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Analysing the case of

Coastal Development in India's Western Coast: Karnataka

| Bhamini Rathore

Issue Brief

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ISSUE BRIEF

Analysing the case of Coastal Development in India's Western Coast: Karnataka

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ABSTRACT

India's 7,516 kilometres long mainland coastline is home to over 13,000 marine species and is a source of employment for over 20 lakh people. An extensive coastline, though lucrative for a country's economic development, also makes the country vulnerable to geopolitical and climate change threats. Due to their economic significance, coastal areas have become hotspots for rapid urbanisation. In July 2022, the central government exempted all expansionary projects up to 100 kilometres of biodiversity hotspots like the Himalayas, beaches, forests, etc., from environmental clearance in the interest of strategic, defence, and security considerations. These projects include highways, fishing ports and harbours, and biomass-based thermal power plants, which raise environmental concerns about soil erosion, coral reefs destruction, and depletion of fisheries near shorelines, thereby straining the ecosystem. India's eastern coast is eroding at a faster rate than the west coast due to strong littoral drift, threatening the marine ecosystem and displacing local fishermen. However, the western coast is likely to encounter environmental issues as well due to the conflict between development and environmental conservation.

This issue brief looks at Karnataka, which lies in a delicate spot of port development, rising sea levels, and declining mangroves. The research studies how the region struggles to protect the coastline and the Western Ghats. We examine the influence of coastal development on the region's biodiversity, settlements, and topography—the article advocates for prioritising climate action in coastal areas and provides recommendations for designing resilient coastal regions.

INTRODUCTION

Coastal locations are coveted for trade, industry, military, and residential activities due to their profitability. Globalisation has necessitated the transfer of vast quantities of raw materials and commodities, calling for an emphasis on constructing ports and harbours. At the same time, the areas around the ports face pressure to develop industries like maritime, shipping, petrochemicals, etc., tourism, and communities (Kudale, 2010). Consequently, marshy lands and tidal flats are retrieved, creeks are redirected, mangroves are destroyed, and major businesses, ports, and projects develop in their place (ibid.). It changes the coast from a natural landscape to a collage of human activities. Natural ecosystems are stressed, leading to ecosystem services breakdown and biodiversity loss.

Indian coastal regions, with a 7,516-kilometer shoreline, are habitats to some of the biosphere's most significant ecosystems– estuaries, backwaters, and coastal wetlands. India's diverse biodiversity includes species from various ecosystems, such as mangroves, lagoons, oceanic islands, and coastlines. More than 11,000 faunal and 800 floral species have been discovered in Indian coastal regions (Council for Scientific and Industrial Research, 2011). However, the terrestrial and marine ecosystems in coastal zones are fading away due to rising sea levels, coastal erosion, changing coastlines, and increasing temperatures. Rapid sedimentation and frequent weather events like tsunamis, floods, and storms are frequent results of the loss and degradation of coastal ecosystems.

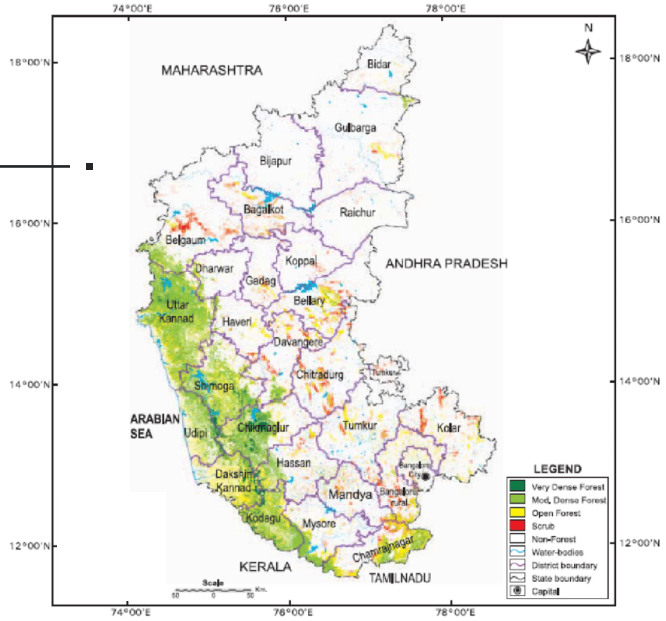
This issue brief examines the effects of climate change and coastal development on ecosystems like mangroves and coral reefs. It uses Karnataka as a case study, with its 320 kilometres long coastline. Karnataka has one of the most significant shares of the Western Ghats undergoing coastal development. The article also highlights the impact of changing marine patterns on coastal settlements and advocates for the urgency of climate action in coastal areas.

This issue brief analyses the role of Indian banks in the climate crisis by reviewing their investments and lending portfolios in fossil fuel projects and evaluating their stances on global climate agreements.

OVERVIEW: KARNATAKA, BIODIVERSITY, AND ECOSYSTEMS

FIGURE 1:
KARNATAKA STATE MAP

Source: Indian Institute of Science (n.d.)



Karnataka's coastal zone is a complex and dynamic but sensitive ecosystem. It comprises three types of beaches: sandy, rocky, and muddy flat. With a population density of about 1,500 people per square kilometer, it is one of the world's most densely inhabited coastal zones. The Western Ghats extend parallel to Karnataka's coastline. The Ghats are vital since fourteen rivers flow from them into the Arabian Sea, substantially contributing to the diversity of coastal ecosystems by providing nutrient benefits, dissipating sea wave energy, and protecting against tsunamis. The southwest coast of Karnataka has a rich biodiversity with 184 species of fish fauna, 59 species of mangroves, and nearly 14 species of coral reefs (Zacharia et al., 2008).

The coastal waters of India's southwest coast sustain a diverse marine ecology and are among the most valuable in the world due to coastal upwelling. Karnataka's coastal zone also comprises 27,000 square kilometres of a continental shelf and 31 operational Special Economic Zones [SEZ] out of 51 (College of Fisheries, 2021; Press Information Bureau [PIB], 2019). As a result, Karnataka facilitates economic expansion in agriculture and horticulture, fishing and aquaculture, shell mining, harbour development, and trade and transportation (Environmental Management & Policy Research Institute, n.d.). Such development impetus naturally affects coastal ecosystems, including mangroves, coral reefs and fisheries. Climate change threatens 101 offshore islands in Karnataka out of 120, while little focus has been given to the coastline and islands by the government (Khanna, 2021).

Moreover, since 2014, Karnataka has been on a port-development spree under the Karnataka Minor Ports Development Policy. The state is developing one major and 12 minor ports (Government of Karnataka, 2014). Rapid port development has further pressurised coastal commons such as pastures, forests, fishing grounds, sacred groves, etc., increasing the risk of biodiversity loss and livelihood vulnerability.

COASTAL ECOSYSTEM: MANGROVES, FISHERIES AND CORALS REEFS

The mangrove ecosystem is essential to protect against coastal erosion and bring down the effects of natural disasters like storms and cyclones. Mangroves also provide haven and nutrition for many juveniles and larvae of fishes, other mammals, and birds (Venkataraman, 2012). Karnataka hosts 10.04 square kilometres of mangroves in its Uttara Kannada and Udupi regions, with 18 dominant species (Forest Survey of India, 2019). However, due to developmental pressures, including agriculture, aquaculture, tourism, urban development, industrialisation, and over-exploitation, mangroves in India are declining rapidly. It is recorded that between 1975 and 1981, over 7,000 hectares, i.e. 40% of India's mangroves, were lost (Environmental Management & Policy Research Institute, n.d.). Karnataka also witnessed a steep decline in mangroves from 6,000 hectares in 1987 to 300 hectares in 1997 (ibid.) While this decline results from aquaculture exploitation and reclamation activities, environmental changes like rainfall levels due to global warming are also at fault.

Mangrove forest borders are also frequently used as a breeding ground and nursery habitat for marine life, which helps enhance stocks of fisheries, establish commercially significant marine fisheries, and add economically valuable marine fisheries. This ecosystem directly or indirectly supports the livelihoods of those living in and around the mangrove. More than 97 settlements comprising over

1 - Blowing off of continental coastlines by strong winds and the earth's rotation generate a phenomenon known as coastal upwelling that pushes surface waters offshore. Then, water from the ocean's depths is drawn up, or upwelled, to the surface to replace it.

1,57,989 people are spread across 100 km of Karnataka's coast, largely dependent on agriculture and fishing (Vohra, 2022). Climate change impacts, like the rise in sea surface temperature, have led to regime shifts of fish around the coast of Karnataka as many common species have migrated to seek suitable habitation (Krishnakumar et al., 2006). Developmental encroachment, like port construction and highways along the coastline, has put additional pressure on fisher communities in Karnataka. For instance, 2,000 fisherwomen's livelihood is threatened due to the construction of a 4-kilometre road on a beach in Uttara Kannada. The beach is a village common where these women have been drying their fish for a long time. Protests in 2021 to protect the eco-sensitive area and fisher livelihoods resulted in the demolition of fishing equipment and sheds of fishers and detainment by state police (Vohra, 2022). Therefore, immense pressure was created on coastal management systems, where fisher communities play a crucial role in maintaining sustainable conservation practices.

Though Karnataka lacks significant coral deposits, 14 types of coral reefs have been discovered on Netrani island off the coast (Zacharia et al., 2008). Coral reefs, much like mangroves, serve as physical ecosystem engineers for fish and other tiny marine organisms. They help stabilise shoreline development by reducing the power of waves as they approach the beach. Coral reefs, on the other hand, are more susceptible than mangroves because corals are temperature-sensitive and bleach due to warm water (College of Fisheries, 2021). Furthermore, numerous anthropogenic activities, including overfishing, exploitation of corals for the aquarium market, marine trash, silt, and nutrient or chemical contamination from land and ships, can further damage coral reefs.

CHALLENGES TO KARNATAKA'S COAST

With the increasing severity of climate change, Karnataka and other coastal states in India are at the forefront of experiencing its effects. According to the National Assessment of Shoreline changes and the Indian Coast Report, the state has witnessed a coastline erosion of over a fifth of its coastline between 1990-2016 (Kankara, Ramana, & Rajeevan, 2018). The erosion issue is more severe in the Dakshin Kannada and Udupi regions (Chandran et al., 2012). Coastal water erosion can result in substantial losses of land and property. They put coastal settlements and marine biodiversity at risk of extinction. Such biodiversity protects against natural calamities like storms and floods and supports life on land and underwater.

Added to the erosion problem is the pressure of coastal construction as Karnataka joins India's vision of 'Sagarmala' and continues its spree to build coastal ports and harbours, railways, and highways to facilitate connectivity for trade and commerce. The construction will not only raise pollution levels off the coast of Karnataka but also create excess pressure on the ports' land and expose the areas to hazardous materials and industry discharges (Kudale, 2010). Water quality, coastal hydrology, and marine and coastal ecology will be impacted as the construction will starve the coast of sediments that the rivers would otherwise carry and disrupt the natural balance. Moreover, to facilitate its vision of infrastructure development, Karnataka's new industrial policy has made it easier to acquire land. It has removed restrictions on land conversion and exempted industries from the Karnataka Land Reforms Act 1961, targeting national and international investors for port development and management. Privatisation of ports and habours risks resource exploitation and regulatory non-compliance, which can further contribute to deterioration of the region's resources. Multiple port projects in Karnataka have already run into trouble from coastal communities resisting development to protect their livelihoods and local biodiversity.

As severe storms hit the coast of Karnataka and destroyed shelters and homes of coastal communities, the state turned to the construction of seawalls and groynes for protection. Currently, more than 20 seawalls cover near 15% of Karnataka's coast. Despite preventing soil erosion, seawalls disturb longshore drift and cause down shore erosion, redirect water flow, and create water pressure in a narrow opening. These river mouths then become spots for higher erosion (Vinayaraj et al., 2011). Moreover, shoreline hardening affects the functioning and habitat of ecosystems. Structures like seawalls support 23% less biodiversity and nearly 45% lesser organisms (Gittman et al., 2016). Moreover, while seawalls provide protection to coastal settlements, they also forcibly change livelihood patterns. They disconnect coastal communities from the shores and alter their use and reliance of marine ecosystem reserves. Therefore, though seawalls provide momentary relief and protection, their long term efficiency is questionable.

CONCLUSION:

Soil erosion in Karnataka's coastal regions is critical. It affects marine life, land biodiversity, and coastal settlements. While the cause of higher soil erosion over the years is attributed to climate change effects, construction and commercialisation of the coastline have not been helpful. Such commercialisation directly impacts marine life as practices like overfishing and dumping industrial pollutants in river bodies are taken up. However, it also indirectly destroys the coastline morphology by trapping sand upstream, causing structural shore erosion. As Karnataka permits the construction of ports, harbours, highways, and industries on its coast, coastal biodiversity and land stand at risk. Such structural changes could also bring about coastal migration to the inner regions of the state to seek livelihood opportunities, as the coasts will be left inhabitable. While CSOs engage in coastal conservation activities, the state has only sought seawalls as a way of coastal preservation, considering coastal erosion on the shore is in patches. The Integrated Coastal Zone Management [ICZM] plan is essential in ensuring livelihood security and environmental conservation, but in Karnataka's development spree, the impact of ICZM is not enough.

Moreover, soil erosion, deforestation and encroachment in river catchments in the environmentally sensitive area of the Western Ghats are also concerning as weathering and landslides increase. Karnataka, along with the coastline and the Western Ghats, is at a critical juncture. Thus, the occuring risks and pressures on the state's coastal ecosystem mandates the state government to take stricter actions to protect the coast and its biodiversity reserves.

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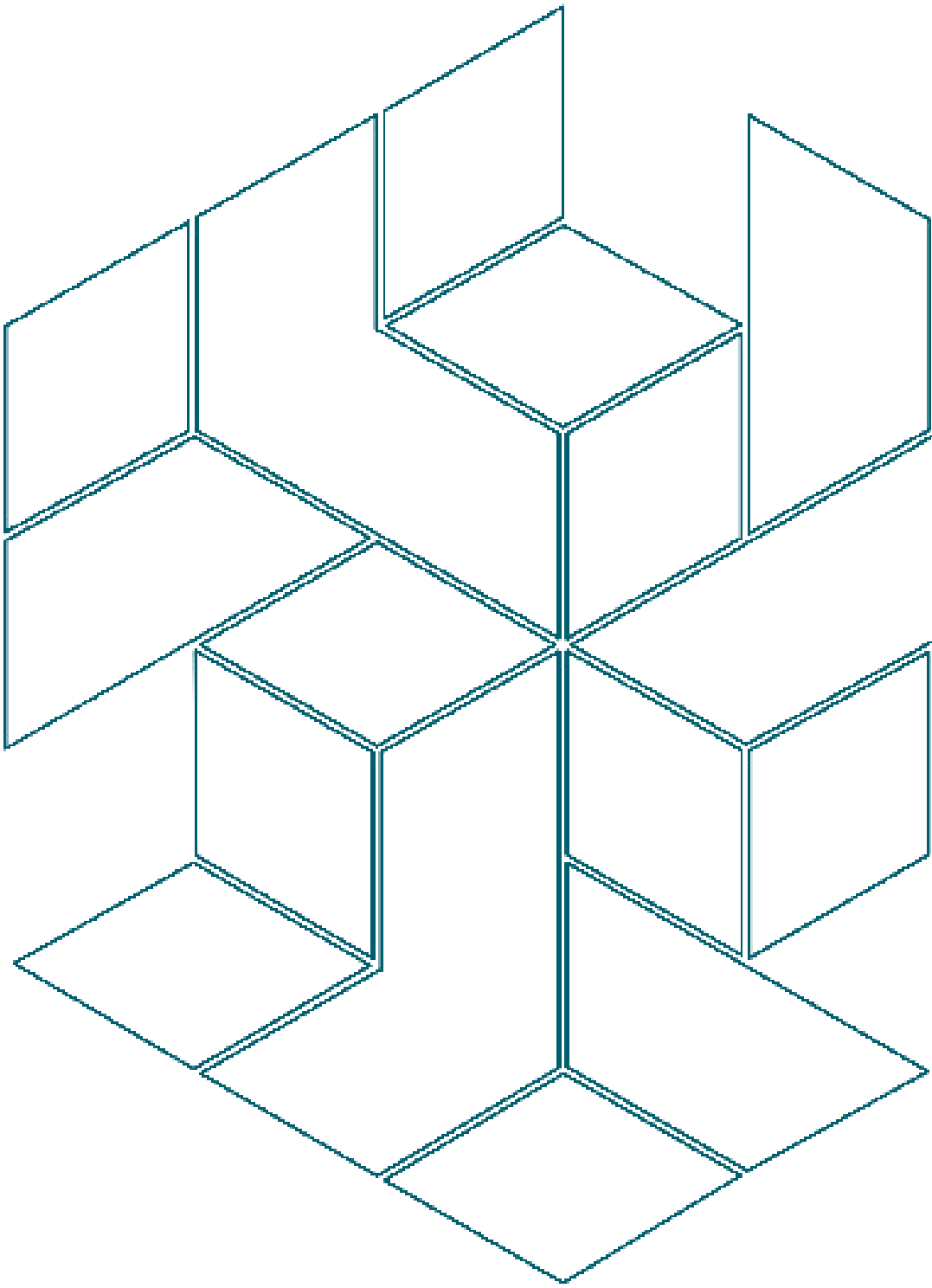

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