

The Dynamic Coast: How Sand on the Move Shapes Our Shorelines

Coastlines are in a constant state of change, shaped by the dynamic interplay between energy from waves, tides, and storms, and the movement of sediment. Understanding these processes is key to predicting shoreline changes and managing coastal zones effectively.

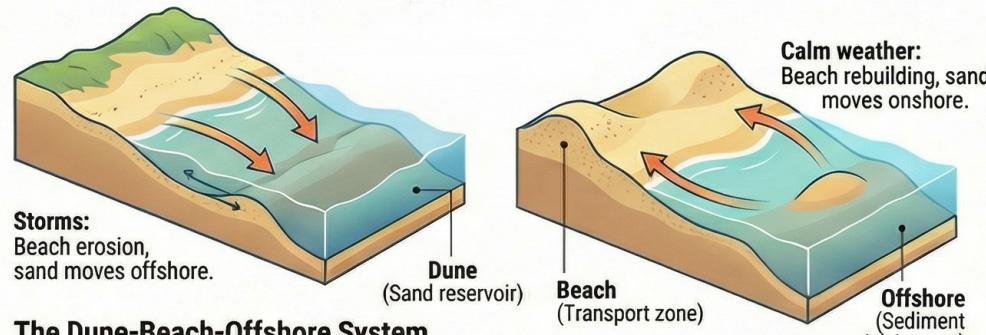
The Primary Forces Shaping Our Coasts

Coastlines are shaped by five key natural drivers acting over different time scales, from the seconds-long action of waves to the centuries-long effect of sea-level rise.



The Two Directions of Sediment Transport

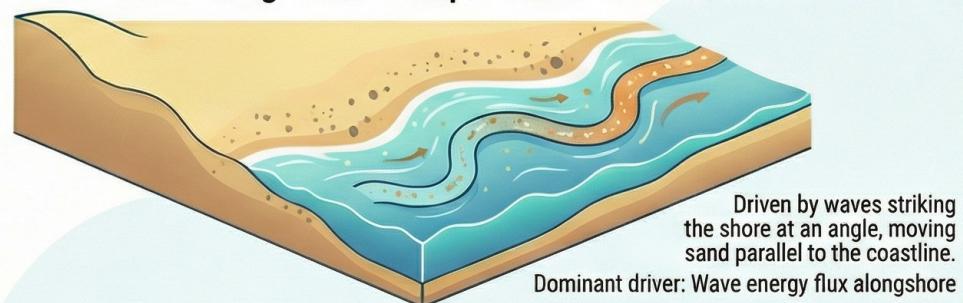
Cross-Shore Transport: An In-and-Out Exchange



The Dune-Beach-Offshore System

These three zones act as a connected reservoir, exchanging sand to adapt to changing wave energy.

Longshore Transport: A “River of Sand”



Sediment Transport Comparison

	Longshore Transport	Cross-Shore Transport
Primary Motion	Continuous current-driven drift	Alternating onshore/offshore movement
Transport Direction	Largely one-way (net littoral drift)	Two-way, strongly time-varying
Dominant Driver	Wave energy flux alongshore	Oscillatory flow and wave breaking