

### Meanwhile, the Western Indian Ocean Estuaries Are Under Threat. . . . .

The West Indian Ocean/WIO region is one of the least ecologically-disturbed areas of ocean in the world. Nevertheless, several of its estuaries and deltas are experiencing serious stresses attributable to land-based activities taking place in the upstream areas draining into them. This situation is jeopardizing many of the ecosystem services they provide, including the well-being of the local communities's dependent upon them. In fact, the region's coastal and marine environment has been exhibiting significant signs of degradation over the last decade. A number of natural factors contribute to this degradation, including climate change/variability leading to coral bleaching, sea level rise, flooding, etc. However, there are also a range of pressures and drivers attributable to human activities, acting at different intensities and in various combinations, including agricultural development, urbanisation, deforestation, river damming and industrialisation.

Although the region's overall population density is not remarkably high, still more than 60 million people inhabit its coastal zones. In fact, the WIO coastal zone hosts most major cities, harbours, industries and other socio-economic infrastructure in the region, a factor that is increasingly affecting the coastal and marine environment. A major problem is the pollution from domestic, industrial and agricultural sources that is degrading water and sediment quality in some key spots within the WIO region. This pollution, in turn, is causing decreased biological diversity, human health problems, and reduced fish stocks and catches. Further, the increasing population pressures, combined with inadequate alternative resources being available to sustain the local populations, are resulting in unsustainable extraction of marine resources. Coastal habitats also have been converted to other uses in some areas, including agriculture, aquaculture, ports/harbours and urban settlements, which are destroying vital coastal habitats, including mangrove forests, sand dunes, sea grass beds and coral reefs. The physical alteration of the WIO coastline from erosion and accretion participate indeed to the loss of the natural coastal protection and regulation functions of coastal habitats.

One key WIO concern focuses on the interactions between river basins and their coastal-marine environment. Important transformations of the coastal and marine environment can be attributed to human activities and climatic variability occurring in the river basins that drain into them. The impacts of these human activities include impeded freshwater flows, terrigenous sediment and increased organic matter, which collectively have significantly altered the interactions between river systems and downstream coastal processes. It is clear that water quality degradation in some major river systems draining into the WIO estuaries, deltas and other coastal ecosystems is the results of nutrients and other pollutants from domestic sewage, industrial and agricultural chemicals from human activities in these upstream river systems.

The available evidence indicates alteration of river flows is the most common factor throughout the WIO region in regard to the severity of associated river issues. This problem can be traced to increased water abstraction, damming and land use changes that are subsequently altering the hydrological dynamics of the WIO estuarine region. There also are cases

whereby sediment loading and water quality changes have resulted in severe impacts on the productivity of critical WIO coastal habitat, including mangroves, sea grass beds and coral reefs.

The following chapter provide an overview of some of the main cases of impacts related to human factors on estuaries and related coastal habitats in the WIO region.