1. Describe the physiographic features of the Tibetan plateau. How does the Tibetan plateau affect the weather pattern in the Indian subcontinent? Explain.

Demand of the question:

It expects students to give a clear account of the physiographic features of the Tibetan plateau. It also expects students to explain how does the Tibetan plateau affect weather pattern in the Indian subcontinent.

Introduction:

The Tibetan Plateau, also known as the Himalayan Plateau in India is a vast elevated plateau in Central Asia and East Asia, mostly covers parts of the India, Bhutan and China.

Body:

Physiographic features of the Tibetan plateau:

- Physiography of an area is the outcome of structure, process and the stage of development.
- The Tibetan Plateau is usually considered the largest and highest area ever to exist in the history of Earth. The plateau covers an area about half the size of the contiguous United States and averages more than 5,000 meters (16,400 feet) above sea level.
- The Tibetan Plateau is extremely important to the world's water cycle because of its tremendous number of glaciers. These glaciers contain the largest volume of ice outside the poles.
- The Tibetan Plateau is surrounded by the massive mountain ranges of High-mountain Asia. The plateau is bordered to the south by the inner Himalayan range, to the north by the Kunlun Mountains, which separate it from the Tarim Basin, and to the northeast by the Qilian Mountains, which separate the plateau from the Hexi Corridor and Gobi Desert.
- The northern section of the plateau, called Qiangtang, is dotted with many brackish lakes; its southern section contains the headwaters of the upper Indus and Brahmaputra rivers.
- To the east and southeast the plateau gives way to the forested gorge and ridge geography of the mountainous headwaters of the Salween, Mekong, and Yangtze rivers in northwest Yunnan and western Sichuan (the Hengduan Mountains).
- In the west the curve of the rugged Karakoram range of northern Kashmir embraces the plateau. The Indus River originates in the western Tibetan Plateau in the vicinity of Lake Manasarovar.
- Other rivers that have their headwaters in the highlands are the Yangtze River (Chang Jiang), the Huang He (Yellow River), the Mekong, the Salween, and the Tarim.
- Grasslands are used for pasturage, and barley is grown on the plateau; forests grow on the slopes of valleys, particularly in the south.
- The most extensive farming in Tibet takes place on the fertile plains of the Brahmaputra River and its tributaries.

- Lhasa, the capital of Tibet, is the plateau's major centre of population, economic activity, culture, and air and land transportation.

Tibetan plateaus effect on weather pattern in India Subcontinent:

- Monsoons are caused by the different amplitudes of surface temperature seasonal cycles between land and oceans. This differential warming occurs because heating rates differ between land and water.
- Tibetan plateau is an important heating surface of the atmosphere. Approximately 2,400,000 square kilometres (930,000 sq mi) ice sheet covered the plateau.
- Onset of the summer monsoon in the beginning of June is promoted by the hydrodynamic effect the Himalayas and not by the thermally induced low-pressure centre over northwest India.
- With a much lower latitude, the ice in Tibet reflects at least four times more radiation energy per unit area into space than ice at higher latitudes. Solar heating in late spring heats the Indian subcontinent, making it warmer than the Indian Ocean. It also warms the Tibetan plateau that acts as an elevated heat source. This drives southwest monsoon winds towards the Indian landmass.
- The snow-monsoon tele-connection works by altering this temperature gradient. There is dominant effect of the Himalaya and Tibetan plateau snow on monsoon is because of albedo, the reflectivity of snow. Increased snow cover over the Himalaya and Tibetan plateau reflects more solar radiation, resulting in less than normal warming of the land surface there. Consequently, the temperature gradient decreases and monsoon winds weaken. This means they bring less moisture to India and don't penetrate as far north.
- The Tibetan plateau is the high level source of heat during summer time. During southwest monsoon, a thermal anticyclone appears over Tibet, which the resultant formation of dynamic anti-cyclogensis. On the south side of the anticyclone, the tropical jet stream is from.
- As a result, there is a sensible heat transfer from the elevated surfaces of the Himalayas and Tibet to the atmosphere. Besides this, large amounts of latent heat released by monsoon rains over India are also added to the upper troposphere anticyclone.
- Thus the presence of Tibet Highland is very important, as it helps for the onset of monsoon and helps to protect India from the northern cold winds.

Conclusion:

The Tibetan plateau due to its distinct and unique physiographic features plays a vital role on the weather of Indian subcontinent and also has a geopolitical strategic significance as it is known as the "Rooftop of the World;" Hence, more study of this plateau can also help to tackle the emerging challenge of the global warming induced climate change.

2. How do oceanic currents impact the global weather pattern? Illustrate with the help of suitable examples.

Demand of the question:

It expects students to give a clear description of the mechanism of the oceanic currents. It also expects students to elaborate in detail the impact of oceanic currents on the global weather pattern with examples.

Introduction:

The ocean covers 71 percent of the planet and holds 97 percent of its water, making the ocean a key factor in the storage and transfer of heat energy across the globe. The movement of this heat through ocean currents affects the regulation of global weather pattern.

Body:

Ocean currents are located at the ocean surface and in deep water below 300 meters (984 feet). They can move water horizontally and vertically and occur on both local and global scales.

- The ocean has an interconnected current, or circulation, system powered by wind, tides, the Earth's rotation (Coriolis effect), the sun (solar energy), and water density differences.
- The topography and shape of ocean basins and nearby landmasses also influence ocean currents. These forces and physical characteristics affect the size, shape, speed, and direction of ocean currents. Figure 1 represents the ocean currents.

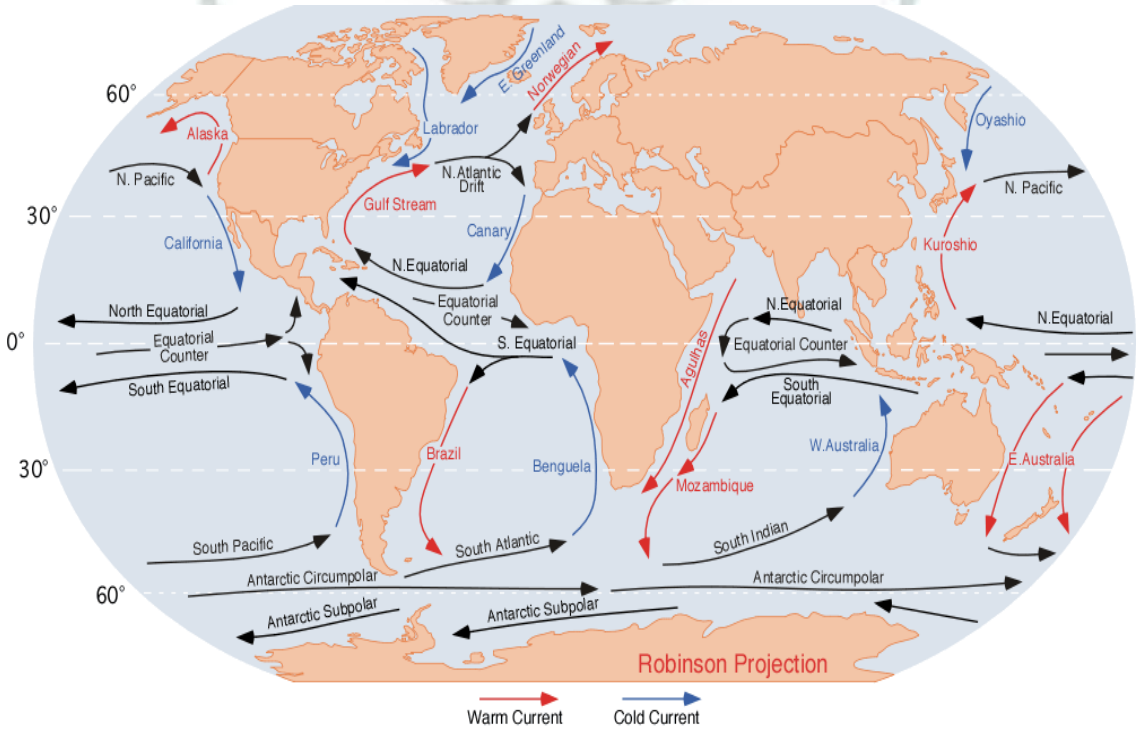

Figure 1: Oceanic Currents

- There are 2 types of Ocean Currents: First one's are Surface Currents also called Wind-Driven Currents and the second one's are Deep-water Currents also called Thermohaline Currents.
- The Surface Currents are a result of the Wind-stress and are modified by Coriolis force. deep-ocean currents are driven by differences in the water's density, which is controlled by temperature (thermo) and salinity (haline).

Impact on global weather pattern:

- Coastal Areas weather: Most of warm currents are found in eastern margin of continent in lower latitude and influencing the coastal climate such as North Atlantic drift in eastern USA, Florida current in gulf of Florida etc. So, Coastal areas will generally have more moderate temperatures than inland areas because of the heat capacity of the ocean.
- Fishing grounds: Places where cold currents meet warm currents are characterized by Fog conditions which make navigation difficult. These areas are also characterized by fishing grounds due to abundance of nutrients to support marine life. For instance, In E. Asia meeting of the warm Kuroshio and the cold Oyashio current provides ideal conditions for rich fishing grounds in Japan.
- Desiccating effects: Cold current brings the temperature down and creates a desiccating effect and foggy condition in the coastal area through which it passes.
- El-Nino and La-Nino: El-Nino is also caused due to periodic changes in cold water current replaced by warm water currents off Peruvian coasts which affects weather pattern of South Asia, Africa, and Oceania.
- Global Thermohaline circulation: Ocean currents act as global conveyor belts which transfer heat from one part of the earth to another. They regulate the coastal climate thereby indirectly regulating the vegetation, fauna and the lifestyles of the people.
- Great ocean conveyor belt: The global conveyor belt includes both surface and deep ocean currents that circulate the globe in a 1,000-year cycle. The global conveyor belts circulation is the result of two simultaneous processes: warm surface currents carrying less dense water away from the Equator toward the poles, and cold deep ocean currents carrying denser water away from the poles toward the Equator.
- The ocean's global circulation system plays a key role in distributing heat energy, regulating weather and climate, and cycling vital nutrients and gases.
- Desert: Cold current are generally found in the western margin of the continents in lower latitudes, usually associated with the desert landforms in these latitudes e.g. California current in western USA, Peru current in western south America etc.
- Temperature and Humidity: Warm current increases the temperature and humidity of the coastal area through which it passes, such as the Norwegian current which increase the temperature of the coastal areas of North Sea make the port workable and climate cool and moist.

Here we have seen the impact of ocean currents on the global weather pattern. However, due to global warming induced climate change the flow of ocean currents is affected in some regions. Such as, evidence from Greenland ice cores, showed that the North Atlantic circulation could come to an abrupt halt within the space of a century or two. Fears arose that global warming might trigger such a switch, which could wreak serious harm.

Conclusion:

As we know that climate change is the biggest global challenge from the environmental perspective, the knowledge of Ocean currents and their circulation can help to minimize the negative effect of climate change and will also help to re-establish the balance of the nature.

3. Which parts of the world are most prone to floods? With the help of suitable examples, explain the most common physiographic features that cause flooding of a place.

Demand of the question:
It expects students to give an account of the world's most flood prone areas. The question also expects an elaboration on the most common physiographic features that cause flooding of a place.

Introduction:
Floods are the most frequent type of natural disaster and occur when an overflow of water submerges land that is usually dry. Floods are often caused by heavy rainfall, rapid snowmelt or a storm surge from a tropical cyclone or tsunami in coastal areas.

Body:
The flood prone areas are well scattered in different parts of the country, ranging from the heavy rainfall areas to the scanty rainfall areas. According to the 'Coastal city Index', a research based in Netherlands and UK, following parts of the world are prone to flood:

- The South Asia including south eastern part of China.
- African continents South eastern part along with the area surrounding the Gulf of Guinea.
- South eastern part of North American continent and North western as well as South eastern part of South America.

Physiographic causes of flooding:

- Heavy Rains: The simplest explanation for flooding is heavy rains. Heavy rainfall can result in water arriving too quickly to infiltrate the soil. This increases surface run-off, leading water to reach the river channel quicker, resulting in a greater risk of flooding.
- Prolonged rainfall: Soil becomes saturated after prolonged rainfall. This leads to an increase in surface run-off as rainfall can no longer infiltrate the soil. This leads to more water entering the river channel increasing the likelihood of flooding.
- Lack of Vegetation: Vegetation can help slow runoff and prevent flooding. When there is a lack of vegetation, however, there is little to stop water from running off.
- Relief and Melting Snow and ice: The steeper the slope the more rapid the flow of water into a river channel, increasing the risk of flooding. A winter of heavy snow and other precipitation can lead to a spring of flooding. Most mountainous areas experience relatively consistent snowfall totals from year to year, but an unusually heavy winter of precipitation can spell bad news for low-lying areas around the mountains when spring hits.
- Soil type: Very wet, saturated soils, compacted or dry soil can aggravate the flooding in the surrounding area.

- Geology: Impermeable surfaces such as clay and granite do not allow infiltration leading to greater surface run-off. The risk of flooding increases as water reaches the river channel quickly, increasing discharge and the risk of flooding.

Conclusion:

Due to global warming as the sea level is going to rise, it is going to increase the frequency of floods in the flood prone areas. Hence, it becomes imperative to be prepared, to tackle the challenge of flooding in near future, as this challenge is going to pose numerous challenges ranging from increasing intensity of flooding to its wide scale effect on the GDP's of the country.