



## Mains Practice Question

**Q.** Discuss the major factors that influence the distribution of temperature, precipitation, and wind on the Earth's surface. How do these factors vary across different climatic zones? (250 words)

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### Approach:

- Start the answer with factors which influence the distribution of temperature, precipitation, and wind on the Earth's surface.
- Explain the factors in detail and how these factors vary across different climatic zones.
- Conclude suitably.

### Answer:

The distribution of temperature, precipitation, and wind on the Earth's surface is influenced by a complex interplay of various factors, both natural and anthropogenic. These factors vary across different climatic zones, creating distinct climate patterns worldwide. To discuss these major factors comprehensively, we can categorize them into natural and anthropogenic influences.

#### Natural Factors:

- **Latitude:** Latitude plays a crucial role in determining temperature distribution. Near the equator, where sunlight is more direct, temperatures tend to be higher, while at higher latitudes, the angle of sunlight is lower, resulting in cooler temperatures. This leads to the formation of the tropical, temperate, and polar climate zones.
- **Altitude:** As elevation increases, the temperature typically decreases. This phenomenon is known as the lapse rate. Mountains can block or redirect wind patterns, leading to variations in precipitation and temperature on either side of the mountain range. This effect is evident in rain shadows.
- **Ocean Currents:** Ocean currents transport heat across the globe, influencing the climate of coastal regions. Warm currents, such as the Gulf Stream, can raise temperatures in nearby coastal areas, while cold currents can have a cooling effect.
- **Land-Water Distribution:** Water bodies like oceans and seas have a moderating influence on temperature, leading to milder climates near coastlines compared to inland areas. This effect is known as maritime influence.
- **Topography:** The physical features of the Earth's surface, including mountains, valleys, and plains, can affect temperature, precipitation, and wind patterns. Wind patterns can be channeled and intensified or weakened by topographical features.

#### Anthropogenic Factors:

- **Urbanization:** Urban areas tend to have higher temperatures compared to rural areas due to the urban heat island effect, caused by buildings, roads, and other human-made structures that absorb and radiate heat.
- **Deforestation:** The removal of forests can disrupt local climate patterns, leading to changes in temperature, precipitation, and wind patterns. Deforestation also contributes to climate change

through the release of carbon dioxide.

- **Industrialization:** The release of greenhouse gases from industrial processes and the burning of fossil fuels contributes to global warming, which in turn affects temperature and precipitation patterns on a global scale.
- **Agriculture:** Changes in land use for agriculture, including irrigation practices, can alter local climate conditions, especially in arid and semi-arid regions.

#### Variation Across Different Climatic Zones:

- **Tropical Zones:** Near the equator, the primary driver of temperature is latitude, resulting in consistently warm temperatures year-round. Precipitation is influenced by the Intertropical Convergence Zone (ITCZ), and trade winds dominate wind patterns.
- **Temperate Zones:** These regions experience seasonal temperature variations due to the tilt of the Earth's axis. Prevailing westerlies and jet streams influence wind patterns, while precipitation varies seasonally.
- **Polar Zones:** High latitudes experience extremely cold temperatures due to the low angle of sunlight. These regions have low precipitation and are characterized by polar easterlies.
- **Mountainous Regions:** Altitude and topography play a significant role in temperature and precipitation variations, leading to diverse microclimates on mountain slopes.

The distribution of temperature, precipitation, and wind on Earth's surface is a result of a complex interplay of natural and anthropogenic factors. These factors vary significantly across different climatic zones, creating the diverse climate patterns we observe around the world. Understanding these influences is crucial for comprehending the Earth's climate system and its response to ongoing environmental changes.

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