

# Incentive Based Conservation Planning and Management through Ecological Zoning and Community Based Ecotourism in Ecologically Critical Areas of Bangladesh

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## Abstract

In 1999 several areas of Bangladesh were declared 'ecologically critical areas' (ECAs). In 2002, the Government of Bangladesh through its Department of Environment (DoE) started to institutionalize a model of management to ensure the conservation and sustainable use of globally significant biodiversity within ECAs. One of the key outputs of the initiative was to prepare eco-specific conservation management plans for the ECAs, one of which is the Sonadia Island. This paper is prepared based on the documentation and learning from GOB/UNDP funded biodiversity management project to which I was a part for long four years.

The main management actions required to stem threats to biodiversity conservation within the ECA include, simultaneously, the control of adverse activities through law enforcement and awareness raising, the provision of alternative livelihoods and incomes for the poorest and most highly dependent resources users, the in-situ and ex-situ conservation of species and the rehabilitation of habitats. Specific requirements include legislating and enforcing existing and new ECA regulations, mangrove regeneration, mudflat reclamation, sand dune stabilization, fishing controls, stray dog control, the use of zoning to protect core habitat and species and the provision of alternative livelihoods via ecotourism and agricultural diversification. A model of co-management between the government and the local community is necessary for effective biodiversity conservation. Development of an integrated Conservation Management Plan would be the central focus of such initiative.

Zoning is an integral part of Conservation Management Plans, as it is a tool by which conservation plan is realized. Zones, in this regard, are used to describe management actions and to guide and control the human and development activities. Additionally, it is difficult to describe, or even consider, the management of large or complicated sites unless they are divided into a series of zones. In order to develop functional and meaningful zones, an analysis based on the ecological information derived from relevant sources is used. This analysis is supported by field based information and good understanding of current land use and development pattern on the ground. Planning for alternative sustainable livelihoods would be the central purpose of ecosystem specific operational zoning.

Current tourism at the site is virtually non-existent, however a limited amount of tourism in the form of ecotourism is recommended for the site as an important component the strategy for biodiversity conservation. Ecotourism activities around turtle observation, bird watching and mangrove and mudflat appreciation are tentatively recommended. Interpretation to enhance visitor experience and help them understand, appreciate and enjoy the site and its conservation features will need to be developed in line with ecotourism development requirements.

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## 1. Site Description

Sonadia Island is located in the Bay of Bengal on the West side of Cox's Bazar, and it is under Kutubjurm union of Moheshkhali Upazilla. Sonadia is inhabited by about 2,000 households. For their living, they are depending on shrimp fry collection, fishing, fish drying, salt and shrimp cultivation. A good number of outsiders also stay seasonally in the Island for business purposes.

Around 4916 ha in area, the site is mostly government-owned land. Eight zones have been identified for the site to assist the management of core habitats and species at the site. Little in the way of biodiversity conservation has been undertaken at the site in the past apart from some

turtle conservation activities and efforts to reduce the reliance of fishing communities on marine resources. While past land use was limited due to the effects of natural disasters the recent conversion of mangrove and mudflats to shrimp farming and salt pans has had a large impact on the current state of the site. The local community of around 12,000 people are highly dependent on the natural resources of the site including shrimp fry collection and



fishing. There is very little tourism at, or educational use of, the site however researchers have been attracted in small numbers mostly for mangrove, turtle and bird surveying. Site infrastructure is relatively limited but includes, among others, many household dwellings, a few dirt roads, cyclone shelters, schools and mosques.

The site is rich in species despite its small size. The important habitats and communities at the site include mangrove, mudflats, beaches and sand dunes, canals and lagoons and marine habitat. The site supports the last remaining remnant of natural mangrove forest in south-east Bangladesh. The site lies on the East Australasian and Central Asian Flyways and the mangrove and shallow shoals surrounding the Island provide an excellent wintering area for migratory waterfowl and shorebirds, including three globally threatened species. The sandy beaches and sand dunes support one globally threatened marine turtle species. Other important species include several dolphin and crustacean species, a wild grass relative of rice, fishes and mollusks.

## **2. Baseline-additionality Reasoning**

The main threats to biodiversity at the site include the cutting of mangrove and sand dune vegetation for fire-wood, the degradation of mangrove and sand dunes habitats due to grazing, the conversion of mangrove and mudflat habitat to agriculture, aquaculture and salt pans, the harvesting of turtles and turtle eggs, destructive fishing methods including shrimp fry collection, hunting of shorebirds, shell collection, illegal settlement and pollution and land degradation from boat discharges. This pressure is further exacerbated by a lack of legally instituted protection measures for ECAs, field-level management that is only in the initial stages, limited meaningful participation by local communities in resource-use decision making, limited information on the status and functioning of critical ecosystems, no integrated management planning for ECAs, limited opportunities for alternative sustainable livelihoods, a lack of alternative sources of firewood and fodder, limited public awareness of environmental issues, a lack of technical knowledge and capacity, poor enforcement of fisheries and wildlife protection acts and a lack of integrated coastal zone management.

The main management actions required to stem threats to biodiversity conservation within the site includes, simultaneously, the control of adverse activities through law enforcement and awareness raising, the provision of alternative livelihoods and incomes for the poorest and most highly dependent resources users, the *in-situ* and *ex-situ* conservation of species and the rehabilitation of habitats. Specific requirements include legislating and enforcing existing and new ECA regulations, mangrove regeneration, mudflat reclamation, sand dune stabilization, fishing controls, stray dog control, the use of zoning to protect core habitat and species and the provision of alternative livelihoods/incomes via ecotourism and agricultural diversification. A model of co-management between the government and the local community is necessary for effective biodiversity conservation. The local community is highly dependent on the resources of the site and if assisted can manage day-to-day resource exploitation, but only the government can manage the major abuses of resources at the site.

## **3. Vision Statement**

Managed with the full support and involvement of local communities and based on best-practice principles for co-managed areas, Sonadia Island ECA is a dynamic and healthy ecosystem that protects globally, nationally and locally significant biodiversity. It supports important wildlife and fisheries resources and sustainable livelihoods. The site is a mosaic of mudflats, mangrove and sandy beach shore, with a small area of sustainable agriculture between Sonadia West and Sonadia East villages that meets the needs of the local community.

Extensive healthy mangrove and mudflat areas cover the site, providing important habitat for bird and aquatic life. A wide variety of migratory and resident birds are seen feeding, nesting and resting on the mudflats, in the mangroves and on the beach and sand bars. The long sandy beach is covered in a multitude of mollusk shells and during winter turtle crawl marks are visible between the shore and the dunes. The sand dunes are covered in sand-binding vegetation and support a variety of nesting birds and nesting turtles. Turtle hatchlings are observed making their way to the shore from their nests in winter. The canals, creeks and lagoons are siltation free and support a variety of water-birds and aquatic life, including fish, crabs, shrimp, prawns and

mollusks. Dolphins are observed both in the canals and in- and near-shore marine habitat at the site.

#### **4. Legal Status and Co-management**

Since the fundamental environmental and natural resource laws (1927 Forest Act, 1950 Protection and Conservation of Fish Act, 1974 Wild Life (Preservation) (Amendment) Act, 1995 Environment Conservation Act) in Bangladesh predate introduction of the co-management concept, there is no explicit mention of co-management in the current legal framework. Some of the laws and their accompanying rules do espouse participatory concepts of resource management and agencies are using other legal tools at their disposal to move their co-management efforts forward pending more comprehensive changes to the legal framework.

The 1927 Forest Act (as amended in 2000) provides some authority for participatory approaches to forest management. Section 28 of the Forest Act authorizes social forestry programs in the reserve forests, and triggered the development of Social Forestry Rules (and a social forestry program) in 2004. Section 28 also authorizes the establishment of village forests, and rules to implement this provision are currently being written. While these approaches do not specifically apply to protected areas (although there may be some social forestry agreements operating in protected areas, according to one interviewee), recognition of participatory approaches under the Forest Act is particularly significant given that the country's forest protected areas (national parks, wildlife sanctuaries, and game reserves) all lie within reserve forest lands. On the other hand, neither the 1974 Wildlife Act nor the 1950 Fish Act addresses community participation in resource management.

The Multilateral Environmental Agreements to which Bangladesh is a party (including the Convention on Biological Diversity (CBD) and the Ramsar Convention, among others) may also provide authority for participatory resource management. The CBD stresses the importance of preserving indigenous and customary practices for the conservation and sustainable use of biological resources and urges the adoption of economic and social incentives and public-private cooperation, among other measures. The 2005 Poverty Reduction Strategy Paper and Climate Change Action Plan also address participatory resource management. In thinking about the current legal framework governing protected areas, as well as potential changes to this framework, a number of thematic issues come to mind.

- i. One question concerns whether, and how, the strategy should explicitly define protected areas. While there is no formal definition of the term under present law, the Wildlife Preservation Amendment Act does define national parks and wildlife sanctuaries so as to prohibit community access. In order to formalize a co-management approach, the strategy might consider incorporating a legal definition of protected areas that supports co-management objectives, such as by explicitly allowing some degree of community access to resources or a community role in managing protected areas.
- ii. The current legal framework in Bangladesh raises a host of jurisdictional questions with respect to protected areas management. One issue involves overlapping jurisdiction between the 1927 Forest Act and other laws, which creates a risk of regulatory conflicts. A countervailing question arises as to how to promote a landscape-level approach to protected area management when the resources within a single ecosystem or landscape fall under the control of different departments. Presently, the Forest Department cannot address activities, such as tea gardens, on the borders of protected

areas that do not fall under its control (rather, these gardens operate on long-term leases from the Ministry of Lands).

- iii. A more fundamental question is posed by the way in which co-management would alter the balance of power between government agencies and local communities. Under the current legal framework, the government exercises direct control over protected area management, with specific rights granted to communities on a case-by-case basis (through social forestry, the fisheries leases, etc.).
- iv. Another issue entails whether and how to institute a zoning system within the legal framework governing protected areas. While the laws do not formally provide for zoning, some protected areas appear to have de facto buffer zones, with income-generating activities operating around their borders. Moreover, the zoning system – at least when comprised of a core protected area surrounded by a more flexible buffer zone – is not appropriate in all cases.
- v. Benefit sharing is a critical component of the co-management approach, and arguably constitutes the foundation upon which co-management must be structured, for co-management will not succeed without addressing the subsistence and livelihood needs of local communities living near protected areas. Examples of benefit sharing approaches include the apportioning of revenue from resource-based activities such as ecotourism and resource harvesting (fisheries leases, timber sales). Carbon sink projects have also been explored as a potential revenue source, although without success thus far.
- vi. As a key component of protected area conservation, enforcement authority is essential to a successful co-management approach. It is clear that conventional approaches to enforcement have not been entirely successful – for example, brick-burning activities take place adjacent to protected areas in clear contravention of the Brick Burning Control Act of 1952, and resource plundering has taken place across a wide swath of protected areas.

Over the years, a number of management plans have been prepared for protected areas pursuant to various projects. In the past, some protected areas were also managed under the working plans for the reserve and protected forests out of which they were carved. The extent to which these successive management plans incorporate participatory management principles vary, and their implementation, which is dependent on project funds, has sometimes been hindered by a lack of resources. It is not clear whether management plans are independently authorized under existing law, given that the 1974 Wildlife Act is silent on the topic, and the only reference to them in the Forest Act is found in the Social Forestry provision (Section 28).

The co-management approach to protected area management, both as a way of meeting community subsistence needs and as a means to ensure more effective protection of valuable resources is a now big concern for Bangladesh in the face of depleting biodiversity and forest resources. There is a widespread sense that the co-management models will work and that momentum for co-management is building – it is not a question of whether to scale up, but how. Of course, not everyone takes the same view of how co-management should function, and questions have been raised (among others) about such issues as the relative roles of communities and government in the co-management scheme; whether protected areas should be defined to include community resource use; and how to extend the co-management concept from fisheries to protected forest areas, given the significant distinctions in how these resources are classified and managed by the government. Nevertheless, the support of

agencies and NGOs is crucial to both the continued implementation of co-management and the adoption of more fundamental legal changes to enable this approach in the long term.

On the other hand, neither the 1974 Wildlife Act nor the 1950 Fish Act addresses community participation in resource management. As will be discussed below, some efforts are already under way to remedy these deficiencies. A large-scale proposed amendment to the Wildlife Act would incorporate the co-management approach for protected areas covered by the Act, and the Department of Fisheries is recommending new laws and changes to existing MOUs and guidelines to implement elements of a co-management approach.

## 5. Habitats and Communities of Competing Interests

The site's habitats include sand dunes and beaches, salt marshes and mudflats, mangrove and near and in-shore waters.

*Sand dunes, beaches and sandy shoals:* An intertidal sandy beach and sandy ridge extends for approximately 12.5 km along the length of the western side of Sonadia Island, from north-west to south-east. The beach is rich in mollusc shells. Winds and waves are the major forces determining the features of the dunes. Two dune ridges are recognised; one known as "Barchar" and the other, "Moghchar", covering a relatively smaller area. There are also several sand bars/shoals along the upper north-western part of the site (approximately two km in length) and along Ghotivanga's south-eastern coastline, adjacent to the Moheshkhali channel (approximately four km in length, but not continuous). The beaches and shallow shoals surrounding the site provide an excellent staging area and wintering ground for migratory waterfowl and shorebirds, and the sand dunes provide nesting grounds for marine turtles.

*Salt marshes and mudflats:* There are several salt marsh and mudflat areas fringed with intertidal grassy vegetation and mangrove saplings. GIS calculations estimated a total mudflat area of 1,175 ha in 1999; the current area of mudflat is unknown. The largest undisturbed salt marsh area is in south Sonadia Island; other areas include along the mangrove formations north of Sonadia West village, between Moheshkhali and Sonadia Islands, and along the mangrove formations of Baradia-Vanga canal in Moheshkhali. The mudflats are important habitat for migratory and resident birds and mud crabs.

*Mangrove:* The site supports the last remaining remnant of natural mangrove forest in south-east Bangladesh. The mangroves have developed in a lagoonal coastal setting rather than in a deltaic formation, with salt-tolerant dominant species attributed to the extreme ecological factors of high salt-content soil and water. The distribution of mangrove within the site is at the sheltered inland part of Sonadia Island and a very narrow intertidal area on the edge of the estuary, covering an area of 332 ha, and at northern Ghotivanga, covering an area of 169 ha, giving a total mangrove area of 500 ha. The mangrove is dominated by the shrubby *Aegialitis rotundifolia* and consists of seven tree species of which *Avicennia* spp. and *Aegialitis rotundifolia* constitute the upper and lower stratum, attaining a maximum height of 3.6 and 2.4 metres respectively. The floristic diversity (seven woody species) is very poor compared to other mangrove areas of Bangladesh (e.g. the Khulna Sunderbans, with 23 woody species). The mangroves provide an excellent wintering ground for migratory waterfowl and shorebirds, and nursing and feeding ground for fish and shrimp species.

*Estuarine and in- and near-shore waters:* The site's in- and near-shore waters consist of a number of channels separated by shallow sand bars. The site also has several mangrove-dominated estuarine canals and lagoons, covering a total area of approximately 316 ha. The eastern part of the site is fed by freshwater from the Bak-khali River estuary and Moheshkhali Channel, and the western part of the site from the Kuhelia River. The in- and near-shore waters provide important habitat for the breeding, growth and development of many in- and near-shore fishes and invertebrate species of the north-eastern part of the Bay of Bengal.

## **6. Functional Zoning of Sonadia Island ECA**

The term "Zoning" means dividing the Protected Area (PA) or Ecologically Critical Areas (ECA) into logical units or belts mainly for management purposes. ECA and PA usually suggest a zoning system in order to achieve their management objectives, realize specific conservation goals, determine the level of management, and set measures for accepted development in each zone.

In brief, the idea of developing zoning system for conservation is to create balance between biodiversity protection and economic development. So, the designing of zoning system must reflect the natural and cultural values of the protected areas and must also respect the current pattern of land use on the ground and the essential needs of local communities.

The zoning options vary between strictly reserved zone, which is the highest level of protection and down to multiple use zone or general use zone, which is the most flexible management belt. Between these two zones, there is usually a buffer zone which is established to soften the line between preserving biodiversity and general use areas that include some forms of development. Zoning, in this sense will separate incompatible land uses within ECA, for instance mining and ecotourism.

### **6.1. Ecological Zoning and Conservation Management Planning**

Zoning is an integral part of Conservation Management Plan, as it is a tool by which conservation plan is realized. Zones, in this regard, are used to describe management actions and to guide and control the human and development activities. Additionally, it is difficult to describe, or even consider, the management of large or complicated sites unless they are divided into a series of zones.

In order to develop functional and meaningful zones, an analysis based on the ecological information derived from relevant sources is required. This analysis must be supported by field based information and good understanding of current land use and development pattern on the ground.

Zones in management plans must be delineated and described as clear as possible, and the basis or justification for their selection should be clearly presented. That is why in many cases, conservation management plans are developed with a provisional zone map until a clearer idea is crystallized regarding zoning and objectives of the site.

There are few basic rules that should be applied when establishing zoning system, these rules are;

- A full and detailed rationale is required to explain the basis for establishing the zones.

- A concise description of the functions and/or restrictions applied within each zone must be prepared and included.
- A map showing the zones must be prepared and included in the management plan.
- Zone boundaries must be easily recognizable and clearly identifiable on the ground, physical features such as rivers, walls or roads form the best boundaries.
- Boundaries of zones which are based on habitats must be identified with permanent markers since communities are often dynamic and liable to change in area.
- Uniform sites or areas of homogeneous habitat, fixed markers are needed for demarcation.

## 6.2. Ecological Zoning System

This section describes in details the proposed zoning system, which comprises of 5 zones. Each zone is clearly demarcated on the map and its rationale is outlined together with its management strategy and objectives. General rules and regulations are also provided for each zone.

This array of zones, which are designed to be technically and administratively appropriate, see map below, will enable ECA authorities to practice flexible and effective management system with respect to both nature conservation and development. Here, Managed Resource Zone – MRZ01, Restricted Access Zone – RAZ02, Natural Restoration Zone – NRZ03, Habitat Management Zone – HMZ04, and Sustainable Use Zone – SUZ05.

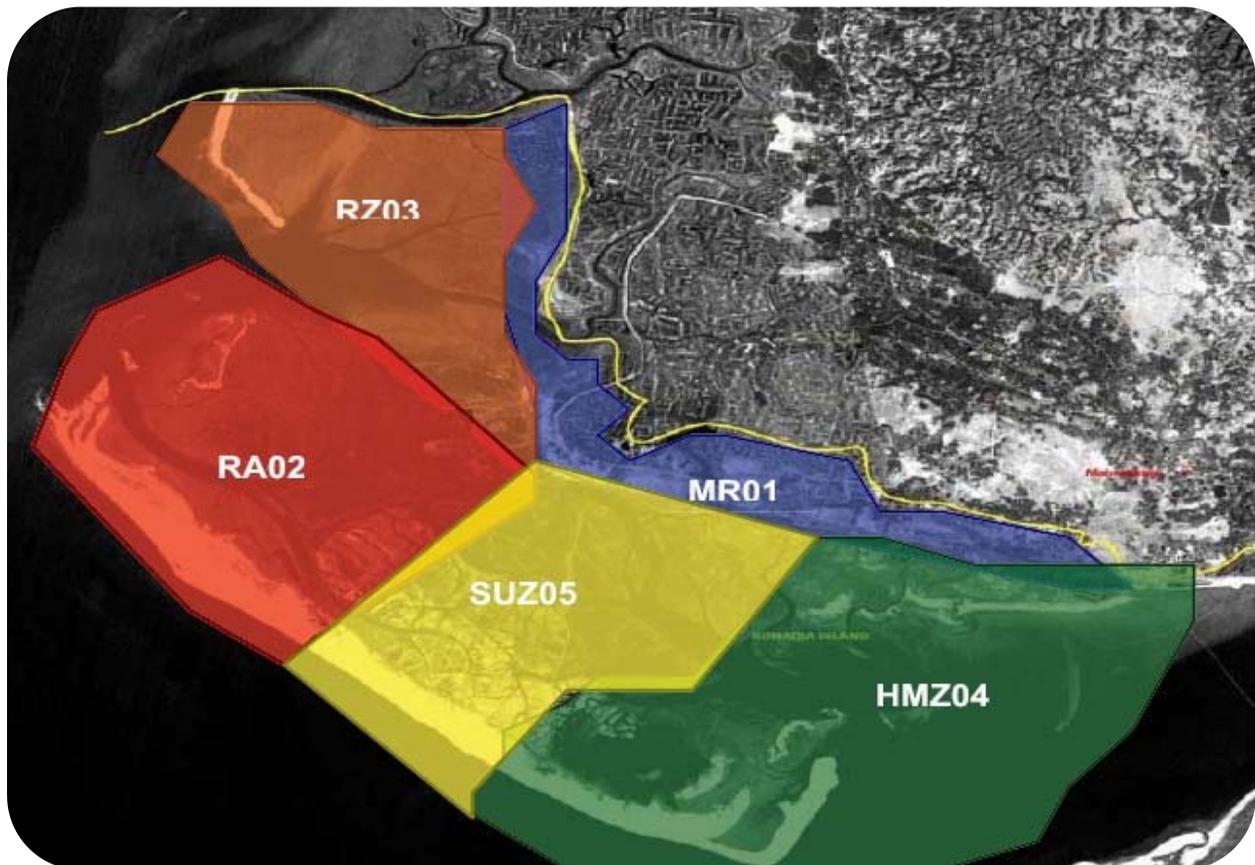


Figure: Functional Ecological Zoning of Sonadia Island ECA

### 6.3. Managed Resource Zone (code MRZ01)

This zone covers the Northern (East to West) border of ECA and stretches to the southern range of Mohashkali and passing through Gohtibanga, Kutubdia, and Bangakhal. It represents a belt of about 12 Square Kilometer (12 Km length X 1 KM width).

**Current Situation:** This zone is very close to the highly populated northern villages of Sonadia and that is clearly reflected on the current land use. The area is under high pressure of development in forms of salt production, shrimp farms, buffalo grazing, boat harbor, and associated activities.

The habitats of this zone contain stretch of mud flats, sandy beach and dunes. However, the ecological features of the area are totally altered to the extent that restoration could not be feasible or successful (See photo).

**Rationale:** This zone contains modified natural systems and does not have exceptional ecological features. The ecosystems in this area are significantly altered due to heavy development practices. As mentioned earlier, the zone is under intense production of salt and shrimp, in addition to agriculture and fishing, and these activities represent the main source of income for locals in area.

Considering the ecological situation of this zone and the need of the local communities, the zone was designed as a Managed Resource Zone in order not to disrupt the main source of living of those poor communities, especially because there is no significant ecological return is expected. This will allow local communities to continue their commercial activities, and improve their local economy, provided that they will follow the rules and regulations of this zone and adapt their activities to be more sustainable and in harmony with the overall objectives and rules and regulations of ECA.

If this zone moves towards sustainability, this will maintain flow of natural products and services to meet community needs. This zone will represent the contribution of ECA to local people to support sustainable development. In turn, ECA will be able to protect the core areas and areas of ecological significance in strict mode as a compromising agreement.

**Management strategy and objectives:** The strategy of this zone is to serve the local community in sustainable manner and without impinging upon the overall objective of ECA. So, the management objective will focus on allowing sustainable development in order to ensure sustainable flow of natural products and services for local community in harmony with overall objective of ECA and its rules and regulations. Specific objectives are;

- Promote sound management practices for sustainable production systems of agriculture, salt production, crab culture/fattening, and fish-shrimp poly-culture exclusive for local communities and local consumption.
- Contribute to local development and improve local economy in line with the national and regional policies.
- Function as a managed layer to protect the core and buffer zones of ECA, so as not to jeopardize the natural and cultural values of ECA.
- Serve as a model for sustainable development within ECA and hence improve the profile and the role of ECA in local development.

- Create a bridge of trust between ECA authority and local communities.

### **General rules and regulations**

- Zone is open for sustainable development activities with particular emphasis on organic farming, traditional uses, ecotourism, cultural activities and art-crafts production.
- Agricultural production and plantation of native species i.e coconuts should replace exotic species such as Eucalyptus and Acacia.
- Environmental clearance certificate based upon Environmental Impacts Assessment is required for any development plan in the area, and approval of ECA authorities is mandatory for any environmental clearance certificate.
- Any activity which could result in deterioration of the natural conditions of this zone or more importantly the other zones of ECA is strictly forbidden.
- The following activities are not allowed in this zone or in any other zone of the ECA;
  - Any activity that may change the natural characteristics of the area
  - Establishment of any industry that may pollute the soil, water and air.
  - Cutting of natural forest or killing or hunting wildlife.
  - Commercial use of chemicals or pollutants of negative impacts on environment.
  - Disposal of boats oil waste into water or land.
  - Disposal of solid wastes into water or land.

### **6.4. Restricted Access Zone (code RAZ02)**

This square shape zone covers the West part of Sonadia ECA. It starts from the West-southern boundary of the Western village from the beach side and move along the main sandy beach towards North-West, Belekordia, including marine belt of about 500 meter width.

The Sandy beach of this zone is 3.7 Km length. At the tip of the sandy beach from North-West the zone turns right toward North-East to Kalardia including Dofardia, then 5 km long Southern side of Kalardia to Moch Khal in order to include the most pristine mangrove forest in Sonadia Island.

The zone moves toward South- East across Moch Khal Canal until it meets Baddar Khal at a point parallel to the beginning point of the zone at the Western Village from the Northern- Eastern side. The average length of this zone is 3.7 Km and the average width is 3 km and the approximate total area is 11 square kilometer. That represents less than 10% of the total area of ECA.

**Current situation:** This zone represents the ecological critical features upon which the ECA was declared. It has the most intact mangrove forest, which is still in good and natural conditions but in the same time very vulnerable considering the development pressure surrounding it. The area also includes undisturbed mudflats, canals; a stretch of sandy beach and sand dunes these are favorable conditions for migratory and local birds. The sandy beach is famous for turtle nesting and can be considered as a good sanctuary for sea turtles being relatively remote.

There are no permanent human settlements in the area and no existence of infrastructure or any other similar human developments. The area can be dedicated for in situ conservation and can be easily managed according to this objective. This zone is designed for this very reason, which is feasible, practical and realistic from both technical and administrative point of view.

**Rationale:** This zone enjoys the existence of last remaining area of natural mangroves in South-eastern Bangladesh. It also includes an undisturbed mudflat areas and canals that are important habitat for migratory and resident birds, such as Bar-headed Goose, Shoveler, Grey Heron, and Eurasian Curlew, and other waders and shore birds, Additionally, it provides habitat for red crab, mud crab, horseshoe crab and other crabs, mollusks and echinoderms such as sea stars and sea anemones. Moreover, the zone is considered spawning and nursery grounds for juvenile marine fishes and shrimps. Sandy beach of this area is very important as a nesting ground for marine turtle.

This zone represents the core value of ECA, and hence should enjoy the highest level of protection in order to serve as refugia for wildlife, mangrove forest and associated natural features and processes. The area should be significantly free of direct human intervention and should remain so. In the meantime, the conservation of the area's biodiversity is achievable through protection and does not require substantial active management or habitat manipulation.

**Management strategy and Objectives:** The management strategy for this zone is to protect biologically significant species and habitats in pristine conditions to serve as refugia for wildlife and for natural processes to interact largely for scientific research and environmental monitoring. Conservation of natural values and natural processes takes precedence over other forms of uses in this zone. The management objectives of the zone are;

- Maintain genetic resources in a dynamic and evolutionary state to maintain established ecological processes.
- Preserve habitats, ecosystems and species in an undisturbed state as possible.
- Safeguard structural landscape features and geological formations.
- Secure examples of the natural environment for scientific studies, environmental monitoring and education.
- Minimize disturbance by careful planning and execution of research and other approved activities.
- Limit public access and associated disturbance to wildlife.
- Practice minimal management intervention so natural processes occur unimpeded.
- Maintain the essential natural attributes and qualities of the environment over the long term.

**General rules and regulations:** The zone should exercise high level of protection as justified earlier. So, it should be restricted from development and human interventions in all forms. It should be dedicated only to regulated scientific research and ecological monitoring. The following rules and regulations are strongly applicable to this zone;

- Human settlements and associated infrastructure and practices are not allowed.
- Alteration of natural features and landscape is strictly prohibited, i.e. collection of natural components or mining.
- Disposal of solid wastes, oil and/ or any pollutants to land, marine or estuarine water are strictly prohibited.
- Any activity that could change the natural process of terrestrial or marine life is prohibited.

- Hunting or disturbing wildlife in any form is strictly prohibited in this zone.
- No development in this zone, so agriculture, grazing of livestock, fishing, crab trapping and fry collection or any other form of development are strictly forbidden.
- No fishing zone for 1000 meter radius from shore.
- The following activities are not allowed in this zone or any other zone of the ECA;
  - Any activity that may change the natural characteristics of the area.
  - Establishment of any industry that may pollute the soil, water and air.
  - Cutting of natural forest or vegetation, collection of natural components unless for regulated scientific research.
  - Commercial use of chemicals or pollutants of negative impacts on environment.

### **6.5. Natural Restoration Zone (code NRZ03)**

This triangular shape zone is located on North-Western Corner of Sonadia ECA; one arm of the triangle starts from Moch Khal point of Ghotivanga and stretches approximately 5.5 km long towards North up to Bhangra Khal Point parallel to Western border of (MRZ01). The other arm is traveling parallel to the border of (RAZ02) for about 6.5 km long Eastern side of the Moch Khal up to Kalardia, including Alordia. The base of the triangle is almost 4 km long Southern side of Bhangra Khal up to Kalardiar and 500 m seaward side. This zone fills the gap between the two zones of RAZ02 and MRZ01 and the cluster of these three zones cover almost half of the total area of the ECA.

**Current situation:** This zone is approximately 10-12 sq. km of area, dominated by large expanse of semi-degraded mangrove and slightly disturbed mudflats, and canals. There are sand bars in Kalardia in the Western side; a few shrimp farms in the Eastern side and one just at the Eastern side of Kalardia. See photos below.

It is a part of the last remaining areas of mangrove in South-eastern Bangladesh; it is also a staging area and wintering ground for domestic and migratory waterfowl and shorebirds such as; Bar-headed Goose, Shoveler, Grey Heron, and Eurasian Curlew. It is considered estuarine fish nursery ground; dolphin habitat; and sea turtle nesting ground. The area is also famous for mud crab and horse-shoe crab.

**Rationale:** This zone is located between the Restricted Access Zone (RAZ02) and the Managed Resource Zone (MRZ01), or in other words, between a core zone and a general use zone. Thus, these two incompatible zones require a buffer as a transitional zone. This zone is par excellence a buffer between the core area and general use area.

There are two factors determine function of this zone; the first is its close location to a core area (RAZ02) of significance ecological importance, and the second factor is the environmental conditions of this zone; it includes degraded mangrove forest which could be easily restored to the natural conditions. So the designation of this zone will provide an added and effective layer of protection to the core zone and will function as a buffer and transitional belt between the incompatible adjacent zones.

**Management strategy and objectives:** The management strategy of this zone is to protect and restore degraded mangrove forest and associated natural features to allow ecological recovery and protect the sensitive natural areas surrounding it. There is no need for interventions through

plantation or habitat restoration, as the current conditions would improve naturally, and the mangrove will regenerate if the pressure is removed.

The primary objective of the zone is to protect the present significant natural resources, features and processes because of their special character and their potential impacts on core zone (RAZ02). The specific objectives of this zone are:

- Regain and maintain essential natural attributes and qualities of environment.
- Allow gradual restoration of natural habitats by reducing pressure on natural resources and mitigating negative impacts.
- Allow the most environmentally friendly activities in order to support the local people's economy, e.g. very low profile of ecotourism such as Wildlife viewing and bird watching.
- Eliminate and thereafter prevent exploitation and occupation that may harm this zone and its adjacent core zone (RAZ02).
- Maintain and promote harmonious interaction between nature and traditional life style.
- Minimize potential impacts on wildlife and fish resources.

**General rules and regulation:**

- Any activity that could cause degradation to mangrove trees and other natural vegetation, wildlife, birds, marine and estuarine life is prohibited.
- No alteration of natural landscape.
- Traditional fishing by local people is allowed provided that it does not generate negative impacts on mangrove and associated natural features, specifically;
  - No use of estuarine set bag net (ESBN), fine-meshed seine nets (Tana Jal/Kukkuru Jal), and Stake nets (Char Jal) especially during winter (Dec-Mar).
  - No fishing by 'Khati' method.
  - Fishing by cast nets, gill nets and catching of mud crabs by crab traps could be allowed with conditions
- Regulated research, educational and public awareness activities are allowed with conditions
- Buffalo grazing is prohibited.
- Ecotourism of very low profile could be allowed with regulations and conditions
- any activity that could cause pollution to air, water, and land is not allowed
- The following activities are not allowed in this zone or any other zone of the ECA;
  - Any activity that may change the natural characteristics of the area.
  - Establishment of any industry that may pollute the soil, water and air.
  - Cutting of natural forest or killing or hunting wildlife.
  - Commercial use of chemicals or pollutants of negative impacts on environment.
  - Disposal of boats oil waste into water or land.
  - Disposal of solid wastes into water or land.

**6.6. Habitat Management Zone (code HMZ04)**

This zone is located in South-eastern part of Sonadia, it starts from East village and extends Northward to the mudflats of Northern side of Baddar Khal and Kutubzome Khal parallel to the border of the Managed Resource Zone (MRZ01). It includes sand bars of Moghchar, and a radius

of 500 meter off-shore from the western beach, including the lagoon, sandy shore and sand dunes.

**Current situation:** This zone includes mudflats, lagoon, sandy beach, sand dunes and mangrove shrubs. This combination of habitats, in addition to the water canals, represents fertile ground for local and migratory birds. There are some low scale development activities in the area; for instance, seasonal dry fishing is taking place near Mogchar, and fishing is also common in the area.

**Rationale:** Flocks of birds have been recorded in this area by CWBMP, some of these birds are rare and of global significance. So, this zone is designed to protect birds' habitats and provide relevant management interventions so as to improve the natural conditions of these habitats.

As mentioned earlier, this zone includes combinations of habitats; namely sandy beach which is important for turtle nesting; undisturbed sandy-mud area which is favourable for domestic and migratory water birds; lagoon and mudflats as roosting and feeding habitat for many birds such as small pratincole, ducks, herons and waders; and canals and mud flats which is considered a feeding and nursing area for fishes, crabs, molluscs and other invertebrates.

So, this zone is designed for management intervention so as to improve and ensure maintenance of these habitats to accommodate birds of national and global ecological significance and other living organisms. Traditional activities that do not harm these habitats, and do not negatively interfere with the natural processes and services of these habitats, could be allowed provided that the rules and regulation are strictly followed.

**Management strategy and objectives:** This zone plays an important role in the protection of sensitive natural habitats and the survival of the birds, as it includes breeding areas, wetlands, estuaries, grasslands and mangrove shrubs. In this area, protection of the habitat is essential to the well-being of nationally and globally important resident and migratory birds. Successful conservation of these habitat and species depends upon active intervention by the management authority of ECAs.

The management strategy of this zone is to serve as a healthy and productive ecosystem that could be self sustained as a Bird Sanctuary Zone and to secure and maintain the habitats conditions necessary to protect significant bird species and associated natural and physical ecological features. Specific objectives are;

- Eliminate and thereafter prevent exploitation or occupation inimical to the purposes of designation as a bird sanctuary
- Conduct habitat restoration program in order to improve habitats conditions and retrieve its functional capacity through for instance; plantation of native species, removal of development pressure and regulating traditional activities.
- Facilitate scientific research and environmental monitoring as primary activities associated with sustainable resource management.
- Develop limited areas for public education and appreciation of the characteristics of the habitat and wildlife management, for example, bird watching posts and visitor centers.

## General rules and regulations

- Any activity that could cause alteration of natural landscape is prohibited.
- Low-Profile ecotourism is encouraged in this area, particularly bird watching with conditions.
- Educational and public awareness activities are allowed with conditions; including handcraft production and information centers.
- Agriculture, fishing and other human development activities are prohibited, however traditional fishing by local people is allowed provided that necessary precautions, including approved gear, are taken to mitigate the negative impacts on mangrove and associated natural features.
- Cutting or alteration of mangrove is prohibited.
- The following activities are not allowed in this zone or any other zone of the ECA;
  - Any activity that may change the natural characteristics of the area.
  - Establishment of any industry that may pollute the soil, water and air.
  - Cutting of natural forest or killing or hunting wildlife.
  - Commercial use of chemicals or pollutants of negative impacts on environment.
  - Disposal of boats oil waste into water or land.
  - Disposal of solid wastes into water or land.

### 6.7. Sustainable Use Zone (code SUZ05)

This zone lies among the other four zones and covers the remaining part of ECA. Its Northern Border is zone (MR01) and (RZ03), Western border is zone (RAZ02) and Eastern Border is zone (HMZ04), and the Southern border is a radius of 500 meter from the sandy beach into the marine water between zones (RAZ02) and (HMZ04).

The zone is a stretch of sandy beach and sand dunes along the south Western coastline of Sonadia Island, and the area of the degraded mangrove up to southern side of Baddar Khal including the Gura Mannar Khal, Kaper Khal, Majherdhar Khal, and the settlements of the villages of Badarkhalipara, Sonadia Purbapara, Sonadia Pashchimpara.

**Current situation:** This zone is approximately 25 sq. km area and includes sandy beach and sand dunes, degraded mangroves, mud flats and estuarine waterways and canals. The evicted shrimp farms and salt pans are located in this area. The area has also human settlements, homestead areas and some seasonal agricultural land. There are two villages of total population of approximately 2000, with their infrastructure and amenities such as houses, cyclone shelters and mosques.

Some patches of the zone are planted by Jhau trees by Coastal Forest Department, and there are some plantation of economic values such as coconuts done by CWBMP to support local communities and village conservation groups. This is a populated zone and currently providing the communities with their basic needs of agriculture and fisheries products along with other business. In the same time, this zone is located very close to sensitive ecological zones such as (RAZ02) and (HMZ04).

**Rationale:** The area possess a landscape and seascape of high scenic quality, with diverse associated habitats, flora and fauna along with manifestations of traditional land-use patterns

and social arrangement as evidenced in human settlements and local customs, livelihoods, and beliefs. The zone is famous as nesting ground for marine turtles in line between Sonadia East and Sonadia West (Majher vita). In addition, it includes mangroves of highest species diversity in Sonadia ECA, in degraded conditions, and there are also shorebirds, red crabs, mud crabs and mollusks.

In general, the area contains slightly modified natural systems and could be managed to ensure long term protection and maintenance of biological diversity, while providing at the same time sustainable flow of natural products and services to meet community needs. In this area the interaction of people and nature is a welcome tradition and has over time produced significant aesthetic, ecological and cultural values. Safeguarding the integrity of this traditional interaction is a part of the ECA mandate and is vital to the protection, maintenance and evolution of this zone and the ECA as a whole.

**Management strategy and objectives:** The strategy of this zone is to function as strong buffer to sensitive core zones around it, as it is located between the Restricted Access Zone (RAZ02) and Habitat Management Zone (HMZ04), and those zones require a layer of buffer. In the meantime, this zone will also serve the community by providing sustainable flow of natural services and products through environmentally friendly plans such as organic farming, handcrafts production and ecotourism.

It also provides opportunities for public enjoyment through recreation and tourism within its normal lifestyle and economic activities. Specific objectives of this zone are:

- Maintain the harmonious interaction of nature and culture through the protection of landscape and seascape and the continuation of traditional land uses and social and cultural manifestations.
- Prevent any activity that could have negative impacts on the surrounding zones particularly zones (RAZ02) and (HMZ04).
- Protect the existing diversity of mangroves and promote the natural recovery to its functional conditions.
- Design a program for mangrove plantation in the evicted shrimp farms.
- Support lifestyles and economic activities which are in harmony with nature and the preservation of the social and cultural fabric of the local communities.
- Maintain the diversity of landscape and habitat, and associated species and ecosystems.
- Eliminate where necessary, and thereafter prevent, land uses and activities which are inappropriate in scale and character with the purpose of this zone and other adjacent zones.
- Provide opportunities for public enjoyment through recreation and sustainable tourism appropriate in type and scale to the essential qualities of the area.
- Encourage scientific and educational activities which will contribute to the long term wellbeing of resident populations and to the development of public support for the environmental protection of ECA.

- Bring benefits to, and to contribute to the welfare of, the local community through the provision of natural products, i.e. fisheries products and services such as clean water or income derived from sustainable forms of tourism or ecotourism.
- Protect the natural resource base from being alienated for other land-use purposes that would be detrimental to the area's biological diversity.
- Promote ecotourism plans as a win-win strategy for conservation of Natural Resources.

### **General rules and regulations**

- Zone is open for sustainable development activities which are in harmony with nature conservation and generate income for local communities
- Environmental clearance certificate based upon Environmental Impacts Assessment is required for any development plan in the area and approval of ECA authorities is mandatory for any environmental clearance certificate.
- No more expansion of human settlement within current boundaries and around sand dune areas.
- Fishing activity should abide to the following rules;
  - No use of ESN, fine-meshed seine nets (Tana Jal/Kukkuru Jal), and Stake nets (Char Jal) in the canals and canal mouths especially during winter (Dec-Mar).
  - No fishing by 'Khati' method
  - Fishing by cast nets, gill nets and catching of mud crabs by crab traps could be allowed with conditions.
- Any activity which could result in deterioration of the natural conditions of this zone or more importantly the adjacent zones of ECA is strictly forbidden.
- The following activities are not allowed in this zone or any other zone;
  - Any activity that may change the natural characteristics of land or water
  - Establishment of any industry that may pollute the soil, water and air
  - Cutting of natural forest or killing or hunting wildlife
  - Commercial use of chemicals or pollutants of negative impacts on environment
  - Disposal of boats oil waste into water or land
  - Disposal of solid wastes into water or land
- No plantations within the dune system, except for carefully planned vegetation that is native to the area and has no negative impacts on turtle nesting and other species.
- Alteration of natural features and landscape due to collection of natural components, such as mining is strictly prohibited
- Any activity that could change the natural process of terrestrial or marine life is prohibited.
- No alteration of natural landscape, human settlements should adopt eco-construction principles using local styles and local materials for building as possible.
- Educational and public awareness activities are allowed with conditions.
- any activity that could cause pollution to air, water, and land is not allowed
- Low-Profile ecotourism is encouraged in this zone.

## **7. The Concept of Ecotourism**

The widely used definition for ecotourism was established by The International Ecotourism Society in 1990 as; "Responsible travel to natural areas that conserves the environment and improves the well-being of local people." Despite there are many definitions for ecotourism developed by different organizations and specialists, the above definition, in few words, captures the core concept of ecotourism. Nature conservation and improving local economy are the two-dimensional matrix of ecotourism, in other words, an ecotourism initiative should benefit both environment and local people.

Some forms of tourism may sometimes confuse with ecotourism concept; such as Nature-Based Tourism and Sustainable Tourism, yet ecotourism is the most accepted concept for conservation of natural resources. Nature-Based Tourism, for instance, is simply a tourism based on visitation of natural resources and it does not necessarily involve conservation or benefits for locals. UNEP and the World Tourism Organization set the following criteria as crucial requirements for any ecotourism initiative:

- Minimize negative impacts on the natural and socio-cultural environment
- Respect local cultures and traditions
- Consult stakeholders and local communities during planning and development
- Generate income for local people and stakeholders
- Increase public awareness and play educational role for conservation of natural resources

These criteria help to differentiate ecotourism from other forms of tourism that based on nature. This proposal will adopt that ecotourism concept taking into account these five requirements.

### **7.1 Ecotourism Development Planning**

Ecotourism is defined here as; "*Responsible travel to natural areas that conserves the environment and improves the well-being of local people.*" So, ecotourism is considered an innovative strategy for conservation of natural resources especially in areas where poverty is a real challenge.

The strategy adopted in this intervention is to demonstrate a quick and low profile ecotourism initiative as a model of real ecotourism investment. This introductory intervention will allow future expansion, improvements and replication in other sites following the zoning principles and guidelines. It will also be flexible enough to allow modification in the future if circumstances change. The proposed infrastructure could be summarized as an eco-lodge of two units (SUZ05), botanical garden (HMZ04) and supportive facilities such as information center (SUZ05), toilette and kitchen, resting shelters (SUZ05 & NRZ03) and improved trails supported with signage system (HMZ04 & RAZ02).

Landscaping and decoration will also demonstrate the conservation values; a botanical garden will be created in the vicinity of the eco-lodge using native and rare species, for educational and recreational purposes. Local handcrafts will be encouraged and used for internal decorations.

The suggested Management Structure of the plan is a combination from Community-Based Enterprise and Private Concession. As the community capacity is not strong enough to manage

such kind of business, the intervention will contract a private investor on annual concession basis. This is mainly to ensure good standard of management and achieving financial benefits. In the same time, and to ensure social and environmental gains, Memorandum of Understanding (MoU) will be signed with the private investor to realize these imperatives. All the decisions will be taken through the Village Conservation Groups and thus the community will be virtually managing the plan through a private company. In the future, when the community becomes of better capacity, the private sector role can be gradually decreased and the management operations can be fully implemented through the community.

Environmental Impacts Assessment shows that the positive expected impacts of the proposal far exceeding the negative impacts and these negative impacts can be managed and easily mitigated. Furthermore, primary evaluation for both sites gives positive feedback, as most of the needed criteria for successful ecotourism initiatives, are met in these sites. Thus the proposal can be accepted from both ecological and administrative point of view.

## **7.2. Expected Benefits**

The intervention is expected to be very beneficial to all stakeholders particularly to the local communities that host the plan. Tangible expected benefits to be achieved are outlined below.

**Local people:** The intervention will benefit local people from diversified sources; firstly job opportunities will be available for construction and also operation of the plan. Additionally, local people will provide the plan with services; such as food, gifts and maintenance, and that will support local economy and reduce poverty.

The plan will also encourage private business in the field of handcrafts, composting, organic farming and other environmentally friendly ventures. Training will be provided, through this proposal, for some activities of strong relevance to the ecotourism management and operation. These interventions will significantly improve and widen the capacity of the community.

**Nature conservation:** The local people will be increasingly engaged in ecotourism activities and that will divert their sources of income towards more environmentally friendly interventions. The local communities will appreciate more the importance of the natural resources as the main attraction to ecotourism. Moreover, some people who are currently contributing in the degradation of the natural resources will be trained and recruited in the intervention. The existence of such plan will also function as a watch dog to sensitive ecological sites. So, violators will think twice before damaging any environmental component. This array of actions will be positively reflected on the condition of ecosystems and will reduce the pressure on natural resources.

**Concerned organizations:** The competent organizations will be indirectly benefiting from the intervention; Department of Forestry, Department of Environment, Tourism Authorities and Conservation Agencies will all benefit from the protection of the fragile resources in the area and from promoting sustainable ecotourism. Also the plan will be – hopefully – a successful model that other organizations and private sector will pick and replicate in other places and areas, particularly because it requires modest financial investment and provide long term benefits and income.

## Environmental Compliance

The proposed area for the project is located within General Use Zone according to the Conservation Management Plan and is ecologically qualified to harbor such activities. Since there are few information available about tourism carrying capacity of the area, so the project is introduced in low-profile scale and far below expected carrying capacity. There are no significant negative impacts expected from the intervention. The intervention is in full harmony with Conservation Management Plan of the site.

Also, the project will always use local materials and labor and will encourage environmental techniques; such as Sun Stoves and other environmentally friendly practices. In all cases; environmental protection will be the first priority during construction and operation of the intervention.

### 7.3. Adopted approach

A pilot intervention of low profile ecotourism will be introduced to the site as an attempt to create income and build the capacity of the community. The proposed intervention will provide basic platform for future expansion and development. The intervention will try to show an example of an ecotourism that directly benefit the local people. It is expected to generate income; however most of the income will be recycled locally through providing services or employment. The entire community will receive a considerable percentage of expected income which will be channeled into VCG<sup>3</sup>s and other community organizations and stakeholders.

The intervention will consist of basic and flexible infrastructure that can be easily modified or upgraded according to the market needs and future development. The infrastructure will be basically eco-lodge and information center supported by needed facilities and trails system. The intervention will be inspired from traditional designs; it will demonstrate a good example of real Bangladeshi style. Furniture will be made from local materials and will express local skills.

The basic infrastructure will need no source of energy; as it will use natural sources of energy as possible. Passive energy and good ventilation system will be utilized. It will also encourage Sun Stoves and other environmentally friendly practices. In all cases; environmental protection will be the first priority during construction and operation.

### 7.4. Design and architecture

In principle, the design elements will be largely inspired from local and indigenous knowledge, using local materials and local labor for construction. The architecture will highly respect the surrounding environment and will protect the natural landscape. These will allow the project to meet its mandate and to function as educational example for environmentally friendly construction. The following part describes the components of the proposal in more details.

**Wooden elevated walkway (in HMZ04 & RAZ02):** Sometimes and according to tidal changes, visitors, have to walk in mudflats. This proposed walkway will provide a convenient access to the

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<sup>3</sup> Village Conservation Groups (VCGs) may be organized to facilitate sustainable conservation and management of biodiversity in the area through participatory, stakeholder and community based approaches, organization of communities.

island. It will not only serve the tourists but it will be of great use for women and old people who have to travel to and from the island on regular basis. The design will be simple and made from wooden materials as possible, supported by pillars depending on architect design. The length of the walkways will be 50 meter and it will harbor small boats for easy and comfortable access to the site.

The walkway will be a good infrastructure provided to serve the villagers as well, in the same time it will provide employment for local people to construct and maintain. On the other hand, the environmental measures will be taken to ensure the protection of marine life during this process.

**Eco-lodge (in SUZ05):** This permanent structure will be designed with much flexibility to allow changes in both interior and exterior design. The architecture will be in harmony with the traditional style of construction, made from plants and bamboo. It will contain relatively large windows for good ventilation and to give a chance for visitors to enjoy the natural views. The eco-lodge will consist of two big rooms, approximately 7 X 5 meter in size with an open yard in front. The interior design will be flexible and open; the room will be big enough to accommodate 5 people. It will be furnished with simple furniture to allow internal re-design according to the needs and the numbers of the visitors. Matrices and bed covers will be provided from local markets. Side tables, couple of chairs and clothes hanger are the needed furniture.

**Botanical garden (in HMZ04):** This will be a shop window to display beautiful native and rare species of plants. It will serve both recreational and educational purposes. The total area will be approximately 700 square meter, and it will include seats and shelters, as appropriate.

**Information center and administration (in SUZ05):** This structure will consist of big room to function as information center and administration. It will display brochures, and educational material related to conservation, it will also display handcraft of locals and will serve as a gift shop. This area will be on a distance to ecolodge to give privacy for visitors and in same time can be reached easily for logistic arrangements. Visitors will start and conclude in this point. Total area will be around 25 square meters.

**Common area (in SUZ05):** This common area is simple structure of a wide room with roof and short wall made up of local materials. It allows people to enjoy the surrounding landscape while eating or gathering for any other purpose. Number of tables and chairs will be provided for multiple purposes. The common area will be decorated by natural and cultural portrait and posters from the area. In this common area educational and public awareness programs and cultural events can be held. Total area will be around 50 square meters.

**Designed Trails (in RAZ02):** One loop of trails starting from the eco-lodge and concluding there will be developed to take tourists around the area. Sensitive conservation areas will be avoided, and the visitors will have a chance to enjoy walking by beach and natural areas, and see a traditional village. The trails will be supported by resting facilities such as wooden seats and tubewells, in order to create a pleasant and comfortable hiking experience.

**Kitchen (in SUZ05):** On medium size room (3X4 meters) designed for cooking purposes either by visitors themselves or by local people will be built. The and cutleries of local style. No fridge or

other electric appliances will be provided in this stage. Sun stoves will be provided as an alternative source of energy to relief pressure on firewood. Similar design, with some improvements, will be used kitchen will be provided by cook, utensils The kitchen will be provided with two-bin recycling system; one for organic and one for non organic and recyclable material. In the future the system can be upgraded to threebin system; one for organic material and one for plastic and glass and the third for the remaining materials.

**Toilette (in SUZ05):** An environmentally friendly toilette will be designed of two separate units (male and female). Simple design will be used, while considering the conservation of natural resources. The water can be recycled for other purposes such as irrigation.

**Safety and security:** Upon discussion with local people and VCG members, it was quite obvious that they are welcoming ecotourism initiative to the area. They understand that this project is introduced mainly for their benefit. Thus local leaders have voluntarily raised this issue and pledged to ensure safety and security of tourists. Generally, and as it is community based initiative, it is unlikely to face security problems. After initiation of the program if a need for extra security measures arises, in that case, 2-4 armed Ansar forces will be hired with the consultation of District Administration. On the other hand, a permanent police petrol camp is under consideration for the Island at present. Also consultation with local leader revealed that there are no, above normal, potential risks of accidents. The history of the site has no record of repeated or serious accidents.

## **8. Summery and Conclusions**

Since the bedrock laws do not explicitly authorize co-management of protected areas, developing a framework co-management strategy that would apply to all protected areas across different government departments and agencies, as opposed to a piecemeal approach that focuses on each agency's sectoral authorities. Development of a framework co-management strategy will offer the simplicity of formalizing the co-management approach through a single guideline. It might be difficult to tailor the strategy to the different circumstances presented by forests, fisheries, and other ecosystems in a way that would meet with the approval of all relevant agencies. A formalized co-management approach would redefine the traditional lines of authority in creating a level playing field for all actors in protected area management. The details of an on the ground co-management strategy are likely to vary not only according to the targeted resource (forests, fisheries, wildlife reserves, etc.) but also according to the region, the community (its relationship to the resource, livelihood needs, cultural practices, etc.), participating government and NGO actors, and other factors specific to the geographical area.

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