



# KETRI BUNDER

## WHERE THE SEA IS REDRAWING THE LAND

Nestled at the edge of the Indus delta, Ketri Bunder is more than just a coastal town, it's a thriving sanctuary for life. Its mangrove belts are among Pakistan's most significant, providing shelter to incredible wildlife diversity. Tiny mudskippers dart through the muddy roots, crabs scuttle along the banks, and prawns and fish, like Indian shad and mullet, find safe haven in these waters. The skies above are equally alive, with migratory visitors such as flamingos, sandpipers, and Eurasian oystercatchers mingling with resident kingfishers and herons.

But beneath this abundance, the landscape itself is shifting; and not in its favour. Ketri Bunder has witnessed devastating tropical cyclones like, 02A (1999), Yemyin (2007), Phet (2010), and Biparjory (2023), bringing widespread damage, displacement and repeated disruption to life along its shores. Combined with rising sea levels, reduced freshwater from the Indus river, and strong wave action, the mangroves are now at risk- as erosion silently redraws the coastline they stand on.



Figure 1: Ketri Bunder as seen on Google Earth Target area highlighted in yellow color

To better understand this threat Keti Bunder's shoreline was mapped across 1952, 2008 and 2025, using the Digital Shoreline Analysis System (DSAS), a GIS tool. High-resolution historical aerial and satellite imagery, along with Google Earth images, provided a bird's eye view of how the coast has shifted over time, revealing a grim reality.



Figure 2: Shoreline change over different years, as witnessed by Google Earth Images Hajamro (a, b, c) and Khober Creek (d, e, f)

The shoreline of Keti Bunder is a living record of change. Some areas show severe erosion, threatening both habitats and livelihoods, while only a few pockets exhibit sediment buildup and limited seaward growth. Stretches near Hajamro and Kap creek, have undergone significant landward migration- evidence of the persistent push of waves and tides. In contrast, smaller areas like Khober creek have seen occasional sediment gain, underscoring the shoreline's complex and uneven dynamics.

This patchwork of erosion and accretion reveals a shoreline that is not just dynamics, but increasingly imbalanced- where gains may be isolated or short-lived, and losses are widespread and enduring.

Quantitative analysis confirms a dominant erosion trend along Keti Bunder's coastline. Shoreline retreat accounts for nearly 85% of the studied transects, with a strong long-term erosion rate of  $-10.3 \pm 6.2$  m/year. In several segments, erosion exceeds  $-31$  m/year, amounting to an estimated cumulative shoreline loss of approximately 752 meters between 1952 and 2025.

In contrast, accretion is limited to just 15% of transects and remains confined to small, isolated patches. Although localized gains reach up to  $+28.25$  m/year, they are spatially restricted and statistically insufficient to offset the widespread and persistent erosion.

Linear Regression Rate (LRR) analysis indicates an average retreat of approximately 10.3 m/year, highlighting a sustained and long-term pattern of shorelines loss over the past seven decades.

Keti Bunder reflects the fragile interface between land and sea, and these findings underscore the need for continuous monitoring and ecosystem-based management approaches and interventions to strengthen shoreline resilience in this mangrove landscape.

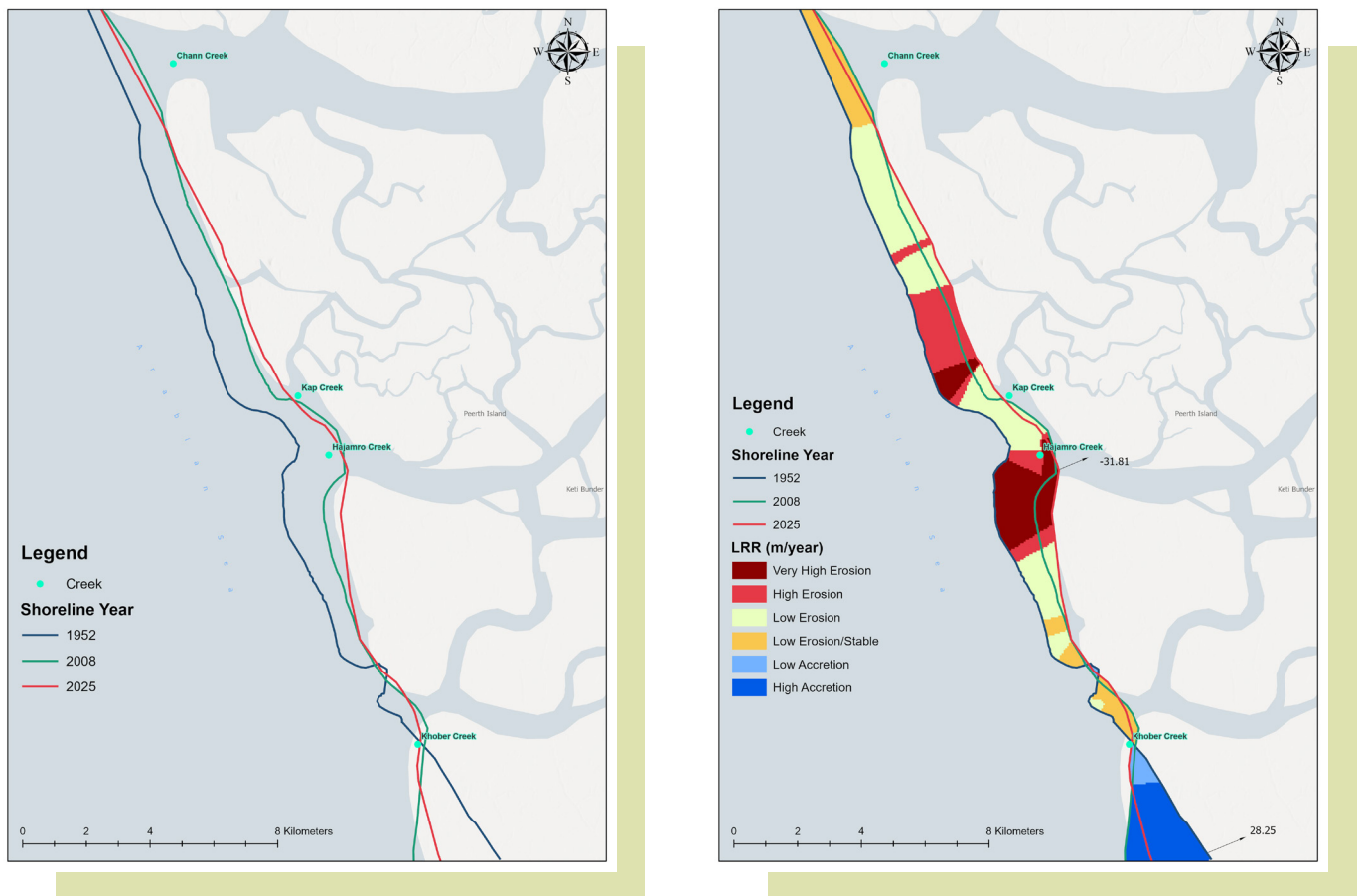


Figure 3: Keti Bunder shoreline change analysis (1952–2025)  
Arrows in the map denote areas with highest erosion and accretion

## WHAT DOES THIS MEAN FOR NATURE?

As the shoreline changes, the ecological fabric of the Delta is being reshaped. Mangroves, which serve as critical buffers against storm surges and act as nursery grounds for marine life, are under increasing stress. Their degradation also triggers cascading impacts across the food web, affecting fish, crustaceans, and coastal biodiversity.

## WHAT DOES THIS MEAN FOR PEOPLE?

As land is gradually lost to erosion and salinity intrusion increases, homes, grazing areas, and freshwater sources are steadily compromised. Fishing communities, already dependent on fragile coasts, face declining catch as habitats deteriorate, deepening economic vulnerability and accelerating displacement pressures.

## KEY IMPLICATIONS



### Coastal livelihoods under pressure

Land loss and salinity intrusion are reducing agricultural productivity and freshwater availability, increasing economic insecurity.

### Habitat degradation and biodiversity loss

Weakening mangrove systems are disrupting critical breeding and feeding grounds for fish, crabs and migratory birds.



### Reduced natural protection

Declining mangrove cover is weakening the coast's natural defense against storms and tidal surges; increasing long term vulnerability.

### System under imbalance

With erosion dominating and accretion remaining limited and localized, the shoreline signals a progressively unstable coastal ecosystem.



### Credits

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