IASBABA'S TLP 2023 (PHASE – 1) – DAY 60 SYNOPSIS

Q-1.Evaluate the role of deserts and their geographical features such as sand dunes and salt pans on the climate and ecosystem of the regions they occupy and their impact on human settlements and trade ?

Approach -

A simple straightforward question where candidates need to write about role of deserts and their features such as sand dunes salt pans on climate change and ecosystem of the regions .and impact they had on trade and human settlements .

Introduction -

A desert ecosystem is characterized by low precipitation and high temperatures, with a variety of plant and animal life adapted to these harsh conditions.Sand dunes can have an impact on climate change by trapping and preserving carbon in the sand. They can also help to reduce the amount of carbon in the atmosphere by acting as a sink, absorbing and storing carbon from the atmosphere.

Body -

- Dunes move when sand grains on one side are picked up by the wind and deposited on the other. But the speed of movement varies greatly depending on factors including the shape and size of the dunes, moisture content in the sand, and wind speed.
- Dune movement can be dramatically slowed or prevented by sparse vegetation. When vegetation cover drops below 14%, erosion speeds up significantly. The result is a self-perpetuating system in which the blown sand smothers remaining plants, destroying ecosystems and prompting further erosion.
- These shifting sands are likely to destroy local ecosystems, making any kind of farming or other use of nearby land even more difficult, they report in Nature.
- The model included seasonal variations in annual rainfall and the likely impact of an increase in atmospheric greenhouse gases on temperature. It did not, however, include the influence of higher carbon dioxide levels on plant productivity, nor human impacts such as increased agriculture in surrounding areas.
- Fighting the process of vegetation loss and dune movement would require major adaptations," says Thomas. One possible solution would be to plant new vegetation. But dune ecosystems are very sensitive and differ greatly from region to region. It would take many years of careful tending to stop a moving dune from wandering around, he explains.

Salt pan

- Natural salt pans or salt flats are flat expanses of ground covered with salt and other minerals and are found in deserts.
- Large salt plains are common in the Sahara Desert, the Kalahari Desert, the Rann of Kutch, the western United States and the central deserts of Australia.

- These are natural formations which are formed by evaporation of a water pool such as a lake or pond.
- This happens in climates where the rate of water evaporation exceeds the rate of precipitation.
- If the water cannot drain into the ground, it remains on the surface until it evaporates, leaving behind minerals precipitated from the salt ions dissolved in the water.
- Over thousands of years, the minerals (usually salts) accumulate on the surface. These minerals reflect the sun's rays (through radiation) and often appear as white areas.
- Ecological significance: Salt pans play a significant role in the ecology of the neighbouring areas. Salt pans have different species of birds and insects thriving on them. They have an enormous water-holding capacity that helps in flood control.
- Sand dunes in the Kalahari Desert in Africa, which have been immobile for thousands of years, will soon start to move again, researchers warn. The wandering dunes may affect hundred of thousands of people in southern Africa.
- Low precipitation: Deserts typically receive very little rainfall, which can contribute to a lack of vegetation and a high rate of evaporation. This can increase the amount of carbon dioxide in the atmosphere.
- High temperatures: Deserts are known for their high temperatures, which can accelerate the rate of evaporation and contribute to the formation of heat waves.
- Dust storms: Deserts are also known for their dust storms, which can transport large amounts of dust and other particles into the atmosphere. These particles can reflect sunlight and contribute to cooling the planet
- Researchers have long warned that some of the driest and poorest parts of the world are getting drier, causing deserts to grow. But researchers wondered whether the anticipated climate change might also affect the movement of dunes within deserts.

Impacts on human settlements -

- Human settlements in deserts are challenging due to the arid conditions and lack of water, which can limit the availability of resources such as food and fuel. Additionally, the harsh living conditions can make it difficult for people to survive in these regions.
- Deserts also act as a barrier to human expansion and help to preserve unique ecosystems and biodiversity.
- Researchers have long warned that some of the driest and poorest parts of the world are getting drier, causing deserts to grow.
- Dune movement can be dramatically slowed or prevented by sparse vegetation. When vegetation cover drops below 14%, erosion speeds up significantly.
- These shifting sands are likely to destroy local ecosystems, making any kind of farming or other use of nearby land even more difficult.
- The model included seasonal variations in annual rainfall and the likely impact of an increase in atmospheric greenhouse gases on temperature.
- It did not, however, include the influence of higher carbon dioxide levels on plant productivity, nor human impacts such as increased agriculture in surrounding areas.

- Local people are aware of the problem, , but often act to worsen it. Large-scale sheep farming in the northern part of South Africa, for example, reduces available ground water, because it requires extensive well digging.
- Fighting the process of vegetation loss and dune movement would require major adaptations,". One possible solution would be to plant new vegetation. But dune ecosystems are very sensitive and differ greatly from region to region.
- It would take many years of careful tending to stop a moving dune from wandering around
- Additionally, deserts can also impact human settlement through their arid conditions and lack of resources. However, they also can act as barriers to human expansion and can help to preserve unique ecosystems and biodiversity.

Conclusion

Deserts have played a significant role in human settlement and trade throughout history. Due to their harsh conditions, deserts have often been viewed as barriers to human migration and economic activity. However, many deserts have also served as important trade routes for caravans and merchants, connecting different regions and cultures.

2. Evaluate the role of plateau and highlands in shaping the climate, vegetation, and human settlement patterns of the regions they occupy.

Approach

Candidates can start the answer with giving basic idea about plateaus and highland and then simply highlight its role in shaping climate, vegetation and human settlement.

Introduction

Plateaus or plateaux, also called a high plain or a tableland, is an area of a highland consisting of flat terrain that is raised sharply above the surrounding area on at least one side.

Body

Shaping Climate:

- Plateaus and highlands typically have a cooler and drier climate than the surrounding lowlands due to their elevation. This can limit the types of vegetation that can grow, with forests giving way to grasslands and shrublands.
- This is due to the fact that as air rises, it cools and moisture condenses, producing clouds and precipitation. However, as air continues to rise, it can cool so much that the moisture condenses into snow and ice rather than rain, reducing the amount of precipitation that reaches the ground.

- The highlands and plateaus can also create local weather patterns due to the relief of the terrain, leading to the formation of clouds and precipitation in certain areas while other areas remain dry.
- Additionally, they can act as a barrier to the prevailing winds, causing them to rise and cool, leading to the formation of clouds and precipitation on the windward side of the highlands or plateau, while the leeward side remains dry.
- The high altitude of highlands and plateaus also means that the temperature tends to drop with altitude, creating a colder climate at higher elevations. This can lead to the formation of glaciers and permanent snowfields.
- These regions may also have unique microclimates and biodiversity. Human settlement patterns in plateaus and highlands tend to be sparse, as the rugged terrain and harsh climate make agricultural and economic development difficult.

Shaping vegetation:

- The lower temperatures and lower precipitation rates at higher elevations can limit the types of vegetation that can grow. Typically, as one goes up in elevation, forests give way to grasslands, shrublands, and rocky alpine tundra.
- Forests, which thrive in warmer and more humid environments, are typically found at lower elevations and are replaced by grasslands and shrublands as the elevation increases.
- The shrublands and grasslands are adapted to the drier and cooler conditions and are characterized by tough, hardy plants that can survive in the harsher environment.
- In addition, highlands and plateaus often have unique microclimates due to their topography, which can lead to high levels of biodiversity, with many endemic species found only in these regions.
- These microclimates can also create local weather patterns, leading to the formation of clouds and precipitation in certain areas while other areas remain dry, which can affect the vegetation.

Human settlements:

- These regions may be important for resource extraction, such as mining and grazing, and they may also be used for protection and conservation.
- Additionally, some highlands and plateau regions are also known for their cultural, spiritual and historical significance which attract tourism.
- They may also be used for protection and conservation of natural resources, as well as for recreational activities such as hiking and mountaineering.
- Human settlement in plateaus and highlands tends to be sparse due to the harsh climate and rugged terrain. These regions are often difficult to cultivate, and the lack of water resources can make economic development difficult.

Conclusion

Plateaus and highlands shape the climate, vegetation, and human settlement patterns of the regions they occupy through their elevation and unique microclimates, making them less hospitable for human habitation but more for specific plant and animal species, and also for resource extraction, protection and tourism.

3. Discuss the impact of volcanic activity and the formation of volcanic landscapes on the geology, climate, and ecosystem of the regions they occupy, and how it affects human settlement and economic development.

Approach

Candidates can start the answer with giving basic idea of volcanism and then write down how it impacts geology and climate also write down how it positively and negatively affect the human settlements.

Introduction

A volcano is an opening or rupture in the earth's surface that allows magma (hot liquid and semi-liquid rock), volcanic ash and gases to escape. The volcanic eruption could have implications for the local and regional environment like earthquakes, landslides, lahars (mudflows), ash and thunderstorms.

Body

Climate and ecosystem due to volcanic activity:

- The gases and dust particles thrown into the atmosphere during volcanic eruptions have influences on climate.
- Volcanoes have also caused global warming over millions of years during times in Earth's history when extreme amounts of volcanism occurred, releasing greenhouse gases into the atmosphere.
- Even though volcanoes are in specific places on Earth, their effects can be more widely distributed as gases, dust, and ash get into the atmosphere.
- This is due to the atmospheric circulation patterns, eruptions in the tropics can have an effect on the climate in both hemispheres. Eruptions at mid or high latitudes only have an impact on the hemisphere they are within.

Geology landscapes due to volcanic activity:

- Volcanic eruptions can create new landforms, such as volcanic islands and mountains, and deposit layers of ash and lava, which can change the soil composition and fertility.
- Volcanic activity can also create new mineral deposits, such as gold, silver, copper and other metals, which can become an important resource for human civilization.
- These mineral deposits can form in different ways, for example, in the form of veins and lodes, as well as in the form of volcanic-hosted massive sulfide deposits.
- The volcanic ash and rock fragments can also change the albedo of the region, which can affect the regional climate.

- Volcanic activity can also create geothermal areas, which can be used for power generation and other forms of economic development.
- Additionally, volcanic landscapes often have unique biodiversity, with many endemic species found only in these regions.
- However, volcanic activity can also be hazardous to human settlements and can lead to destructive events such as volcanic eruptions, ashfall, lahars, and volcanic gas emissions. These events can cause significant damage to infrastructure, agriculture, and human health, and can lead to displacement of populations.

Economic development and human settlements:

- Volcanic activity and the formation of volcanic landscapes can have both positive and negative impacts on human settlement and economic development. While they can be inhospitable and hazardous to human habitation, they can also provide opportunities for economic development.
- For example, Volcanic ash and rock fragments can be used for construction and road building, and volcanic landscapes often have unique biodiversity which can be utilized for tourism and recreation. Volcanic landscapes can also contain geothermal resources which can be used for power generation and other forms of economic development.
- Volcanic eruptions can cause significant damage to infrastructure, agriculture, and human health, and can lead to displacement of populations. Additionally, the rugged terrain and harsh climate of volcanic landscapes can make it difficult for people to settle in these regions.

Conclusion

Most of the active volcanoes on earth occur on the Circum-Pacific Belt, also referred to as The Ring of Fire. Volcanoes are a natural exogenic phenomenon that cannot be avoided, but developing disaster risk resilience will surely be a step in the right direction.