

Types of Soil Erosion

According to origin the soil erosion can broadly be categorised into two types i.e., geologic erosion and accelerated erosion. Under natural undisturbed conditions an equilibrium is established between the climate of a place and the vegetative cover that protects the soil layer. Vegetative covers like trees and forests retard the transportation of soil material and act as a check against excessive erosion. A certain amount of erosion, however, does take place even under the natural cover. This erosion, called **geologic erosion**, is a slow process and is compensated by the formation of soil under the natural weathering process. Its effect is not of much consequence so far as agricultural lands are concerned. On the other hand, when land is put under cultivation, the natural balance existing between the soil, its vegetation cover and climate is disturbed. Under such condition, the removal of surface soil due to natural agencies takes places at faster rate than it can be built by the soil formation process. Erosion occurring under this condition is referred to as **accelerated erosion**. Its rates are higher than geological erosion. Accelerated erosion depletes soil fertility in agricultural land.

According to erosion agents the soil erosion is broadly categorised into four different types depending on the agent which triggers the erosion activity viz, water erosion, wind erosion, glacial erosion and gravitational erosion.

A. Water Erosion

It is seen in many parts of the world. In fact, running water is the most common agent of soil erosion. This includes rivers which erode the river basin, rainwater which erodes various landforms, and the sea waves which erode the coastal areas. Water erodes and transports soil particles from higher altitude and deposits them in low lying areas. Water erosion may further be classified, based on different actions of water responsible for erosion, as: (i) raindrop erosion, (ii) sheet erosion, (iii) rill erosion, (iv) gully erosion, (v) stream bank erosion, and (vi) slip erosion.

Sheet Erosion: Sheet erosion is the removal of soil in thin layers by raindrop impact and shallow surface flow. This action called skimming and is prevalent in the agricultural land. It results in loss of the finest soil particles that contain most of the available nutrients and organic matter in the soil. Soil loss is so gradual that the erosion usual cumulative impact accounts for large soil losses. This type of soil erosion is mainly responsible for loss of soil productivities. Soils most vulnerable to sheet erosion are overgrazed and cultivated soils. Early signs of sheet erosion include bare areas, water puddling as soon as rain falls, visible grass roots, exposed tree roots, and exposed subsoil or stony soils. Soil deposits on the high side of obstructions such as fences may indicate active sheet erosion. Vegetation cover is vital to prevent sheet erosion because it protects the soil, impedes water flow and encourages water to infiltrate into the soil. The surface water flows that cause sheet erosion rarely flow for more than a few metres before concentrating into rills.

Rill Erosion: Rills formation is the intermittent process of transforming to gully erosion. The advance form of the rill is initial stage of gully formation. The rills are shallow drainage lines less than 30 cm deep and 50 cm wide. They develop when surface water content depressions or low points through paddocks and erodes the soil. Rill erosion is common in bare agricultural land, particularly overgrazed land, and in freshly tilled soil where the soil structure

has been loosened. The rills can usually be removed erosion is mostly occurs in alluvial soil and is quite frequent in Chambal River valley in India. is the removal of soil in thin layers by raindrop impact and shallow surface flow. This action called skinning and is prevalent in agricultural land. It results in loss of the finest soil particles that contain most of the available nutrients and organic matter in the soil. Soil loss is so gradual that the erosion usually goes unnoticed, but the cumulative impact accounts for large soil losses. This type of soil erosion is mainly responsible for loss of soil productivities. Soils most vulnerable to sheet erosion are overgrazed and cultivated soils where there is little vegetation to protect and hold the soil. Early signs of sheet erosion include bare areas, water puddling as soon as rain falls, visible grass roots, exposed tree roots, and exposed subsoil or stony soils. Soil deposits on the high as fences may indicate active sheet erosion. Vegetation cover is vital to prevent sheet erosion because it protects the soil, impedes water flow and encourages water to infiltrate into the soil. The surface water flows that cause for more than a few metres before concentrating into rills.

Gully Erosion: The advance stage of rills is transformed into initial stage of gully. Gully formation are initiated when the depth and width of the rill is more than 50 cm. Gullies are deeper channels that cannot be removed by normal cultivation. Hillsides are more prone to gully when they cleared of vegetation, through deforestation, over-grazing or other means. The eroded soil is easily carried by the flowing water after being dislodged from the ground, normally when rainfall falls during short, intense storms. Depending upon the depth and width, the gullies further divided into 4 classes namely G1, G2, G3 and G4. Gullies reduce the productivity of farmland where they incise into the land, and produce sediment that may clog downstream water bodies. Because of this, much effort are required to invested into the study of gullies within the scope of geomorphology, in the prevention of gully erosion, and in restoration of gullied landscapes. The total soil loss from gully formation and subsequent downstream river sedimentation can be sizable.

Tunnel Erosion: Tunnel erosion occurs when surface water moves into and through dispersive sub soils. Dispersive soils are poorly structured so they erode easily when wet. The tunnel starts when surface water moves into the soil along cracks or channels or through rabbit burrows and old tree root cavities. Dispersive clays are the first to be removed by the water flow. As the space enlarges, more water can pour in and further erode the soil. As the tunnel expands, parts of the tunnel roof collapse leading to potholes and gullies. Indications of tunnel erosion include water seepage at the foot of a slope and fine sediment fans downhill of a tunnel outlet. This type of erosion is more frequent in foothills where elevation is between 500–750 m.

Stream Bank Erosion: Stream bank erosion occurs where streams begin a consequence of increased peak flows or the removal of local protective vegetation. Stream bank erosion is common along rivers, streams and drains where banks have been eroded, sloughed or undercut. This is quite preva bank erosion becomes a problem where development has limited the meandering nature of streams, where streams have been channelised, or where stream bank structures (like bridges, culverts, etc.) are located in places where they can actually cause damage to downstream areas. Stabilising these areas can help protect watercourses from damage to adjacent land uses, control unwanted meander, and improvement of habitat for fish and wildlife.

Coastal erosion: About 40% of the Indian coasts are subjected to severe erosion that has the potential to Soil erosion is initiated by detachment of soil particles due to action of rain.