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CVE 512 ASSIGNMENT

**CONCEPT OF SEDIMENT TRANSPORT AND HOW IT AFFECTS COASTAL AREAS**

Sediment transport is important in the fields of [sedimentary geology](https://en.wikipedia.org/wiki/Sedimentary_geology), [geomorphology](https://en.wikipedia.org/wiki/Geomorphology), [civil engineering](https://en.wikipedia.org/wiki/Civil_engineering) and [environmental engineering](https://en.wikipedia.org/wiki/Environmental_engineering) .Knowledge of sediment transport is most often used to determine whether [erosion](https://en.wikipedia.org/wiki/Erosion) or deposition will occur, the magnitude of this erosion or deposition, and the time and distance over which it will occur. **Sediment transport** is the movement of solid particles ([sediment](https://en.wikipedia.org/wiki/Sediment)), typically due to a combination of gravity acting on the sediment, and /or the movement of the [fluid](https://en.wikipedia.org/wiki/Fluid) in which the sediment is entrained. Sediment transport occurs in natural systems where the particles are [clastic](https://en.wikipedia.org/wiki/Clastic%22%20%5Co%20%22Clastic) rocks ([sand](https://en.wikipedia.org/wiki/Sand), [gravel](https://en.wikipedia.org/wiki/Gravel), [boulders](https://en.wikipedia.org/wiki/Boulders), etc.), [mud](https://en.wikipedia.org/wiki/Mud), or [clay](https://en.wikipedia.org/wiki/Clay); the fluid is air, water, or ice; and the force of gravity acts to move the particles along the sloping surface on which they are resting. Sediment transport due to fluid motion occurs in [rivers](https://en.wikipedia.org/wiki/River), [oceans](https://en.wikipedia.org/wiki/Ocean), [lakes](https://en.wikipedia.org/wiki/Lake), [seas](https://en.wikipedia.org/wiki/Sea), and other bodies of water due to [currents](https://en.wikipedia.org/wiki/Current_%28fluid%29) and [tides](https://en.wikipedia.org/wiki/Tide). Transport is also caused by [glaciers](https://en.wikipedia.org/wiki/Glacier) as they flow, and on terrestrial surfaces under the influence of [wind](https://en.wikipedia.org/wiki/Wind). Sediment transport due to only gravity can occur on sloping surfaces in general, including [hillslopes](https://en.wikipedia.org/wiki/Hill%22%20%5Co%20%22Hill), [scarps](https://en.wikipedia.org/wiki/Escarpment), [cliffs](https://en.wikipedia.org/wiki/Cliff), and the [continental shelf](https://en.wikipedia.org/wiki/Continental_shelf)-continental slope boundary.

**Concept of sediment transport**

The simplest definition of sediment transport is the transport of granular particles by fluids. The main agents by which sedimentary materials are moved include gravity (gravity transport), river and stream flow, ice, wind, and estuarine and ocean currents. Running water and wind are the most widespread transporting agents. In both cases, three mechanisms operate, although the particle size of the transported material is very different, owing to the differences in density and viscosity of air and water. The three processes are rolling or traction, in which the particle moves along a sedimentary bed but is too heavy to be lifted from it; saltation; and suspension, in which particles remain permanently above the bed, sustained there by the turbulent flow of the air or water.

How sediment transport affects coastal areas

1. It results in the formation of characteristic coastal landforms such as [beaches](https://en.wikipedia.org/wiki/Beach), [barrier islands](https://en.wikipedia.org/wiki/Barrier_islands), and capes.
2. It takes place in near-shore environments due to the motions of waves and currents.
3. In coastal waters, sediment transport processes are strongly affected by high-frequency waves introducing oscillatory motions acting on the particles. The high-frequency (short) waves generally act as sediment stirring agents; net sediment transport is due to the mean current.

## Effects of Sediment Transport and Deposition

While sediment is needed to build aquatic habitats and reintroduce nutrients for submerged vegetation, too much or too little sediment can easily cause ecosystem and safety issues. Whether the concerns are caused by scour, erosion, build up, or simply excessive turbidity, the sediment transport rate is an important environmental factor. In addition to the problems cause by load quantity, sediment can easily introduce pollution and other contaminants into a waterway, spreading the pollutants downstream.

### Too Much Sediment

Large sediment loads are the most common issue seen with sediment transport rates. Too much sediment can cause poor water quality, algal blooms, and deposition build-up. For aquatic life, excessive suspended sediment can disrupt natural aquatic migrations, as well damage gills and other organs.

Diminished water quality occurs with unusually high sediment transport rates. Turbidity can cause water temperatures to rise (sediment absorbs more solar heat than water does). Rising water temperatures will cause dissolved oxygen levels to drop, as warm water cannot hold as much oxygen as cold water. Suspended sediment can block sunlight from reaching submerged plants, decreasing photosynthesis rates and lowering dissolved oxygen levels still further. If the increase in the sediment load is due to agricultural and urban runoff, algal blooms can occur from the increased nutrient load carried into the water body.

Regular sediment deposition can build bars for aquatic habitats, but increased sedimentation can destroy more habitats than it creates. Siltation, the name for fine sediment deposition, occurs when water flow rates decrease dramatically. This fine sediment can then smother insect larvae, fish eggs and other benthic organisms as it settles out of the water column. Deposition can also alter a waterway’s banks and direction as an unusually high sediment load settles out. Sediment deposition is responsible for creating alluvial fans and deltas, but excessive accumulation of sediment can build up channel plugs and levees. These deposits then block the river from reaching other stream threads or floodplains. Increased sedimentation is considered one of the primary causes of habitat degradation. Depending on the local geology and terrain, sediment build-up can damage aquatic ecosystems not only in downstream sites, but in upstream headwaters as the deposits grow.

Sediment deposition is considered extreme when it exceeds the recommended or established total maximum daily load (TMDL). A TMDL establishes a limit for measurable pollutants and parameters for a body of water. That means that TMDLs can be created for several different elements of the sediment load, including total suspended solids, nutrient impairment, pathogens and siltation. When developing a TMDL report, it is important to consider whether or not the waterway itself is generating the sediment load naturally, as an unstable stream channel.

**Too Little Sediment**

Coastline erosion can be tied to sediment starvation – when rivers do not bring enough sediment to be deposited on the beach.

Though too much sediment is the more common concern, a lack of sediment transport will also cause environmental issues. Sediment starvation is often caused by man-made structures such as dams, though natural barriers can also limit sediment transport. Without sediment transport and deposition, new habitats cannot be formed, and without some nutrient enrichment (carried with sediment into the water), submerged vegetation could not grow. Too little sediment can alter an ecosystem to the point that native species cannot survive.

**Contaminated Sediment**

Contaminated sediments are the accumulated riverbed materials that contain toxic or hazardous substances that are detrimental to aquatic, human or environmental health. These contaminants often come from point-source pollution (such as industrial wastewater or other effluent sources), though they can also enter the water through runoff over contaminated soils (mine waste, landfills and urban areas), chemical spills, or deposits from air pollution. As contaminants do not degrade (or degrade very slowly), they can be a source of environmental issues for long periods of time, even if they are not frequently suspended. The most problematic contaminants in both bedded and suspended sediment are metals and persistent bio accumulative toxics (PBTs), such as pesticides and methyl mercury.

Sediment remediation may involve dredging to remove the contaminated sediment from the waterway.