



Movement of Sediments in Aquatic and Coastal Systems and Its Environmental Influence

Mateo Lindberg*

Department of Earth Surface Processes, North Sea Institute of Geoscience, Tromsø, Norway

DESCRIPTION

Sediment transport refers to the movement of solid particles such as sand, silt, clay and gravel by natural forces including water flow, wind, ice and gravity. In aquatic environments, rivers, estuaries, coastal zones and ocean currents play a major role in redistributing sediments across landscapes. This movement shapes landforms, influences habitat structure, affects water quality and plays an important role in coastal and riverine ecosystem dynamics. Sediment transport is a continuous process that connects upland regions with downstream environments and ultimately with the ocean floor.

Rivers are one of the primary agents responsible for sediment movement. As water flows from high-altitude regions toward lower elevations, it erodes soil and rock materials from riverbanks and beds. These materials are carried downstream in different forms depending on particle size and water velocity. Larger particles such as gravel and sand are often transported along the riverbed through rolling or sliding movements, while finer particles like silt and clay remain suspended within the water column. Seasonal variations in rainfall and river discharge strongly influence sediment load and transport intensity.

As rivers reach coastal areas, sediment transport becomes closely linked with tidal action and wave dynamics. Estuaries, where freshwater meets seawater, are particularly active zones for sediment deposition and redistribution. The mixing of river currents with tidal flows creates complex circulation patterns that influence where sediments settle. Fine particles often accumulate in estuarine mudflats, while coarser materials are deposited closer to river mouths. These depositional environments support wetlands, mangroves and other coastal habitats that depend on nutrient-rich sediments.

Coastal sediment transport is shaped by waves, tides and longshore currents. Waves approaching the shoreline at an angle generate movement of sand along the coast, a process known as longshore drift. This mechanism gradually shifts sediment from one area to another, forming beaches, spits and barrier islands.

Changes in wave energy, storm frequency and sea level can significantly alter sediment distribution patterns along coastlines. In some regions, sediment erosion exceeds deposition, leading to shoreline retreat and coastal land loss.

Wind also contributes to sediment transport, particularly in dry coastal regions and desert environments. Fine sand particles can be lifted and carried over long distances, forming dunes and other aeolian landforms. Coastal dunes act as natural barriers that protect inland areas from storm surges and wave action. Vegetation plays an important role in stabilizing these dunes by reducing wind speed at the surface and trapping moving sand particles.

Sediment transport has important ecological implications because it influences habitat formation and water quality. Coastal wetlands, mangroves and deltas depend on a steady supply of sediment to maintain their structure and elevation. Without sufficient sediment input, these ecosystems may become submerged due to rising sea levels. Sediments also carry nutrients that support plant growth and aquatic food webs. However, excessive sediment loads can reduce water clarity, block sunlight penetration and disrupt photosynthetic processes in aquatic plants and algae. Human activities have significantly altered natural sediment transport processes in many regions. Deforestation, agriculture, mining and urban development increase soil erosion rates, leading to higher sediment loads in rivers.

CONCLUSION

Sediment transport remains a fundamental natural process that shapes Earth's surface and supports ecological systems. Its influence extends from mountain catchments to deep ocean basins, connecting terrestrial and marine environments through continuous material movement. Understanding sediment dynamics is essential for managing water resources, protecting coastal infrastructure, maintaining ecosystem health and adapting to environmental changes affecting landscapes

Correspondence to: Mateo Lindberg, Department of Earth Surface Processes, North Sea Institute of Geoscience, Tromsø, Norway, E-mail: mateo.lindberg@nsigeo.no

Received: 24-Sep-2025, Manuscript No. JCZM-25-31572; **Editor assigned:** 26-Sep-2025, Pre QC No. JCZM-25-31572 (PQ); **Reviewed:** 10-Oct-2025, QC No. JCZM-25-31572; **Revised:** 17-Oct-2025, Manuscript No. JCZM-25-31572 (R); **Published:** 24-Oct-2025, DOI: 10.35248/2473-3350.25.28.707

Citation: Lindberg M (2025). Movement of Sediments in Aquatic and Coastal Systems and Its Environmental Influence. J Coast Zone Manag. 28:707.

Copyright: © Lindberg M. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

worldwide. Climate change has introduced additional complexity into sediment transport processes. Changes in rainfall patterns affect river discharge and erosion rates. Increased storm intensity may lead to higher sediment mobilization and coastal reshaping. Sea level rise can alter

sediment deposition zones and influence estuarine circulation patterns. These changes require updated management approaches to protect vulnerable coastal and riverine environments.