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WORLD ENVIRONMENT DAY 2023 – A CONFERENCE PAPER ON – BEATING PLASTIC POLLUTION: PAVING THE WAY TO CLEANER COASTAL AREAS IN PAKISTAN

Mahmood Akhtar Cheema

World Environment Day 2023 – A conference paper on

BEATING PLASTIC POLLUTION: PAVING THE WAY TO CLEANER COASTAL AREAS IN PAKISTAN

by

Mr. Mahmood Akhtar Cheema[1]

The paper highlights the urgent need to address plastic pollution, a pressing environmental challenge that affects our planet. The theme for World Environment Day 2023, "Beat the Plastic Pollution," emphasizes the importance of tackling this global crisis.

Plastic pollution has detrimental effects on ecosystems, wildlife, and human health, with alarming statistics of over 300 million tons of plastic produced each year, a significant portion of which ends up in our oceans. However, we stand together to take action and ensure that plastic pollution does not define our future.

Marine plastic is a major threat to our oceans. They pose a significant threat to all species in the ocean and endangers their survival. Tackling this challenge requires a multi-faceted approach involving governments, industries, communities, and individuals. Governments must implement policies and regulations to reduce plastic production and promote recycling, while industries should take responsibility for their plastic waste and explore innovative packaging and product design solutions.

IUCN in Pakistan has worked with different partners and stakeholders to help address the marine plastic issue. IUCN had also undertaken a study to assess solid waste and marine plastic at PQA Karachi through its Business and Biodiversity Platform, established jointly with PQA and private sector companies.

There is wide agreement among diverse stakeholders that unsustainable exploitation of marine and coastal resources is the main challenge to the preservation of marine ecosystem. In view of the environmental issues being faced and further exacerbated by climate change, there is a greater need to conserve our precious marine ecosystem.

The main direct causes of this problem include: destructive/illegal fishing; loss and encroachment into mangroves; and unregulated waste discharge. The underlying, or root causes, are poverty, population pressure; port, industry and urban coastal developments; lack of effective management and weak governance. The external factors adding to the problems include economic drivers, especially the global demand for seafood, and climate change. In particular, coastal development plans exist, but they are not being implemented; there is a lack of legal enforcement of coastal regulations;

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1 Country Representative, IUCN Pakistan

and inter-agency cooperation is poor. The result is weak governance over coastal resources and coastal development activities.

IUCN programmes on the coast and marine aim to strengthen coastal governance and implement practical measures that will help to halt or reverse the negative trends of natural resources exploitation and degradation that are so detrimental to sustainable coastal development, while also safeguarding the well-being of traditional coastal communities. Given the high level of poverty within the communities living within Pakistan's coastal areas, there is also a need for strong poverty reduction focus.

IUCN's Mangroves for the Future Programme (MFF) was a flagship programme aimed at introducing nature based solutions and Blue Economy. MFF adopted "Blue Economy" as the key approach to coastal development keeping in view the fact that oceans provide a substantial portion of the global population with food and livelihoods and are the means of transport for 80% of global trade, tourism and renewable blue energy. However, according to FAO data 87% of global fish stocks are fully or overexploited. Increasing pollution and unsustainable coastal development further contribute to the loss of biodiversity, ecological function and the decline in provision of environmental services. The potential of the oceans to meet sustainable development needs is enormous; but only if they can be maintained in and/or restored to a healthy, and productive state.

The notion of a 'coupled social-ecological' system (SES) envisages that social and ecological processes need to be understood, studied and managed in an integrated way. A systems approach provides a method of enquiry to study SES. This approach to resilience recognizes the importance of integrating diverse 'knowledge' of social and ecological systems to generate a more enriched picture of their dynamics, including not just scientific knowledge from various disciplinary or interdisciplinary perspectives, but also the experiential knowledge of practitioners, local knowledge of resource users and the traditional/indigenous knowledge of communities.

Recognizing that many coastal communities are critically dependent on well-functioning ecosystems and their services, MFF uses a resilience approach based on four steps that are used to map the resilience parameters at a project site. The first step establishes the socio-ecological history of the site ("looking back"); the second step generates a view of the present by generating a "General Systems Model" of a site's social and ecological systems; this step includes a validation process between community members and scientific experts. The third step envisions future scenarios of a project site ("looking forward"); while the fourth step formulates strategies to develop a resilient community. An additional fifth step is aimed at making the first four steps achievable in practice, by identifying grant-funding priorities. Stakeholder participation is critically important at all stages to increase legitimacy, ownership and success of the interventions.

Resilience analysis process was applied to analyse priority sites in Pakistan identified by the National Coordinating Body (NCB) of Mangroves for the Future (MFF) in Pakistan. The sites were identified based on their socio-economic significance and vulnerabilities of the local communities to degradation of coastal natural resources. The chosen sites are large enough to ensure that the interventions will be meaningful in scale and impact, rather than being only pilot, or demonstration-level activities.

Recognizing that many coastal communities are critically dependent on well-functioning ecosystems and their services, IUCN proposes a resilience approach. This entails livelihoods improvement of small-scale fishers, whose livelihoods are threatened by a number of socio-economic and environmental factors. These include declining of fish stocks; use of illegal and unsustainable fishing gears; a lack of, or poor infrastructure, such as jetties and fish handling facilities; coastal erosion, habitat degradation and pollution.

Creating Marine Protected Areas (MPAs) are a useful way of preserving the coastal and marine ecosystems. In Pakistan, IUCN helped the Ministry of Climate Change to establish Pakistan's first MPA, which is Astola Island. IUCN also proposed a management plan for it. There is a need to create more MPAs which is the key to preserving our degraded marine ecosystem.

In broader terms, key aspects covered under Blue Economy include:

- The management of sustainable fisheries and aquaculture;
- Addressing threats posed to ocean health by marine pollution, including litter and plastics, from marine or land-based sources;
- The sustainable development of key oceanic sectors such as tourism, maritime transport and off-shore renewable energy;
- Building government capacity to manage marine resources, including nature-based infrastructure such as mangroves, in an integrated way to deliver more and long-lasting benefits to countries and communities.

According to a World Bank report, in Pakistan, for instance, the current focus of the blue economy includes supporting the revised nationally determined contribution (NDC), which includes the blue carbon (the carbon stored in coastal and marine ecosystems) rapid assessment to help the government enhance its commitments in the revised NDCs through blue carbon ecosystems and prepare for the next round of revisions toward mitigating climate change.

More specifically, national and provincial review of blue ecosystem climate change mitigation and adaptation policies and regulation finds that, in Pakistan, blue carbon has great climate change mitigation and adaptation value and should be integrated into the upcoming NDC revision. The blue carbon assessment has provided model language and policy recommendations to the Ministry of Climate Change on the NDC revision.

Pakistan's coastline is about 990 km long and the Exclusive Economic Zone (EEZ) covers an area of about 240,000 sq. km. The maritime zone of Pakistan, including the continental shelf, extends up to 350 nautical miles from the coastline. The shelf of the coast is dominated by the Indus (a major river of Pakistan) canyon. The continental shelf varies in size distinctly along the Sindh and the Balochistan provincial coasts. The seaward coastal zone up to 12 Nautical Miles (NM) from the coastline is basically within the jurisdiction of the two provinces (Sindh and Balochistan). The coastal zone beyond the 12 NM up to 24 NM is the contiguous zone and beyond the 12 NM up to 200 NM is under the jurisdiction of the federal government. However, the protection and conservation of the coastal resources is the responsibility of the federal government,

which also has the authority for legislation and its enforcement within a 3 mile limit of the ports and within the 12 to 200 NM of the EEZ.

The two coasts exhibit varying climatic and physical characteristics and are influenced by the extreme most reaches of the 'Indian Monsoon' weather and the 'Mediterranean weather'. Coincidentally, this division almost falls on the Sindh – Balochistan administrative border. The Sindh coast can further be sub-divided into two parts, namely, the Indus Delta / Creek system and the Karachi (capital city of Sindh province) Mega City coast. Balochistan coast can also be sub-divided into the Lasbella and the Gwadar (districts of Balochistan province) coasts.

The Sindh coastal region, stretching over 220 kms, is located in the southeastern part of the country between the Indian borderline along Sir Creek on the east to Hub River along the Balochistan coast on the west. Approximately 300,000 sq. km of the Indus water-shed, of which 50% is located outside Pakistan (India, China & Afghanistan), is drained by the Indus River. The Indus Delta (approx. 1000 sq. miles) is the most prominent ecological feature of the Sindh coast (covering 85% of the coastal belt in Sindh), the coastal morphology of which is characterised by a network of tidal creeks formed as a result of changes in river beds and a large number of small and large islands with scattered mangrove vegetation. The Indus Delta has the largest arid climate mangroves in the world. The Karachi coast constitutes a coastal belt of about 100 km length situated between the Indus Delta on the south-east and the Hub River on the west. Most of the coast, with the exception of scattered patches of mangroves, is devoid of any other kind of vegetation. Karachi city is the commercial and industrial hub of Pakistan along with being a busy port. The wildlife along the Pakistan coast consists of both marine and terrestrial species.

The Balochistan coast extends from the mouth of the Hub River in the east to the middle of Gwater Bay (bordering Iran) in the west and stretches over a distance of about 770 km. There are a few indentations in the coastline, which can be classified as follows (a) embayed coast; (b) tidal lagoons; (c) mouth of small coastal rivers.

The Balochistan coast is hyper-arid to arid (sub) tropical and includes piedmont plains and low hill ranges. The small and ephemeral rivers hardly influence salinity and / or turbidity of the coastal waters. Locally, small tidal mangrove forests, natural and artificial, are present on the mouth of seasonal rivers. The extent and diversity of turbidity in these bays is considerable. The biodiversity of Balochistan's diverse coastal features with its beaches, sand dunes, sea cliffs, rocky headlands, intertidal mudflats, deltas, estuaries, tidal lagoons, bays, islands and shelf areas remains undocumented. The Indus River is part of a major flyway for birds between Siberia and warmer lands to the south.

The Sindh passive coastline is characterised by mudflats, delta wetlands, estuary systems and a wide and almost flat continental shelf. The Balochistan coastline is characterised by four types of land forms, namely, raised beaches, sand dunes, playas and pediments. The soil cover along the coast is generally in-situ or zonal and mainly composed of sand and silt. Geomorphology and geology of Sindh coast can be studied in two parts, i.e. (1) the area between Cape Monze and Korangi in the east (Karachi coast) characterised by wide surf zone, cliff beaches, sea arch, sea notch and river silt; and (2) the area east and south-east of Korangi towards Rann of Kutch characterised by

Indus Delta creek system, wet and marshy lands. Three rivers, namely Hub (perennial), Lyari and Malir (non-perennial) drain the area between Cape Monze and Korangi Creek. The prominent geomorphologic features of Karachi coast comprise shallow lagoons, sea cliffs, sea stacks and terraces - wave cut platforms, sea caves and notches, which dot this part of the Sindh coast.

The major physiographic features of the Northern Arabian Sea are the Indus Fan in the east and Oman Basin in the west, both of which are separated by the Murry Ridge. The Murry Ridge extends south-west from the continental slope near Karachi for a distance of over 750 km.

Biodiversity (Ecosystem, Habitats and Species Diversity)

The coastal and marine areas of Pakistan are rich in biodiversity. At least 12 species of marine dolphins and whales have been recorded in the Sindh-Balochistan waters. The identified species include five dolphin species, one porpoise species, two species of the toothed whale and four species of the baleen whale. Three species of endangered marine turtles are reported from Pakistan's coasts, which include the Green Turtles (Chelonia mydas), Olive Ridley Turtles (Lepidochelys olivacea) and Leather Back Turtles. The most important beaches that are used as nesting grounds are Sandspit, Ormara (Tak), Astola Island and Jiwani. The terrestrial species include partridges, jackal, fox, porcupine, butterflies, dragonflies, snakes, lizards and chinkara. The main habitats for migratory birds and other waterfowl are wetlands, estuaries and lagoons.

The Economic Importance of Mangroves

The economic importance of mangroves in Pakistan largely comes from the fishery resource that they harbour. An estimated 80% of the fish caught in coastal waters spend at least part of their life cycle as fry in the mangrove creeks, or depend on the food web within the mangrove ecosystem.

Shrimp fishery is the major fish export of mangroves, accounting for 68% of the $100 million of the foreign exchange the country earns from fisheries exports. The mangrove swamps of the Sindh coastal zone are extensive, presently spread over approximately 100,000 hectares (ha) compared with 8058 ha along the Balochistan coast. The coastal zone also has large areas of bare mudflats.

The system is intersected by large and small creeks that allow tidal water to move into and out of the area during the twice-daily ebb and flow of the tides. The mangrove swamps are made up of species of trees that are adapted to survive in brackish water or seawater. The main species in the area is the black mangrove, *Avicennia marina,* which has aerial roots growing up out of the mud. The swamps also have less common species of mangrove, which along the Sindh coast includes the red mangrove, Rhizophora mucronata, Ceriops tagal and Aegiceras corniculatum. Several species of marine seaweed also grow in mangrove swamps, often as algal mats on the surface of the mud.

The mangrove swamps, bare mudflats, and mangrove creeks support many animals along the Sindh coast. These include a large number of invertebrates, such as mussels, oysters, and shrimp, as well as many species of fish in the creeks. The young stages of shrimp and fish live in the creeks, and move offshore as they grow. Some species of

birds also use the swamps as wintering grounds during their long distance migrations. The mangrove trees are used for firewood and building, while the mangrove green shoots and leaves are used as fodder for livestock by the local communities. The 100,000 people living along the northern edge of the Indus Delta use an estimated 18,000 tons of mangrove firewood each year. At certain times of the year, about 16,000 camels are herded into the mangroves and left to browse for about 6 months. The creeks provide a source of shrimp and fish for the local village fisher folk working from small inshore boats. Bees that live in the mangroves and above the high tide level inland provide honey, which is a valuable marketed commodity.

Mangrove swamp ecosystems face a number of threats, as they are an exploitable natural resource for the rural communities along the Pakistan coast. Man-made and natural impacts have degraded the mangroves. These include (i) construction of dams and barrages, (ii) freshwater diversion for irrigation, (iii) decrease in freshwater inflow and sediment load, and (iv) increase in salinity. For example, the estimated historic freshwater flow down the Indus is about 150 million acre feet (MAF) per year (180 billion cubic metres). However, over the past 70 years, water abstraction for irrigation has reduced the supply of freshwater in the Indus Delta. Other threats include domestic and industrial pollution, overgrazing, cutting of mangroves by rural communities, cyclones and storms, and coastal erosion.

Sea level rise, as one impact of climate change, poses a major long-term environmental threat to the Sindh coastline and its mangrove swamps. Over the past century, the rise has been 1.1 millimetres per year. While the predicted sea level rise of 2.00 millimetres per year will support mangrove growth, anything above this rate would cause a loss of mangroves. This would require replanting species with longer propagules, such as Rhizophora mucronata, and propagating Avicennia marina on higher grounds, as is occurring along the Balochistan coastline.

Fisheries and Aquaculture

The economy of Pakistan is predominantly based upon agriculture. This sector contributes about 26% of the GDP and provides employment to about 52% of the labour force of the country. Fisheries, which forms a part of the agriculture sector, contributes only 0.5% of the GDP of Pakistan and 1% of the labour force is employed in this sector. However, marine fishery is the main economic activity along the Balochistan coast and, in general, an important economic activity in coastal Pakistan. Despite low contribution of fisheries in GDP and employment, export earnings from this sector are substantial. Export of fish and fishery products have yielded, on an average, a sum of Rs.8.8 billion per year. These exports are critically dependent upon environmental sustainability, and that sustainability is threatened. Although a major part of the fishing fleet of Pakistan is mechanised, the vessels are ill-equipped and as such fisheries are considered as small scale. Fisheries activities in Pakistan are concentrated in shallow coastal waters, the estuarine system of Indus and associated creeks and to a lesser extent, in the deeper part of the ocean. Owing to lack of navigational aids and small size of the fishing boats, major part of the fishing fleet of Pakistan confines its activity to coastal waters up to 25-30 kms from the coast.

Shrimp trawling, which is the mainstay of the fisheries in Pakistan is mainly carried out in shallow waters up to an isobaths of 20-30 metres. Shrimp trawling grounds are located in Sindh and in backwaters of Sonmiani and Kalmat Bay, Ormara, Pasni, Gwadar and Jiwani. The Sindh coast facing the Indus deltaic creeks, especially at the mouth of the inlets (creeks), backwater Kalmat and Sonmiani bay and famous Shamal Bunder in Balochistan are exceptionally rich in shrimp stock. Shrimping activity along Sonmiani coast is carried out in shallow water near Gadani, Phor and Sapat. Although, under Balochistan Sea Fisheries (Amendment) Act, 1986, there is a ban on trawling in the territorial waters of Balochistan, appreciable quantities of shrimp are harvested (although illegally) from Balochistan waters especially from Ormara to Jiwani area. Species like mullets, silver whitening and other small sized demersal fishes, especially juveniles of large commercially important estuarine fish, are harvested from shallow waters in the creek area of Indus and other small rivers and also in enclosed and semi-enclosed bays throughout the coastline

Ecotourism

The coastal belt of Pakistan, with the exception of some basic recreational infrastructure / outlets along the Karachi coast, is presently not served with tourism related infrastructure. However, tremendous potential exists. The Indus Deltaic coast has numerous islands and harbours. The network of creeks and islands offers a sound potential for developing holiday resorts featuring a variety of water sports and nature tourism. There are some additional features such as mud volcanoes, turtle beaches and sites of archaeological / religious interest. For example, a Hindu Temple at Hanglaj in the Hingol River valley surrounded by mud volcanoes and a water pond (Aneel Kumb) is dedicated to a Hindu goddess. Similarly, the Astola Island is considered by Hindus to be an abode of their goddess ‘Kali Devi’. Thousands of Hindu pilgrims from all over the world visit these sites annually. Buzy Pass (natural carvings on mud mountains), Princess of Hope, Mud Volcano (Chundar Gup), Sapat Bundar, Kund Malir, and Ras Malan are some beautiful spots for tourism development.

CHALLENGES IN SUSTAINABLE COASTAL MANAGEMENT AND BEATING THE PLASTIC POLLUTION

The beaches and coastal waters of Pakistan are relatively free from manmade pollution, except in harbours, industrial areas, urban discharge points and water front development sites. High grade pollution has not developed, because the coastal belt is devoid of industry and large population concentrations, except in the Karachi vicinity. However, projects such as Gwadar Deep Sea Port, Mirani Dam, construction of jetties/villages, coastal highway, mining of coal in Thar (Sindh), copper / gold in Saindak (Balochistan), and other similar projects open up the chances of growth of significant levels of human settlements along the coast. Provision of essential services and infrastructure, such as potable water and roads, could greatly expedite the development of large scale settlements. In places, there is a complete loss of open spaces at the seafront. This eventuality, in the absence of any coordinated and integrated coastal zone development / management and monitoring plan, is considered as a threat to maintaining the pristine environment of the coast and critically impacting the natural, desirable and sustainable land use status of the coast.

Industrial Pollution

As mentioned earlier, 70% of the total industry of Pakistan is located in Karachi city and in the Bin Qasim Industrial Area. Most of the industry is located in the Sindh Industrial Trading Estate (S.I.T.E), Landhi Industrial Trading Estate (L.I.T.E), Korangi Industrial Area, West Wharf Industrial Area of Sindh and Hub Industrial Trading Estate (H.I.T.E) of Balochistan. Sindh Industrial Trading Estate (S.I.T.E) covers an area of about 1600 hectares and houses 2500 industrial units.11 The pollutants they discharge include heavy metals, organic matter (also including benzene and toluene), oils and greases and other toxic chemicals. Waste is discharged, mostly untreated into the Lyari River, which drains into the Arabian Sea in the Karachi Harbour area, via the Manora Channel. The river has also been known to carry calcium, alum, sulphates, magnesium, sodium, potassium, arsenic, halides and bicarbonates. Landhi Industrial Trading Estate (L.I.T.E) and the Korangi Industrial Trading Estate (K.I.T.E) discharge their effluents in the mangrove populated mud flats of Korangi Creek.

Over-exploitation of Natural Resources

As has been discussed earlier, the communities residing in the mangrove forested regimes, such as inter tidal creeks, lagoons, and estuaries, do exploit the mangroves to fulfil their daily living needs, which may include use of mangroves as fuel woods, fodder and house construction material. Pressures are intense in more densely populated areas such as the Korangi Creek area of the Karachi coast. Reckless over-exploitation of marine living resources has led to depletion of many wild stocks that had traditionally supported commercial fisheries. The fishing grounds in the coastal areas are under heavy fishing pressure from the mechanised boats and fixed nets in the delta area and are among the major source of depletion of fish stocks. The trawlers and the harmful fine mesh nets (Bolo Gujo nets) fixed in the creek areas catch large quantities of juvenile fish of larger species and small edible fishes as well as endangered, associated or dependent species, without any consideration of target or non-target species. Harmful fishing practices, coupled with weak governance, have led to the depletion of some of the stocks and pose a serious threat to other stocks. Shrimp and lobster have already been over-fished; crabs, razor clams and many other shellfish are at the verge of collapse.

Lack of Freshwater Inflow from the Indus River

Since the Indus River is by far the main source of fresh water for the whole country, most of its water is withdrawn by upper riparian for agricultural, industrial and domestic use. Over the years, increasing amounts of water have been withdrawn for the expansion of irrigation (accelerated by rising temperatures and hence evaporation increases), so that less water finally reaches the Delta. The requirement for 'environmental flows', to keep the ecosystem in the Indus Delta healthy and viable, has never been assessed for informed decision making and allocation of water for various uses throughout the country.

Sea Water Intrusion

Sea water intrusion is the encroachment of saline water into fresh ground water regions in coastal aquifer settings. Seawater can also intrude into surface water bodies, such as

the Indus River, lagoons and wetlands. This is because seawater is heavier and denser than freshwater. As a result, freshwater tends to float on top of seawater. Sea intrusion due to sea level rise is in the range of tens of meters to several kilometers, depending on recharge and groundwater tables persisting. Observations on the distance to which sea intrusion has progressed inland vary between 54 km inland on areas adjacent to the Indus River, 80 km upstream in the link canals and 150 km from the river mouth up to Thatta-Sujawal Bridge affecting 567,000 hectares of previously arable land (SIDA 2013). This has forced nearly a million people to migrate out, inflicted huge financial losses and pushed the boundary of the sea further inland.

Sustainable management aims at practicing land stewardship ethics which integrate the growing, nurturing, and harvesting of resources sustainably with the conservation of soil, air, water quality, and biodiversity. The coastal zone of Pakistan is one of the significant fish producing zones. Fisheries and allied industrial activities are the most important economic activities along the coast and support the livelihoods of about one million fishermen and their families living in rural villages. Some of the measures that have been taken to ensure sustainable use of fish and other marine resources are discussed as follows:

Fishing has increased due to increased fleet:

At the time of creation of Pakistan, there were only 800 small wind-driven fishing boats. Presently about 13,000 fishing vessels are being operated in Pakistan, some of which are more than 30 m long and fitted with all the necessary fishing gadgets, including onboard freezing facilities. Additionally, fishing technologies have improved, providing greater access to harvest resources in the deep sea. This has resulted in depleting fish and shellfish populations along the coast of Pakistan. Shrimp trawling was introduced in Pakistan in the 1950s and now the shrimping fleet consists of about 2,500 efficient fishing trawlers which have the capacity to fish in deeper waters. The operation of such a large fleet has resulted in depletion of shrimp stocks.

The introduction of some of the exotic and harmful fishing gear has further aggravated the situation. If we continue to fish at this rate and use harmful gear, we may soon witness a collapse of the fisheries stocks.

There is a very close link between the fisheries resources and the mangroves. Mangroves, and their associated tidal flats, provide a habitat for clams, crabs, oysters, and other species. Mangroves are known to be an important breeding, nursery and feeding ground for a large number of fish and shellfish species and other aquatic resources. The coastal mangrove creek systems are shallow and nutritionally rich, providing an ideal habitat for a variety of marine animals in addition to commercial fish and shrimp species. The shrimp industry largely depends upon the shrimp nurseries located in the mangroves of the Indus Delta. Although the shrimp are distributed along the entire coast, the main fishing grounds in the sea are usually located along the coastline adjacent to mangroves. The reduction in freshwater flow into the Indus Delta has impacted mangrove growth and productivity of fish and shrimp and other marine resources. The Palla fish, which used to be caught in abundance, has reduced due to decline in freshwater flows in the Indus especially below the Kotri Barrage.

Increasing levels of pollution also has serious bearing on the fish stocks in coastal as well as in the offshore waters. Disposal of untreated domestic and industrial sewage from coastal cities and towns has resulted in loss of fishing grounds in some highly polluted areas. It was estimated that about 430 million gallons/day (MGD) of untreated sewage is dumped into the sea by the metropolis of Karachi alone through the Lyari and Malir Rivers as well as through a number of small drains. There is only about 15 % capacity of sewage treatment in Karachi. Because of the disposal of a huge quantity of sewage, the habitat in Manora Channel and Gizri Creek has been completely destroyed and most of the area in these two water bodies is devoid of any marine life. In addition, a major part of the creek system adjacent to Port Qasim is also heavily polluted because of thermal discharges from power plants, heavy metal discharge from the Steel Mill and tanneries, and organic discharge from cattle colony.

Solid waste discharged in the marine environment is also a serious threat to marine life. A substantially large quality of solid waste from the coastal towns enters the sea on a regular basis which is accumulated on beaches as well as in the shallow coastal waters, making the coastal area polluted. Presence of solid waste in the marine environment is a major threat to some of the threatened species such as sea turtles, who try to engulf plastic bags considering them to be their favorite food, i.e. jellyfish.

In Pakistan, most of the fishing is done through use of non-target fishing gears. As such, a number of other non-target animals including cetaceans (dolphin, porpoises and whales), sea turtles as well as fish and invertebrate species get entangled in these gears as by-catch. In most cases, these non-target by-catch species get seriously injured or killed, having a serious impact on their threatened population. By-catch of trawl fisheries consists of juveniles and early stages of a large number of fish, sea turtles and invertebrates as well as benthic animals that inhabit soft substrates of the trawling grounds. It is estimated that for every one kg of shrimp caught through trawling, about 95 kg of by-catch is being caught by trawl fisheries in Pakistan. The ploughing action of trawl net and otter boards also causes severe damage to the fishing ground. By-catch of gillnet fisheries consists of a large number of non-target species including endangered species like whale, dolphins and turtles. Studies have indicated that annually about 10,000 dolphins die in gillnet fisheries of Pakistan because of entanglement and drowning and a large number of sea turtles (annually about 30,000) get entangled in gillnets.

Enforcement of Fisheries Legislation:

To ensure sustainable fishing and conservation of the fish stocks, a number of steps have been taken by the government agencies. A regular programme for assessment of fish stocks has been initiated which has revealed that most fish stocks have already been overfished in Pakistan. The Government of Pakistan has enacted laws to control use of deleterious fishing gears. The Government of Sindh has imposed a ban on the use of trawl, seine and set bag nets in the creek areas of Sindh. A number of these gears have been confiscated and later on burnt by the Fisheries Department of Sindh. There is a ban on the use of harmful gear in the waters of Balochistan. Both provincial governments undertake regular operations in their respective waters to take action against the violators of this legislation. Fishermen communities and the Balochistan

Fisheries Department, in collaboration with local NGOs, have taken steps to eliminate the use of harmful nets (ESBN) in Miani Hor lagoon with a good success rate. Karachi-based trawlers and seine (Katra) boats are known to poach heavily in the waters of Balochistan against which action has been taken by the local communities on some occasions. In order to save sea turtles from being entangled in shrimp trawl nets, legislations have been enacted by the Marine Fisheries Department under which it is mandatory to install a Turtle Excluder Device (TED) in a shrimp trawl net. Installation of TED in trawl nets is also mandatory under United States regulations for export of shrimp from Pakistan and other countries into the US. The Marine Fisheries Department has taken measures to ensure that a TED is installed and used in all shrimp trawling operations.

Prohibition of Deep Sea Trawling:

A greater threat to fisheries and marine life is posed by deep-sea trawling. These trawlers have been combing the territorial waters of Pakistan for a long time by indulging in poaching and under-reporting, besides polluting the sea by throwing by- catch (unwanted species) into it. Deep-sea trawlers are supposed to operate beyond 35-miles of the coastline; however due to weak surveillance and enforcement, these trawlers often intrude in territorial waters.

Establishment of Marine Protected Areas Marine Protected Areas:

MPAs are established to ensure that fisheries resources in these areas are fully protected against any human activities including unsustainable fishing practices. Marine Protected Areas act as “Refugia” for breeding of fish, shellfish and marine species. Marine Protected Areas (MPAs) involve the protective management of natural areas so as to keep them in their natural state. MPAs can be conserved for several reasons including economic resources, biodiversity conservation, and species protection. They are created by delineating zones with permitted and non-permitted uses within that zone. Target 11 of the Aichi Biodiversity Targets agreed by all Parties to the CBD in 2010 specifies that each Party has to declare at least 10% of its coastal and marine areas as Marine Protected Area, especially the areas of biodiversity significance and ecosystem services. Further, the Sustainable Development Goals (SDGs) agreed by the UN General Assembly in September 2015 call for conservation and sustainable use of the oceans, seas and marine resources for sustainable development (SDG 14). IUCN under Mangroves for the Future Programme has taken steps in collaboration with Ministry of Climate Change to establish marine protected areas along the coast of Pakistan. Churna Island, Miani Hor, Astola Island and Gwatar Bay have been initially identified as potential sites based on their ecological and socioeconomic significance. The Government of Balochistan has decided to establish an artificial reef in Jiwani which will help in enhancing fish stocks in the area.

Constraints

Currently, no umbrella national legislation exists to protect the coastal and marine resources in general or in any specific area of ecological significance. However, relevant programmes on wetlands under Ramsar Convention and Pakistan National Conservation Strategy do cover / protect some of the coastal ecosystems. Over 345,000 hectares of mangroves forest land have been declared as protected forests in 1958 and

Keti Bundar area of the Indus Delta has been declared as a wildlife sanctuary under the Sindh Wildlife Ordinance 1972. Similarly, about 722 hectares of mangrove forests in Miani Hor are protected since 1958 and their wildlife is also protected under Balochistan Wildlife Ordinance. An extensive administrative framework of local, provincial and federal agencies operates all along the Pakistan coast but without any coherent approach. Most of their planning, development and conservation are done in isolation and are little known to others due to lack of coordination. In the absence of legislation, designated responsibilities, appropriate well-defined procedures and the means of institutional capacity building, management of marine and coastal areas is in a disarray. Non-government organisations, such as IUCN, WWF, Shirkat Gah, TCCR, etc., are actively involved in this sector and have worked out model conservation projects with the co-operation of the local coastal inhabitants. However, the limited resources of NGOs cannot influence the vast coastal and marine areas of the country without the full engagement of state authorities. Pakistan's Exclusive Economic Zone (EEZ) is almost equal to the landmass of the country. Maritime Security Agency (MSA) is the only agency present throughout the Pakistan Coast. Legislative support, with specific regulations, needs to be updated for marine and coastal management. Unlike pollution, there appear to be no provincial laws that explicitly aim to protect marine resources.

RECOMMENDATIONS

Some of the key recommendations include the following:

- **Joint review of existing coastal policies**

  This calls for reviewing existing coastal policies and updating them as per needs of the time so that they are practical and serve the purpose.

- **Ministerial coordinating forum**

  A coordination forum is needed at the ministerial level so that highest level of ownership is created, and interventions are more efficient given the coordination amongst the different ministries involved in coastal affairs.

- **Creating a Consortium of Donors (such as World Bank, ADB, IDB, Private Sector, etc.)**

  A consortium of donors is highly recommended, given that donors have in the past contributed significantly to Pakistan's coastal and marine sustainability through their different projects. Their involvement in the form of a consortium can bring about synergies both financially and through their own expertise in such matters.

- **Consortium of Implementers**

  A consortium of implementers is suggested so that key implementers are identified, and they work in a consortium to avoid any overlaps in implementation.

- **Prepare Large Projects financed by Green Climate Fund (GCF)**

  As coastal and marine interventions require huge investments for long term sustainability and transformation, it is important to seek additional finances and not just rely on state support. These additional finances may include

development of large projects which can be funded by renowned agencies such as Green Climate Fund and other donors.

- **Strengthening of National Coordination Body (NCB)**

  NCB has been a tested model for years and IUCN has been privileged to carry it out with support from donors and government. The NCB forum can play a vital role in coordinating activities amongst coastal stakeholders, and this has been tested in a Mangroves for the Future Project also in the last several years.

- **Upscaling existing mangroves restoration initiatives in Pakistan**

  Given the importance of mangroves, it is essential that mangroves ecosystem continues to be restored as and where possible along the coast. Mangroves are a unique ecosystem and their importance in building coastal sustainability is well documented.

- **Engagement with non-traditional partners, such as Ministry of Defence, Pakistan Navy, and Private Sector**

  Creating collaborations with new entities such as private sector companies will be beneficial, as the private sector is now actively pursuing green agenda and can greatly contribute to ongoing coastal initiatives and earn the mileage they generally aim for.

- **Creation of new Marine Protected Areas**

  While Astola has been created as Pakistan's first Marine Protected Area (MPA), more of such MPAs are now needed to safeguard the coast.

- **Reducing marine plastic**

  It has been stressed repeatedly that marine plastic must be reduced to ensure survival of coastal and marine species.

IUCN expresses its gratitude to the Pakistan Engineering Congress for providing a platform to address this significant environmental issue. We believe that cooperation between the Consortium of Donors and Consortium of Implementers holds great potential. It also acknowledges that building resilience against these challenges requires a coordinated and comprehensive strategy, which can be facilitated through the platform of National Coordinating Body provided by IUCN Pakistan. By coming together and capitalizing on the strengths of various stakeholders, we can make meaningful progress in safeguarding our coastal areas for future generations.