

Habitat Management Plan for the proposed Turtle Beach Protected Area A Framework for Action



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1. Introduction

Though the green turtle enjoys a protected status in Pakistan, the Hawksbay/Sandspit beaches, where virtually all marine turtle nesting sites occur do not enjoy a protected area status. This shortcoming provides a serious hindrance in efforts to preserve the turtle habitat in a sustainable manner. The beaches are not secluded and human habitation levels that are both of a temporary and permanent nature, are significant. Whereas the absence of a protected status results in both private and commercial utilization of the beaches, lack of adequate environmental and ecological safeguards in the hut lease deeds and applicable building rules/regulations has led to ineffective regulation of activities related to beach hut usage as they impact on the environment (*turtle habitat*).

Activities such as generation of waste, beach lightening, encroachment of space have adverse impacts on the turtle nesting process. The only existing legislative instruments i.e. the hut lease deeds and the building/zoning regulations have failed to address such concerns. An important reason for this inadequacy is that since the beaches are not designated as protected areas, the existing legislative instruments do not address the environmental sensitivity of the area. It is therefore indicated that the recognition and designation of the most visited (*turtle nesting*) parts of the beaches as protected areas, could contribute to greater pressure on the land owning agencies to incorporate the required environmental safeguards in their legislations.

This *Study* that forms part of the project *Helping the Turtles Survive* assesses the feasibility of according the turtle habitat at the Sandspit/Hawksbay beaches a protected area designation. The ecological values and functions of the projects area's turtle habitat are highlighted in detail to develop the case for a protected area designation. Various protected area options are subjected to a comparative analysis to identify the most relevant and best available options. State-of-the-art protected area assessment and management models are adapted and employed to assess the case of the project area's turtle habitat. In addition to arguing the case for designating a protected area status, a comprehensive protected area management plan framework is also discussed.

It is hoped that this *Study* would assist policy makers, conservationists and regulatory agencies in coordinating and implementing the appropriate and urgently required policies and plans for according a protected area designation and preparing an effective management plan for the Sandspit/Hawksbay beach turtle habitat.

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2. Protected areas: Historic development, issues and concerns

2.1. Protected areas: Conserving nature

The idea of setting aside areas of natural or semi-natural land is not something new. It dates back many thousands of years. Most early protected areas were actually hunting reserves. Other places were protected because they were considered sacred. It was only in the latter half of the 19th century that it was recognized that protection might be for nature without consideration for hunting, or for aesthetic appeal.

The establishment of Yellowstone National Park in the United States in 1872 is usually acknowledged as the starting point of the modern protected area movement, marking the first instance the term *national park*, had been used. In the decades that followed, the process gained rapid momentum as new protected areas were created in virtually every country in the world. In 1962, there were 10,000 protected areas around the world, and by the 5th World Parks Congress in Durban, South Africa, in September 2003 the number had increased to 100,000. Protected areas now cover almost a twelfth of the world's land surface as well as a small but increasing proportion of marine sea. This enormous portfolio of real estate includes spectacular and wondrous places, extraordinary species and ecosystems, irreplaceable examples of cultural and natural heritage, and refuges of peace and spirituality. These protected areas are on the front line in the campaign to conserve biodiversity on planet earth.

Since the First World Conference on National Parks held in Seattle, United States, in 1962, the concept of *protected areas* has evolved considerably to include increasing emphasis on sustainable human use, cultural values, environmental benefits and the active participation of local communities in management decisions. Management decisions now look beyond the parks borders to its place in the wider landscape. This redefining of the understanding of the concept and practice of protected areas has been driven by an overall greater worldwide growth in interest in environment and development, manifested in a series of key events and publications, including the United Nations (UN) Conference on Environment in Stockholm and the adoption of the World Heritage Convention, both in 1972, the 1980 World Conservation Strategy and the 1992 UN Conference on Environment and Development (*the Earth Summit*), which included adoption of the Convention on Biological Diversity (CBD). Another significant factor has been the expansion of the World Commission on Protected Areas (WCPA, originally the *Commission on National Parks*).

2.2. Defining a “Protected Area”

Although the London Convention in 1933 and the Western Hemisphere Convention in 1940 proposed definitions of protected areas, in many ways 1959 was the benchmark year in the global recognition of protected areas. A UN Economic and Social Council (ECOSOC) resolution noted that:

'national parks and reserves...contribute to the inspiration, culture and welfare of mankind and national parks are valuable for economic and scientific reasons and also as areas for the future preservation of fauna and flora and geologic structures in their natural state'

The Convention on Biological Diversity (CBD) is the most important international legal instrument addressing and supporting protected areas, with 187 Parties (*signatory States*). *Article 8* specifically calls for the establishment of protected area systems. The CBD defines a protected area as:

'a geographically defined area which is designated or regulated and managed to achieve specific conservation objectives'

The present IUCN definition of a protected area, developed at the IVth World Congress on National Parks and Protected Areas in 1992 is:

'an area of land and/ or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means'

2.3. Historic milestones in protected areas development

From the time the first World Conference on National Parks was held in Seattle, United States, many milestones have been reached in the establishment of Commissions and the signing of treaties and conventions. Listed below are some of the key milestones in the history of protected areas development:

Table -2a Milestones in Protected Areas Development	
Year	Milestone
1962	First World Conference on National Parks, Seattle, United States
1971	Ramsar Convention adopted. There are now 138 Contracting Parties to the Convention with 1328 sites covering more than 1.1 million km ²
1972	United Nations (UN) Conference on Environment and Development, Stockholm, Sweden. Endorsed new conventions affecting protected areas, and led to the establishment of the UN Environment Programme (UNEP)
1978	International Union for the Conservation of Nature (IUCN) system of categories of protected areas published: it set logical framework for worldwide assessment of protected areas coverage.
1981	Protected Areas Data Unit established by IUCN and its Commission on National Parks and Protected Areas.
1991	Global Environment Facility created by the World Bank, UNDP and UNEP, providing a major new intergovernmental funding mechanism for protected areas
1992	The Earth Summit, Rio de Janeiro, Brazil, produced Agenda 21, and approved Convention on Biological Diversity (CBD) and Framework Convention on Climate Change, both highly relevant to protected areas
2000	UN General Assembly approves Millennium Development Goals, with Goal 7 calling for environmental sustainability
2002	World Summit on Sustainable Development, Johannesburg, South Africa, endorsed these targets and called for a system of marine protected areas to be established by 2012

Source: Protected areas and biodiversity: An overview of key issues. UNEP

Discussed below are two major developments promoting the cause of protected areas development:

2.3.1. Convention on biological diversity

At the 1992 Earth Summit in Rio de Janeiro, world leaders agreed on a comprehensive strategy for *sustainable development* -- meeting our needs while ensuring that we leave a healthy and viable world for future generations. One of the key agreements adopted at Rio was the *Convention on Biological Diversity*. This pact among the vast majority of the world's governments sets out commitments for maintaining the world's ecological underpinnings as we go about the business of economic development. The *Convention* establishes three main goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources.

The *Convention* recognizes protected areas as a tool for in situ conservation that should be used in conjunction with other relevant provisions of the *Convention*. Paragraphs (a), (b), (c) and (e) of *Article 8* contain specific references to protected areas and provide that Parties should:

- (a) Establish a system of protected areas or areas where special measures are taken to conserve biodiversity;
- (b) Develop guidelines for the selection, establishment and management of protected areas
- (c) Regulate or manage biological resources important for biodiversity conservation whether within or outside protected areas; and
- (d) Promote environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering protection of these areas.

2.3.2. Protected areas and the global environment facility

The Global Environment Facility (*GEF*) is the major source of funding for conservation and sustainable use of the Earth's biodiversity. As in the case of the financial mechanism for the CBD, GEF receives guidance from the Conference of Parties on policy, strategy, program priorities and eligibility criteria related to the use of resources. In its first decade of operation, the GEF provided nearly \$ 1.1 billion for approximately 200 biodiversity projects involving parks and other types of protected areas. This portfolio supports more than 1000 sites covering more than 2.26 million km².

Table – 2b The GEF's Protected Areas Portfolio – Linking natural landscapes		
	GEF projects	Protected areas
Buffer zones	44	209
Corridors	32	207
Cultural linkages	8	24
Trans-boundary protected areas	5	29
Integrated coastal zone management	7	15

Source: Protected areas and biodiversity: An overview of key issues. UNEP

Bolstering the sustainability of protected area systems is one of four main directions in which the GEF plans to develop its portfolios. The priority targets not just ecological sustainability, but also institutional, social, political and financial sustainability in the context of national protected area systems. Objectives include expanded engagement of the private sector, further development of innovative financial mechanisms, intensified capacity building and comprehensive stakeholder participation, and an emphasis on in situ conservation of globally important and threatened sites and ecosystems.

GEF projects work to link protected areas and their surroundings through, for example, buffer zones, corridors, cultural linkages, integrated ecosystem management, integrated coastal zone management and trans-boundary protected areas. Forty four GEF financed biodiversity projects have incorporated buffer zones. Ecological corridors multiply the conservation benefits of protected areas by linking them within the larger context of surrounding ecosystems, and 32 GEF funded biodiversity projects include corridor components.

Table – 2c Major international initiatives recognizing or designating specific sites		
Initiative	Geographical Coverage	Thematic Coverage
World Heritage Convention	Global	
Ramsar Convention	Global	Wetlands
UNESCO Man and Biosphere Program biosphere reserves	Global	
Helsinki Convention	Baltic	Marine and coastal
Barcelona Convention and Specially Protected Areas Protocol	Mediterranean	Marine and coastal
Cartagena Convention and Specially Protected Areas and Wildlife Protocol	Caribbean	Marine and coastal

Antarctic Treaty and Madrid Protocol	Antarctic	
Bern Convention	Europe	Listed species/habitats
EU Birds Directive	European Union	Listed species
EU Habitats Directive	European Union	Listed species/habitats
Council of Europe Biogenetic Reserves	Europe	
Council of Europe European Diploma	Europe	
ASEAN (<i>Association of Southeast Asian Nations</i>) Declaration on Heritage Parks and Reserves	Southeast Asia	

Source: *Protected areas and biodiversity: An overview of key issues*. UNEP

Table – 2d Examples of conventions and programs with a commitment to establishing protected areas	
Initiative	Geographic Coverage
Article 8a of the Convention on Biological Diversity	Global
Article X of the African Convention	Africa
Article II of the Western Hemisphere Convention	Americas
Convention for the Conservation of Biodiversity and Protection of Wilderness Areas in Central America	Central America
Article 13 of the ASEAN (<i>Association of Southeast Asian Nations</i>) Declaration	Southeast Asia
Article 14 of the Convention for the Protection of the Natural Resources and Environment of the South Pacific Region	South Pacific
Convention on the Conservation of Nature in the South Pacific	South Pacific
Other regional sea agreements, including southeast Pacific and eastern Africa	Various
Pan-European Biological and Landscape Diversity Strategy	European

Source: *Protected areas and biodiversity: An overview of key issues*. UNEP
Protected Areas: Benefiting humanity

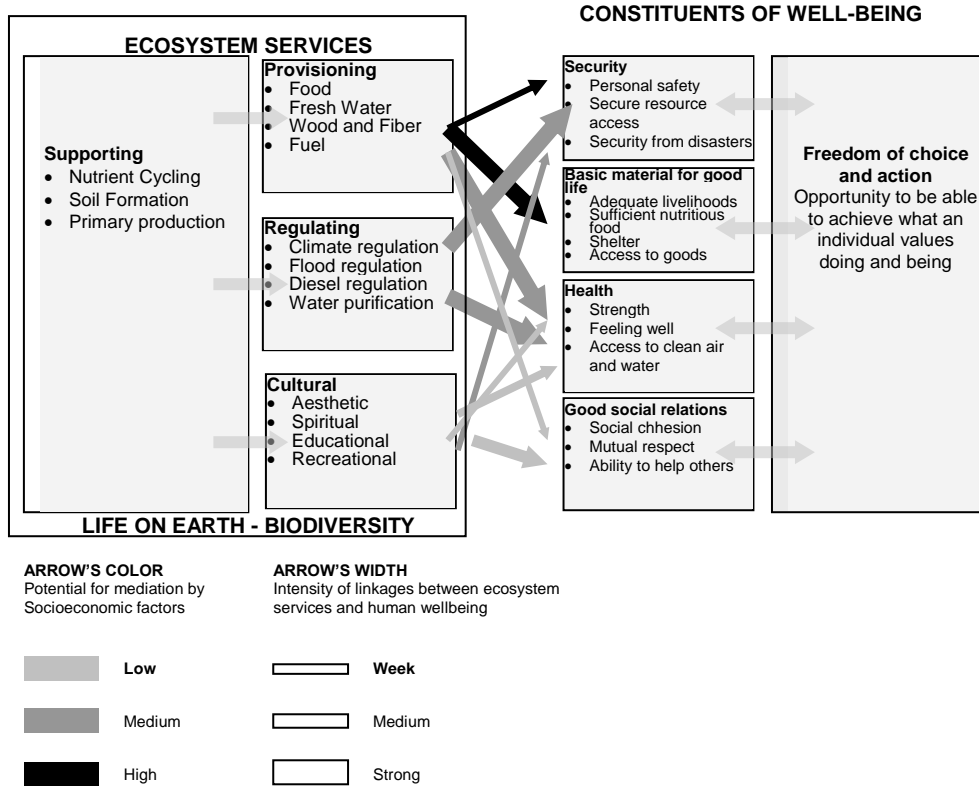
Why do we need to develop protected areas? This question finds an answer in the identification of the main purpose of designating areas as protected. IUCN suggests that the main purposes of protected areas can be summarized as:

- Scientific research
- Wilderness protection
- Preservation of species and genetic diversity
- Maintenance of environmental services
- Protection of specific natural and cultural features
- Tourism and recreation
- Education
- Sustainable use of resources from natural ecosystems
- Maintenance of cultural and traditional attributes

The *Millennium Ecosystem Assessment Report* draws a strong link between ecosystem services and human well being. The following figure depicts the strength of linkages between categories of ecosystem services and components of human well being that are commonly encountered and includes indications of the extent to

which it is possible for socio-economic factors to mediate the linkage. The strengths of the linkages and the potential for mediation differ in different ecosystems and regions. Attempts to place a value on protected areas must therefore consider many of the activities associated with human existence.

Chart – 2a Linkages between Ecosystem Services and Human Well-being.



Source: Millennium Ecosystem Assessment Synthesis Report

According to the Millennium Ecosystem Assessment Report, most resource management decisions are most strongly influenced by ecosystem services entering markets; as a result, the non-marketed benefits are often lost or degraded. These non-marketed

benefits are often high and sometimes more valuable than the marketed ones. For example, one of the most comprehensive studies to date, which examined the marketed and non-marketed economic values associated with forests in eight Mediterranean countries, found that timber and fuel-wood generally accounted for less than a third of total economic value of forests in each country. We also now

Table – 2c

Total Economic Value

Total economic value (TEV) assessments attempt to find economic values for both present and future uses of protected areas, and divide these into a number of different categories

Use values

Direct use values such as grazing, harvesting, tourism and research
Indirect use values like carbon sequestration and replenishment of water supplies
Option values, assigned to future direct and indirect uses, for example genetic resources and protection of climate change refugia

Non-use values

Existence values including aesthetic, spiritual and cultural
Bequest values (use and non-use) as a legacy to future generations

Source: Protected areas and biodiversity: An overview of key issues. UNEP

know that national parks protecting Jakarta's watersheds supply the city with water worth \$1.5 billion. Protected area tourism in Canada and the United States was estimated to be worth between \$237 billion and \$ 370 billion in 1996.

However, it has to be noted that many protected area values are very difficult to capture in economic terms. Certain natural features can be of irreplaceable spiritual value to particular communities, or even to major faiths. The general public tends to place considerable importance on the intangible values of protected areas, even when these are not considered at political and economic levels. What is however significant is that the wider arguments for protected areas are increasingly being recognized.

Habitat type	Total Habitat area (km ²)	Protected area (km ²)	Percentage protected
Temperate and boreal needle-leaf forest	11425000	1514000	13.3
Temperate broad-leaf and mixed forest	10180000	1240000	12.2
Tropical moist forest	10392000	2471000	23.8
Tropical dry forest	2716000	399000	14.7
Savannah	15368000	1878000	12.2
Shrubland	5611000	692000	12.3
Grassland	14284000	1478000	10.3
Wetlands (<i>inland</i>)	3429000	434000	12.7
Desert	45474000	4589000	10.1
Caspian Sea	375000	4000	1.1
Marine	361800000	1637000	0.5
Artificial – terrestrial	24421000	1880000	7.7
Artificial – aquatic	3167000	170000	5.4
For this analysis the global land-cover characterization (<i>GLCC</i>) was used. This classification is based primarily on the unsupervised 1-km AVHRR (<i>advanced very high resolution radiometer</i>) 10- day NDVI (<i>normalized difference vegetation index</i>) composites. The source imagery dates from the early 1990's and there have also been some problems with the classification. In a series of new assessments, UNEP-WCMC will redo this analysis with updates to the World Database on Protected Areas undertaken after the Vth World Parks Congress and using data from the Global Land Cover 2000 Project, which also gives ca.1km resolution coverage taken from SPOT imagery, but based on images from the year 2000			

Source: Protected areas and biodiversity: An overview of key issues. UNEP

2.4. Protected areas under threat

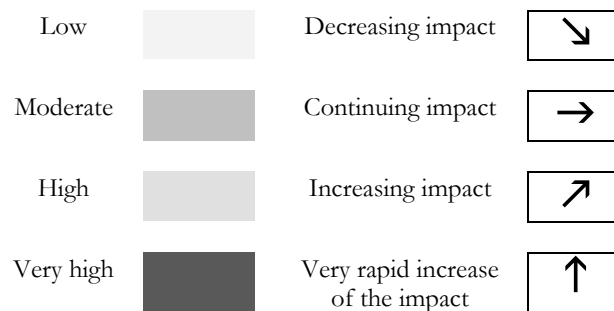
Protected areas face a myriad of threats to their integrity and few are adequately managed, especially in the tropics where biodiversity is concentrated. Even many of the well designed and properly implemented protected areas face an alarming array of threats. The protected areas and the biodiversity they harbor, can be threatened in many ways, ranging from the removal of key species (*for example by poaching*), through more general ecological damage to, in extreme cases, almost total destruction.

Protected areas cannot also be considered in isolation rather they have to be incorporated within a holistic and interactive framework. Even if the protected areas themselves remain relatively secure, they can be adversely impacted from changes in the surrounding land use. Some threats are of an inherent nature and can be traced to flaws in the design of protected areas resulting in reserves that are isolated from other suitable habitat, too small, missing key components or simply in the wrong

place. Then there are the *Paper Parks*, so called as they exist only in government statistics and all plans associated with them never get implemented.

Chart – 2b Main Direct Drivers of Change in Biodiversity and Ecosystems

		Habitat change	Climate Change	Invasive species	Over-exploitation	Pollution (nitrogen, phosphorus)
Forest	Boreal	↗	↑	↗	→	↑
	Temperate	↘	↑	↑	→	↑
	Tropical	↑	↑	↑	↗	↑
Dryland	Temperate grassland	↗	↑	→	→	↑
	Mediterranean	↗	↑	↑	→	↑
	Tropical grassland and savanna	↗	↑	↑	→	↑
	Desert	→	↑	→	→	↑
Inland water		↑	↑	↑	→	↑
Coastal		↗	↑	↗	↗	↑
Marine		↑	↑	→	↗	↑
Island		→	↑	→	→	↑
Mountain		→	↑	→	→	↑
Polar		↗	↑	→	↗	↑



Source: Millennium Ecosystem Assessment Synthesis Report

In a recent analysis of threats to protected areas carried out by WWF and the World Bank, which looked at almost 200 forest protected areas around the world, the three most critical and immediate threats identified by managers were poaching, encroachment and logging. Apart from threats faced inside the protected areas, there are external threats also. Freshwater protected areas are vulnerable to threats that occur in other parts of the watershed and even in different countries. Large dams have adversely affected several important protected areas. The amount of water impounded behind dams quadrupled since 1960 and three to six times as much water is held in reservoirs as in natural rivers. By flooding existing wetlands, dams can dramatically reduce environmental richness.

Pollution from outside sources is another major threat. According to the findings of the *Millennium Ecosystem Assessment Report*, since 1960, flows of reactive (*biologically available*) nitrogen in terrestrial ecosystems have doubled, and flows of phosphorus have tripled. An emerging challenge of the future is the threat of global climate change. Over the course of the 20th century, the average surface temperature increased by 0.6°C and the rate of change is accelerating. The best available computer models predict average temperature rises of 1.4 to 5.8°C between 1990 and 2100.

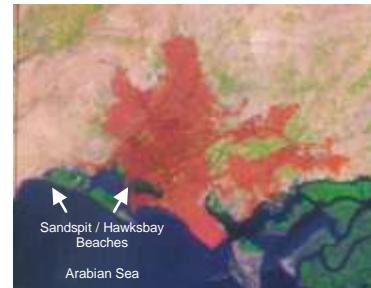
3. Sandspit/Hawksbay beaches/adjacent creeks coastal ecosystem: Potential for protected area status

3.1. The proposed Turtle Beach Protected Area

A landmass of 780 hectares, located in the Sohri Creek, on the Karachi coast and covering part of Sandspit beach and the whole of Hawksbay beach in addition to the backwaters (*sustaining mangrove forestation*) is being proposed to be designated as a Protected Area (*see Map 3b*). Maximum turtle nesting takes place on this section of the beach. For our convenience we shall term this proposed protected area as the **Turtle Beach Protected Area (TBPA)** in this report for all future reference to the area. Discussed in this section are general geographical, physical, social and hydrological details about the TBPA and the surrounding coastal ecosystems.

3.1.1. Location

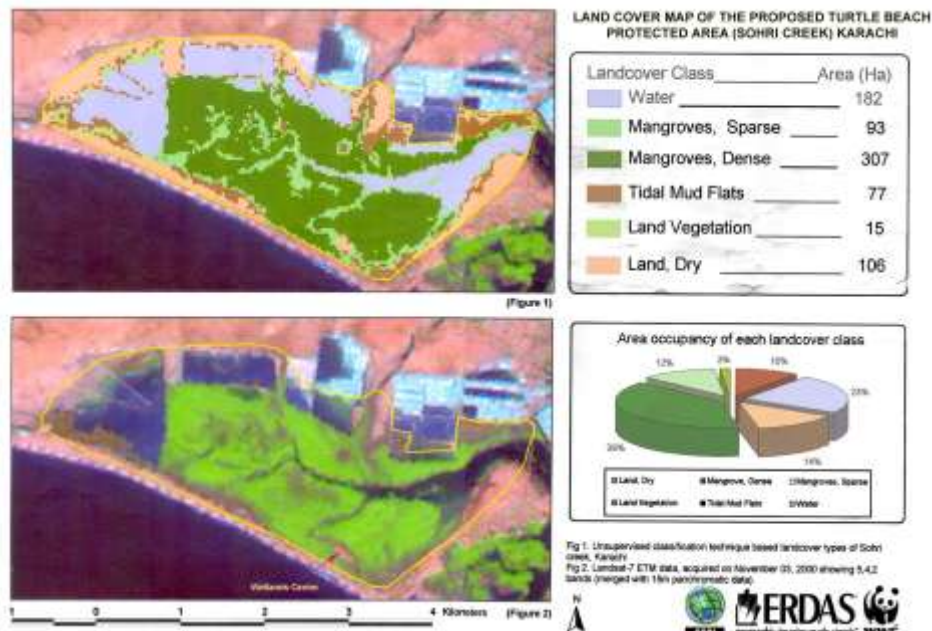
Located 24° 47' – 24° 52' N, 66° 50' – 66° 59' E; on the coast southwest of Karachi City. This stretch of the coast lies in between the area west of Karachi Harbor entrance upto Buleji/Paradise Point consists of sandy beaches, which are separated from each other by rocky protruding points. The Hawksbay/Sandspit beaches lie about 15 km south west of Karachi City. They are flanked to the northwest by the Arabian Sea and to the southwest by a dense mangrove forest cover in the coastal backwaters.



Map – 3a Hawksbay / Sandspit beaches on the Karachi Coast

3.1.2. Description of site

A gently sloping sand beach with open sandy offshore approaches stretching for about 20 km along the Arabian Sea coast west from Manora Point at the mouth of the Karachi Harbor, and a complex of creeks and shallow tidal lagoons with extensive inter-tidal mud-flats and some mangrove swamp behind the beach. The eastern part of the beach (*Sandspit*) is all sand; the western part (*Hawksbay*) has some rocky areas. The beach platform is high enough to stay above the high tide mark at all times of the year except during the monsoon when it can be inundated by high tides.



Map – 3b The proposed Turtle Beach Protected Area
 (Courtesy: WWF Pakistan)

3.1.3. Climatic conditions

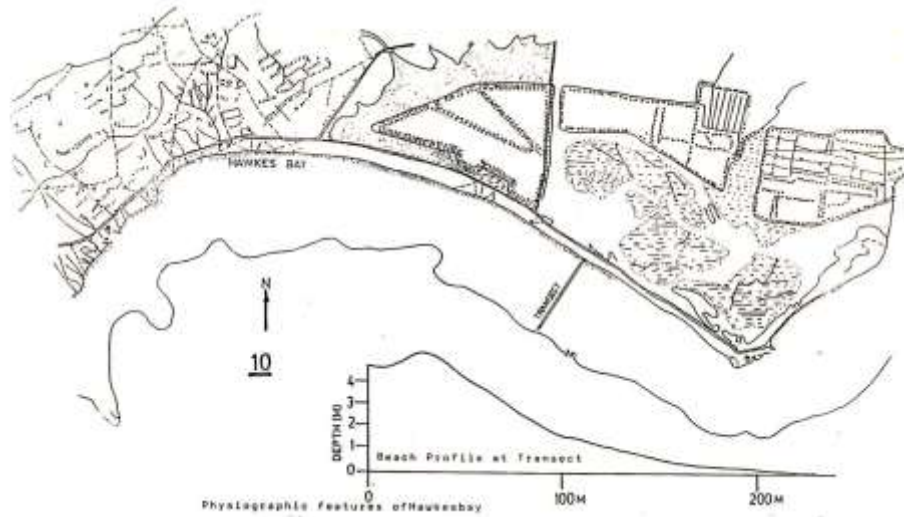
The area experiences an arid subtropical climate with temperatures remaining high throughout the year. The average annual rainfall is 125 mm, and the mean annual temperature is 32°C.

3.1.4. Physical features

The significant shoreline features of both the Hawksbay and Sandspit beaches are discussed as follows:

3.1.4.1. Hawksbay beach

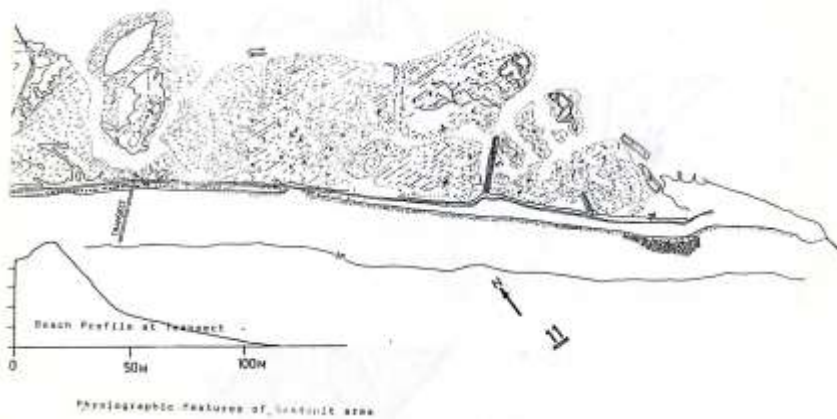
There is no cliff at the Hawksbay beach. The sand dunes are common all along the beach at high water zone (*Map 3c*). The beach slopes vary between 20-40 degrees from high water mark to the sub-tidal area and then slopes are very gentle up to a depth contour of 5 meters. There is a small rocky outcrop within the inter-tidal area between Hawksbay and Sandspit called Kakapir area. The rocky ledges have a very gentle slope and extend only up to the neap low water zone. There are sabellarian reefs along the edges of the rocky ledge near the neap low water zone. The rest of the basement of the rocky ledges is buried in the sand and extends up to the adjacent sub-tidal area.



Map – 3c Profile of Hawksbay Beach

3.1.4.2. Sandspit beach

No cliffs are present. Sand dunes at high water zone of this long sandy beach oriented at southwest direction. The beach slopes vary between 40-60 degrees from high water mark to the sub-tidal area and then slopes are very gentle up to a depth contour of 5 meters (*Map 3d*).



Map – 3d Profile of Sandspit Beach

3.1.5. The Ecosystems – Flora and fauna

Discussed below are the salient features of the nature of the prevailing ecosystems:

3.1.5.1. Seashore – beaches and cliffs

Stretching from Sandspit through Yunus Abad Goth, Hawksbay, Buleji and Paradise Point to Cape Monze, the coastal areas west of Karachi consists of some 20 km of mainly sandy beaches with small rocky areas, cliffs and raised mud plateaus. The beaches of Sandspit and Hawksbay are mostly lined with beach huts built between the road and the top of the sand dunes.



Green turtle nesting on the Hawksbay / Sandspit beaches

The sandy shores of Karachi coast have three to four main groups of macro marine organisms such as crabs, gastropods, macro-fauna, interstitial fauna and cast off sea weed along the high water zone as well as floating near the coastal waters. The beach is a very important nesting site for the Green Sea Turtle (*Chelonia mydas*) and Olive Ridley (*Lepidochelys olivacea*). The site is of international importance for *C.mydas* both in regional and in global terms.

The crabs *Ocytopoda rotundata* – the ghost crabs, are very common near the high water zone, and the moon crab (*Matuta lunaris*) are also found on some of the sandy shores. The common gastropods of the sandy shores include *Nautica didyma*, *Terebra sp.* The star fishes (*massive star fishes - Asterina sp.*) are also common in the sandy shores (e.g. *Clifton, Hawksbay etc.*). The gastropods are usually found more frequently on the sandy beaches at steep angle of the beach slope. Star fishes are more commonly found on sandy beaches with gentle angle of beach slope.

3.1.5.2. Backwaters, mangroves and mud flats

The backwaters extend into the area behind Sandspit beginning from Yunus Abad Goth and reaching the Naval Officers Housing Society at a couple of points. A large area of backwaters supports a dense mangrove vegetation comprising *Avicennia marina*. The mud flats are generally barren except for some very stunted bushes of mangroves. There is 400 hectares of mangrove forest in Sandspit area and it includes 307 hectares of dense forest and 93 hectares of sparse forest. There is only one species of mangroves in the backwaters at Sandspit called *Avicennia marina*.



Mangrove swamps in the coastal backwaters of Hawksbay / Sandspit

The backwaters contain a very rich and complex food web of algae, invertebrates living in the mud, such as worms, shrimps, crabs and juvenile fish. In this particular area the diversity of species may be somewhat curtailed by the extensive pollution which must be swept back by the tide from the sewage and industrial and industrial waste being discharged un-treated from the Lyari River.

Many water birds are to be found in this area, especially herons, waders such as stints, sandpipers, redshanks, avocets and black winged stilts, and hawks such as ospreys, brahminny kites and marsh harriers. At times, when they lose their way back to the seas, adult turtles and their hatchlings can also be found in the backwaters.

3.1.5.3. Saltpans and low-lying salt effected areas

The saltpans have been in the area for over half a century. These occupy the area between the backwaters and the Naval Officers Housing Society. Sea water is pumped into these pans for salt production. Neither these nor the adjoining low-lying salt affected areas support any vegetation due to high salinity and waterlogged soil. However, in some of the salt pans, containing water at the appropriate depth, thousands of migratory wading birds cab be seen in the winter time, particularly little and temminck stints (*Calidris minuta* & *C.temminckii*), dunlin (*Calidris alpinus*), sandpipers (*Numenius arquata*, *Tringa hypoleucos*, *Numenius phaeopus*, *Tringa terek*, *T. stagnatilis*, *T. tetanus* etc.) avocets (*Himantopus*, *Recurvirostra avosetta*), godwits (*Limosa limosa*, *L. lapponica*) etc. Several hundred Flamingoes (*Phoenicopterus roseus*) are also seen regularly in this area. It is assumed that they are attracted by the food from small crustacean which can survive in highly saline conditions such as brine shrimp.

3.1.5.4. The creek system

The creek system is one of the most important areas for wintering, passage and summering shorebirds in Pakistan, and also supports significant numbers of cormorants, flamingoes, ducks, gulls and terns. Thirty two-species of shorebirds have been recorded, including *Dromas ardeola*. The commonest species are *Charadrius alexandrinus*, *C. mongolus*, *Calidris alba*, *C. minuta* and *C. alpine*. Migratory shorebirds begin to arrive in large numbers in August and most leave by the end of April, but significant of non-breeding *Haematopus ostralegus*, *Charadrius mongolus* and *C. alba* remain in the area throughout the summer.



A Greater Flamingo visiting the Hawksbay / Sandspit area

3.1.6. Socio-economic profile

Two separate types of human settlement patterns exist in the proposed TBPA.

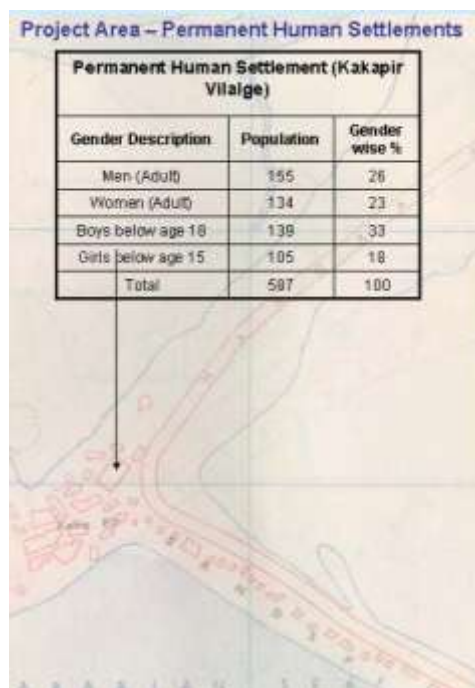
- Permanent Human Settlement
- Non-Permanent Human Settlement

3.1.6.1. Permanent human settlement

The permanent human settlement exists in the form of the Kakapir coastal fishing village located at the meeting point of the Sandspit and Hawksbay beaches. Kakapir village is spread over an area of about one (1) square km. The village has a population of 587 with 95 households (*census year 2000*). Average family size is about 6 to 7 members. Population is 95% ethnic Sindhi with some clusters of Baloch and Seraiki speaking communities. Almost 90% of households are dependent on fishing and related activities. Women are mostly involved in household chores, child rearing, livestock management and fuel and fodder collection.



A girls school in the Kakapir fishing village

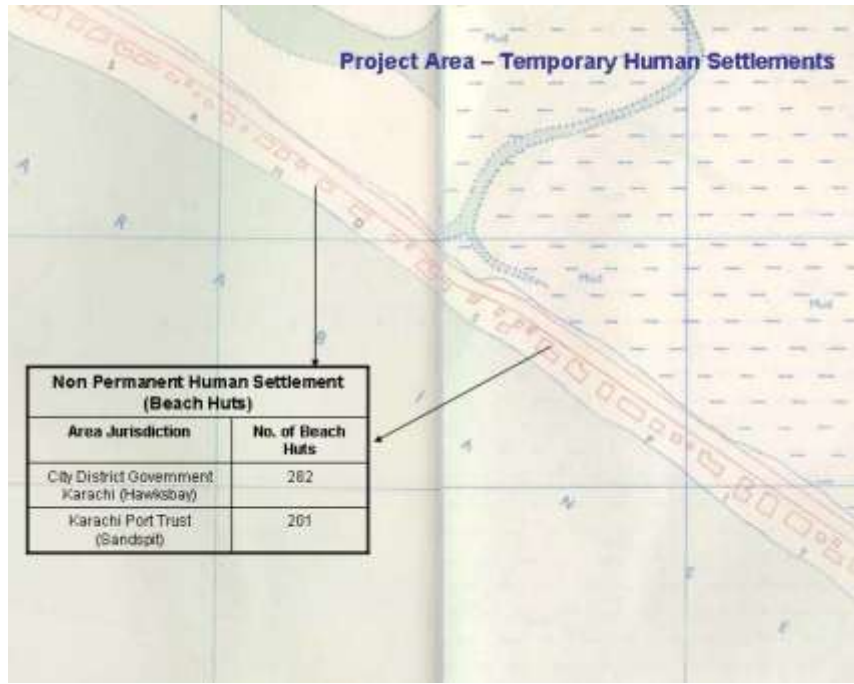


Map – 3e Permanent human settlement in the TBPA

3.1.6.2. Non-permanent human settlement

Visitors to the beach huts represent non-permanent classification of human settlement in the proposed TBPA. 201 huts are located in the KPT owned stretch of the beach, while 282 beach huts are located in the jurisdiction of

the CDGK owned stretch of the beach area. The plots in the jurisdiction of KPT are held on temporary lease for 10 years renewable for another 10 years, while the huts falling in the jurisdiction of CDGK are held on a temporary lease for 1 year renewable for another 1 year. The temporary leases are neither ownership nor tenancy as the allottee possesses temporary lease rights



Map – 3f Non-permanent human settlements in the TBPA

3.1.7. Land ownership/management and regulation

Land is state owned. Land ownership on the beaches is shared between Karachi Port Trust (KPT) and City District Government Karachi (CDGK). The area falls under the territorial and political jurisdiction of Keamari Town of the CDGK. Sandspit beach area comes under the jurisdiction of KPT. Regulatory control is by the Manora Cantonment Board. It provides services of water supply/sewerage, street lightening, predator control, garbage disposal and land-use control (e.g. Hut Lease Violations).

The Hawksbay beach area falls under the jurisdiction of CDGK, which owns land and through its sub-agencies like the Karachi Building Control Authority (KBCA) exercises land use control and is responsible for provision of facilities/amenities. It is also responsible for undertaking predator control.

3.1.8. Current land use

Presently, the following human activities take place in the proposed TBPA.

3.1.8.1. Fishing activities

Round the year fishing activity occurs in the area. Mostly, gill netting is used. Fishermen generally own small fishing boats with out-board engines. Very few people own deep sea fishing vessels of medium size. Economy of the area depends primarily on fishing and related activities.

3.1.8.2. Livestock

Most of the villages have cattle, goats, camels and donkeys. In addition to grazing, the livestock is also stall-fed using locally grown fodder and mangrove leaves collected from the backwaters.

3.1.8.3. Agriculture

A variety of vegetables, fruits and fodder is cultivated by a majority of the villages depending on rainfall. The soil is good and gives good yield without adding any commercial fertilizer.

3.1.8.4. Salt works

For over half a century, the area behind Sandspit has been used for salt-works. There are five salt-works in the area between Mauripur and Hawksbay. Salt production is a commercially viable activity between Mauripur and Hawksbay. Salt production is a commercially viable activity with about 200,000 tones of sea salt being produced each year in the area; this is mainly used for industrial purposes.

3.1.9. Recreation

According to a survey carried out by KDA in 1988/89, the average number of visitors on a summer Friday at Sandspit, Hawksbay areas was 16,800 and to French Beach and Paradise Point were 8,600. They predicted that by the year 2000 these visitor figures will have risen 26,600 and 13,000 respectively. The same study predicts that the total numbers using the coastal areas around Karachi for recreation will be about 270,500. Whilst the majority will be in the central coastal areas around Clifton and Keamari, the beaches west of Karachi are the second most important. As mentioned earlier, the beaches of Sandspit and Hawksbay are bordered by beach houses accessible from the road network, and are used by the general public as is Paradise Point.

3.1.10. Factors affecting the areas ecological character (including changes in land use and development projects)

Sea Turtles enjoy a protected status in Pakistan. Virtually all the marine turtles nesting sites in Sindh occur on the Hawksbay/Sandspit beaches, concentrated along one 5 km stretch but extending in some degree along the entire beach strip of around 20 km. These two beaches represent the largest nesting habitat for marine turtles in Pakistan where the dominant resident turtle is the green turtle. Due to various human activities, this habitat is now threatened. In the absence of any effective and regular beach cleanup and garbage disposal system, beaches often contain large amounts of beach litter. Green turtles eat a wide variety of

marine litter such as plastic bags, plastic styro-foam pieces, balloons and plastic pellets. Effects of consumption include interference in metabolism or gut function, even at low levels of ingestion as well as absorption of toxic by-products. In addition, garbage attracts predators like dogs and crows/gulls in large numbers that then pose a direct threat to the turtle eggs/hatchlings.



A green turtle caught in a wire net erected along a beach hut



Garbage on the beach which results in attracting predators such as crows and dogs.

Presently, beachfront development is limited to the construction of beach huts. However, land use violations have been observed with a number of huts exceeding the limits of land usage as described in the law. This is resulting in the reduction of available nesting habitat for turtles. Land previously used by turtles for nesting has been built upon (*Huts/roads*) and hence space for turtle nesting is now severely restricted. Night use of beach huts is common. Use of lightening in the night discourages females from nesting and causes hatchlings to become disoriented because they instinctively head towards the brightest horizon, which should be the moonlit ocean. Beachfront lighting instead causes them to disorient and wander inland, where they often die of dehydration or predation. They are also run over by offshore road traffic.



Sand extraction which adversely impacts the characteristic of the turtle nesting beach habitat



Illegal extension of a beach hut along with the erection of a wire net

Of great concern these days is the issue of construction debris from newly constructed and unused/unprotected huts that has been noticed at various locations on the beaches. The debris can alter the beach habitat, hamper or deter nesting attempts as well as interfere with the incubation of eggs and the emergence of hatchlings. Sand excavated during the process also causes much

Table – 3a Examples of Pressures and Threats in the TBPA with Varying Degrees					
Activity	Extent	Impact	Permanence	Degree	Description and Rationale
Nest Predation	Throughout (4)	High (3)	Medium Term (2)	24	Visitors to the beach generate garbage that attracts predators such as dogs/crows. Till such time that an effective garbage management plan is implemented coupled with regular pye dog campaigns this problem to continue
Poaching	Localized (1)	Mild (1)	Medium Term (2)	2	Limited occurrences reported. Since turtle meat is not locally consumed no significant impacts expected
Beachfront Development	Throughout (4)	High (3)	Permanent (4)	48	It is a beach that has been privatized by lasing out huts. Interests and structures likely to have permanent presence
Beachfront Lightening	Throughout (4)	Moderate (2)	Medium Term (2)	16	Related to beach hut usage. Impact limited as night usage of huts not common
Beach	Throughout	High	Medium	24	Includes

Pollution	(4)	(3)	Term (2)		garbage and construction debris. Attracts predators and causes likely permanent damage to the beach characteristics
Sand Mining	Scattered (2)	Moderate (2)	Long Term (3)	12	Impact as yet not widespread but could very well increase with time. Likely permanent damage caused to beach/sand characteristics
Natural Resource Depletion (e.g. Mangroves)	Localized (1)	Moderate (2)	Long Term (3)	6	Gas has been supplied to the local community. As such exploitation of mangroves limited. Strong conservation campaign of WWF Pakistan also having good effects

Adapted from RAPPAM-WWF

damage to the beach habitat. Experience and research in other parts of the world have shown that when beaches are nourished by pumping, trucking or otherwise depositing sand on a beach to replace what has been lost due to natural erosion process or physical removal, it can negatively impact sea turtles. If the sand is too compacted for the turtles to nest in or if the sand imported is drastically different from native beach sediments, the nest-site selection, digging behavior, incubation, temperature and the moisture content of nests is effected. Therefore, it is felt that activities such as sand removal could have irreversible adverse impacts on the turtle nesting habitat at the Hawksbay/Sandspit beaches.

Development activities in the vicinity of the proposed TBPA are also of critical concern. Of special significance is the Hawksbay



Scheme 42 housing project (*Map 3g*). Also included in the development program is an ambitious Resettlement Program for displaced communities of the Lyari Expressway Project. This influx of people and communities is likely to add new, as yet unspecified and critical stresses to the area ecology and wildlife, if the process is not effectively monitored and regulated.

Based on the Rapid Assessment and Prioritization of Protected Area Management (*RAPPAM*) Methodology developed by WWF, a matrix (*Table 3a*) has been developed, adapted to the site specific conditions of the proposed TBPA.

3.1.11. Current scientific research/facilities and conservation education

Three separate Turtle Conservation Projects are being conducted independently by the Sindh Wildlife Department (*SWD*), Ministry of Forest and Wildlife, Govt. of Sindh, the World Wide Fund (*WWF*) for Nature Pakistan and Shehri-Citizens for a Better Environment, are presently ongoing in the project area.

3.1.11.1. Turtle conservation project – SWD

The SWD has been engaged in conservation of marine turtles in the Hawksbay - Sandspit area since late 1979 through a project on research and conservation of turtles. The main specified objective of this program is to save the marine turtles from extinction. The following steps have been undertaken to achieve this project objective:

- Establishment of enclosures for protection of turtle eggs/hatchlings along the nesting zone to save them from the predators and poachers
- Documentation (*count*) of turtles visiting the beaches for nesting and of hatchlings released into the sea.



Turtle hatcheries in the Hawksbay / Sandspit area

- Tagging of nesting turtles (*tagged turtles have been found to make multiple visits to area during a single nesting season and have also been spotted on the beaches of Oman, Eriteria and Gujarat, India*). Three fenced hatcheries are presently being used for the project related activities – two are located in Sandspit and one in Hawksbay beach. Construction work is also underway on a laboratory in Hawksbay beach that is being built to do research on behavior of turtles during captive breeding, study their migration patterns and document nesting frequency.

3.1.11.2. Turtle conservation project – WWF Pakistan

The WWF Pakistan is conducting a research/education program on turtle conservation. Though the main focus of the WWF Program



in the area is on conservation of mangrove ecology, limited level documentation on turtle nesting (*count of turtles*) does take place.

WWF has recently in cooperation with Hong Kong Shanghai Bank (*HSBC*) initiated a program for supporting turtle conservation activities in the Project Area. The program has three main focus areas: **awareness**

- Setting up of billboards giving information on green turtle conservation practices
- Supporting research project for one M.Phil or PhD student in turtle conservation
- Hiring two personnel for beach cleaning and watch and ward activities during the green turtle nesting season

WWF Pakistan has also recently with the financial support of ICI Pakistan launched a program with focus on following activities

- Monitoring Turtle population at Sandspit
- Release of rescued hatchlings
- Rescue of stranded adult turtles
- Creating awareness among beach visitors, students, communities and other target groups
- Providing safe nesting place to marine turtles by organizing beach cleaning activities

The WWF Pakistan have also proposed to Karachi Port Trust to declare Hawsbay/Sandspit and the adjacent habitats as a Nature Reserve

3.1.11.3. Turtle conservation project – Shehri –Citizens for a Better Environment

Shehri-Citizens for a Better Environment is presently executing a project aimed at developing plans and strategies for the conservation of the green turtle nesting habitat in the Hawksbay/Sandspit beach area. The primary objective of the project is to develop sustainable programs and activities for protecting the green sea turtle and conservation and land use management of their nesting



Training and certification program for Hut Chowkidars

beach habitat in the project area through interventions based on the concept of environmental stewardship and participatory management.

This project is funded by the Global Environment Facility and administered by the UNDP office in Pakistan. In this project, Shehri-CBE are collaborating and coordinating our efforts with the Sindh Wildlife Department and the World Wide Fund for Nature, Pakistan in undertaking the following activities:

- Prepare a (*Land Use*) Habitat Management Plan
- Preliminary Assessment Study of Green Turtle Migration Patterns (*DNA Profiling*)
- Conduct Training/Certification Programs on Environmental Stewardship for the Local Community
- Legal Review and proposed modifications in relevant legal instruments
- Preparation of Public Awareness Tools and awareness raising campaigns
- Formation of Green Turtles Environmental Stewards Committee

3.1.12. Conservation measures proposed but not yet implemented

The following policy based conservation measures have been proposed for the areas falling within the proposed TBPA. However, implementation has not taken place:

3.1.12.1. Karachi Coastal Recreation Development Plan (1990-2000)

The Karachi Coastal Recreation Development Plan (1990-2000) was the first comprehensive planning document that proposed a protected area status for the critically threatened ecological sites along the Karachi coast. The plan was the outcome of a study and planning effort sponsored by the Master Plan & Environmental Control Department of the Karachi Development Authority, assisted by the United Nations Development Programme



Map – 3h Proposed protected areas in the Karachi Coastal Recreation Development Plan (including the proposed TBPA)

through its executing agency the United Nations Development Programme through its executing agency the United Nations Centre for Human Settlements (*Habitat*). The study identified the following rationale for the delimitation of protected areas in the coastal region of Karachi:

Delimitation of protected areas is limited to environmentally and ecologically sensitive parts of the coastal zone. Such protection is required, as the development activities of various types and magnitudes are likely to have adverse effects on the ecosystems. Development causes physical changes and the resultant stresses will typically lead to biological or ecological responses. Based on the study and present understanding of the coastal environmental conditions and ecosystems, the following three areas are proposed to be designated as environmentally protected areas:

- Hub River outfall and adjacent Sonari Hills
- Sandspit beach frequented by green turtles
- Creek mangrove ecosystem

These areas have been classified as Environmental Planning Zones Level 2 (*Conservation Area*) with limited infrastructural development but accessible for public to watch and enjoy the unique physical features and natural habitats (*Map 3h*). In these areas, the conservation practices should be strictly observed in order to protect and preserve their unique environmental conditions.

3.1.12.2. General Standard: Coastline recreation development: The Karachi Building and Town Planning Regulations 2002

The Karachi Building and Town Planning Regulations 2002 took all its recommendations regarding coastal conservation and planning from the Karachi Coastal Recreation Development Plan (1990-2000) and earmarked the entire 40 mile strip of Karachi Coastline right from Hub River Estuary passing through Paradise Point, Hawksbay, Manora and Western Backwaters, Eastern Backwaters and Clifton, Gizri, Defence and Korangi Creek, Phitti Creek, Kadero Creek and right upto Gharo Creek as an interim control area for the purpose of recreation and tourism.

Recreational Land use	% of total acres/hectares
Boarding and lodging area	20
Open area for landscaping for recreation	70
Circulation roads and car parking	10
<i>A plot ratio of 1:1 shall be used for all buildings for hotels, motels, amusement balls</i>	

All the environmental planning recommendations of the Karachi Coastal Recreation Development Plan (1990-2000) were incorporated in the General Standard: Coastline recreation development of the Karachi Building and Town Planning Regulations 2002. Following land use composition was allowed for a recreation project:

4. Arguing the case: Turtle Beach Protected Area

4.1. Presenting the case

In the previous section, detailed information has been provided about the various physical, ecological and socio-economic aspects of the proposed TBPA. The various options available for designating a protected status for the area have also been highlighted. In this section, a case for a designated protected area status within the national and international context will be discussed.

4.2. The proposed protected area: A globally important green turtle nesting habitat

The case for designating the Sandspit/Hawksbay beaches/adjacent creeks coastal ecosystem as a protected area has to be principally argued on the basis of the fact that it is a globally significant green turtle nesting habitat. Following is discussed the importance of the proposed TBPA within the context of being a globally significant green turtle nesting site.

4.2.1. Green turtles – Distribution and habitat

Green sea turtles are distributed throughout the world's oceans between 35 degrees north-south latitude. They are found in the eastern and western hemispheres and nest on beaches throughout the Atlantic, Pacific and Indian Oceans. Green Sea Turtles enjoy warm, tropical and sub-tropical, shallow waters near continental coasts and around islands where the sea is plentiful.

Green turtles occupy three habitat types:

- High energy oceanic beaches
- Convergence zones in the pelagic habitat
- Benthic feeding grounds in relatively shallow, protected waters

Females deposit egg clutches on high energy beaches, usually on islands, where a deep nest cavity can be dug above the high water line. Hatchlings leave the beach and apparently move into convergence zones in the open ocean where they spend an undetermined length of time. When the turtles reach a carapace length of approximately 20 to 25 cm, they leave the pelagic habitat and enter benthic feeding grounds. Most commonly, these foraging habitats are pastures of sea grasses and/or algae, but small green turtles can also be found over coral reefs, warm reefs and rocky bottoms. Coral reefs or rocky outcrops near

feeding pastures are often used as resting areas, both at night and during the day.

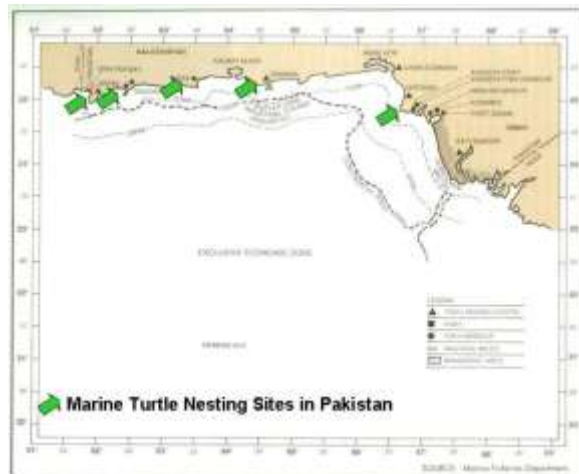
4.2.2. Sea turtles in Pakistan – The status

Sea Turtles enjoy a protected status in Pakistan, either directly or indirectly through the following legal and regulatory provisions:

- According to the *Second Schedule* of the Sindh Wildlife Protection Ordinance 1972, all marine turtles in the Sindh province enjoy the status of a Protected Animal
- The clause 5 (*Export Restriction*) in the Pakistan Fish Inspection and Quality Act 1997, of the Federal Ministry of Food, Agriculture and Livestock, Government of Pakistan, forbids the export and domestic consumption of aquatic turtles.
- Pakistan is a signatory to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (*CITES*). All marine turtles are included in Appendix I of CITES
- The Government of Pakistan acknowledges the IUCN Red List of Threatened Species which lists the green turtle as a Threatened Species (*see Annex B*)

4.2.2.1. Sea turtle nesting sites in Pakistan

Virtually all the marine turtle nesting sites in Sindh occur on the Hawksbay – Sandspit beaches, concentrated along the entire beach strip of around 20 km. Some nesting also occurs on parts of the remaining coast extending westward to the Balochistan border near Cape Monze. Though Hawksbay – Sandspit beaches



Map – 4a Marine turtle nesting sites in Pakistan

represent the largest nesting habitat for marine turtles in Pakistan, having importance both in regional and global terms, there have been some indications that the remaining coastline of Pakistan, in Balochistan province, may hold significant numbers of marine turtles.

Marine turtles have been found to nest in the vicinity of each of the four main fishing towns – Jiwani, Gwadar, Pasni, Ormara - along the Makran Coast of Balochistan. All the valuable evidence, comprising nest pits, stacks and skeletal material, suggest that the green turtle is the main species involved.

4.2.2.2. Sandspit/Hawksbay green turtle nesting site

Kabraji and Firdous (1984) estimated that some 6000 *C.mydas* and 200 *L.olivacea* came to the beach to nest each year during the period 1981-83. According to the Sindh Wildlife Department, from October 1979 to December 1997, 1,531,980 eggs from 17,702 nests were transplanted to enclosures (three# enclosures, each having a capacity of 300 nests) to protect them from predators. Of these, 1,453,966 were green turtle eggs from 17,702 nests and 78,014 were olive ridley eggs from 654 nests. A total of 3,91,556 hatchlings were released to the sea. Out of these, 3,70,414 were green turtle hatchlings and 21,142 were olive ridley hatchlings. In addition, 88,108 hatchlings were collected from outside the enclosures and were released to the sea. In total, 4,79,664 hatchlings were released to the sea.



Green turtle nesting site – Hawksbay / Sandspit beaches

Present nesting estimates are provided by the recently released data by WWF Pakistan. The monthly estimate of the population of green turtles based on the mean observation counts made on Sandspit/Hawksbay beach during the nesting season 2004-05 is as follows:

Month	Mean Green Turtle Population
September 2004	123
October 2004	180
November 2004	168
December 2004	72
January 2005	25
February 2005	7

Source: WWF-Pakistan

4.2.3. A globally recognized coastal wetland

In addition to being an important green turtle habitat, the xx is also globally recognized for its wetland characteristics. Pakistan is a signatory to the *Ramsar Convention on Wetlands*. On the basis of the criteria as adopted by the Conference of the Parties to the Convention

in Regina, Canada in 1987, some of the main wetland sites on Karachi coast have been identified as Wetlands of International importance and includes Sandspit/Hawksbay area. It has been considered worthy of being listed because:

- It is particularly a good representative example of a wetland characteristic of the region
- It supports an appreciable assemblage of rare, vulnerable or endangered species or sub-species of plant or animal or an appreciable number of individuals of any one or more of these species
- It is of special value as the habitat of plants or animals at a critical stage of their biological cycle
- It regularly supports 20,000 waterfowl or more

Further, Scott & Poole (1989) considered Hawksbay/Sandspit beaches and adjacent creeks as one of the most threatened wetlands of Pakistan. They have indicated that the habitat is likely to be lost or major ecological changes are likely to occur unless immediate remedial action is taken. They have also indicated that in the Hawksbay/Sandspit area, some form of management is required to maintain or enhance the nature conservation value of the site. The area has exceptional potential for conservation education and/or nature oriented outdoor recreation; this should be developed to improve the awareness of the local people to the need for wetland conservation.

4.3. Evaluating the case

For ascertaining the value, functions and importance of the TBPA as a potential protected area, a particular model for evaluating the ecological status and significance of protected areas will be applied to evaluate the case of the proposed TBPA. This methodological framework has been developed by Rudolf S.de Groot who is the Coordinator of the Center for Environment and Climate Studies of the Wageningen Agricultural University, Wageningen, the Netherlands.

4.3.1. Functions and values of the TBPA: Applying the de.Groot method

In order to ascertain the functions and values that can be attributed to the proposed protected area, it is to be evaluated within the context of the following categorizations:

- **Regulation functions:** This group of functions relates to the capacity of natural and semi-natural environments to contribute to the maintenance of a healthy living environment by providing clean air, water and soil and by regulating essential ecological processes and life support systems
- **Carrier functions:** Natural and semi-natural environments provide space and a suitable substrate or medium for many human activities such as habitation, cultivation and recreation, provided the use of these functions remains within the carrying capacity of the ecosystem involved
- **Production functions:** Nature may provide many resources on a sustainable basis, ranging from food and raw materials for construction and energy conversion to medicines and genetic material
- **Information functions:** Natural environments contribute to the maintenance of mental health by providing opportunities for reflection, spiritual enrichment, cognitive development and aesthetic experience

To develop a general checklist of parameters that may be used to assess the contribution of a given ecosystem to certain environmental functions, several case studies were carried out by Rudolf S. de Groot on various ecosystem complexes. Based on these case studies, and on additional information from literature a checklist of functions that can be attributed to natural ecosystems was identified. Once the many functions provided by natural and semi-natural ecosystems have been identified and described, the contribution of these goods and services to human welfare can be analyzed in more detail. This checklist is now being applied to the proposed TBPA for identification of its values and functions. *(see Table – 4b Those functions that do not relate to the area are being termed as non-applicable while the applicable functions are being rated)*

Which functions are most relevant for a given protected area depends on the ecological characteristics, the cultural and socio-economic setting, and the management objectives of the area in question. An assessment of the checklist for the proposed TBPA indicates that more pronounced in their impact are the regulation and information functions for the TBPA. The regulation functions are such that they can be attributed to both protected and unprotected areas, provided that these areas are in largely natural state. The other functions *(carrier, production and information)* are strongly related to specific human needs and objectives. In case of the proposed TBPA, which can allow for certain kinds of human uses, such as recreation and research, the information function seems more important in terms of the direct

economic benefit they may provide. However, when human uses such recreation and scientific research is being proposed, these activities have to be performed in a manner compatible with the habitat protection requirements. As with regulation functions, information functions are usually best performed when nature is left untouched as much as possible. It is also to be stressed that the maintenance of the regulation functions is essential to the proper functioning of all natural systems and should always be taken into account when assessing the economic benefits of the protected areas as most other functions such as recreational, scientific and educational use depend on these regulation processes. Often, the importance of protected areas to regulation functions becomes apparent only after these functions have been disturbed.

Table – 4b Checklist of Functions of the TBPA		
1. Regulation Functions		
1.	Regulation of the chemical composition of the atmosphere and oceans	a(2)
2.	Climate regulation	a(2)
3.	Watershed protection	a(Not applicable)
4.	Water catchment	a(Not applicable)
5.	Coastal protection	a(3)
6.	Erosion prevention and sediment control	a(2)
7.	Fixation of solar energy/biomass production	a(1)
8.	Storage and recycling of organic matter, nutrients and human waste	a(3)
9.	Biological control	a(2)
10.	Nursery function and migration habitat	b(3)
11.	Maintenance of biological diversity	b(3)
2. Carrier Functions		
1.	Habitation (indigenous people)	c(2)
2.	Cultivation (sustainable)	c(1)
3.	Energy conversion	c(1)
4.	Recreation and tourism	c(3)
5.	Nature protection	b(3)
3. Production functions		
1.	Food /nutrition	c(2)
2.	Genetic resources	c(1)
3.	Medicinal resources	c(1)
4.	Raw materials for clothing	Not applicable
5.	Raw materials for manufacturing etc.	Not applicable
6.	Bio-chemicals	Not applicable
7.	Fuel and energy	Not applicable
8.	Ornamental resources	Not applicable
4. Information functions		
1.	Aesthetic information	b(3)
2.	Spiritual/religious information	b(1)
3.	Historic information	b(1)
4.	Cultural/artistic inspiration	c(2)
5.	Educational/scientific information	b(3)

- | |
|---|
| <p>a. Function is performed regardless of management objective, no special management resources needed (<i>other than maintenance of the natural integrity of the area in question</i>)</p> <p>b. Main objective of protected areas; in principle compatible with conservation objectives and natural park management</p> <p>c. Secondary objective, only to be utilized when this possible in a sustainable manner (<i>i.e. without interference with primary objectives</i>), preferably in special use zones</p> <p>1. Low</p> <p>2. Moderate</p> <p>3. High</p> <p>(<i>Ratings corresponding to the level and significance of functions provided</i>)</p> |
|---|

4.3.1.1. Total Socio-economic and capital value of the protected area

With the analysis of the *Checklist of Functions* for the proposed TBPA, it can now be concluded that the proposed protected area fulfills a multitude of functions with many different values to human society. In order to incorporate better all the information on goods and services of protected area into the planning and decision making process, these values are now discussed within the context of their ecological and socio-economic aspects and rated in a matrix (*Table*) for their impact.

- **Ecological value**

The ecological value can be categorized as conservation value and existence value:

- **Conservation value**

One can rightly argue that most functions provided by the proposed TBPA depend on the conservation of the biological diversity and natural processes occurring in the islands. The conservation value mainly relate to the regulatory functions discussed earlier. The proposed TBPA contributes significantly to the maintenance of biodiversity by providing a habitat for the endangered green turtles, a multitude of migratory birds and the rich mangrove ecosystem. The mangroves provide coastal protection, sediment control and prevent erosion.

- **Existence value**

The mere existence of natural areas presents an important factor in the feeling of well-being to many people. The level of uniqueness or naturalness of the area defines the existence value. The proposed TBPA provides the most significant green turtle habitat of the country and one of the most significant such site globally. In addition, it provides a haven for migratory birds. The presence of dense mangrove forestation adds to the uniqueness and naturalness of the area.

- **Social values**

The social values can be categorized as human health and option values;

- ***Human health***

Many environmental functions provided by the proposed TBPA contribute directly or indirectly to the maintenance of human health, such as the regulation of the local and regional climate, nutrient recycling, opportunities for recreation, education and research. The consciousness of the importance of these functions to human health is only slowly emerging and the associated economic benefits are partly reflected by other value categories, notably the conservation and productive use values. Human health impacts, though measured only in qualitative terms are important factors that should be taken into account on their own merits in the planning and decision making process.

- ***Option value***

This value deals with the importance placed on maintaining the option to benefit from known and as yet unknown functions of natural processes and components in the future. For this reason, the conservation of natural areas represents an important contribution to human welfare by satisfying the need for a safe future for both present and future generations. Though no known medicinal, genetic or fuel and energy values of the area exist, the presence of natural resources does not also preclude the chances of any future discoveries that change this status. The untapped potential of recreation and tourism can also not be discounted.

- **Economic values**

The economic values can be categorized as consumptive, productive and employment values:

- ***Consumptive values***

The consumptive use value relates to goods and services which are harvested and used directly by the local population without passing through the market. Harvesting natural resources for direct consumption in the proposed TBPA that includes the cutting of mangrove wood for fulfilling fuel and house construction needs and fish catch is rather limited. However, the 'direct' consumption of information functions such as the aesthetic quality and historic value of natural ecosystems need to be mentioned.

➤ **Productive values**

The productive use value of environmental functions in the proposed TBPA mainly relates to recreation that includes beach visitation. However, the recreation potential associated with activities related to the natural and biodiversity assets such as green turtles, migratory birds and mangrove forests remains unexplored. Salt from the sea is reclaimed in the salt pans existing in the area.

➤ **Employment values**

An important indicator for the socioeconomic value of environmental functions is their contribution to employment. The proposed TBPA is inhabited by fishing communities that seek the deep sea for their fish catch as limited fish catch is available in the coastal waters. As has been mentioned earlier, the tourism related economic potential of the proposed TBPA has not yet been tapped into. The involvement of local communities (*e.g. Hut Chowkidars*) as tour guides on activities such as turtle watch tours, boating in the mangrove swamps and bird watching hold significant employment potential for the local people.

In the following matrix, the values discussed above are being rated. The de Groot Model allows for converting qualitative values into monetary terms. However, the paucity and at times complete non-availability of the required data for the proposed TBPA precludes the chances of placing a monetary value on the different environmental functions. The generation of the relevant data was beyond the scope of this study. As such in the Matrix, the values are only being rated based on the available ecological, social and economic data.

Environmental functions	Ecological values		Social values		Economic values			Ratings (Environmental functions)
	Conservation Value	Existence Value	Health	Option value	Consumptive value	Productive use value	Employment	
Regulation	a(3)	a(3)	a(3)	c(1)	c(1)	b(2)	c(1)	14
Carrier	b(2)	b(2)	c(1)	b(2)	b(2)	b(2)	a(3)	14
Production	c(1)	c(1)	b(2)	c(1)	c(1)	c(1)	c(1)	8
Information	a(3)	a(3)	a(2)	a(3)	b(2)	a(2)	a(3)	23
Ratings (Environmental Values)	9	9	8	7	6	7	8	

Level	Ratings
A	(3) High
B	(2) Moderate
C	(1) Low

Conclusions:

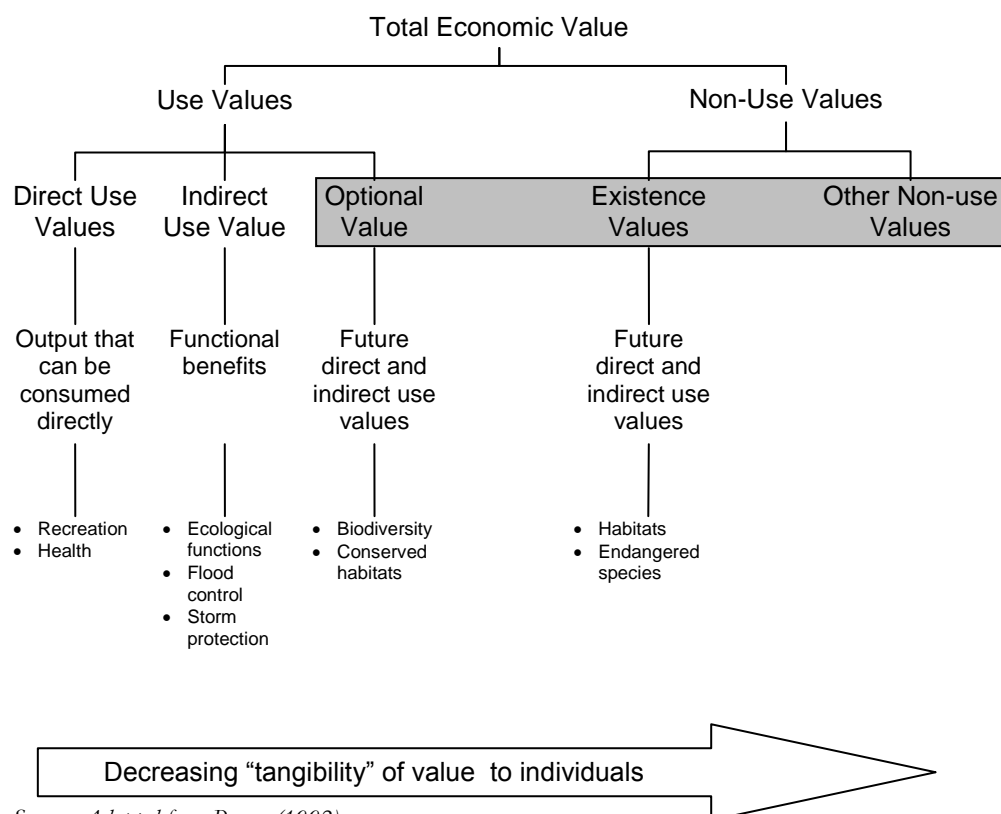
1. The most important potential environmental function of the proposed TBPA comes out to be its information function, while regulation and carrier functions also score highly
2. The most important Environmental values of the proposed TBPA are identified as its conservation and existence values, while health and employment also score highly

4.4. The Role of Environmental Economics

Environmental economics play a key role in identifying efficient natural resource management options for sustainable development. It is an essential bridge between the traditional techniques of decision making and the more environmentally sensitive approach, now emerging.

Chart – 4a shows how environmental economics can play a bridging role in case of the TBPA by mapping the environmental assessment results onto the framework of conventional economic analysis. Once again, a variety of environmental economic techniques including economic valuation of environmental effects at the local or project level, integrated resource management at the sector or regional level, environmental macroeconomics and environmental accounting at the economy-wide multi-sectoral level, and global or transnational environmental economics at the international level facilitate this process of incorporating environmental issues into traditional decision making.

Chart – 4a Categories of Economic Values Attributed to Environmental Assets for the TBPA



Source: Adapted from Pearce (1992)

4.5. Options for protected area designation: A comparative analysis

In the following discussion, based on the ecological importance determined for the proposed TBPA, an analysis would be made of the various protected area options that can be designated. Three separate options are being discussed, that independently or in combination contribute significantly to attaining the objectives of long term and sustainable protection of the turtles and their habitat in the proposed TBPA. The options are as follows:

- Nationally designated protected area
- Ramsar site
- Nature reserve

4.5.1. Nationally designated protected area

As has been identified earlier, three separate protected area designations can be assigned to a threatened ecosystem within the national context, namely:

- National Park
- Wildlife Sanctuary
- Game reserve

While the criteria for both the National Park and Wildlife Sanctuary put restrictions on killing/hunting of animals, damaging of vegetation and polluting of the environment (*important requirements for protecting the regulation and carrier functions of the proposed TBPA*) the Wildlife Sanctuary designation clearly specifies that such a protected area *shall be set aside as undisturbed breeding ground for the protection of wildlife*. This specification gives this option an edge.

Of critical importance to giving sustainability of actions in the proposed TBPA, provide incentives for the involvement of the community, it is required that controlled tourism activities be allowed (*information functions*). The definition of a National Park says that it *shall be accessible to public for recreation, education and research*. While there is no clearly provided allowance for the use of a Wildlife Sanctuary for recreational purposes, a caveat is provided that can be availed for opening the Wildlife Sanctuary for activities such as controlled tourism. It is stated that *provided that Government may for scientific purposes or for aesthetic enjoyment or betterment of scenery authorize the doing of certain acts, otherwise prohibited*. At another place it is mentioned that *access to public shall, accept in accordance with the rules, be prohibited*.

In case of a National Park, the *construction of rest houses, hostels and other buildings* are allowed. Such a provision if applied in the case of the proposed TBPA can easily be misused and be detrimental to the objective of protecting the turtle habitat. In a Wildlife sanctuary *entering or residing and introduction of any domestic animal or allow it to stray* is clearly prohibited. This prohibition goes in favor of the conservation requirements of the turtle habitat.

In case of a Game Reserve, restrictions are relaxed and even the hunting of animals can be allowed by issuing permits. This option does not find favor or compatibility with the essential requirements of turtle habitat protection.

It can therefore be recommended that within the national context, the best available protected area option is that of a Wildlife Sanctuary.

4.5.2. Ramsar site

The Ramsar Convention on Wetlands has already been discussed in an earlier section. It is now being proposed that the option exists for applying to the Ramsar Secretariat for designating the proposed TBPA as a Ramsar site. On the basis of the criteria as adopted by the Conference of the Parties to the Convention in Regina, Canada in 1987, some of the main wetland sites on Karachi coast have been identified as *Wetlands of International Importance* and includes the Sandspit/Hawksbay area. The area has already been included in the Directory of Asian Wetlands.

The text of the Convention (*Article 2.2*) states that:

Wetlands should be selected for the List (of Wetlands of International Importance) on account of their international significance in terms of ecology, botany, zoology, limnology or hydrology' and indicates that ' in the first instance, wetlands of international importance to waterfowl at any season should be indicated'

To facilitate the implementation of this provision, the Conference of the Parties has developed criteria to assist in the identification of wetlands of international importance. The latest version of the Criteria was adopted by the 7th meeting of the Conference of the Contracting Parties in 1999. Of the eight (8) criteria identified, the proposed TBPA fulfills the following four (4) criteria

- **Criterion 2:** A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities
- **Criterion 3:** A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular bio-geographic region
- **Criterion 4:** A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions
- **Criterion 5:** A wetland should be considered internationally important if it regularly supports 20,000 or more water birds

It is therefore concluded that a strong case for the designation of the proposed TBPA as a Ramsar site can be argued.

4.5.3. Nature reserve

It is recognized world over that land ownership of a particular habitat of ecological and biodiversity importance also vests upon the land owners the role of the guardians of the habitat. It becomes their responsibility to protect and conserve the habitat and the biodiversity it nurtures and promote sustainable uses of the natural resources. In the case of the proposed TBPA the role of the two landowning agencies is extremely inadequate and unfortunate. Their policy and planning documents do not even recognize the ecological importance of the proposed TBPA let alone implement measures for its protection.

However, if there is to be any hope of providing sustainability of actions to habitat protection measures, it is essential that this attitude undergoes an urgent change. A beginning can be made by first recognizing the ecological and biodiversity importance of the proposed TBPA as a globally significant green turtle nesting habitat. This can initially be done by seeking suitable and desirable amendments in the existing legislative instruments presently employed for land use management in the project area so that they can adequately address the areas environmental and ecological sensitivity. Of critical importance is the requirement of incorporating the desirable legal and policy safeguards in important legislative instruments such as the Hut Lease Deeds (*see annex*).

Based on the preliminary legal review process, the following additions/amendments in the KPT/CDGK Hut Lease Deeds are being

proposed so that this important legal instrument can effectively ensure the protection of the environmental sensitivity of the turtle habitat.

Add Clause on Protection of Green Turtle Habitat:

- The Hut Lessee to assume the role of Steward for the protection and conservation of the sea turtle habitat. The role of Steward to involve compliance with practices compatible for making the beach habitat safe for turtle nesting and breeding
- The Hut Lessee to employ only those persons in the capacity of Hut Chowkidars that have attended conservation awareness and training program

In the long run it is desirable that the land owning agencies designate a protected status such as a Nature Reserve to the landmass of the proposed TBPA under their jurisdiction and plan and implement appropriate measures for the protection of the habitat that sustains the turtles, migratory birds and the rich flora including the mangrove forests.

Alliances can be developed with relevant government agencies such as the Sindh Wildlife Department, Sindh Environmental Protection Agency and non governmental organizations such as WWF Pakistan and Shehri-Citizens for a Better Environment. Another option that can be explored is the transferring of some critically sensitive habitat areas into private ownership purely for the purposes of habitat protection and conservation, and having a mix of government regulation and private and non-governmental management controls.

5. Towards a Protected Area Management Plan

5.1. Managing a protected area: Issues and concerns

Problems of environmental policy and implementation that particularly hamper efforts to preserve biodiversity are varied: They include weak analytical tools, lack of skilled human resources, inadequate political will and fragmented institutional frameworks. The lack of trained personnel and political will to take sometimes unpopular measures are also difficulties that loom especially large in developing countries beset with a host of other pressing problems including poverty and starvation.

The fragmentation of institutions, as in the case of the project area is a serious problem, because of the way human societies are structured. Environmental problems are essentially holistic and best studied in terms of complete natural resource systems. Thus we might analyze the pollution of air, water and land resources, or the degradation of a natural habitat in terms of these systems. Nevertheless, experience has shown that the causes of environmental problems are rooted in socio-economic systems that are structure quite differently from these natural resource systems. For example, the destruction of a forest ecosystem may arise from tax policies that encourage land clearing by large landowners, the construction of a road that suddenly opens up the forest hinterland or as in the case of the project area, damaging land use development that critically encroaches upon the most prime sea turtle nesting sites on the beaches.

However, addressing the underlying causes will require a series of policy changes by a large number of disparate ministries and line agencies. It is a formidable task in itself to effectively coordinate the separate actions of such a large number of institutions. The designation of the proposed turtle nesting sites holds the promise of providing an effective policy umbrella under which the priorities and actions of all relevant stakeholders can be merged and coordinated to achieve mutually shared objectives and protect special interests of each stakeholder that find compatibility with the overriding objective of protecting the sea turtles and their nesting habitat in the Sandspit/Hawksbay beach area.

5.2. Designating and managing a protected area

All over the world huge investments of money, land and human effort are being put into protected areas acquisition and management. However, in most cases it is difficult to determine whether management of individual protected areas or of whole systems is effective. In response to this situation many individuals and institutions have been developing ways to monitor and evaluate effectiveness of protected areas. Essentially, evaluation enables managers to reflect on experience, allocate resources efficiently, and assess and plan for potential threats and opportunities.

In the following sections are highlighted some management approaches that can form the basis of a protected area designation and subsequent management of the

protected area in a sustainable manner that will be discussed in relevance with the feasibility of designating Sandspit/Hawksbay and adjacent creeks as protected areas and devising viable options for its management.

5.2.1. Management effectiveness evaluation

It measures the degree to which a protected area is protecting its values and achieving its goals and objectives. Its primary aim is to help better management, but it can also help guide project planning and resource allocation, provide accountability and transparency, and increase community awareness, involvement and support. Evaluation will also enable managers to anticipate future threats and opportunities. Three main components can be evaluated.

- Design of individual protected area or protected area systems
- Adequacy and appropriateness of management
- Delivery of protected area objectives

Monitoring and evaluation can provide concrete evidence of successes and failures in managing pressures and thus help to identify necessary changes in management, including warning of serious problems. Good evaluation looks beyond park borders at the performance of buffer zones, corridors and trans-boundary parks wherever applicable and at the economic and other benefits that protected areas provide. It also gives a voice to indigenous and local communities, both to express their opinions and also to become more involved in the management of the area and thus feel greater ownership and support for the park. Assessment should look beyond whether management actions are being implemented, to whether they are really delivering the desired conservation benefits. Practitioners get a chance to share experiences and incorporate both scientific and traditional knowledge into management.

5.2.2. Rapid Assessment and Prioritization of Protected Area Management (*RAPPAM*) Methodology - WWF

WWF has developed a methodology for assessing the management effectiveness of protected area systems. This Rapid Assessment and Prioritization of Protected Area Management (*RAPPAM*) Methodology looks at the effectiveness of each protected area, as well as the effectiveness of the system as a whole. The methodology, which is based on a framework developed by the World Commission on Protected Areas, is relatively easy and inexpensive to use, and can be modified to fit local needs. The methodology has been tested and / or implemented in Algeria, Bhutan, Cameroon, China, France, Gabon, Mexico, Russia, South Africa, and Swaziland. Assessing the effectiveness of protected areas is not a panacea for improving management. However, it is a critical first step. WWF's Rapid Assessment and Prioritization of Protected Area Management Methodology can be a powerful tool for enabling park managers and policy makers to identify management steps needed to ensure a fully functioning system of protected areas.

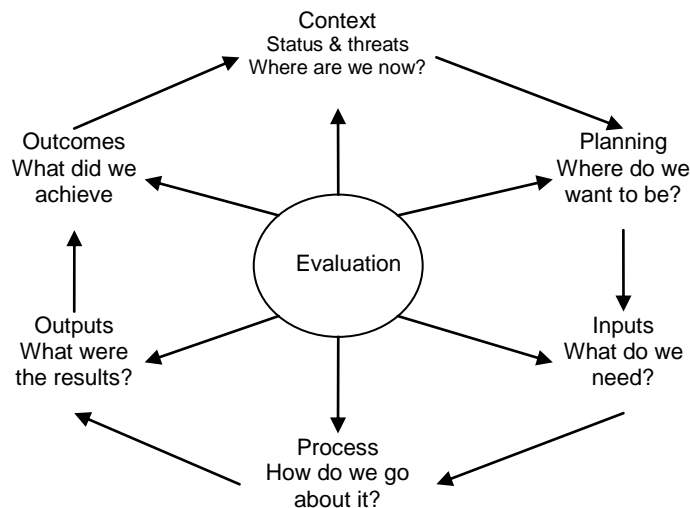
5.2.3. The IUCN World Commission on Protected Areas Framework for Assessing Management Effectiveness

Following a recommendation at the IVth World Congress on National Parks and Protected Areas in 1992, IUCN convened an international task force to address the issue. One result was the development of a framework and principles for evaluation of management effectiveness, which aims to help in the design of assessment systems, provide a checklist of issues that need to be measured, suggest some useful indicators and encourage basic standards for assessment and reporting.

The WCPA framework is based on the premise that the process of management starts with establishing a vision (*within the context of existing status and pressures*), progresses through planning and allocation of resources and, as a result of management actions, produces results that hopefully lead to the desired outcomes. Monitoring and evaluation of these stages provides the link that enables planners and managers to learn from experience.

Ideally, assessments should cover each of the above elements, which are complimentary rather than alternative approaches. Monitoring inputs and outputs over time can be especially useful to show changes in management efficiency and may highlight the effectiveness of a particular change to management. However, assessments are driven by particular needs and resources and a partial evaluation can still provide very useful information.

Chart – 5a The WCPA framework



5.2.4. Integrated Conservation and Development Projects

Since the 1980's Integrated Conservation and Development Projects (*ICDP's*) have attempted to reconcile park management with local needs and aspirations, with results not often found satisfactory. However, the lessons provided from the ICDP experience provide an important opportunity to

inform the next generation of biodiversity conservation programs. More recent and more promising approaches have started to incorporate elements of adaptive management, new partnership models with stakeholders and the vertical integration of site level work with policy initiatives and institutional development.

ICDP's have been defined as '*an approach to the management and conservation of natural resources in areas of significant biodiversity value that aims to reconcile the biodiversity conservation and socio-economic development interests of multiple stakeholders at local, national and international levels*'.

ICDP's initially offered the attractive prospect of contributing to three of the most sought-after goals on the international sustainable development agenda: more effective biodiversity conservation, increased local community participation in conservation and development, and economic development for the rural poor. However, the road to achieving these objectives has been bumpy. Despite the rather demoralizing array of problems the ICDP's have experienced, the rationale for these types of projects has not disappeared. It has been indicated that more attention needs to be given to the implementation of projects rather than the current emphasis on detailed planning. The now emerging concept of Adaptive Management merges planning with implementation and monitoring as part of a constantly rotating project cycle, not as separate, sequential phases as is often the case now.

5.2.5. Private and Non-Governmental Protected Areas

Of late, private protected areas have started becoming a major component in some national and regional protected area networks. Legislation has taken place in Brazil where the government has by law declared that a private protected area brings with it the same long-term management obligations as those for protected areas controlled by the state. In both the United States and the United Kingdom, amongst other countries, charitable trusts own hundreds of nature reserves of varying sizes. In South Africa, the government is investigating options for some kind of certification system for private protected areas so that they can be given assurances of permanence and good management. There are also many other privately owned areas that are managed unofficially with biodiversity conservation in mind, without reaching the status of an official protected area.

5.3. Identifying the basic parameters for a protected area management plan: The Habitat Suitability Index

Habitat Models provide a viable tool of species and resources co-management. They are practical operational tools based on assessment of physical and compositional attributes of the habitat. *Habitat Models* thus estimate the suitability or capacity of targeted areas to provide the needs of a species. In order to develop the desired *Environmental Criteria*, the habitat modeling technique has been used to assess the requirements for sustainable turtle nesting/hatching in the project area to act as a tool for policy makers and protected area managers to enhance their capacity for sound protected area management.

5.3.1. Concept of Resource Space

A habitat can be described as the resources and conditions present in an area that produce occupancy – including survival and reproduction – by a given organism. The habitat concept is thus organism-specific as it relates the presence of a species, population or individual (*animal or plant*) to the areas physical and biological characteristics. For each habitat resource variable we can define the total resource space in the landscape. The distribution of habitat resources can be predicted using a process-oriented, conceptual model based on expert knowledge, where the specific physical, causal relations leading to the modeled, plausible processes, remains unspecified.

5.3.2. Process Oriented Habitat Suitability Model

A *Process Oriented Model* will be used to assess the suitability of the proposed TBPA for turtle nesting/hatching while at the same time assisting in the development of the relevant *Environmental Criteria*. The *Model* can be used to assess the plausible causal relationships or functional processes underlying habitat use, and therefore provides a general conceptual framework for assessing species-habitat relationship. This species-habitat model aims at modeling the relative suitability of an area for the focal species. It uses known or plausible causal relationships as the base for predictions of an area's relative quality. This model can also be used to model habitat use or species distribution. It predicts the distribution of a species on the basis of environmental parameters that are believed to be the causal, driving forces for the distribution and abundance of the target species.

The output for the model is a *Habitat Suitability Index (HSI)* score that evaluates the aptness of the study area for the species – in this case the turtles (*their nesting hatching process*). The *HSI* is used for assessing the suitability of an area for the species of interest as a function of several environmental variables, which most effect species presence, abundance and distribution. *HSI* scores are on a standard scale between 0 and 1, where 0 indicates unsuitable habitat and 1 indicates optimum conditions and optimum quality and availability of resources. Process-oriented *HSI* models are based on the assumption that a species will select and use areas that are best able to satisfy its life requisites, and thus greater use should occur in higher quality habitat. The fundamental components of such *HSI* models are the environmental variables (*independent variables*) and the resultant habitat suitability values

(*dependent variables*) and the classification functions or functional processes that link the two.

5.3.3. Environmental Criteria for suitability of turtle nesting habitat

As a result of the data analysis and related work in the field, following are being established the relevant *Environmental Criteria* needed for ensuring the suitability of the proposed TBPA as an environmentally sound turtle-nesting habitat.

5.3.3.1. Space (*Nesting Grounds/Conservation Zone*) as a critical factor in suitability of the turtle habitat

The species in question – the sea turtles, use the proposed TBPA only for nesting. As such, the amount and characteristic of suitable space available on the beaches for the turtles to nest can be considered directly related to the number of turtles that visit the beach site. It has been established that the present beachfront development (*beach hut development*) process is encroaching on the free space available for turtle nesting. However, it is yet to be established as to how critically important this factor is in the overall scenario with regards the sustainability of the beach site to play host as a suitable turtle-nesting habitat. The *Process-oriented model* would attempt to assess the relative suitability of the beach habitat in relation to space available for nesting-both the magnitude of the space available and its characteristics. By identifying turtle distribution patterns, it can be ascertained as to which parts of the beach habitat are more preferred for nesting and as such what impact the beachfront development process is having on the suitability of the beach habitat to continue acting as an important turtle-nesting habitat. This information will establish critical environmental criteria for the turtle habitat and important guidelines can thus be established that can assist in:

- Incorporating the required environmentally sound measures in the future land development and land-use management of the beaches
- Identifying areas that need to be designated a *Protected Status*

5.3.3.2. Magnitude of beach visitation

It has also been established that the number of people visiting the beach has a direct relation to the suitability aspects of the beach for turtle nesting. In the absence of proper garbage and predator control measures, an increase in the number of beach visitors results in the creation of a greater threat potential for the turtles in the proposed TBPA. While assessing the *Habitat Suitability Index*, the number of beach visitors would be considered as a variable and its relation to the turtle nesting process would be evaluated.

5.3.3.3. Waste Load

As a measure of the human impact on the beach area and an important variable in the consideration of the suitability of the habitat, waste generated in the beach area will be considered to identify its impact on the turtle nesting activity.

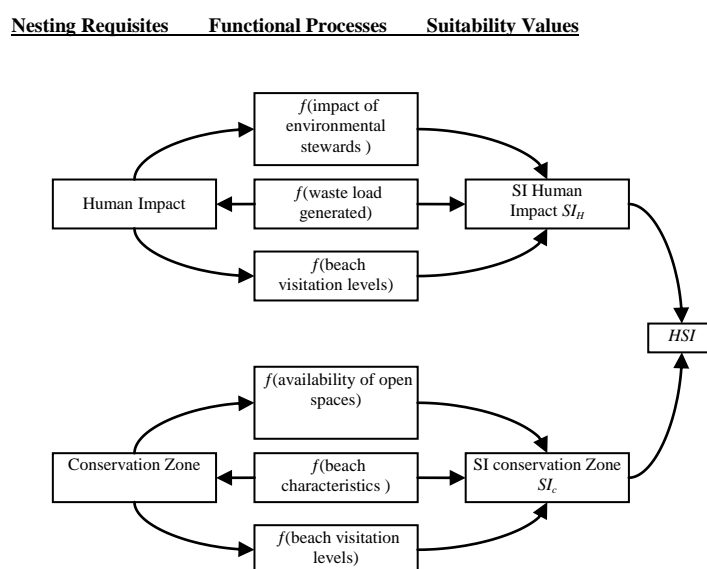
5.3.3.4. Environmental Stewards

When operational, *Hut Chowkidars* in the form of trained *Environmental Stewards* are expected to have a significant impact on suitability levels of the turtle habitat in the proposed TBPA. The level of turtle nesting activity in the project area would find direct relation to the presence of the *Environmental Stewards* and the likely impact will figure as a variable in the determination of the *Habitat Suitability Index*.

5.3.4. Environmental Variables

The variables related to the space, pollution and human impact used in the *process-oriented model* are given below in alphabetical order (*Also see Figure 5a*). Available secondary data and the data generated during the next phase of the project will be used as the observed data to predict the habitat suitability of the project area.

Figure 5a – Habitat Suitability Model



Variable	Abbrev.
Environmental Stewards (%)	es
Waste load (t)	wl
Beach Visitation (no. of visitors in nesting season including hut users)	bv
Conservation Zone (%)	cz
Beach characteristics / sand dunes – Habitat/Nesting (%)	sd

Table – 5a Environmental variables for habitat suitability

5.3.5. Establishing a Habitat Suitability Index for the TBPA

Habitat is modeled as a function of variables (*Table 5a*) known or perceived to be important components of the life requisites and having significant impact on the suitability of the habitat. A conservation suitability index has been calculated based on three variables (*Fig 5a*): availability of open spaces (*cz*), beach characteristics (*sd*) and beach visitation levels (*bw*). Based on available data and observations made during the physical survey some rationales for assessing the habitat suitability index are being identified in *table 5a*.

Table – 5b Environmental Variables and Rationale for Perceived Impact	
Environmental variables	Rationale for assessing perceived impact
Environmental stewards (<i>es</i>)	Based on the calculation for the total number of Hut Chowkidars available and those that were trained during the project in addition to the Chowkidars employed by the SWD. The variable indicates the measure of the total number of trained environmental stewards in relation to the available space in the turtle nesting grounds
Waste load generated (<i>t</i>)	Based on the calculations for the total number of beach huts/ average number of people using the beach huts on a daily basis to identify waste generation levels and then estimating its impact within the overall threat scenario
Beach visitation levels (<i>bw</i>)	Based on the calculations for the beach visitors and their direct and indirect impact on the overall threat scenario
Availability of open spaces (<i>cz</i>)	Based on the documentation done on the overlap of beachfront development /beach huts) with the prime nesting grounds to identify levels of encroachment
Beach Characteristics (<i>sd</i>)	Based on the physical survey of the beach to assess adversely affected parts of the prime nesting areas due to garbage/construction debris and sand extraction

- Approximately half of the prime resting space is encroached by beach huts (*Fig. 5b*) $SI_{cz} = 0.5$
- Approximately half of the beach is rendered unsuitable for nesting due to construction debris, garbage, sand extraction $SI_{sd} = 0.54$
- Beach visitation levels are having lesser impact on the habitat. $SI_{bv} = 0.1$

In the overall suitability, index, SI_c the 3 SI components for availability of open spaces, beach characteristics and beach visitation levels are regarded obligate and are calculated as follows

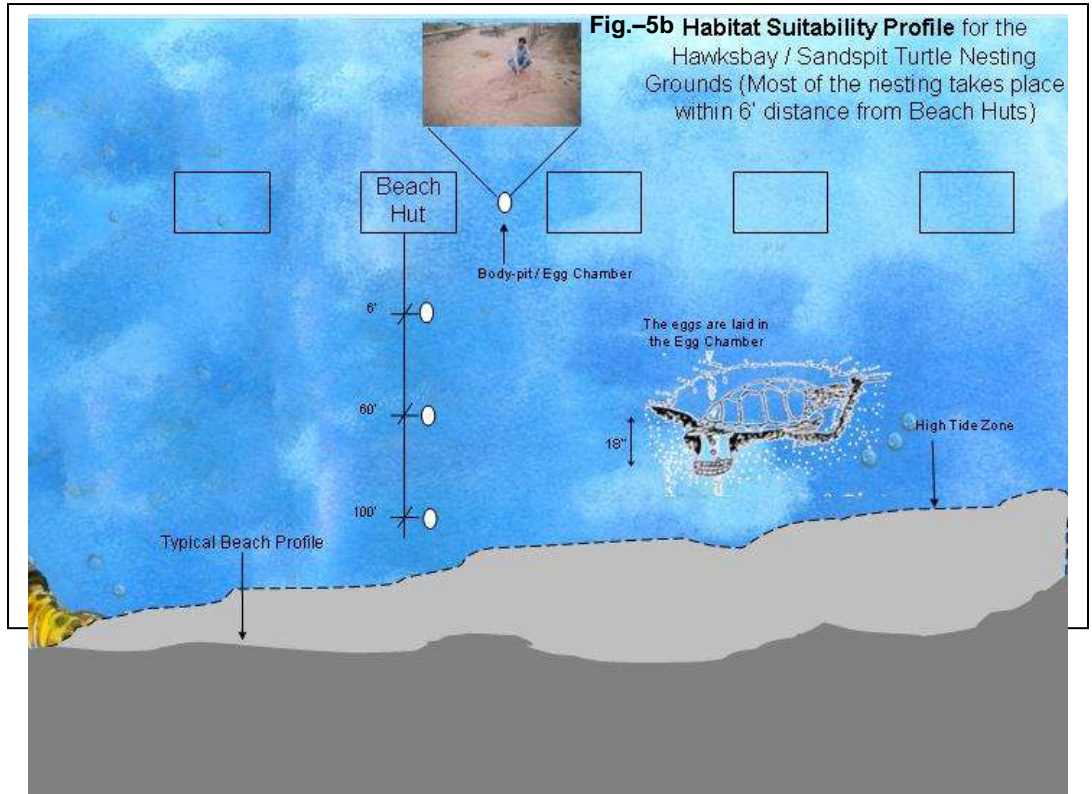
$$SI_c = 3\sqrt{SI_{cz} \times SI_{sd} \times SI_{bv}}$$

$$= 3\sqrt{0.5 \times 0.54 \times 0.1}$$

$$SI_c = 0.3$$

A human impact suitability index SI_{H_i} has been calculated in a similar way as the SI_c and is based on three variables (*Fig 5a*): impact of environmental stewards (*es*), waste load generated (*t*) and beach visitation levels.

- It is estimated that the number of hut chowkidars trained during the project in environmental stewardship along with the hired staff of SWD account for only about 1/3rd of the total potential for environmental stewardship. $SI_{es} = 0.93$



results.

$$SI_t = 0.97$$

- Beach visitation levels are having lesser impact on the habitat.

$$SI_{bv} = 0.1$$

$$SI_H = 3\sqrt{SI_{es} \times SI_t \times SI_{bu}}$$

$$= 3\sqrt{0.93 \times 0.97 \times 0.1}$$

$$SI_H = 0.45$$

Now prior to calculating the HSI, it is to be noted that in the overall context of the environmental impacts on the turtle habitat, the conservation index is being given a 30% value and human impact is being given a 70% value. This is because human influence has been identified to play a key role in all factors adversely impacting the turtle habitat.

$$HSI = (SI_H)^{0.7} \times (SI_C)^{0.3}$$

$$HSI = (0.45)^{0.7} \times (0.3)^{0.3}$$

$$HSI = 0.4$$

An HSI valued at 0.4 indicates diminishing environmental returns from the turtle habitat. It needs to be clarified at this stage that the HSI worked out for the year

2004 for the proposed TBPA is based on physical observations and available secondary data. The availability of data was limited while generation of extensive field data was not included in the scope of work. Therefore, the desirable level of exactness and fine calibration for the model could not be achieved. However, it is an extremely useful and important initiative that does not only set a benchmark of habitat suitability for the proposed TBPA but should also promote similar initiatives in other sensitive ecosystems and protected areas in Pakistan. The *Model* provides the policy makers with a tool for effective protected area management by managing the impacts of various environmental variables that have been established in order to achieve optimum suitability index for the proposed TBPA. Co-relations would need to be worked out between the various factors affecting the suitability levels of the turtle habitat to identify the range of parameters that produce optimum results. However, field data and data on other impacting factors would have to be continuously generated and updated in order to get the maximum output from the *Model*.

5.4. Developing a management vision: Applying the WCPA framework

The WCPA Framework can be adopted to clarify the vision for designating and managing a protected area and carting progress through planning and allocation of resources and identifying as a result of management actions the desired results and outcomes. The WCPA Framework for Evaluation may be adapted within the present context to highlight the basic framework for evaluating management actions in the proposed TBPA.

Table – 5c The WCPA Framework for Evaluation & Monitoring of the TBPA

Elements	Context	Planning	Inputs	Process	Outputs	Outcomes
Explanation	Where are we now?	Where do we want to be?	What do we need?	How do we go about it?	What were the results?	What did we achieve?
	A threatened habitat with no policy, regulation or management control	PA design and planning	<ul style="list-style-type: none"> • Political will • Stakeholder collaboration • Financial resources • Technical / scientific resources 	<ul style="list-style-type: none"> • Approve policy and plans for PA • Design and plan PA • Plan & Implement Management Framework with stakeholder support 	<ul style="list-style-type: none"> • A viable and functional PA design • A viable and function management Plan 	<ul style="list-style-type: none"> • A habitat safe for turtle nesting / breeding and supporting the existing floral / fauna
Focus of valuation	Status	Appropriateness	Economy	Efficiency	Effectiveness	Effectiveness appropriateness

5.4.1. Integrated conservation and development program: A management framework for the Turtle Beach Protected Area

Based on the analysis of the available options for protected area designations and the possible management plans, it is being proposed that the ICDP approach be applied as a possible management plan for the proposed TBPA. Inputs would also be taken and integrated into the plan from other management frameworks such as the WCPA framework and RAPPAM. The following broad guidelines would have to be followed for the proper implementation of the plan:

5.4.2. Management guidelines and proposed actions

Guideline: Start to apply ICDP approaches to the management of broad landscapes that include protected areas as well as zones of more intensive human use, thereby corresponding to the ecosystem approaches.

Proposed Action: *Place the management plan within the context of the overall development policies/plans and processes that would include commercial, recreational and social (e.g. housing settlement) development and analyze impacts*

Guideline: Build alliances with and among local communities to help establish trust

Proposed Action: *Involve the local communities (e.g. local CBO's) in a meaningful and pro-active manner in the proposed actions for the management plan in roles such as Environmental Stewards/Tour Guides*

Guideline: Building coalitions for conservation by engaging with all key stakeholders, including local and national political actors, many of whom can help address broader development related issues and constraints beyond the scope of the site specific project

Proposed Action: *All relevant stakeholders to be included in the process of protected area designation and management with roles identified as follows:*

Proposed Action	Stakeholder for Action	Yardstick
Environmentally appropriate legal instruments –Hut Lease Deeds	KPT/City District Government Karachi	Clauses incorporated in the leases and implemented
Environmental Stewardship training – Certification Program	Hut Lessees/ KPT/City District Government Karachi	Certified Hut Chowkidars in the role of Environmental Stewards
Protected Area Designation	Elected local/provincial/national representatives/Sindh Wildlife Department/KPT/City District Government Karachi	Protected Area/Nature Reserve designated
Environmental control measures – Garbage, predators	Manora Cantonment Board/City District Government Karachi/Hut Lessees	Effective management and monitoring
Eco-Tourism & Research	Manora Cantonment Board/City District Government Karachi/GOS/NGO'S/Donors/local community	Generation of funds/management of controlled tourism

Guideline: Engaging with local and sectoral government agencies who are in a position to deliver key services to protected area residents and neighbors

Proposed Action: *Establish a mechanism for coordinated planning and action such as a multi sectoral Protected Area Management Board*

Guideline: Helping the communities in and around the protected areas develop and implement their own plans, by building capacity for independent planning and action among emerging community based organizations whose activities can affect adjacent protected areas

Proposed Action: *Initiate a program of continuous training/ capacity building and monitoring of local communities in their role as Environmental Stewards*

Guideline: Contributing to broadening the mandates and capacities of protected area and natural resource management agency staff to better address the broader challenges of ecosystem and landscape approaches to conservation

Proposed Action: *Build human, financial and technical capacity in the agencies/ organizations involved in the management of the TBPA to better protect and conserve the turtle habitat. The main agency identified for capacity building is the Sindh Wildlife Department*

Guideline: Supporting the basic environmental education to broaden and deepen the constituency of support for biodiversity conservation

Proposed Action: *Initiate measures for including in the curriculum of schools subjects and activities related to the preservation of the environment with particular focus on locally existing biodiversity and natural resources. E.g. teaching for turtle conservation measures in the local schools of Karachi*

Guideline: Raising local awareness of the extraordinary values of local biodiversity and the importance of conservation

Proposed Action: *Use effectively the various available media organs and other participatory approaches to promote the cause of protecting the turtles and their habitat.*

Guideline: Supporting carefully selected, tentative, small scale pilot income generating activities with genuine local support, real prospects of sustainability and clear benefits for biodiversity conservation

Proposed Action: *Efforts should be made for introducing environment friendly projects and activities with local support and participation for promoting the cause of habitat conservation. These activities may include such sustainable eco-tourism activities as:*

- *Turtle/ Bird Watching*
- *Mangrove walk/ eco-trails*
- *Turtle Museum (Interactive audio-video based educational activities)*

5.5. Turtle Beach Protected Area: Charting a management framework

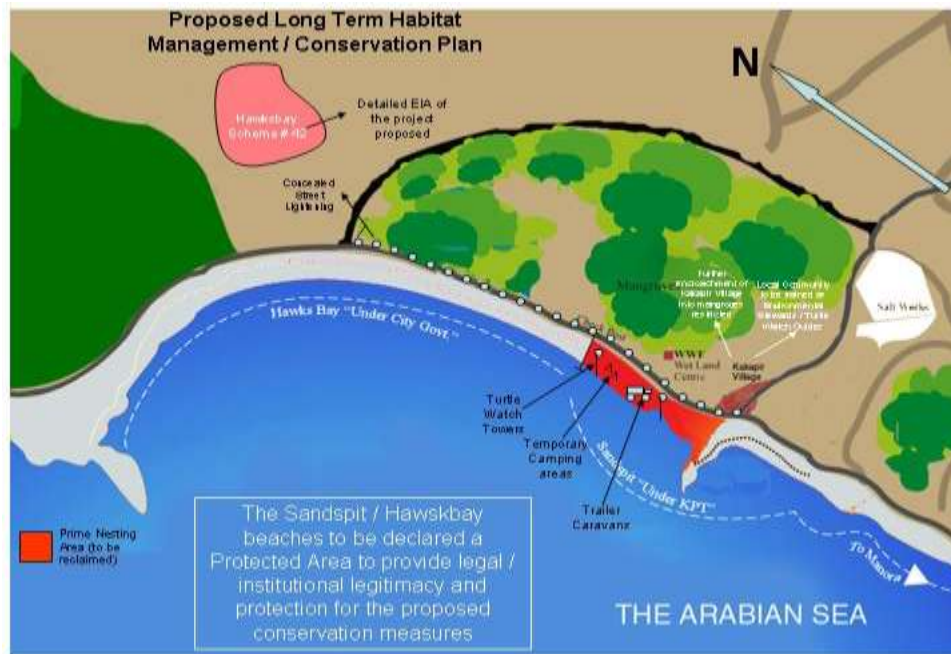
Following are discussed some critically important considerations for the future management of the proposed TBPA within the structural framework of the ICDP approach:

5.5.1. A holistic management framework

While implementing the management plan some key considerations would have to be accounted for. It can be safely said that our understanding of the root causes of biodiversity loss, and environmental degradation in general, has become more sophisticated. It is also clear that many of the most important threats to biodiversity originate far from protected area boundaries and involve issues and institutions well outside the traditional realm of conservationists. The ongoing and planned development plans for the coast of Karachi that includes the proposed TBPA and its immediate environs by various development agencies without even acknowledging the ecological sensitivities of the area are proof of this fact. The *Pakistan National Conservation Strategy*, while referring to the turtle conservation project of SWD clearly states that *conceived as a habitat conservation project, it would have the added virtue of preserving all marine and shore life within the turtle habitat (the entire coast) and of exploring opportunities for education and tourism. It could also integrate well with any coastal zone planning activities through advising on the choice of environmentally benign development sites.*

However, this does not mean that site specific efforts have become redundant. What is now more important than ever is that these need to be nested within broader based strategies supportive of biodiversity conservation and more eco-friendly forms of economic development. Interventions must occur at different scales. Policy change is as important as field level intervention. These two should ideally go hand-in-hand with local action, helping people to influence the policies that impact upon their lives. As has been identified in this Study, the complete lack and absence of any legislative or regulatory instrument that specifically caters to the vital ecological considerations of protecting the turtle habitat in the proposed TBPA significantly reduces the impacts of field interventions.

More effective protected area management requires local-scale interventions to be complimented by stronger law enforcement within protected areas, more effective environmental screening of nearby development projects and more aggressive policy interventions in support of biodiversity conservation. In the case of the proposed TBPA, it is therefore critically important that measures for local participation such as proposed environmental stewardship role of the local communities receive proper endorsement and guardianship of the land owning agencies and development plans such as the Hawksbay Scheme 42, are exhaustively evaluated, mitigation measures proposed and development process is monitored for its impact on the turtle habitat. It is therefore strongly recommended that the use of field and policy oriented approaches must be vertically integrated, ensuring that site-based actions are directly supported by policy-level actions both nationally and internationally.



Map – 5a Vision for the future

5.5.2. Applying the adaptive management approach

The experience of managing protected areas the world over has made it very clear that externally imposed standardized solutions don't often work. In response, the adaptive management approach integrates design, management and monitoring to systematically test assumptions in order to adapt and learn. It implies thoughtful experimentation, research, testing through implementation, monitoring and redesign. It is important to strengthen the capacity of conservation agencies, communities and project managers on an ongoing basis to experiment, learn and take effective decisions within the constraints of the contexts in which they work. Adaptive management is flexible in meeting varying kind of case scenarios in that it merges planning with implementation and monitoring as a part of a constantly rotating project cycle, not as separate, sequential phases as is often the case now.

5.5.3. Ensuring stakeholder participation

It has often been observed that finding more effective ways to engage local constituents or stakeholders represents itself as one of the stiffest challenge in the process of protected areas management. People whose livelihoods, interests and futures are linked to those of a protected area, as well as institutions with relevant interests and jurisdiction such as community based organizations, local and national government agencies and research organizations. The *Study* has put forward a framework whereby communities act as full participants in the process of conserving the turtle habitat with strong financial and health incentives. The land owning agencies are also provided a leadership role in managing the habitat with incentives for area conservation and promotion of eco-tourism and international recognition. With the designation of a protected area status for the proposed TBPA, the research agencies such as the Sindh Wildlife Department and the WWF Pakistan would have a direct role and involvement with incentives for greater human and technical capacity building and increased financial options for greater research.

5.5.4. Managing trade-offs

While the ICPD approach can play key role in helping bring different stakeholder interest groups together, it is important they be explicit and open about their own missions and objectives. Experience has shown that site-specific biodiversity conservation is rarely compatible with unfettered development, income generation or livelihood interests. In practice there will be winners and losers. So better techniques are needed to identify and understand the goals and interests of the major stakeholders in and around protected areas. Once these different interests have been identified and understood, the opportunities for negotiation and tradeoffs can be explored. However, it is important to identify the scales of the trade offs. At what scale should conservation and development trade offs be considered? How does the heterogeneity of natural and human dominated areas affect one another; at what scales do differing threats affect both human and natural systems that are critical to the ICDP's? At what scales are conservation targets best set?

The present study attempts to answer some of these questions by developing the Habitat Suitability Index (*HSI*) for the TBPA. This index identifies the present suitability of the turtle habitat for turtle nesting that can be used by the TBPA managers to determine and implement the optimum parameters required for the sustainable conservation of the turtle habitat.

The *Study* has also indicated that development and conservation interests of the various stakeholders operating in the proposed TBPA merge and overlap and there is no mechanism for collaboration and interaction particularly on conservation issues. It is being proposed to establish a Steering Committee involving all relevant stakeholders that develops and lobbies the case for the TBPA. This Steering Committee will provide a platform for conflict resolution and decision making with the aim of protecting the turtle habitat while finding a place for incorporating the legitimate interest of all concerned. Civil society groups such as WWF Pakistan and Shehri-CBE and multilateral donor organizations such UNDP can play a key role in facilitating the formation of such a Steering Committee by bringing all stakeholders closer by finding common ground and bridging differences. Once a protected area status has been achieved, this Steering Committee can be replaced by a Management Board for taking the process forward.

5.6. The way ahead

The challenge of effectively managing protected areas is formidable. As the TBPA experience clearly shows, the stakeholders may represent a startlingly diverse range of interests, some of which may be incompatible with conservation as well as each other. Reconciling the needs and aspirations of local stakeholders with the goals of protected areas involves an extraordinary complex set of issues, including not only ecological science but also social and economic policies and opportunities, land use laws and practices, formidable resource constraints and often discouraging political realities that few protected area managers can hope to fully appreciate, let alone influence. The park managers and their staff too often lack the resources and capacities needed to carry out basic management duties.

Future ICDP's such as the one proposed for the TBPA, will need to address all the above mentioned issues and need to be designed on the basis of clearly stated objectives together with explicit and testable assumptions and tangible conservation targets. They may evolve into loose clusters of strategies and tools brought together to achieve both conservation and development goals. They need to be implemented using decentralized and adaptive management. They should promote relatively simple and adaptive conservation and development initiatives that are consistent with an overall protected area strategy but are based on specific site conditions and local community dynamics. In the case of the TBPA, the ICDP will need to play a very open and effective role in identifying and addressing diverse stakeholder interests, while helping build protected area management capacity and supporting these institutions (*e.g. KPT, CDGK*) become more sensitive and supportive of local needs.

Perhaps most critically, the ICDP for the TBPA should seek effective partnerships within a framework structured as a vertically integrated mix of site-based programs, policy initiatives and campaign actions. In the end, the following corner stones for managing the proposed TBPA are being identified.

1. Management-oriented research
 2. Establishment of a centralized database and information network
 3. Appropriate information awareness programs
 4. Marine turtle resource management and protection program
 5. Appropriate ecotourism program
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