

Climate is also one of the most important factors affecting the soil formation processes with implication on soil structure, stability, water holding capacity, nutrient availability and erosion. Any change in climate and weather patterns could intensify soil erosion processes as explained below:

- **Frequent and intense precipitation events:** Soil erosion by running water is more significant in regions with heavy rainfall and steep slopes. Any rise in temperatures will intensify the earth's water cycle increasing evaporation, which will result in more frequent and intense rainfall events. **Higher rainfall intensity** results in **higher rates of infiltration excess runoff**, and a much greater transport of suspended sediment load.
- **Loss of vegetation cover:** In some areas, **intense heat results in reduced rainfall** and **increased soil moisture evaporation** contributing to drying and loss of vegetation. It reduces the permeability of the soil to rainwater, thus increasing surface runoff. Also, absence of plants increases susceptibility to water and wind erosion thus enhances the rate of erosion.
- **Severe sand storms:** With the **sudden rise in surface temperature** the soil is going to become drier. So, the **amount of soil that wind can carry is also increasing**. With both the intensity of the wind and dryness of the soil increasing, the intensity of dust storms is going to further increase in the future leading to blowing away of the top layer of soil. Further changes in soil surface conditions, such as surface roughness, sealing and crusting, may change with shifts in climate, and hence affect erosion rates.
- **Glacial melt:** An increase in glacial melt due to global warming **erodes the underlying rock by abrasion and plucking**. Glacial melt water seeps into cracks of the underlying rock, the water freezes and pushes pieces of rock outward.

Soil erosion continues to be a major environmental problem with regard to land use in India and elsewhere around the world. Furthermore, with changing climate and/or weather patterns, such problems are expected to increase due to forecasting of high intensity storms and denudation of forest cover. Hence, there is a need to adapt and mitigate the adverse effects of climate change in order to balance the soil formation processes.

6. ***Highlighting the conditions that are conducive for the formation of Karst topography, discuss its distribution around the world. (150 words) 10***

Approach:

- Briefly write about the landforms of Karst topography.
- Enlist the essential conditions for their development.
- Mention its distribution across the world, including India.
- Conclude by highlighting their significance.

Answer:

Landforms produced by **chemical weathering or chemical erosion of carbonate rocks** mainly calcium carbonate (limestones) and magnesium carbonate (dolomites) by surface and subsurface water (groundwater) are called Karst topography. Features such as **caves, sinkholes, underground rivers, swallow holes, uvalas, doline, barren and rocky ground** are all results of the chemical processes of karst topography. It derives its name from the characteristic landforms produced by chemical erosion on crystalline jointed limestones of **Karst region of erstwhile Yugoslavia** situated along the eastern margin of Adriatic Sea.

Essential conditions for development of Karst topography

- The limestones must be **massive, hard and tenacious, well cemented and well jointed**.
- Limestone must be **non-porous and thickly bedded** resulting in water infiltrating through joints leading to effective corrosion of limestones along the joints and solution holes would be formed. If limestones are porous, the water may pass through the rock mass and thus whole rock mass will become weak and will collapse.
- The position of limestone should be **above the groundwater table** so that surface drainage may disappear through sinks, blind valleys and sinking creeks to have subsurface drainage so that cave, passages etc. may be formed.