zones, namely II, III, IV, and V; Zone V is the high risk zone. The Himalayas and the surrounding regions are situated in the Zone V and zone IV. In the same risk zone, lies the Rann of Kutch. A large part of the Deccan Plateau is made up of highly resistant rocks. Consequently, low seismic activity is found in this part of India. They are classified under Zone III (low risk Zone).

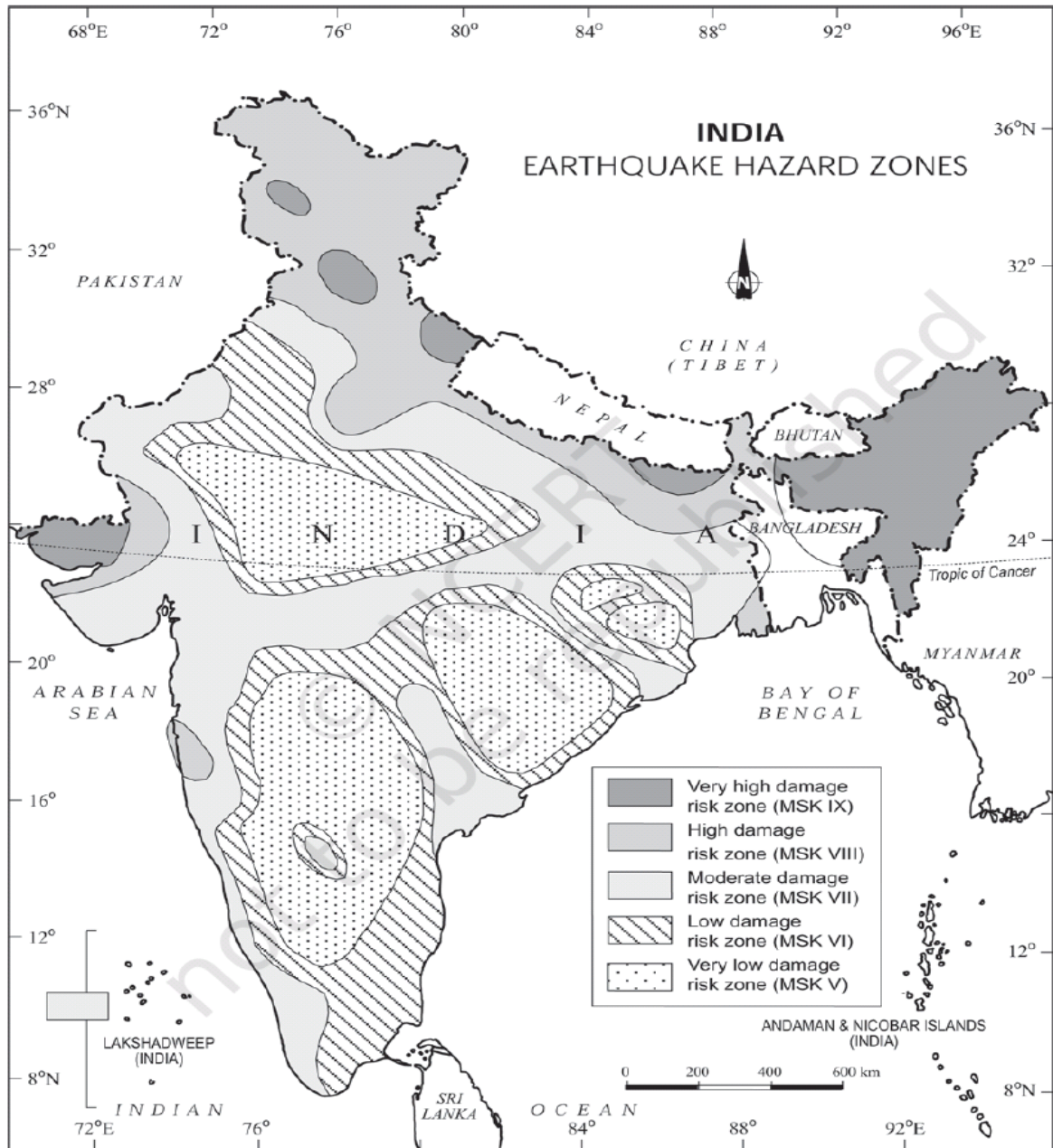


Figure 7.2 : India: Earthquake Hazard Zones

## 5. Examine the National Disaster Management policy.

தேசிய பேரிடர் மேலாண்மை கொள்கையை விவரித்து எழுதுக.

### National Policy on Disaster Management - 2009

#### Approach and Objectives

#### Vision

To build a safe and disaster resilient India by developing a holistic, proactive, multi-disaster oriented and technology driven strategy through a culture of prevention, mitigation, preparedness and response.

## Disaster Management

A disaster refers to a catastrophe, mishap, calamity or grave occurrence from natural or man-made causes, which is beyond the coping capacity of the affected community. DM involves a continuous and integrated process of planning, organising, coordinating and implementing measures which are necessary or expedient for:

- Prevention of danger or threat of any disaster.
- Mitigation or reduction of risk of any disaster or its severity or consequences.
- Capacity building including research and knowledge management.
- Preparedness to deal with any disaster.
- Prompt response to any threatening disaster situation or disaster.
- Assessing the severity or magnitude of effects of any disaster.
- Evacuation, rescue and relief.
- Rehabilitation and reconstruction.

A typical DM continuum comprises six elements; the pre-disaster phase includes prevention, mitigation and preparedness, while the post-disaster phase includes response, rehabilitation, reconstruction and recovery

A legal and institutional framework binds all these elements together (Diagram).

### DISASTER MANAGEMENT CONTINUUM



## Approach

A **holistic** and **integrated** approach will be evolved toward disaster management with emphasis on building strategic partnerships at various levels. The themes underpinning the policy are:

- Community based DM, including last mile integration of the policy, plans and execution.
- Capacity development in all spheres.
- Consolidation of past initiatives and best practices.
- Cooperation with agencies at national and international levels.
- Multi-sectoral synergy.

## Objectives

The objectives of the national policy on disaster management are:

- Promoting a culture of prevention, preparedness and resilience at all levels through knowledge, innovation and education.
- Encouraging mitigation measures based on technology, traditional wisdom and environmental sustainability.
- Mainstreaming disaster management into the developmental planning process.
- Establishing institutional and techno-legal frameworks to create an enabling regulatory environment and a compliance regime.
- Ensuring efficient mechanism for identification, assessment and monitoring of disaster risks.
- Developing contemporary forecasting and early warning systems backed by responsive and failsafe communication with information technology support.
- Promoting a productive partnership with the media to create awareness and contributing towards capacity development.
- Ensuring efficient response and relief with a caring approach towards the needs of the vulnerable sections of the society.
- Undertaking reconstruction as an opportunity to build disaster resilient structures and habitat for ensuring safer living.
- Promoting productive and proactive partnership with media in disaster management.

### 6. Critically analyze the Paris climate Agreement.

பாரிஸ் காலநிலை ஒப்பந்தம் பற்றி ஆய்வு செய்க.

#### Paris Agreement (2015)

- The Paris Agreement shows a fundamental shift away from the definite binary approach of the Kyoto Protocol towards more nuanced forms of separation, reflected differently in different requirements.
- Main focus is to toughen the global response to the peril of climate change by keeping the average global temperature rise in this century well below 2°C as per pre-industrial levels and to follow efforts to bound the temperature increase even further to 1.5°C.
- The latest treaty ends the strict demarcation between urbanized and developing countries, replacing it with an ordinary framework that commits all countries to place forward their best efforts.
- It established obligatory commitments by all countries to make countrywide determined contributions (NDCs), and to chase domestic measures aimed at attaining them.
- Commit all countries to put forward new NDCs every five years, with the lucid expectation that they will “represent a progression” ahead of earlier ones.
- For the first time encouraging voluntary contributions by developing countries too.
- Extend the existing goal of mobilizing \$ 100 billion a year in support by 2020 through 2025, with a new, higher aim to be set for the period after 2025.
- Extend a device to address failure and harm resulting from climate change, which explicitly will not involve or provide a basis for any liability or reimbursement.

- Necessitate parties engaging in worldwide emissions trading to avoid double counting.
- Call for a new mechanism, similar to the clean development mechanism under the Kyoto protocol, enabling emission reductions in one country to be counted toward another country's NDC.
- Paris deal will come into effect from 2020. This means making sure each nation pledges its own Nationally determined contribution (NDCs) for post -2020 action.

#### 7. Bring out the significance of The Water (Prevention and Control of Pollution) Act, 1974

தண்ணீர் (மாசிலை தடுத்தல் மற்றும் கட்டுப்படுத்தல்) சட்டம், 1974-இன் முக்கியத்துவத்தை வெளிக்கொணர்

#### WATER (PREVENTION AND CONTROL OF POLLUTION) ACT, 1974

It provides for maintaining and restoring the wholesomeness of water by preventing and controlling its pollution. Pollution is defined as such contamination of water, or such alteration of the physical, chemical or biological properties of water, or such discharge as is likely to cause a nuisance or render the water harmful or injurious to public health and safety or harmful for any other use or to aquatic plants and other organisms or animal life.

The definition of water pollution has thus encompassed the entire probable agents in water that may cause any harm or have a potential to harm any kind of life in any way.

The salient features and provisions of the Act are summed up as follows:

- i) It provides for maintenance and restoration of quality of all types of surface and ground water.
- ii) It provides for the establishment of central and state boards for pollution control.
- iii) It confers them with powers and functions to control pollution.
- iv) The Central and State Pollution Control Boards are widely represented and are given comprehensive powers to advise, coordinate and provide technical assistance for prevention and control of pollution of water.
- v) The Act has provisions for funds, budgets, accounts and audit of the Central and State Pollution Control Boards.
- vi) The Act makes provisions for various penalties for the defaulters and procedure for the same.

The main regulatory bodies are the Pollution Control Boards, which have been conferred the following duties and powers:

#### Central Pollution Control Board (CPCB):

- It advises the central govt, in matters related to prevention and control of water pollution.
- Coordinates the activities of State Pollution Control Boards and provides them technical assistance and guidance.
- Organizes training programs for prevention and control of pollution.



- Organizes comprehensive programs on pollution related issues through mass media.
- Collects, compiles and publishes technical and statistical data related to pollution.
- Prepares manuals for treatment and disposal of sewage and trade effluents.
- Lays down standards for water quality parameters.
- Plans nation-wide programs for prevention, control or abatement of pollution.
- Establishes and recognizes laboratories for analysis of water, sewage or trade effluent sample.

## 8. Highlight the importance of Environmental Protection Act, 1986

சுற்றுச்சூழல் பாதுகாப்பு சட்டம், 1986-இன் முக்கியத்துவத்தை எழுதுக

### THE ENVIRONMENT (PROTECTION) ACT, 1986

The Act came into force on Nov. 19, 1986, the birth anniversary of our late Prime Minister Indira Gandhi, who was a pioneer of environmental protection issues in our country. The Act extends to whole of India. Some terms related to environment have been described as follows in the Act:

- Environment** includes water, air and land and the interrelationships that exists among and between them and human beings, all other living organisms and properly.
- Environmental pollution** means the presence of any solid, liquid or gaseous substance present in such concentration, as may be, or tend to be, injurious to environment.
- Hazardous substance** means any substance or preparation which by its Physico-chemical properties or handling is liable to cause harm to human beings, other living organisms, property or environment.

The Act has given powers to the central government to take measures to protect and improve environment while the state governments coordinate the actions. The most important functions of central govt, under this Act include setting up of:

- The standards of quality of air, water or soil for various areas and purposes.
- The maximum permissible limits of concentration of various environmental pollutants (including noise) for different areas.
- The procedures and safeguards for the handling of hazardous substances.
- The prohibition and restrictions on the handling of hazardous substances in different areas.
- The prohibition and restriction on the location of industries and to carry on process and operations in different areas.
- The procedures and safeguards for the prevention of accidents which may cause environmental pollution and providing for remedial measures for such accidents.

Many rules have been notified under this act. Some of these are

1. Hazardous waste (management handling rules, 1989).
2. Manufacture, storage and import of hazardous chemical rules, 1989.
3. Chemical accidents (emergency planning preparedness and response rules, 1996).
4. Biomedical waste (management and handling rules, 1998).

## Powers of the Central Government

- a. **Power of Entry and Inspection** According to section 10, Central Government officers have power to inspect any place.
- b. **Power to Take Samples** They have power to take samples of air, water, soil or substances from industry by
  - Giving notice.
  - Collecting the sample in presence of owner and officer. « Placing the sample in a sealed container signed by both owner and officer.
  - Sample should be immediately send to the laboratory for analysis.
- c. Power to establish laboratory under section 12. It has power to appoint government analysis for the analysis of water, soil and other substances.
- d. Penalties for violating the provision of this Act. According to section 15.5 failing to comply with this act is a punishable offense.

## Demerits of this Act

- a. Control measures to guard against hazardous substances are weak.
- b. There is no leading agency, which can study, plan and implement the long term requirements of environmental safety and to take adequate steps during emergency situation.
- c. There are inadequate linkages in handling industrial matters and environmental safety

Under the **Environmental (Protection) Rules, 1986** the State Pollution Control Boards have to follow the guidelines provided under Schedule VI, some of which are as follows:

- a) They have to advise the industries for treating the waste water and gases with the best available technology to achieve the prescribed standards.
- b) The industries have to be encouraged for recycling and reusing the wastes.
- c) They have to encourage the industries for recovery of biogas, energy and reusable materials.
- d) While permitting the discharge of effluents and emissions into the environment, the state boards have to take into account the assimilative capacity of the receiving water body.
- e) The central and state boards have to emphasize on the implementation of clean technologies by the industries in order to increase fuel efficiency and reduce the generation of environmental pollutants.

Under the Environment (Protection) Rules, 1986 an amendment was made in 1994 for Environmental Impact Assessment (EIA) of various development projects. There are 29 types of projects listed under Schedule I of the rule which require clearance from the central government before establishing.

Others require clearance from the State Pollution Control Board, when the proposed project or expansion activity is going to cause pollution load exceeding the existing levels. The project proponent has to provide EIA report, risk analysis report, NOC from State Pollution Control Board, commitment regarding availability of water and electricity, summary of project report/feasibility report, filled in a questionnaire for environmental

appraisal of the project and comprehensive rehabilitation plan, if more than 1000 people are likely to be displaced due to the project.

Under the Environment (Protection) Act, 1986 the central government also made the Hazardous Wastes (Management and Handling) Rules, 1989. Under these rules, it is the responsibility of the occupier to take all practical steps to ensure that such wastes are properly handled and disposed off without any adverse effects. There are 18 hazardous waste categories recognized under this rule and there are guidelines for their proper handling, storage, treatment, transport and disposal which should be strictly followed by the owner.

The Environment (Protection) Act, 1986 has also made provision for environmental audit as a means of checking whether or not a company is complying with the environmental laws and regulations. Thus, ample provisions have been made in our country through law for improving the quality of our environment.

### 9. Highlight the Missions under NAPCC.

NAPCC யிலுள்ள திட்டங்களின் சிறப்பம்சங்களை எழுதுக.

The Government of India launched National Action Plan on Climate Change (NAPCC) on 30th June, 2008 outlining eight National Missions on climate change. These include:

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 Eco-system
6. National Mission for a Green India
7. National Mission for Sustainable Agriculture
8. National Mission on Strategic Knowledge for Climate Change

### 10. Write a short note on the following

பின்வருவனவற்றிற்கு சிறுகுறிப்பு வரைக

#### a. Nammazhvar

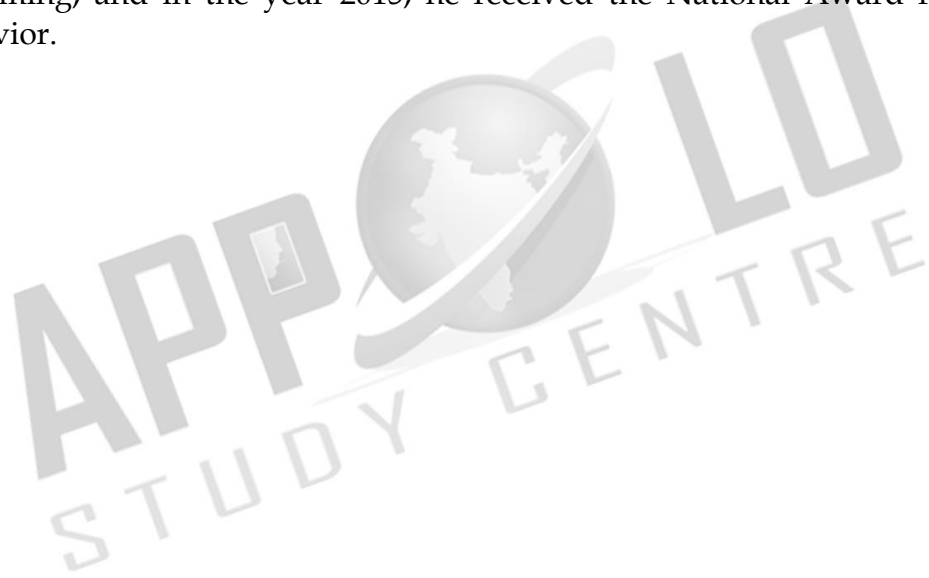
நம்மாழ்வார்

G. Nammalvar was a supporter and expert of organic farming. He was an agricultural scientist, environmental activist celebrated for his work on spreading Ecological farming & Organic farming. He was against the use of chemical fertilisers and pesticides. He trained hundreds of farmers in natural farming. Nammalvar was the author of several Tamil and English books on natural farming, pesticides & fertilisers and was featured in magazines & television programs. He founded the Nammalvar Ecological Foundation for Farm Research and Global Food Security Trust or simply Vaanagam at Karur, Tamilnadu. He developed social forest at Ammankurai and the Kolunji Ecological Farm in Pudukottai. He and his friends made a 10-acre barren land into fertile cultivable land in the dry Pudukottai district. He planted 52 varieties of trees in the same waste land extending in 20 acres. His organization 'Kudumbam' preserves and regenerates hundreds of native flora and fauna, in order to ensure a sustainable livelihood.

**b. Nel Jayaraman**  
நெல் ஜெயராமன்

Nel Jayaraman: Mr. Jayaraman, hails from Adirangam village in Tiruvarur district. He was a disciple of Dr.Nammalvar and state co-ordinator of 'Save our rice campaign, Tamil Nadu. He strived hard for conservation of traditional rice varieties. He had trained a team of farmers and regularly update them on the current issues that affect them.

In 2005, he organized a first ever traditional paddy seed festival in his farm as an individual. The seed festival in May 2016 at Adhirangam was 10th in a row and in which 156 different traditional varieties were distributed to more than 7000 farmers across Tamil Nadu. He was invited by the Philippines Government to give a talk at the International Rice Research Institute (IRRI) on his work and mission. In 2011, he received the State Award for best organic farmer for his contribution to organic farming, and in the year 2015, he received the National Award for best Genome Savior.



Answer all the questions. Answer not exceeding 250 words each

11. Why is damage to the ozone layer a cause for concern? What steps are being taken to limit this damage.

ஓசோன் அடுக்கு சேதம் ஏற்படுவது ஏன் கவலைக்குரியது? இச்சேதத்தை குறைப்பதற்கு என்ன நடவடிக்கைகள் எடுக்க வேண்டும்?

### Ozone layer depletion

Ozone is a form of oxygen (O<sub>3</sub>). In the stratosphere (ozonosphere), ozone blocks out the sun's ultraviolet rays and is a lifesaver.

### DEPLETION OF OZONE LAYER

Ozone gas (O<sub>3</sub>) a minor component of the atmosphere acts as a screen for biologically hazardous ultraviolet 'B' radiation. The column of ozone concentration in the atmosphere reaching the stratosphere is roughly equivalent to a layer of 3 mm thick when compressed at the atmospheric pressure. This thickness varies daily from 2.9 to 3.4 mm when spread out, the maximum vertical concentration of O<sub>3</sub> lies between 20-30 km above and reaches upto 40 km in the upper layer of the stratosphere. Buissom and Febry (1930-31) and Ladenburg (1931) first proved the existence of ozone in the upper layer of atmosphere.

### Effect of Ozone depletions:

If the ozone is depleted more ultraviolet radiations (especially ultraviolet B (UVB) will reach the earth's surface.

**Effect on plants** - Will affect crop yield and forest productivity.

**Effect on animals** - Will cause damage to fish larvae and other small animals

**Effect on human health** - Results in non-melanoma skin cancer and melanoma, acute erythema (sun burn), ocular abnormalities, cataract, affect immune responses.

- ❖ Increases the incidence of cataract, throat and lung irritation and aggravation of asthma or emphysema, skin cancer and diminishing the functioning of immune system in human beings.
- ❖ Juvenile mortality of animals.
- ❖ Increased incidence of mutations.
- ❖ In plants, photosynthetic chemicals will be affected and therefore photosynthesis will be inhibited. Decreased photosynthesis will result in increased atmospheric CO<sub>2</sub> resulting in global warming and also shortage of food leading to food crisis.
- ❖ Increase in temperature changes the climate and rainfall pattern which may result in flood / drought, sea water rise, imbalance in ecosystems affecting flora and fauna.

### Photobiological effects due to O<sub>3</sub> depletion resulting in increased UV-B incidence

In the last 20 years, CFC and related gases have destroyed about 3% of the global ozone concentration. Studies by the US Environmental Protection Agency suggest that a 1% decrease in stratospheric ozone will increase the two types of localised skin cancer, basal cell and squamous cell, by 4% and 6% respectively. A 5% decrease will lead to increase in cancer

by 22% and 33%. This would mean 70,000 new cases of non-melanoma skin cancer a year for 1% ozone depletion, and 360,000 with a 5% depletion. Melanoma are likely to increase by 1 to 2% for every 1% of ozone depletion and the effect could be even greater.

UV-B radiation also causes cataract, one of the main forms of blindness. A 1% ozone depletion may increase the number of cases by between 24,000 and 57,000 a year. Scientists now suspect that UV-B may pose an even greater threat to health by interfering with the ability of the body's immune system to fight off infections that enter by the skin.

Rising levels of UV-B penetration pose a significant threat to phytoplankton of the oceans. The larvae of many fishes, including crabs shrimps, etc., which live near the sea surface, are also threatened. The results could be a serious reduction in commercial fish harvests.

Tests on 200 terrestrial plant species showed that almost 2/3 reacted adversely to increased UV-B exposure. Most sensitive plants are peas, beans squash, melons and cabbage.

## **OZONE LAYER PROTECTION**

### **Vienna Convention, Montreal Protocol & Kigali Agreement**

Vienna Convention (1985) held on the protection of the Ozone Layer & Montreal Protocol (1987) on substances that deplete the Ozone Layer.

Ozone is a protective shield of the atmosphere. It protects the earth from the harmful radiation of the sun. The 1985 Vienna Convention was followed by 1987 Montreal Protocol, which focuses on reducing the manufacture and using up of ozone depleting substances, such as CFCs (Chlorofluorocarbons).

### **Vienna Convention for the Protection of Ozone Layer, 1985**

The Vienna Convention for the Protection of the Ozone Layer is a multilateral environmental agreement, which kick-started global cooperation for the protection of Earth's ozone layer. It was adopted on 22 March 1985. Subsequently, the Montreal Protocol on Substances that Deplete the Ozone Layer was adopted on 16 September 1987 which came into effect in 1989. This international treaty looks into eliminating the use of ozone-depleting substances (ODS). The Ozone Secretariat located at Nairobi, Kenya is the Secretariat for both the Vienna Convention and Montreal Protocol.

### **Montreal Protocol:**

- The Montreal Protocol, which came into force in 1989, is one of the most effective international environmental treaties to gradually phase out the emission of Ozone Depleting Substances (ODSs) into the atmosphere.
- 197 member parties have signed it and thus it became a first such international treaty with complete ratification.
- Several amendments was carried out and Kigali amendment was the 8<sup>th</sup> amendment.
- Successful cut down of 8% of chlorofluorocarbons production and other ODSs have greatly contributed to the repair of the ozone hole.

## Kigali Agreement

- A historic agreement was signed by 97 nations with a vision of amending the Montreal protocol in 28<sup>th</sup> meeting of Montreal Protocol, held in Kigali, a capital city of an African country, 15<sup>th</sup> October 2016.
- The countries signed the agreement are expected to cut down the manufacture and use of Hydro fluorocarbons (HFC), a greenhouse gas, by approximately 80-85% from their respective baselines, till 2045.
- This step is expected to halt the average rise in global temperature up to 0.5<sup>o</sup> C by 2100.
- Kigali agreement is thus, basically an amendment of Montreal Protocol.

## 12. Define Global Warming. What are the causes and effects of Global Warming? Also discuss the control measures.

உலக வெப்பமயமாதல் வரையறு. உலக வெப்பமயமாதலின் காரணங்கள் மற்றும் விளைவுகளை எழுதுக. மேலும் கட்டுப்பாட்டு நடவடிக்கைகள் பற்றியும் விவாதிக்க

### Global warming: Greenhouse effect

Global warming refers to an average increase in the earth's temperature, which in turn causes changes in climate. During the past 4.65 billion years of its history, earth has warmed many times. But at present it is facing a rapid warming mainly due to human activities. The average temperature of earth is about 590F (150C). During the last century this average has risen by about 10F. By the year 2100, it is believed that the rise would be between 2.5 and 10.40F. This will cause dramatic changes such as rise in sea level, changes in rainfall patterns, wide range of impacts on plants, wildlife and humans.

In the environment, greenhouse gases occur (i) naturally or (ii) from human activities.

#### i. Carbon di Oxide:

The most abundant greenhouse gas is carbon dioxide. It reaches the atmosphere due to volcanic eruptions, respiration of animals, burning and decay of organic matter such as plants.

Human activities have caused carbon-dioxide to be released to the atmosphere at rates much faster than that at which earth's natural processes can recycle this gas. There were about 281 molecules of carbon-dioxide per million molecules of air (i.e., parts per million or ppm) in 1750. Today atmospheric carbon-dioxide concentrations are 368 ppm, a 31% increase.

#### ii. Methane:

Methane traps 20 times more heat than carbon-dioxide. It is emitted during the production and transport of coal, natural gas and oil. It is also emitted from rotting organic waste in sand fills, by the cows as a by-product of digestion. Since 1750, the amount of methane in the atmosphere has more than doubled.

#### iii. Nitrous Oxide:

Nitrous Oxide traps 300 times more heat than carbon-dioxide. burning fossil fuels and ploughing farm soils releases nitrous oxide. Since 1750 its level increased by 17%.

#### **iv. Hydrocarbons**

Hydrocarbons formed from the manufacture of foams, coolants such as chlorofluoro carbons used in refrigerators are the other gases responsible for global warming.

#### **v. Trifluoromethyl sulphur penta fluoride:**

In 2000, scientists discovered an alarming increase in the level of a new gas called trifluoromethyl sulphur penta fluoride. Even though the gas is rare, it traps more effectively than all other greenhouse gases. The saddest part of it is that the industrial source of the gas is not yet identified.

#### **Effects of Global warming:-**

1. Due to the warming of oceans, sea level will rise. Glacier ice will also melt, causing further rise in sea level. As a result in the 21st century sea level will rise from 9 to 88 cm. Such a rise will submerge many parts of countries.
2. Seasons will be longer in some areas.
3. The warmed world will be generally more humid and greater humidity will increase the rainfall.
4. Storms are expected to be more frequent and intense.
5. Some regions of the world would become dry.
6. Wind blows will be harder and in different patterns. Hurricane would be more severe.
7. Weather patterns would be less predictable and more extreme.
8. Crops and forests may be affected by more insects and plant diseases.
9. Animals and plants will find it difficult to adjust to the changed environment. Animals will tend to migrate toward the poles and toward higher elevations.
10. Some types of forests may disappear.
11. More people will get sick or die from heat stress.
12. Tropical diseases such as malaria, dengue fever, yellow fever and encephalitis will spread to other parts of the world.

#### **Efforts to control Global warming:-**

Two major ways are there to control global warming: 1. to keep the carbon-dioxide out of the atmosphere by storing the gas or its carbon component somewhere else, a strategy called carbon sequestration. 2. to reduce the production of greenhouse gases.

#### **Carbon sequestration:-**

The simple technique is to preserve trees and plants more. Trees, take up carbon-dioxide, break it down in photosynthesis, and store carbon in new wood. It needs massive reforestation. Carbon-dioxide can also be sequestered directly into deep ocean water or into oil wells or some aquifer form which it cannot escape. Usage of alternate fuels such as nuclear energy, solar power, wind power and hydrogen fuel cells which emit no greenhouse gases are being considered.



1. Minimum use of fossil fuels may reduce the release of carbon dioxide in the atmosphere.
2. Alternative, non-conventional energy-solar energy, tidal energy, geothermal energy may be used as substitutes for fossil fuel.
3. Production and utilization of CFCs may be shortened as far as feasible.
4. Forests should have to be conserved.
5. Afforestation is necessary so that plants can absorb the extra carbon dioxide to maintain balance in environment.
6. Efficiency of engine of vehicles should be increased to minimise use of fossil fuel.
7. Greenhouse effect consciousness among people should be a programme for study in school, college and other institutions
8. Research on greenhouse effect of air should continue and be a continuing process.
9. Agenda-21 for sustainable development should be obeyed by all countries.

### **Kyoto Protocol, 1997**

The Kyoto Protocol, adopted on 11th December 1997, is an international environmental treaty that enhances the scope of the UNFCCC (1992) that imposed legal commitment on the ratified State Parties to reduce greenhouse gas (GHG) emissions. It came into force on 16th February 2005. Considering the historical responsibility of the developed world for the high levels of GHG footprint, the treaty places a stringent mandate on them under the principle of "common but differentiated responsibilities". The COP 7 held at Marrakesh in Morocco in 2007 adopted the detailed framework for the protocol. It is usually referred to as the "Marrakesh Records". After the first commitment which began in 2008, the protocol was amended on 8 December 2012 at Doha, Qatar.

- 13. Enlist the Sustainable Development Goals (SDG). Explain the progress of SDG in India.**  
 நிலையான நீடித்த வளர்ச்சி இலக்குகளை பட்டியலிடுக. இந்தியாவில் நிலையான நீடித்த வளர்ச்சி இலக்குகள் தொடர்பான செயல்பாடுகள் பற்றி விளக்குக

### **Sustainable Development Goals (SDGs)**

In 1992, the UN Conference on Environment and Development published the Earth Charter, which outlined the building of a just, sustainable, and peaceful global society in the 21st century. The action plan was known as 'Agenda 21' for sustainable development.

In September 2015, the United Nations General Assembly formally adopted the "Universal, integrated and transformative" 2030 Agenda for Sustainable Development, a set of 17 Sustainable Development Goals (SDGs). The goals are to be implemented and achieved in every country from the year 2016 to 2030.

Countries adopted a set of goals to end poverty, protect the planet and ensure prosperity for all as part of a new sustainable development agenda. Each goal has specific targets to be achieved over the next 15 years.

For the goals to be reached, everyone needs to do their part: governments, the private sector, civil society and people.

## **Goal 1: End poverty in all its forms everywhere**

One in five people in developing countries still live on less than \$1.90 a day, many people risk slipping back into poverty. Economic growth must be inclusive to provide sustainable jobs and promote equality.

## **Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture**

Agriculture, forestry and fisheries can provide nutritious food for all and generate decent incomes, while supporting people-centered rural development and protecting the environment. A profound change of the global food and agriculture system is needed if we are to nourish today's 815 million hungry and the additional 2 billion people expected by 2050.

## **Goal 3: Ensure healthy lives and promote well-being for all at all ages**

Significant strides have been made in increasing life expectancy and reducing some of the common killers associated with child and maternal mortality. Major progress has been made on increasing access to clean water and sanitation, reducing malaria, tuberculosis, polio and the spread of HIV/AIDS.

## **Goal 4: Ensure inclusive and quality education for all and promote lifelong learning**

Major progress has been made towards increasing access to education at all levels and increasing enrolment rates in schools particularly for women and girls. For example, the world has achieved equality in primary education between girls and boys, but few countries have achieved that target at all levels of education.

## **Goal 5: Achieve gender equality and empower all women and girls**

Gender equality is not only a fundamental human right, but a necessary foundation for a peaceful, prosperous and sustainable world.

## **Goal 6: Ensure access to water and sanitation for all**

Clean, accessible water for all is an essential part of the world we want to live in. There is sufficient fresh water on the planet to achieve this. But due to bad economics or poor infrastructure, every year millions of people, most of them children, die from diseases associated with inadequate water supply, sanitation and hygiene. By 2050, at least one in four people is likely to live in a country affected by chronic or recurring shortages of fresh water.

## **Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all**

Energy is central to nearly every major challenge and opportunity the world faces today. Sustainable energy is opportunity – it transforms lives, economies and the planet.

## **Goal 8: Promote inclusive and sustainable economic growth, employment and decent work for all**

Sustainable economic growth will require societies to create the conditions that allow people to have quality jobs that stimulate the economy while not harming the environment. Job opportunities and decent working conditions are also required for the whole working age population.

## **Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation**

Inclusive and sustainable industrial development is the primary source of income generation, allows for rapid and sustained increases in living standards for all people, and provides the technological solutions to environmentally sound industrialization.

## **Goal 10: Reduce inequality within and among countries**

To reduce inequality, policies should be universal in principle paying attention to the needs of disadvantaged and marginalized populations.

## **Goal 11: Make cities inclusive, safe, resilient and sustainable**

Cities are hubs for ideas, commerce, culture, science, productivity, social development and much more. At their best, cities have enabled people to advance socially and economically. Common urban challenges include congestion, lack of funds to provide basic services, a shortage of adequate housing and declining infrastructure.

## **Goal 12: Ensure sustainable consumption and production patterns**

Sustainable consumption and production is about promoting resource and energy efficiency, sustainable infrastructure, and providing access to basic services, green and decent jobs and a better quality of life for all. Its implementation helps to achieve overall development plans, reduce future economic, environmental and social costs, strengthen economic competitiveness and reduce poverty.

## **Goal 13: Take urgent action to combat climate change and its impacts**

Climate change is now affecting every country on every continent. It is disrupting national economies and affecting lives, costing people, communities and countries dearly today and may be even more tomorrow.

## **Goal 14: Conserve and sustainably use the oceans, seas and marine resources**

The world's oceans - their temperature, currents and life - drive global systems that make the earth habitable for humankind. Careful management of this essential global resource is a key feature of a sustainable future.

## **Goal 15: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss**

Forests cover 30 per cent of the Earth's surface and in addition to providing food security and shelter, forests are key to combating climate change, protecting biodiversity

and the homes of the indigenous population. Thirteen million hectares of forests are being lost every year while the persistent degradation of dry lands has led to the desertification of 3.6 billion hectares.

### **Goal 16: Promote just, peaceful and inclusive societies**

This Goal is dedicated to the promotion of peaceful and inclusive societies for sustainable development, the provision of access to justice for all, and building effective, accountable institutions at all levels.

### **Goal 17: Revitalize the global partnership for sustainable development**

A successful sustainable development agenda requires partnerships between governments, the private sector and civil society. These inclusive partnerships built upon principles and values, a shared vision, and shared goals that place people and the planet at the center, are needed at the global, regional, national and local level.

### **India & sustainable Development Goals**

The Government of India is strongly committed to the 2030 Agenda, including the SDGs

#### **National Action on the SDGs in India:**

- NITI Aayog, the government of India's premier think tank, has been entrusted with the task of coordinating the SDGs.
- The NITI Aayog on December 2018, released its comprehensive national policy for India. The strategy titled "strategy for new India @ 75 lays down a multipronged strategy to promote India's over all development. It is an attempt to bring innovation technology enterprise and efficient management together at the core of policy formulation and implementation.
- NITI Aayog has undertaken a mapping of schemes as they relate to the SDGs and their targets, and has identified lead and supporting ministries for each target.
- They have adopted a government - wide approach to sustainable development, emphasising the interconnected nature of the SDGs across economic, social and environmental pillars.
- States have been advised to undertake a similar mapping of their schemes, including centrally sponsored schemes.
- In addition, the Ministry of Statistics and programme Implementation (MoSPI) has been leading discussions for developing national indicators for the SDGs.
- State government are key to India's progress on the SDG Agenda and several of them have already initiated action on implementing the SDGs.

#### **14. Explain the environmental consequences of climate change and Mitigation measures.**

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#### **Impacts off climatic change**

#### **Environmental impact**

More intense heat waves, changes in ocean currents, frequent cyclones, variation in precipitation, rise in sea level, coastal erosion, inundation, degradation of infrastructure acidification of soil and ocean, increasing wildlife, brake outs of disease everything all together is playing a havoc on maintaining ecological balance and a stable biodiversity.

### **Agricultural Impact**

Increases in temperature and CO<sub>2</sub> can prove to be extremely harmful in the long run. Changing atmospheric temperature directly and indirect effect nutrient levels in soil, soil moisture content, drought, depleting ground water table reducing water availability. More frequency occurring droughts and floods could pose threat for farmers and government. On the other hand, changing temperature also a change behavioural pattern in fishes and animals, which would not only damage the ecological balance but also affect the economy since many fisherman are dependent on fishing for their live hood.

### **Greenhouse effect**

Accumulation of greenhouse gases in excess like water vapour, CO<sub>2</sub>, O<sub>3</sub>, CH<sub>4</sub> and cholorofluro carbon (CFC) is mainly responsible for distributing the balance of energy and therefore increasing the earth's temperature.

### **Global warming**

The graduate rise in the earth's temperature due to excess emission of greenhouse gases in the atmosphere causes global warming. In 1824, Joseph Fourier discovered this greenhouse effect which was first experiment in 1858 by John Tyndall and lastly reported in 1869 by Svante Arrhenius. Global warming is the nothing but solely the consequence of greenhouse effect.

### **Effects of climate change**

Scientists had predicted in the past that the result from global climate change are now occurring, loss of sea ice, accelerated sea level rise and longer, more intense heat waves.

- 1. Temperatures will continue to rise** - Experts agree that greenhouse gases which trap heat and prevent it from leaving the earth's atmosphere are mostly responsible for the temperature spike.
- 2. Frost- free season (and growing season) will lengthen** - it could actually have detrimental effects on the crops we grow. Warmer weather helps pests survive longer which can destroy crops. Rising temperatures are also expected to contribute to a shift in areas which are agriculturally most productive and the crops that grow there.
- 3. Changes in precipitation patterns** - The contrast between wet and dry areas will increase globally. In other words, the wet areas will get wetter and the dry areas will get drier.
- 4. More droughts and heat waves** - With rising temperatures and shifting rainfall patterns, heat waves and droughts are increasing in frequency and intensity.

5. **Sea level rise** - Scientists have determined that global sea level has been steadily rising since 1900 at a rate of at least 0.1 to 0.25 centimeter per year. Sea level can rise by two different mechanisms with respect to climate change.
6. **Arctic likely to become ice-free** - The Arctic Ocean is expected to become essentially ice free in summer before mid-century.

### Consequences of climatic change

The result of global warming is not simplest at all. Starting from temperature, precipitation, soil moisture to air-masses both at the regional and global level are being adversely effected.

**Rising Global Temperature:** Devastating effect on both ecology and economy have been observed.

- 1998 was recorded as the warmest year of the 20<sup>th</sup> century whereas 20<sup>th</sup> century was recorded as the warmest century of the millennium. 7 out of 10 warmest years that were recorded in the last decade were of 20<sup>th</sup> century.
- In Antarctica the ice icebergs, ice shelves, glaciers are melting, breaking up and of reducing in size. Adele penguin's populations on Antarctica have declined by 40%.
- The glaciers of Garhwal region of Uttarakhand in India are rapidly declining at an alarming rate of about 10 meters/year.
- In the 30<sup>th</sup> century, the average elevations of glaciers in the Southern Alps of New Zealand have been recorded to have moved upward about 100 meters.
- The glaciation in the Tein Shan Mountains of China. Caucasus Mountains of Gerogia and Russia have shrank by almost 25%.
- In the past 5 decades the Bering glacier in Alaska has been melting and the area of Bering Sea has shrunk by about 5%.
- In the 20<sup>th</sup> century, the largest glaciers of Mount Kenya have almost completely melted away.
- In the last century, glaciers of Mountain's Alps of European have also shrunk by about 50%.

#### Note:

- According to the report released by IPCC in 2007, global temperature has gone up by 0.74°C over a period of 100 years from 1905 to 2006. Ozone layer depletion and greenhouse gas effects were held preliminary responsible.
- According to IPCC 2007 report, in an average all the continents and ocean surface temperatures have gone up approximately by 1.33°F (0.74°C) over the last century. Since ocean gets warm and cold more slowly than continents, continents have warmed up the most mainly over the Northern Hemisphere.
- The mean global rise in the temperature has been around  $0.6 \pm 0.2^\circ\text{C}$ , over the last 20<sup>th</sup> century.

### Rise in sea level

- Scientists have recorded cyclical changes in sea water level.
- Melting of ice-sheets and glaciers are the main causes sea level rise.
- 18000 years ago, sea level was 82 meters below than what it is now at present. It has been on a constant rise since last 6000 years.
- The water from seas gradually inundates coastal regions that alter the occurrence and frequency and even intensity of tropical cyclones, patterns of precipitation, resulting in frequent droughts and floods which terribly affect the vegetation, soil moisture and standard of life.

### Thermal Expansion

Global warming has resulted in rise in temperatures, high temperature has led to the warming of ocean water that causes thermal expansion. Rise in sea water level can submerge low lying islands and coastal region causing flood. Island countries like Maldives and huge portion of Netherlands, etc. are at risk of getting submerged in near future **Response to Climate Change**

There are two main responses to climate change.

1. Mitigation - Which addresses the root causes of climate change, by reducing greenhouse gas emissions.
2. Adaptation - seeks to lower the risks posed by the consequences of climatic changes. Both approaches will be necessary to deal with the global changes that have already been set in motion.

### Mitigation measures:

It is important that we learn how to reduce climate change, and put them into practice now, before it is too late.

1. **Cleaner alternative energy sources:** One important way to fight climate change is to reduce our reliance on and usage of fossil fuels, and depend on alternative renewable and greener sources of energy such as wind energy, solar energy, water or hydropower, biomass, and geothermal energy.
2. **Energy saving tips** - we can adopt energy saving tips by investing in more expensive energy-saving appliances like the compact fluorescent light (CFL) bulbs, Air-conditioners, refrigerators etc. Switching off our electrical appliances when not in use.
3. **Green driving tips** - The best strategy to reduce toxic gas emissions is definitely to reduce the use of automobiles. Use public transport, carpooling, use of electricity powered cars or two wheelers can be an alternative.
4. **Reduce - Reuse - Recycle practices** - Reducing, reusing and recycling helps us conserve resources and energy, and reduce pollution and greenhouse gas emissions produced thereby.
5. **Re-forestation** - The cleanest and most efficient remover of carbon dioxide from our atmosphere actually is nothing but green plants and trees. The rate at which we are

cutting down our trees and forests to make way for human developments has greatly reduced the earth's ability to remove carbon dioxide from the atmosphere.

6. **Organic farming** - Soils are an important sink for atmospheric carbon dioxide. Nevertheless, deforestation making way for conventional agriculture is increasingly depleting this sink. Sustainable and organic agriculture helps to counteract climate change by restoring soil organic matter content as well as reduce soil erosion and improve soil physical structure. Organic farming uses natural fertilizers and helps maintain crop yields

**15. Bring out the significance of Brundtland Report. Discuss the Outcomes of Rio Earth Summit 1992.**

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**World Commission on Environment and Development (WCED) / Brundtland Commission (1987)**

**World Commission on Environment and Development, 1987**

The World Commission on Environment and Development (WCED), also known as the Brundtland Commission after its chairperson Gro Harlem Brundtland, helped chalk out the strategies for environmental conservation and sustainable development. Its final report titled *Our Common Future*, published in 1987 underscores the interdependence of environmental protection with other factors like economic development and energy production and have become the lynchpin of the international environmental law until now. The idea of sustainable development received the first-ever official definition under this initiative.

The UN General Assembly established WCED, Chaired by the Norwegian Prime Minister "Gro Harlem Brundtland". No governmental control and UN system were involved in establishing the commission.

**The three main mandates of the commission are:**

1. To critically inspect the issues related to environment and development and deal with in through practical solutions.
2. To come up with ideas in which international cooperation can be promoted.
3. To strengthen the understanding and involvement among individuals, non-government organisations, institutes, governments etc.

A "Brundtland Report" / "Our Common Future" report was submitted by the commission on global agenda for an alteration.

**Earth summit resulted in following documents:**

- i. 'Rio declaration' for Environment protection



- ii. 'Agenda 21': It is non-binding, voluntarily implemented action plan by United Nation. It contains total 5 documents, concluded in 300 pages. Agenda 21, recommended for UN Convention on combat desertification (UNCCD) those came into force in 1996.
- iii. Forest Principles: Under this summit, important legally binding agreements were opened for signature.
- iv. Convention on Biological Diversity (CBD)
- v. United Nation Framework for climate change (UNFCCC)
- vi. United Nations Convention to Combat Desertification (UNCCD)

### **Rio Declaration**

- The declaration focused on goals mainly and helped bringing the agenda of developing countries to the front seat. This was adopted by 175 countries as the UNCED.
- The goal of Rio Declaration is "new and equitable global partnership".

**Rio Declaration on Environment and Development:** This agreement supported Agenda 21. Rio declaration highlighted:

- The importance of adopting sustainable development programs with in states,
- The need for taking proper responsibilities by developed countries,
- The need to put a complete end to poverty,
- The need of more women participation in sustainable development practices.

### **Agenda 21**

Agenda 21 highlights the strategies to create innovative rules, strategies, platform and procedures for nationwide administrations so that it can proficiently implement the ethics contained in the Rio Declaration. Agenda 21 contain forty chapters emphasizing on topics like challenges faced by poor people, health hazards, maintainable farming, deforestation, desertification, degradation of land, hazardous wastes, air and water pollution, release of toxic chemicals, impact on biological diversity, etc. These chapters are categorized as:

1. Social and Economic Dimensions
2. Conservation and management of Resources for Development
3. Strengthening the Role of Major Groups
4. Means of implementation

### **United Nations Framework Convention on Climate Change (UNFCCC)**

On 11<sup>th</sup> December 1990, the United Nations General Assembly (UNGA) established the Intergovernmental Negotiating Committee (INC) for UNFCCC. This treaty was produced on 'Earth summit' 1992 come into effect on 1994. Presently it has 197 member nations/Parties (Countries that sign the treaty are known as "Parties"). UNFCCC makes the framework to tackle with the aim of limiting the global temperature. Since the provision made in emission reduction in 1992 was not sufficient to control the emission, KYOTO protocol was made in carbon-dioxide emission plans. The UNFCCC has two sister Conventions also agreed in Rio, the UN Convention on Biological Diversity and the Convention to Combat Desertification.

## UN Convention on combat desertification (UNCCD)

- It is international agreement, which associates both environment and development to sustainable land management. It was accepted on June 1994 in Paris which came into force in December 1996 on the recommendation of the Rio conference's Agenda 21. The aim of this convention is to lessen the effects of drought through nationwide action programmes that incorporates extended period of strategies which is reinforced by International Corporation.
- The year 2006 was declared as "International year of deserts and desertification". This convention acknowledges exclusively and arid, semi-arid and dry sub-humid areas, which are particularly known as dry lands. This convention has been ratified by 196 states. The first country to withdraw from this convention in 2013 is Canada, but in 2016 Canada again became a party. The first Conference of parties (COP1) of UNCCD) was held in 1997, Rome. Latest conference of parties (COP13) was held in 2017, Ordos (China).

### 16. Write a detailed note on Drought management in India

இந்தியாவில் வறட்சி மேலாண்மை பற்றி விரிவாக எழுதுக

#### Drought

Drought declaration is announced when the rainfall is -20% to -59% (early warning), -60% to 99% (drought) and -100% of normal (severe drought) conditions. Around 68% of the country is prone to drought in varying degrees. 35% which receives rainfall between 750 mm and 1125 mm is considered drought prone while 33% receiving less than 750 mm is chronically drought prone.

#### Types

**Meteorological drought** is classified based on rainfall deficiency with respect to long term average - 25% or less is normal, 26-50% is moderate and more than 50% is severe.

**Hydrological drought** occurs when water level in surface and sub surface falls leading to a lack of water for normal and specific needs.

**Agricultural drought** is identified by 4 consecutive weeks of meteorological drought, weekly rainfall is 50 mm from 15/5/ to 15/10, 6 such consecutive weeks rest of the year and crop planted is 80% in kharif season.

#### Drought Management

1. Command Area Development
2. Indira Gandhi Canal Command Area Development Programme
3. Integrated Watershed Management Programmes (IWMP)
4. Desert Development Programme
5. Drought Prone Area Development Programme
6. Kudimaramathu Scheme
7. Institutional mechanism
8. Operation of Drought Early Warning Systems (EWS)

**17. Explain the consequence of climate change in Monsoon pattern of India and Tamilnadu**  
இந்தியா மற்றும் தமிழ்நாட்டின் பருவமழை பொழிவு முறையில் காலநிலை மாற்றத்தால் ஏற்படும் விளைவுகளை விவரி.

Over the past few decades, India's total annual rainfall averages haven't changed but the intensity of precipitation has increased as extreme weather events (EWEs) become more frequent and widespread. Today, the country witnesses more episodes of extremely heavy rainfall, as compared to the past's consistent, well spread-out seasonal rains.

The nation's meteorological department already admits that this is a clear impact of climate change. These intense storms pose a huge danger to India's agriculture-based economy and to millions of farmers whose livelihoods still largely rely upon a consistent rainfall season. There are also periods of droughts interspersed with floods.

For instance in 2019, in the state of Kerala, at the southwestern tip of the Indian peninsula, June and July were months of inadequate rains, followed by a burst of intense storms in early August, causing floods and landslides in northern districts. The Kodagu and Chikkamagalur districts in Karnataka state, northeast of Kerala, saw the same pattern. Avalanche, a river valley in the Nilgiris Mountains of Tamil Nadu state, to the east, received more than 900 millimeters (35 inches) of rain in just one day.

Mumbai, India's commercial capital city, was flooded for weeks this year and saw bouts of intense rain following each other in quick succession. Eastward flowing rivers originating in the Western Ghats have seen increased flow and the western districts of Maharashtra, including Satara, Kolhapur and Sangli, have faced heavy floods and destruction. Northwards in Gujarat state, it was Vadodara and surrounding regions that endured the brunt of the deluge. To the north and northeast, there were floods in Himachal Pradesh, while parts of Uttar Pradesh and Bihar, and Assam states were also under water.

While heavy rains have lashed parts of all three states, the rain-receiving regions are well-defined and isolated with scanty and below-normal rainfall in all surrounding regions. Interestingly, almost the entire region, which is now struggling to cope with excess rains, received below normal rainfall during the summer monsoon and was staring at water shortages and droughts.

In recent years, the shifting patterns of the Indian monsoon (southwest monsoon) and its implications have been spoken about extensively, but the northeast monsoon has, by and large, escaped scrutiny. The northeast monsoon has been considered a fringe player in the traditional telling of the Indian climate story. Known to bring a few heavy showers amidst scanty rains to the southern states, the winter monsoon in India has flown under the radar for most of its course. In recent years though, the winter rains are stepping out of anonymity and making their presence felt.

The northeast monsoons are caused by retreating monsoon winds that attain moisture from the Bay of Bengal on their way back south from the north-eastern region of India. This moisture is responsible for the rains in coastal and southern Andhra Pradesh, Tamil Nadu and parts of Karnataka when the retreating winds move back onto the peninsula between October and December.

The El Niño Southern Oscillation (ENSO), responsible for decadal differential warming in the Pacific Ocean, has been known to impact several weather patterns across the world. Warming due to El Niño is typically characterised by a warm tongue extending westwards from the Eastern Pacific (close to South America). El Niño this year has been the severest ever recorded partly due to the warming of oceans due to global warming phenomena. Warming due to ENSO has been noticed not only in the Pacific Ocean but even in eastern Indian Ocean. The warming affects both the moisture uptake of the winds as well as the path that winds take. In effect, this means the El Niño has an important say in when and where it will rain. Several studies since early 2000s have pointed to a positive correlation between the ENSO and the north-eastern monsoon. The unanticipated excessive rains are more evidence pointing to the same trend.

The correlation with ENSO is not the only newly emerging pattern regarding the north-eastern monsoon. A look at the seasonal rainfall levels in recent decades across districts in coastal Andhra Pradesh, Karnataka and Tamil Nadu reveals that the north-eastern monsoon has become progressively more bountiful. A study, in journal Theoretical and Applied Climatology in 2012, makes use of homogenous rain gauge data maintained by the Indian Institute of Tropical Meteorology (IITM), to show that winter rains in peninsular India have exhibited a positive rainfall trend of 0.4 mm per day per decade between 1979 and 2010. At the same time, an increase in the number of extreme rainfall days and a decrease of normal rain days have also been observed in several parts of south India.

Climate change is not just affecting the southwest monsoons and India's rainy season, but is also driving changes in the north-eastern monsoons. And if the near-constant flooding in southern states is anything to go by, the country needs to really up its game when it comes to anticipating, preparing and adapting to wet and dry spells of increasing intensity.

**18. Write a short note on the following**

பின்வருவனவற்றிற்கு சிறுகுறிப்பு வரைக

**a. Bhopal Gas Tragedy**

போபால் விஷவாயு துயரம்

On the night of December 2, 1984, chemical, methyl isocyanate (MIC) spilt out from Union Carbide India Ltd's (UCIL's) pesticide factory turned the city of Bhopal into a colossal gas chamber. It was India's first major industrial disaster. At least 30 tonnes of methyl isocyanate gas killed more than 15,000 people and affected over 600,000 workers. Bhopal gas tragedy is known as world's worst industrial disaster.

Impact of methyl isocyanate leak

Doctors were not aware of proper treatment methods the incident. Methyl isocyanate gas leak killed more than 15,000 people and affected over 600,000 workers. The stillbirth rate and the neonatal mortality rate increased by up to 300% and 200% respectively. The gas leak impact trees and animals too. Within a couple of days, trees in the nearby area became barren. Bloated animal carcasses had to be disposed of. People ran on the streets, vomiting and dying. The city ran out of cremation grounds.

Govt's response to Bhopal tragedy

Until then, the Indian government had never dealt with a disaster like this. Legal proceedings between India, UCC and the US began right after the catastrophe. The government passed the Bhopal Gas Leak Act in March 1985, which allowed it to act as the legal representative for victims. While the UCC initially offered a \$5 million relief fund to India, the government turned down the offer and demanded \$3.3 billion. Eventually, an out-of-court settlement was reached in February 1989, Union Carbide agreed to pay \$470 million for damages caused. The Supreme Court of India also laid down guidelines for the money – the family of the dead were to be given Rs 100,000-300,000. In addition, fully or partially disabled were to get Rs 50,000-500,000 and those with a temporary injury, Rs 25,000-100,000. The apex court asked UCIL to "voluntarily" fund a hospital in Bhopal to treat victims of the tragedy. In June 2010, seven former employees of UCIL, who were all Indian nationals, were convicted of causing death by negligence and sentenced to two years of imprisonment. However, they were later released on bail.

**b. Hyogo Framework**

ஹூயோகோ கட்டமைப்பு

In January 2005, 168 Governments adopted a 10-year plan to make the world safer from natural hazards at the World Conference on Disaster Reduction, held in Kobe, Hyogo, Japan. The Hyogo Framework is a global blueprint for disaster risk reduction efforts during the next decade. Its goal is to substantially reduce disaster losses by 2015 - in lives, and in the social, economic, and environmental assets of communities and countries. The Framework offers guiding principles, priorities for action, and practical means for achieving disaster resilience for vulnerable communities.

**c. Sendai Framework**

சென்டாய் கட்டமைப்பு

The Sendai Framework for Disaster Risk Reduction 2015-2030 outlines seven clear targets and four priorities for action to prevent new and reduce existing disaster risks: (i) Understanding disaster risk; (ii) Strengthening disaster risk governance to manage disaster risk; (iii) Investing in disaster reduction for resilience and; (iv) Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction.

**19. Write a short note on the following**

பின்வருவனவற்றிற்கு சிறுகுறிப்பு வரைக

**a. Forest Conservation Act, 1980**

காடுகள் பாதுகாப்பு சட்டம்

**Forest Conservation Act, 1980**

Forest constitutes very important natural resource for conservation of forest and matters related to it forest. Conservation Act come into force 25 October, 1980. This Act is applicable to whole India except the State of Jammu and Kashmir. Main provision of this Act are

1. Imposing restriction on the use of forest land for non-forest purpose.

2. To constitute an advisory committee, which act as recommendatory and advisory body in the matters connected to the conservation of forest.
3. According to this act prior approval is taken from central government to declare de-reserved forest as dereserved or forest land is diverted to non-forest purpose.
4. Penalty is imposed if provisions of this Act are not properly followed.
5. Compensatory plantations have to be raised over the degraded forest.
6. To control shifting cultivation and encroachment.
7. Central government holds an authority to carry out provisions of this Act.
8. Multi-disciplinary approach to be followed for conservation of forest.

The forest (conservation) Act, 1980 was amended in 1988 to incorporate stricter provisions against violators.

### **1992 Amendment in the Forest Act**

#### **b. National Green Tribunal**

தேசிய பசுமை தீர்ப்பாயம்

The National Green Tribunal has been established on 18.10.2010 under the National Green Tribunal Act 2010 for effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental thereto. It is a specialized body equipped with the necessary expertise to handle environmental disputes involving multi-disciplinary issues. The Tribunal shall not be bound by the procedure laid down under the Code of Civil Procedure, 1908, but shall be guided by principles of natural justice.

The Tribunal's dedicated jurisdiction in environmental matters shall provide speedy environmental justice and help reduce the burden of litigation in the higher courts. The Tribunal is mandated to make and endeavour for disposal of applications or appeals finally within 6 months of filing of the same. Initially, the NGT is proposed to be set up at five places of sittings and will follow circuit procedure for making itself more accessible. New Delhi is the Principal Place of Sitting of the Tribunal and Bhopal, Pune, Kolkata and Chennai shall be the other four place of sitting of the Tribunal.

#### **c. Biological Diversity Act, 2002**

உயிரிய பன்மயச் சட்டம், 2002

#### **Biological Diversity Act, 2002:**

India with its rich heritage of floral and faunal diversity has been one of the signatories to the CBD convention held at Rio de Janeiro, in 1992. India ratified the International Convention on Biodiversity on 18<sup>th</sup> February, 1994. India ratified to International Convention on Biodiversity on 18<sup>th</sup> February, 1994 and became party to the convention in May, 1994. There have been seven general meetings of the COP parties to convention.

The seventh meeting was held in Kuala Lumpur on February 9 - 10, 2004, where India chaired one of the two working groups. A scheme on biodiversity conservation was initiated in 1991-92 to ensure coordination among the agencies dealing with the various issues and to review, monitor or evolve adequate policy instrument. The next meeting of the Cop is scheduled in India at Hyderabad, 2012.

The first draft of the Biological Diversity Bill (1997), was framed by a committee led by Professor M.S Swaminathan. It aimed for regulation of access to tradable biological resources and traditional knowledge.

In December, 2002, The Biological Diversity Bill, was approved by Rajya Sabha and Lok Sabha, Houses of parliament. Biodiversity Act 2002 was enacted to follow up the convention on Biodiversity. On 17<sup>th</sup> January 2003, the Cartagena protocol on Biosafety or Biosafety Protocol (2000) was ratified in accordance with the Bio Diversity. On 17<sup>th</sup> January 2003, The Cartagena Protocol on Biosafety or Biosafety Protocol (2000) was ratified in accordance with the Biodiversity Act (2002).

On 15<sup>th</sup> April 2004, The Biological Diversity Rules (2004) were notified. The constitutional amendments, 73<sup>rd</sup> and 74<sup>th</sup> were enacted in the same year, but were not reflected in the Biodiversity Act (2002). So these were further compromised in the Biological Diversity Rules (2004).

The objective of the CBD is conservation of biodiversity, sustainable, utilization of natural resources an equitable benefit sharing arising out of access to bio resources. Following the convention, Biological Diversity Act, 2002<sup>nd</sup> the rules 2004, were subsequently enacted in India. The act operates at a three-tier decentralized system. It framed the National Biodiversity Authority, an apex body that operates at the National level which has its headquarters at Chennai. The State Biodiversity Board (SSB) operates at the state level, while a Biodiversity Management Committee (BMC) at the local or village level. The later takes care of the local biological resource, documents local biodiversity (wild and domesticated), their uses and also record the wealth of traditional knowledge.

**A three tiered structure at the national, state and local level is to established.**

- **National Biodiversity Authority (NBA):** All substances relating to needs for access by foreign entities, institutions or companies, and all matters relating to handover of results to any outsider will be dealt with by the National Biodiversity Authority.
- **State Biodiversity Boards (SBB):** All subjects relating to access by Indians for commercial activities will be under the purview of the State Biodiversity Boards (SBB). The Indian industry will be necessary to provide prior hint to the concerned SBB about the use of biological resource. The state board will have the control to restrict any such task, which violates the purposes of conservation, sustainable use and equitable sharing of welfares.
- **Biodiversity Management Committees (BMCs):** Institutions o local self-government will be essential to set up Biodiversity Management Committees in their particular areas for conservation, sustainable use, and certification of biodiversity;

- NBA and SBBs are essential to consult the concerned BMCs on matters connected to use of biological resources and related knowledge within their authority.
- The Indian researches neither need prior agreement nor need to give prior hint to SBB for attaining biological resource for leading research in India.

The act advocates for patents and intellectual property rights, for checking bio piracy, and conservation of biodiversity outside the boundaries of rotated areas of the country. It further advises the Government of India on the management of endangered and endemic species, equitable benefit sharing arising out of access to bio resources and sustainable use of biodiversity. It acknowledges the sovereign rights of the state over its biological resources and also seeks to regulate trade of the same.

**20. Write a short note on the following**

பின்வருவனவற்றிற்கு சிறுகுறிப்பு வரைக

**a. Bonn Convention (5 marks)**

பான் மாநாடு

**Convention on the Conservation of Migratory Species of Wild Animals 1983**

- The Convention also known as Bonn Convention is an environmental treaty under the aegis of the United Nations Environment Programme (UNEP). CMS provides a global platform for the conservation and sustainable use of migratory animals and their habitats. CMS brings together the States through which migratory animals pass, the Range States, and lays the legal foundation for internationally coordinated conservation measures throughout a migratory range. More than 120 states are party to the Convention. India is a member to the convention. China and many other Asian countries are not a part of CMS.

**b. REDD+ (5 marks)**

**Reduction Emission from Deforestation and forest degradation (REDD& REDD+)**

REDD was first discussed in 2005 by the UNFCCC at its Cop11 of the conference of the parties to the convention (COP) at the request of Costa Rica and Papua New Guinea. REDD, approaches to simulate Action", with a demand to create an agenda item to converse about reducing emissions, deforestation and forest degradation in natural forests as a lessening measure.

**REED+ programme**

Reducing Emissions from deforestation and forest degradation (REED+) is a programme that was initiated by the parties to the united Nation frame work convention on climate change (UNFCCC) in 2005.

**Objectives**



- REED + focuses on reducing the emission of greenhouse gases in the atmosphere through sustainable forest management, mitigating the effect of climate change by reducing deforestation and promoting afforestation.
- It allocates fund to developing countries based on the performances and the action taken by them to reduce carbon emission and stabilize the forest cover and not indulging deforestation.

**c. World Heritage Convention (5 marks)**

உலக பாரம்பரிய மாநாடு

**The World Heritage Convention**

- The World Heritage Convention was adopted by the United Nations Educational, Scientific and Cultural Organization (UNESCO) General Conference at its 17<sup>th</sup> session in Paris on 16 November 1972. The Convention came into power in 1975. In August 1974, Australia became one of the first countries to endorse the convention.
- The World Heritage Convention aim to encourage cooperation among nations to defend heritage around the world that have exceptional universal value. This conservation is significant for current and future generations.
- States that are parties to the Convention agree to identify, protect, conserve and present World Heritage properties. The World Heritage Convention is administered by a
- World Heritage Committee, which meets yearly and comprise of 21 members chosen from those States that are parties to the Convention.
- The Committee's main tasks are to:
  1. Decide on the inscription of new properties on the World Heritage List,
  2. Discuss all matters relating to the discharge of the Convention,
  3. Consider requests for international help,
  4. Advise State Parties on how they can make sure States assemble their obligations under the Convention to protect World Heritage Properties.

**The World Heritage Convention and India**

India adopted this convention on 14 November, 1977. Presently 35 places of India are recognized under UNESCO's World Heritage Sites. India's first two sites that were recognized on the list at the 7<sup>th</sup> Session of the World Heritage held in 1983 were the Agra Fort and the Ajanta Caves. Out of these 37 sites, 29 are cultural sites, 7 are natural sites and 1 is a mixed site.