



# Sambhav

## Day 68

**Question 1:** Explain the Koeppen scheme of empirical climatic classification. (250 Words)

**Question 2:** What do you understand by climate change? Mention the forces responsible for the climate change.

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## Approach / Explanation / Answer

### Answer 1

#### Approach

- Introduce the approaches adopted for classifying climate.
- Explain the Koeppen scheme of climatic classification.
- Conclude suitably.

#### Introduction

Empirical, genetic and applied approaches have been adopted for classifying climate. **Empirical classification is based on observed data, particularly on temperature and precipitation.** Genetic classification attempts to organize climates according to their causes. Applied classification is for specific purpose.

#### Body

##### **Koppen's Scheme of Classification of Climate:**

Koeppen identified a close relationship between the distribution of vegetation and climate. He selected certain values of temperature and precipitation and related them to the distribution of vegetation and used these values for classifying the climates. It is an empirical classification based on mean annual and mean monthly temperature and precipitation data.

Koeppen recognised five major climatic groups, four of them are based on temperature and one on precipitation. The capital letters: A, C, D and E delineate humid climates and B dry climates.

- **Group A - Tropical Humid Climates:** Tropical humid climates exist between Tropic of Cancer and Tropic of Capricorn. The sun being overhead throughout the year and the presence of Inter

Tropical Convergence Zone (ITCZ) make the climate hot and humid. Annual range of temperature is very low and annual rainfall is high. The tropical group is divided into three types, namely (i) Af- Tropical wet climate; (ii) Am - Tropical monsoon climate; (iii) Aw- Tropical wet and dry climate.

- **Dry Climates- B:** Dry climates are characterized by very low rainfall that is not adequate for the growth of plants. These climates cover a very large area of the planet extending over large latitudes from 15° - 60° north and south of the equator. At low latitudes, from 15° - 30°, they occur in the area of subtropical high where subsidence and inversion of temperature do not produce rainfall.
  - In middle latitudes, from 35° - 60° north and south of equator, they are confined to the interior of continents where maritime-humid winds do not reach and to areas often surrounded by mountains. Dry climates are divided into steppe or semi-arid climate (BS) and desert climate (BW).
  - They are further subdivided as subtropical steppe (BSh) and subtropical desert (BWh) at latitudes from 15° - 35° and mid-latitude steppe (BSk) and mid-latitude desert (BWk) at latitudes between 35° - 60°.
- **Cold Snow Forest Climates (D):** Cold snow forest climates occur in the large continental area in the northern hemisphere between 40°-70° north latitudes in Europe, Asia and North America. Cold snow forest climates are divided into two types: (i) Df- cold climate with humid winter; (ii) Dw- cold climate with dry winter. The severity of winter is more pronounced in higher latitudes.
- **Polar Climates (E):** Polar climates exist poleward beyond 70° latitude. Polar climates consist of two types: (i) Tundra (ET); (ii) Ice Cap (EF).
- **Highland Climates (H):** Highland climates are governed by topography. In high mountains, large changes in mean temperature occur over short distances. Precipitation types and intensity also vary spatially across high lands. There is vertical zonation of layering of climatic types with elevation in the mountain environment.

## Conclusion

The system of Koeppen uses a letter-based coding system to identify different climate zones, such as tropical, arid, and polar climates. It is a useful tool for understanding the variation in weather patterns and ecosystem distribution across the globe. The Koeppen classification system is an important tool for understanding the Earth's climate and its impact on natural systems.

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## Answer 2

### Approach

- Introducing the concept of climate change.
- Discuss the forces responsible for climate change.
- Conclude suitably.

### Introduction

- **Climate Change** refers to the long-term changes in **temperature, precipitation, wind patterns**, and other measures of climate that occur over several decades or longer.
- These changes are primarily caused by human activities, such as the **burning of fossil fuels** (like coal, oil, and natural gas), **deforestation**, and **soil degradation etc.**

### Body

#### The forces responsible for the climate change-

- **Astronomical Causes:**
  - The **astronomical causes** are the changes in solar output associated with sunspot activities (dark and cooler patches on the sun which increase and decrease in a cyclical manner).
  - When the number of **sunspots increase, cooler** and **wetter weather** and greater storminess occur. A decrease in sunspot numbers is associated with **warm and drier conditions**. Yet, these findings are not statistically significant.
  - Another astronomical theory is **Millankovitch oscillations**, which infer cycles in the variations in the earth's orbital characteristics around the sun, the wobbling of the earth and the changes in the earth's axial tilt. All these alter the amount of insolation received from the sun, which in turn, might have a bearing on the climate.
- **Volcanism is considered as another cause for climate change.** Volcanic eruption throws up lots of aerosols into the atmosphere. These aerosols remain in the atmosphere for a considerable period of time reducing the sun's radiation reaching the Earth's surface. After the recent **Pinatoba and El Cion** volcanic eruptions, the average temperature of the earth fell to some extent for some years.
  - The most important **anthropogenic effect** on the climate is the increasing trend in the concentration of greenhouse gases in the atmosphere which is likely to cause global warming.
- **Greenhouse gas emissions:**
  - Agricultural activities such as fertilizer use, livestock production, and rice cultivation, result in the release of greenhouse gasses such as methane and nitrous oxide into the atmosphere.
  - These gasses trap heat from the sun and contribute to the warming of the planet.
- **Deforestation:**
  - Clearing forests for agriculture and other uses can lead to the release of stored carbon and the reduction of the Earth's capacity to store carbon.
  - Deforestation also contributes to the loss of biodiversity and can have a negative impact on the ecosystem and the people who depend on it.
- **Soil degradation:**
  - Agricultural activities such as overuse of fertilizers and intensive tillage can lead to soil degradation, which can reduce the ability of the soil to store carbon and release it into the atmosphere.
- **Land use change:**
  - Changing the land use from natural vegetation to cropland or pastureland can alter the local climate by changing the albedo, evapotranspiration and energy balance.
- **Livestock:**
  - Livestock farming is also a significant contributor to climate change, through the production of methane during digestion and manure management.

- Methane is a greenhouse gas that is 28 times more potent than carbon dioxide.

## **Conclusion**

Agricultural activities, deforestation, soil degradation and land use change all contribute to the release of greenhouse gasses and the warming of the planet. These activities also have negative impacts on biodiversity and ecosystems and can lead to soil degradation. Livestock farming is also a significant contributor to climate change due to the production of methane. It is essential that we take action to reduce these emissions and find sustainable solutions for agriculture and land use to mitigate the effects of climate change.

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