

Sustainable Coastal Zone Management in Myanmar



**Christoph Zöckler
Simon Delany
Janet Barber**

With contributions from:

**U Zau Lunn
Ren Nou Soe
Arne Langenkamp
U Zaw Thura
Gillian Bunting
Frank Momberg**



ArcCona Consulting



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Scoping paper:

Sustainable Coastal Zone Management in Myanmar

1. Introduction/Summary

Myanmar is the largest country in mainland Southeast Asia with a continuous coastline of almost 3000 km extending along the Bay of Bengal and Andaman Sea. In the north, much of the coast is largely undeveloped with poor transport infrastructure, but in many coastal areas there is high human population pressure. Rapid development of coastal areas (following a model of reclamation and/or construction of Deep Sea Ports for container shipping and adjacent industrial development) is forecast with the easing of sanctions against the government and, in particular, the normalisation of EU and US trade relationships. These are expected to lead to hugely increased foreign investment in coastal and infrastructure development.

The National Biodiversity Strategy and Action Plan (NBSAP) for Myanmar (Government of Myanmar, 2011) highlights the fact that the country still hosts an enormously rich and varied biodiversity. In the coastal zone, mangroves, coral reefs, seagrass beds, sandy beaches and intertidal mudflats are widely distributed and are home to the Irrawaddy Dolphin, the Sea Cow, five species of marine turtle, and many Globally Threatened waterbird species, such as the Spoon-billed Sandpiper, Indian Skimmer and Nordmann's Greenshank. The Myanmar coastal zone is also important for fish stocks which support artisanal fishery, and other livelihoods for local people. Rapid and often unsustainable development is jeopardising the fragile relationship between these crucial habitats and the livelihoods of rural people who make up a high proportion of the population of Myanmar.

Unsustainable development in Myanmar is damaging the coastal ecosystems (particularly mangrove forests) which provide resilience against sea-level rise induced by global climate change.

Unsustainable development is also exacerbating rural poverty in coastal areas, leaving the majority rural population further and further behind as urban populations grow and prosper. Rural poverty remains a considerable challenge and in the context of rising sea levels and increasingly unstable weather, coastal resilience is an issue of ever growing importance.

This scoping paper aims to promote sustainable development, highlighting the social and ecological as well as economic pillars of sustainability. It also aims to promote engagement with civil society, local and national government, as well as selected companies and investors interested in showcasing sustainable development. In this report, available information on coastal biodiversity is summarised and Key Biodiversity Areas, as well as knowledge gaps, are highlighted. Information on existing or planned development projects has also been compiled, providing a basis for future planning. Any project arising from this report will also raise awareness of the need for sustainability in all aspects of coastal and infrastructure development, and partners and alliances are being sought in the local and national governments, and among NGOs and private investors.

2. The Myanmar Coastal Zone and its biodiversity

2.1. Geographic characteristics of the Myanmar coastal zone.

Myanmar has a rich and varied coastline, fertile coastal plain, productive offshore waters and a tropical climate. These provide a strong basis for integrated, sustainable development that will support both a prosperous society and healthy ecosystems and biodiversity.

2.1.1 Physical Geography

Climate

Myanmar enjoys a tropical monsoon climate. Rainfall is highly seasonal, being concentrated in the hot humid months of the southwest monsoon (May-October). In contrast, the northwest monsoon (December-March) is relatively cool and almost entirely dry.

The mean annual rainfall is around 2,350 mm. The most significant regional variations are those associated with the intensity of the southwest monsoon rains. Annual rainfall can be as high as 4,000-6,000 mm along the coastal reaches and in the mountains of Rakhine and Tanintharyi. Intermediate levels of rainfall are found across the Ayeyarwaddy delta area (2,000-3,000 mm). See: http://www.fao.org/nr/water/aquastat/countries_regions/myanmar/index.stm

Tropical storms regularly develop in the Bay of Bengal between May and October, threatening the vulnerable, often unprotected coastline and the people living close by. Healthy coastal ecosystems can provide some protection, but the fierce winds do prevent some areas from permanent settlement by local people.

Coastline

Myanmar has a total coastline of nearly 3,000 km, extending about 1,900 km from 10° to 21° north of the equator and 93° to 97° east of Greenwich. The coast can be divided into three parts. The Rakhine coastal area borders the Bay of Bengal to the west, the Tanintharyi coastal area to the south borders the Andaman Sea (a part of the Bay of Bengal), and the Central Delta region lies in between

The Rakhine Coastline is about 740 km long and extends from the Naff River to Mawdin point. It is shallow and deltaic in the northern section and rocky in the southern part.

The Deltaic coastal zone extends about 460 km from Mawtin Point to the Gulf of Mottama (Martaban) and consists of the entire river - mouth areas of three major rivers, the Ayeyarwaddy, Sittaung and Thanlwin. Sedimentation at a rate of about 250 million tons per year results in seaward delta growth at a rate of about 50m per year. The South-eastern portion of the central deltaic area comprises the coast of Mon state. Here, the Thanlwin River opens into the Gulf of Mottama (Martaban) and "Balu-Kyune" (Bilugyun) (Giant Island) lies at its mouth.

The 900 km long Tanintharyi (Tenasserim) Coastline extends from the Gulf of Mottama south to the mouth of the Pakchan River. It is fringed in the southern part by the Myeik (Mergui) Archipelago island chain.

Coastal Features

In the northwest of Myanmar, the coast has rocky ridges with deep channels. South of Cape Negrais, the southern delta coast is formed by silt from the Ayeyarwaddy and other rivers. From the mouth of the Sittang River, the coast stretches to the south, studded with inlets, rocky cliffs and coral reefs.

Coastal Plains

The Rakhine coastal plain forms a narrow strip, mostly between 5 and 20 km wide, but up to 60 km wide in places, rising to the Rakhine Yoma mountain range parallel to the coast to the east. It is traversed by a number of short, fast-flowing rivers. The Ayeyarwaddy delta and its adjoining coastal plains form an expanse of fertile alluvial land with a network of small rivers and streams extending northward inland to varying distances of some 80 to 320 km. The Tanintharyi coastal plain in the south is similar to the Rakhine plain, being narrow, crossed by short rivers and rising to the Tanintharyi Yoma mountain range parallel to the coast.

Rivers

Many rivers flow into the coastal zones such as the Mayu and Kaladan rivers in the Rakhine Coastal area, the Ayeyarwaddy, Sittaung and Thanlwin rivers in the Delta coastal area and the Ye, Dawai, Tanintharyi and Lenya rivers in the Tanintharyi coastal area.

Islands

Offshore, there are many large islands and hundreds of smaller ones. The islands of Myanmar's western coast and delta have been formed by erosion of the shoreline. Just off the northwest (Rakhine) coast, the large islands of Ramree (1,350 square kilometres) and Cheduba (523 square kilometres) support volcanic activity. Bilugyun is a large island on the southwest coast. Also in the southwest is an undersea ridgeline that forms the Myeik (Mergui) Archipelago, with islands ranging in size from Kadan Island (440 square kilometres) to small rocks. Myeik Archipelago extends from Mali Island to Similand Island and includes about 800 islands covering an area of about 34,340 square kilometres lying up to 30 km off shore. Coral reefs surround the outer islands and mangroves cover many of the inner islands.

Continental shelf

The Myanmar continental shelf covers approximately 230,000 sq.km and is relatively narrow offshore of the Rakhine coast, widest (and still growing) offshore of the central delta, and with a relatively wide portion offshore of Tanintharyi to the south.

http://www.boblme.org/documentRepository/Nat_Myanmar.pdf

Land use and natural resources

Figure 1. shows that the Myanmar coastal zone is characterized by low-intensity land use, principally wetland rice production. Much of the coast still has natural vegetation, with extensive tropical evergreen forest and mangrove forest. There are oil exploration activities in all three regions of the coastal zone and several deep sea port project with related infrastructure development. New and planned activities will be highlighted in more detail and illustrated on maps in this report.

http://mapas.owje.com/maps/3167_burma-myanmar-economic-activity-and-land-use-map.html

Figure 1.

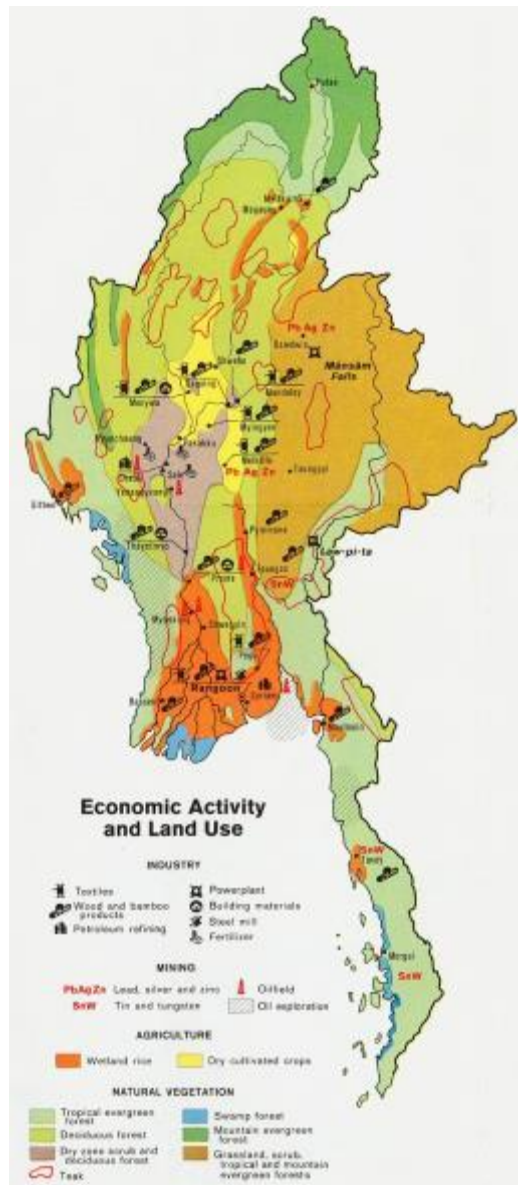


Figure 1.

Hydrography

Large, seasonal variations in hydrographic conditions have been observed, both in the surface and bottom layers in the continental shelf: a variation which in turn may cause horizontal fluctuation in fish distribution patterns. Salinity varies seasonally, depending on runoff from the rivers and the strength of ocean currents. In deeper waters, at depth greater than 150 –200 metres below the transition layer zone, the hydrographic conditions were more stable. It should, however be noted that oxygen content of the deep water was lower in the Bay of Bengal (Rakhine), less than 0.2 ml/l, than in the Andaman Sea (Delta and Tanintharyi), not less than 0.8 ml/l. There is an offshore upwelling off Chaduga Island during the North-east Monsoon. This is associated with high nutrient contents and relatively high organic production, including fish (Myint Pe 2002).

2.1.2 Social and economic environment

Human development

Ranked 149 out of 169 on the Human Development Index (UNDP, 2010), Myanmar is the lowest ranked country in East and Southeast Asia and the only one classified as having a “low” level of human development. <http://hdrstats.undp.org/en/countries/profiles/MMR.html>

Poverty in Myanmar is decreasing, but rural areas experience double the poverty rate of urban areas, and 35% of rural people were recently reported to require year-round loans to buy food (Eleven news media 2013).

Coastal development is thus much needed, and the social, economic and environmental sustainability of this is of great importance.

Population

The most densely populated part of the coastal zone is the fertile Central Delta region (Figure 2). Myanmar will hold its first population census for 31 years in 2014. Until then, estimates of the human population will remain uncertain. The country had a population estimated at 53 million in 2009-10, and an average population density of 73 inhabitants per square kilometre.

<http://www.tradingeconomics.com/myanmar/indicators>

Altogether 68 % of this population were classified by the World bank as rural.

<http://www.tradingeconomics.com/myanmar/population-density-people-per-sq-km-wb-data.html>

Economic development and infrastructure

Employment

Reliable statistics are lacking, but Indexmundi estimates of the composition of each sector of Gross Domestic Product in 2012 were as follows: agriculture: 38.8%, industry: 19.3%, services: 41.8%.

The proportion of the labour force engaged in each of these sectors was:

Agriculture: 70%, industry: 7%, services: 23%

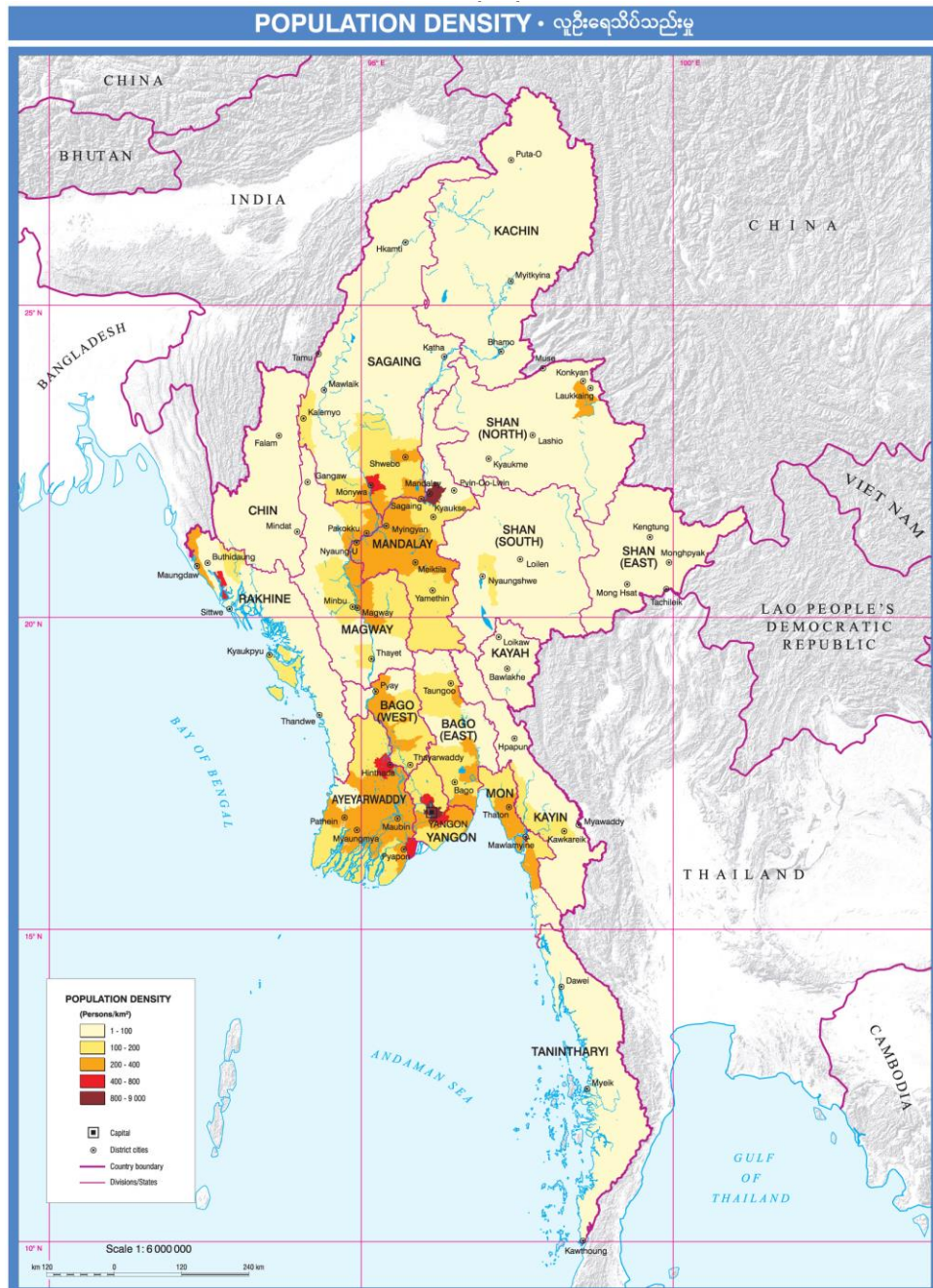
http://www.indexmundi.com/burma/gdp_composition_by_sector.html

There is no separate information for the coastal population but the majority of the population live from fisheries, agriculture, and a few from tourism and industrial development.

Official unemployment rates were below 5%, but a January 2013 press report on the Lower House’s planning and finance development committee put the unemployment rate in the country at 37%. The committee’s chairman, MP Soe Tha, said the study showed how necessary it was for the government to focus on poverty reduction, and that it also identified where in the country people’s needs were greatest. (Eleven news media 2013).

The concept of employment does not apply in most coastal communities where a majority of the population pursue subsistence livelihoods in fishing and agriculture and would not appear in employment (and unemployment) statistics. Available statistics are easily misinterpreted, leading to false conclusions and development strategies that fail the coastal communities.

Figure 2.



Culture and heritage.

Myanmar’s rich and diverse culture and historical heritage are beyond the scope of this report, but the UNESCO World Heritage Convention lists only human heritage among the eight ‘tentative’ World Heritage Sites in the country. While these eight sites are undoubtedly hugely important, the absence of sites on the list noteworthy for their natural heritage suggests that natural heritage is under-valued, and there is a need to include natural heritage in future assessments. An IUCN initiative is working towards addressing this gap(see P 29).

2.2 Characteristics of marine and coastal ecosystems and biodiversity

2.2.1 Mangroves

Distribution

Mangroves are found in all regions and are widely distributed across the entire coastline (Figure 3). The Central Delta region is the most important for mangroves, which are concentrated along the southernmost parts of the Ayeyarwaddy Delta. The two other principal formations are found along sheltered coasts in the Rakhine and Tanintharyi regions. The original area of mangrove forest in Myanmar was 320,106 ha in the early 20th century, about 275,000 ha in 2001 and probably consisting of only two-thirds of the cover of 2001 by 2013 according to a GIS assessment by ArcCona. Figure 3 shows the current distribution of mangroves based on 2001 data (WCMC 2011). More recent analyses using remote sensing as published in the NBSAP (Government of Myanmar, 2011) show a much reduced area of mangrove cover, but the analysis misses large existing areas, such as the Inner Dawei River estuary (see photographs). The FAO (2010) report still mentions 437,931 ha, based on the Forest Department in 2009 in preparation for FRA 2010 by digital classification using 2007 Landsat 7 ETM+ scenes, combined with other Landsat 5 scenes and Aster scenes. This contradicts previous reports and may be based on different assumptions and requires verification and updating with new images. But even this figure suggests a strong decline since the 1980s in line with other assessments, namely those by the Forest Resource Environment Development and Conservation Association (FREDA) (FREDA 2011).

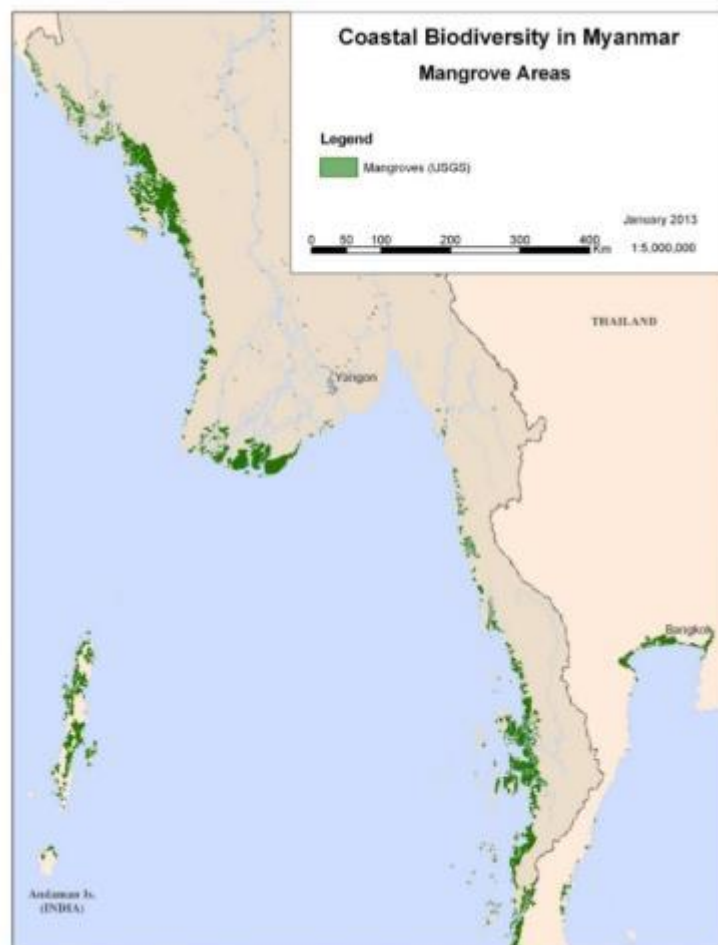


Figure 3. Mangrove distribution according to UNEP-WCMC (2011) based on USGS data compiled between 1998-2000.

Comparison of satellite images between 1974 and February 1995 in the Ayeyarwaddy Delta area indicates mangrove losses from 32.2% to 5.8% of the forest area in Latputta and from 51.9% to 19.5% in Bogalay. The same images show that no forest exists in Mawlamyainegyun at present. The condition of mangrove vegetation in the Rakhine region between 1974 and 1995 shows the extent of degradation within the past two decades (Myint Pe 2002). This trend has probably continued and shows significant losses of ca. 30% or more, but recent data are not available.

It is highly likely that the mangrove cover has decreased further since 2001. A sample analysis of The Wanbika area, an area of dense mangroves in Rakhine, illustrates the loss of mangroves over the last 10-12 years. This area has been one of the densest areas of remaining mangroves (See Figure 4 below). But an analysis using a satellite image of May 2013 (Figure 4) shows a loss of mangroves of 30%-40% compared to the 2001 mangrove layer (GIS analyses by ArcCona using Landsat image comparing with data from UNEP-WCMC, 2011), in the selected Wanbika area on Kyauk Phuy(Ramree) Island and adjacent mainland coast.

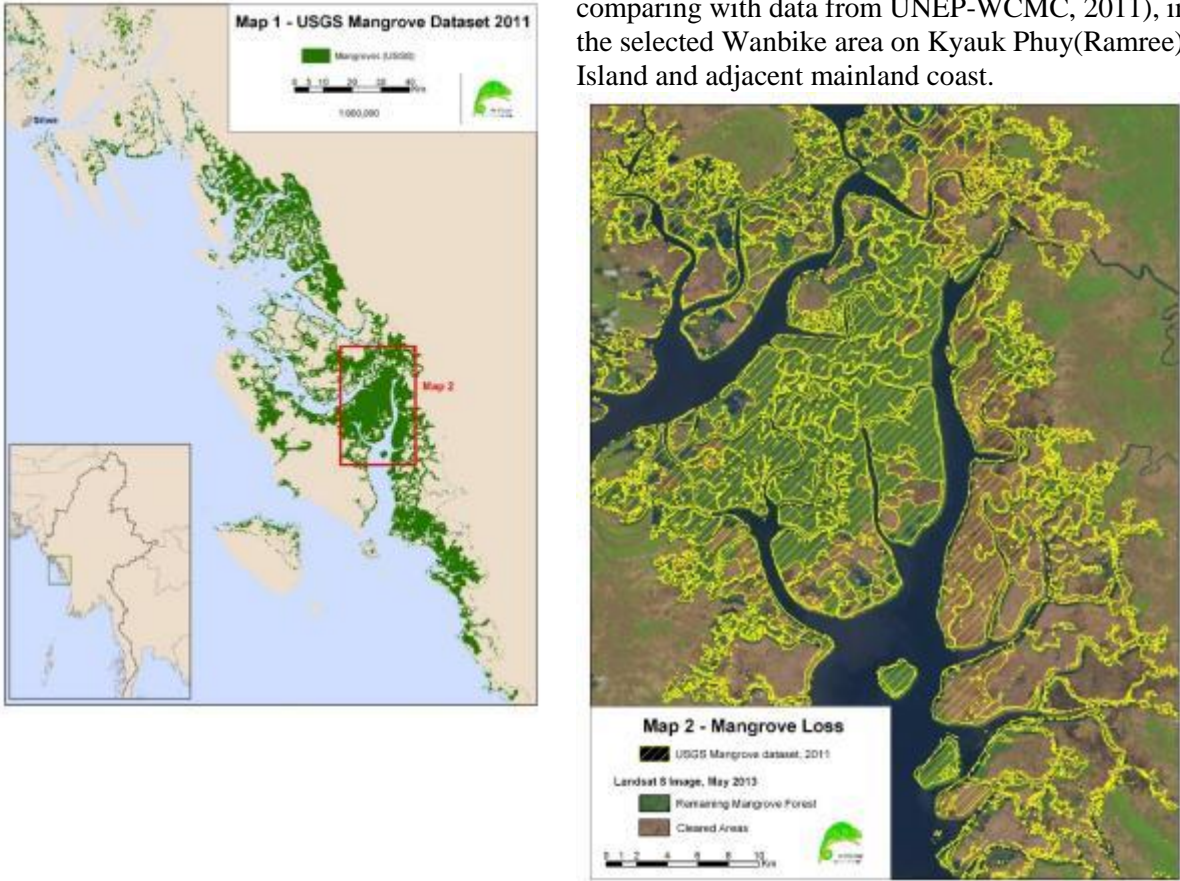


Figure 4 Mangrove loss in the Wanbika area near Ramree Island in Rakhine region between 2001-2013 (based on UNEP-WCMC (2011 and our own analysis)

Pressure on the Rakhine mangrove forest habitat is still increasing according to our own research on the ground, with new developments planned for deep sea ports, gas pipelines, infrastructure projects and hotels (see Figure 14).

It appears that a similar decline has occurred in other regions with mangroves and that possibly only about two-thirds of the mangrove forest cover is left in Myanmar compared to 2001. For example areas such as the Ayeyarwaddy Delta have suffered gradual mangrove losses though logging and shrimp farming and additional losses through cyclone Nargis in 2008 (FREDA 2012).

Originally, the most extensive mangroves in Myanmar were found in the Ayeyarwaddy Delta, with 250,000 ha, but by 2001 that had shrunk to only 110,000 ha or 83,400 ha according to the country forest resource assessment FRA (FAO 2010) by 2005 and the declining trend is continuing (Figure 5). According to a FREDA report (2012), another 30 % of the remaining mangroves disappeared between

2003 and 2008. An estimated 60,000 ha survived cyclone Nargis in May 2008, leaving the densely populated delta area extremely vulnerable, with huge losses of life and livelihoods. Restoration efforts had already started before Nargis but have intensified since, and also become more successful.

Figure 5. Changes in mangrove forest cover between 1975-2008 in the Ayeyarwaddy Delta region (FREDA 2012)

Between 1980 and 2004 14,000 ha of mangroves were re-planted in the Delta region, mostly on old rice paddies and other abandoned agricultural sites. The damage caused by Nargis has been estimated at 35,000 ha of mangrove forest in two division of the Delta region (FREDA 2012).

Mangroves as habitats

Myanmar hosts 24 species of mangrove trees of which *Rhizophora*, *Sonneratia*, *Avicennia*, *Bruguiera* and *Xylocarpus* spp are dominant. A list of common brackish water animals associated with mangroves and mangrove waterways, including 39 species of fish, 11 species of shrimp, 8 species of crab, one *Thalassina* (mud lobster), 2 oysters, 2 mussels, 1 cockle, 9 gastropods and one *Xiphosura* (Horseshoe Crab) was compiled by Htay Aung (1982).

Mangroves along the Myanmar coast are of immediate value to local people, particularly as firewood and charcoal for cooking, timber for construction and as productive habitat for fisheries. A positive correlation between fish and shrimp catches in nearshore waters and the extent of mangrove area has been widely proven (Matosobroto & Naamin 1977; Saesukumar *et al.* 1992; Comach & Bagariano 1987). Artisanal fisheries along the Myanmar coast are largely mangrove dependent. Mangrove forest ecosystems contribute a wide range of goods and services from which local people have benefited since time immemorial. There is a wide range of direct and indirect products from mangrove, which forms the basis for mangrove dependent economic activities vital to many coastal peoples in Myanmar. Unsustainable exploitation has led to the depletion of many mangrove areas.

Some areas of the mangroves in the Ayeyarwaddy delta have been improved to some extent by the Forestry Department's rehabilitation programmes, including the establishment of the Department plantation, and the protection of natural mangrove forests in selected places in Ayeyarwaddy and Tanintharyi regions. In addition, development of poor rural communities and establishment of plantations by UNDP programmes have encouraged the rehabilitation of mangrove forest throughout the whole mangrove area of Myanmar, including the Ayeyarwaddy delta.

Establishment of a mangrove plantation programme with suitable mangrove and other forest growing species has been launched in degraded and abandoned land to meet the needs of local and regional communities and environmental conservation and should be expanded beyond the Ayeyarwaddy.

After Cyclone Nargis devastated 57 hectares of mangrove forest in the Meinmahlakyun wildlife sanctuary (the second 'finger' in the delta from the east in Figure 5) the Myanmar Ministry of Forestry asked the Forest Resource Environment Development and Conservation Association (FREDA) to replace the mangrove forest. Before the cyclone, FREDA had planted over 1200 ha of mangroves and established Forest User Groups (FUG) as guardians in the Ayeyarwaddy delta.

Causes of mangrove forest degradation

Mangrove ecosystems, which make up less than 0.4% of the world's forests (Spalding *et al.*, 2010), are being lost at the rate of about 1% per year (FAO, 2007); in some areas, the rate may be as high as 2 to 8% per year (Miththapala, 2008). Between 20% and 35% of the world's mangrove area has been lost since 1980 (FAO, 2007). The rates of loss are highest in developing countries where mangroves are cleared for coastal development, aquaculture, timber and fuel production (Polidoro *et al.*, 2010).

Over-exploitation for fuelwood and timber production has degraded about 26% of mangrove forests around the world (Valiela *et al.*, 2001) and similar figures are likely to apply with mangrove loss in Myanmar. Shrimp aquaculture has contributed to about 38% of global mangrove loss and other types of aquaculture account for approximately another 14% (Ellison, 2008).

While direct anthropogenic impacts are the biggest threat to mangrove ecosystems, climate change will probably pose even greater risks in the future (Gilman *et al.*, 2008).

Overexploitation of firewood and charcoal production

For at least a hundred years, the Ayeyarwaddy mangrove forests had provided firewood and charcoal to Yangon, the capital city of Myanmar and other towns in the Delta area. The annual firewood requirement for Yangon is about 700,000 tons and this demand is increasing steadily due to dynamic population growth (Myint 2003). However, the Ayeyarwaddy Delta firewood production, of about 432,200 tons per year is not sustainable in the long term and the mangrove forest is diminishing fast. Although the Delta mangroves provided sufficient supply of firewood until 1970, they have been overexploited due to population pressure and scarcity of alternative energy sources. In addition, the introduction of permanent beehive type charcoal kilns in that the delta area in 1970 accelerated the degradation of mangrove forest as they consume a great number of mangrove trees. For this reason, mangrove forests in the Ayeyarwaddy Delta area have come under increasing pressure due to over-exploitation of the forest for charcoal production.

Aquaculture Development

Throughout their range of occurrence, mangroves and intertidal mudflats have been the first coastal environments to suffer where aquaculture development has occurred. For a long time, mangrove areas have been cleared for traditional aquaculture operations in Indonesia and in India. In Myanmar, aquaculture in mangroves was only introduced in 1980 as a pilot scheme. In the northern part of Rakhine, shrimp culture became widespread in the 1990s, mostly in previously degraded, unclassified mangrove forest areas. The process of conversion of mangroves and intertidal mudflats into shrimp farms also continued in recent years in the Rakhine region, where in 2008 and 2009, several small areas were converted (see photos). Later, in the south western part of the Ayeyarwaddy Delta area, mangroves have been converted into brackish shrimp ponds and this development is still continuing (FREDA 2012). Today, aquaculture is the biggest single threat to mangroves in the Ayeyarwaddy Delta. Despite the restoration and plantation of mangroves in suitable areas, shrimp pond development remains a considerable threat.

The Department of Fisheries introduced aquaculture with Tilapia, Common Carp species, and other freshwater finfish from the 1950s onward, succeeding mass production by artificial propagation. The Department of Fisheries has constructed freshwater fish hatcheries around the country and produced fry and fingerlings for fish growout ponds especially rohu (*Labeo rohita*), one of the main export fish from Myanmar. Despite promising market potential, the aquaculture production was low, and only 3,000 ha of fish ponds had been established by 1989. Since one of the main constraints was a lack of legislative support, the Ministry of Livestock and Fisheries promulgated the Law Relating to Aquaculture in 1989.

As mentioned in the mangrove section above, the steadily increasing conversion of mangroves, but also intertidal mudflats into shrimp farms and fish pond farming practices has been a major threat to coastal ecosystems and the vital ecosystem services they provide.

The culture of Tiger Prawns (*Penaeus monodon*) using traditional methods was initiated in 1975, and a system of semi-intensive shrimp farming was encouraged more recently. In the year 2000, The Ministry of Livestock and Fisheries gave technical assistance to potential investors to encourage involvement in shrimp culture. At the same time, the Government formed a State/Division level Committee to supervise the development of the shrimp aquaculture industry. The committee launched

a special operation running from May 2000 to May 2003. Table 1 shows the increase in the area of shrimp ponds expected over this period. This increased from about 28,000 ha in 2000, up to about 49,000 ha at the end of the three year project (Myint 2003). The expansion of aquaculture undoubtedly increased fisheries production, but in many cases, it also resulted in damage to sensitive ecosystems such as mangroves and intertidal mudflats. There is a need, therefore, to carefully assess future aquaculture projects from the point of view of their environmental impacts. The Department of Fisheries policy has developed guidelines for shrimp farm development, but the recent increase combined with loss of mangroves and intertidal mudflats demands a revision of the policy of the Department of Fisheries in this respect to fully address the multiple ecosystem services provided compared to the short term benefits of shrimp pond farming.

Table 1. Expected increase in Area of Shrimp Ponds

Unit – Hectare

| State/Division | 31-3-2000 | Project period | | |
|--------------------|--------------|----------------|--------------|--------------|
| | | 2000-2001 | 2001-2002 | 2002-2003 |
| Rakhine | 24630 | 25850 | 27070 | 28700 |
| Ayeyarwaddy | 2440 | 6630 | 10820 | 16400 |
| Yangon | 520 | 790 | 1070 | 1440 |
| Bago | 20 | 50 | 80 | 120 |
| Kayin | 0 | 30 | 50 | 80 |
| Mon | 30 | 140 | 260 | 410 |
| Tanintharyi | 20 | 630 | 1240 | 2050 |
| TOTAL | 27650 | 34120 | 40580 | 49200 |

There has been no increase after 2001 because there was a severe disease problem affecting shrimp ponds (white sport virus) around 2001-2002. Also, the shrimp business declined in those days because of decreasing market demand.

Another problem for mangroves in particular is suffocation by floating plastic that kills specifically young mangroves trees. (see photos).

Agricultural Development

Conversion for paddy cultivation of rice is a major threat to mangrove conservation, particularly in the Ayeyarwaddy Delta area. Agricultural expansion into mangrove areas to meet the requirements of regional food security is also common in the other two coastal regions, especially in the Rakhine region. Figure 4 showing mangrove loss between 2001 and 2013 overall depicts agricultural land replacing former mangrove areas. This has also been verified by a ground truthing threat assessment in October 2013. Mangrove soils are not generally, suitable for agriculture.

2.2.2 Intertidal mudflats

Distribution

Figure 6 shows the current distribution of intertidal mudflats in Myanmar. Accurate GIS distribution has been compiled for two key areas (Mottama and Nan Thar island). Other key areas with significance for waterbirds have been located but not defined within boundaries on the map. Further important mudflats may exist in the Central Rakhine region and also in Tanintharyi region.

Intertidal mudflats are closely linked with mangroves and are often found next to them forming a continuous ecosystem. The significance of mudflats for fisheries and other marine life, including migratory waterbirds, was often ignored when mangrove plantation schemes were implemented. In the

Gulf of Mottama, however, mangroves hardly develop due to the strong turbulence and turbidity in the system, created by powerful spring tides, which also means that the substrates in the form of sand flats and mudflats are highly dynamic, showing ever-changing patterns of erosion and deposition. These dynamic characteristics of intertidal mudflats are an important component of the ecosystem. (see photos)

Importance for waterbirds, other biodiversity and livelihoods

According to surveys and research over the five years between 2008-2012, ArcCona has identified seven major intertidal mudflat complexes in Myanmar that are significant in size and important for migratory and non-breeding waterbirds. Appendix 1 provides further details of their importance and Figure 6 shows their distribution and extent. The Gulf of Mottama is clearly the most extensive and also the most significant for waterbirds, fish and other biodiversity. The other mudflat areas are smaller and also often linked with adjacent mangroves. Intertidal mudflats are not only important as fish nurseries and as habitat for small marine invertebrates, but also play an important role in the nutrient cycle, sedimentation and the purification of near coastal and coastal marine and estuarine waters.

In this report we emphasize the important role of intertidal mudflats for waterbirds. These are mostly migrating and non-breeding waterbirds that use the mudflats as feeding and roosting places on their migration routes, or during their wintering period before returning on migration to northern breeding grounds as far away as Arctic Russia, Alaska and Mongolia.

Recent data on numbers and species composition are available for some of the above listed sites shown in Figure 6. These include, from north to south: Nan Thar island, Hunters Bay, Natkan, Gulf of Martaban Ahlat and the mudflats around Balu Kyun (Bilugyun) and Dawei (see Annex 1).

The identified selected mudflats host a range of globally threatened waterbirds (see figure 7) and often significant numbers of waterbirds in numbers at sites that fulfil the Ramsar criteria (Zöckler in prep). Detailed species counts from most sites in Figure 6 can be found in Annex 1. The most important site is the Gulf of Mottama which hosts 150,000 wintering waterbirds and is crucially important for the Globally Threatened Spoon-billed Sandpiper *Eurynorhynchus pygmeus*, but other sites also host important numbers of waterbirds. Moreover these sites are critical as fish nurseries and for shell fish harvesting for the local communities.

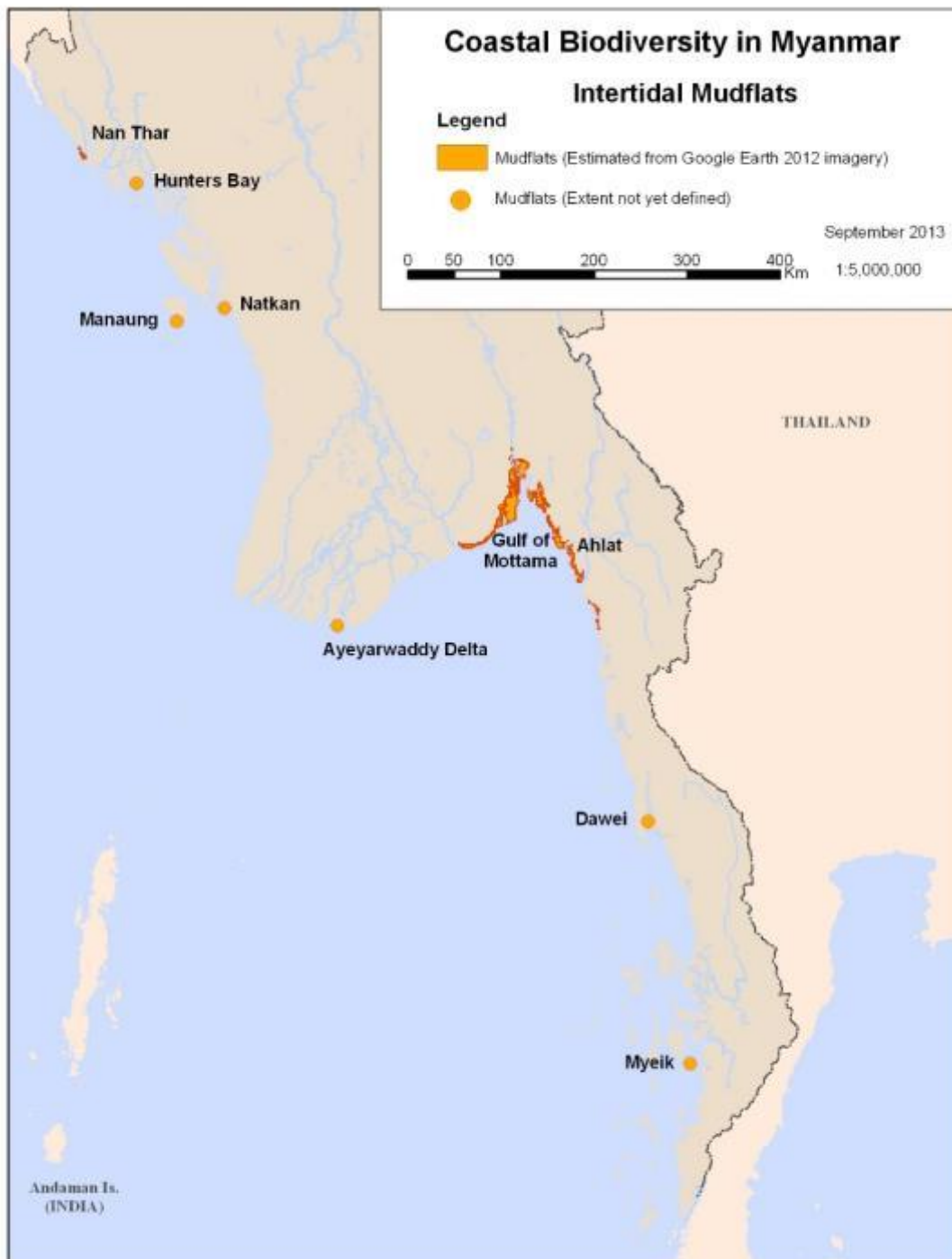


Figure 6. Distribution of intertidal mud and sand flats in Myanmar (ArcCona 2013), circled areas have not yet delineated.

Globally Threatened waterbirds

ArcCona organized five expeditions to inter-tidal areas in Myanmar between 2008 and 2012. See Appendix 1 for details. Figure 7 shows observations of Globally Threatened coastal waterbirds recorded by these expeditions.

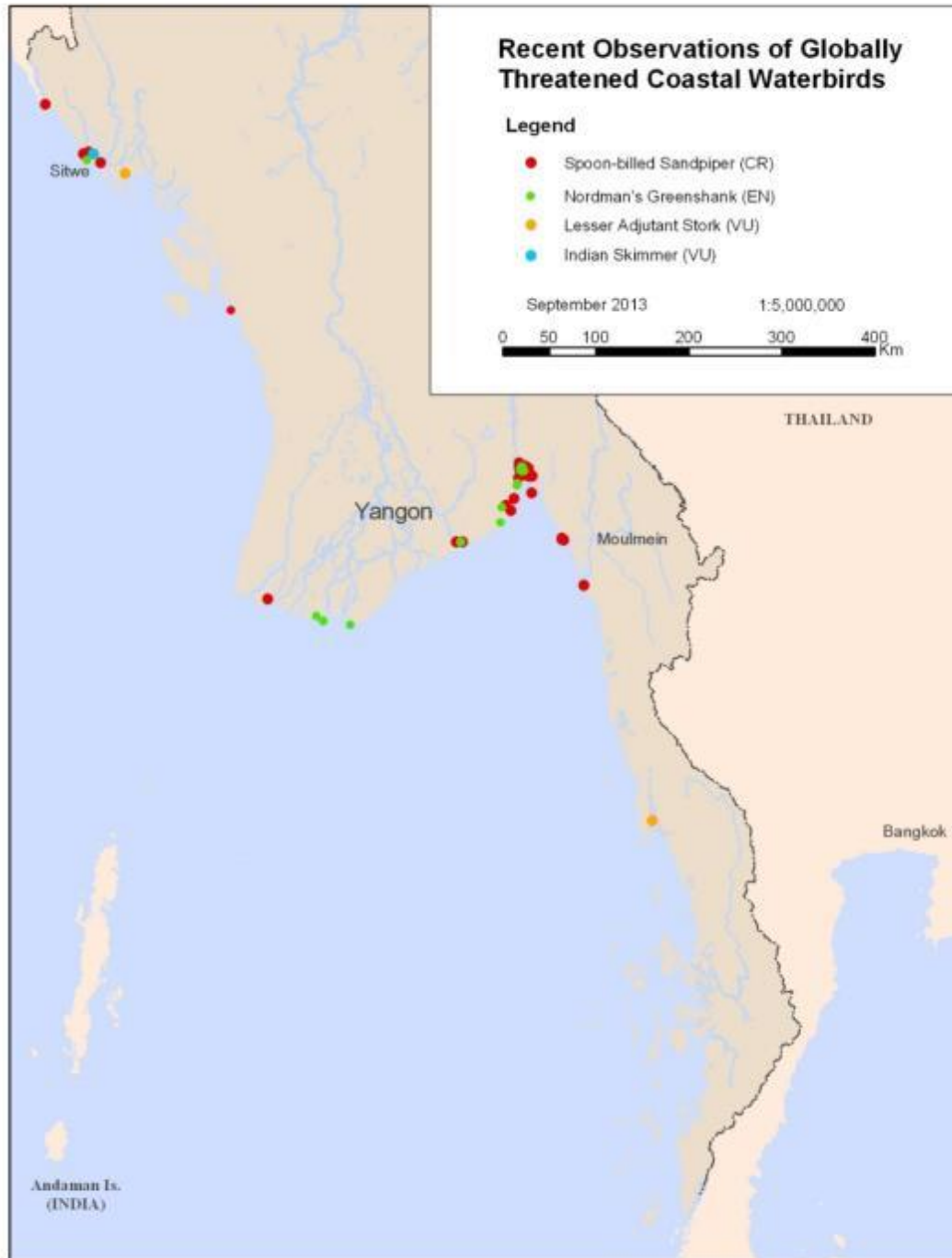


Figure 7: Observations of selected Globally Threatened waterbirds 2008-2012. (Zöckler *et al.* in prep)

2.2.3 Coral Reefs

In Myanmar, the Rakhine, and Tanintharyi coastal areas are favourable for both hard and soft corals. In particular, the islands of the Myeik Archipelago offshore of Tanintharyi coastal areas are abundantly distributed with diverse coral communities (Figure 8). Reef formation in the Ayeyarwaddy coastal zone is restricted to Coco and Preparis islands which lie far away from the influence of river runoff (see “the distribution of coral reefs in Myanmar” (Spalding *et al.* 2001). The more shallow central coasts from the Ayeyarwaddy delta and the southern end of the Gulf of Mottama includes an estimated reef area of 1870 km² with 77 species of corals recorded (Spalding *et al.* 2001). However, ground-truthing of these data has not been carried out and very little is known about the detailed distribution of corals and the threats they face.

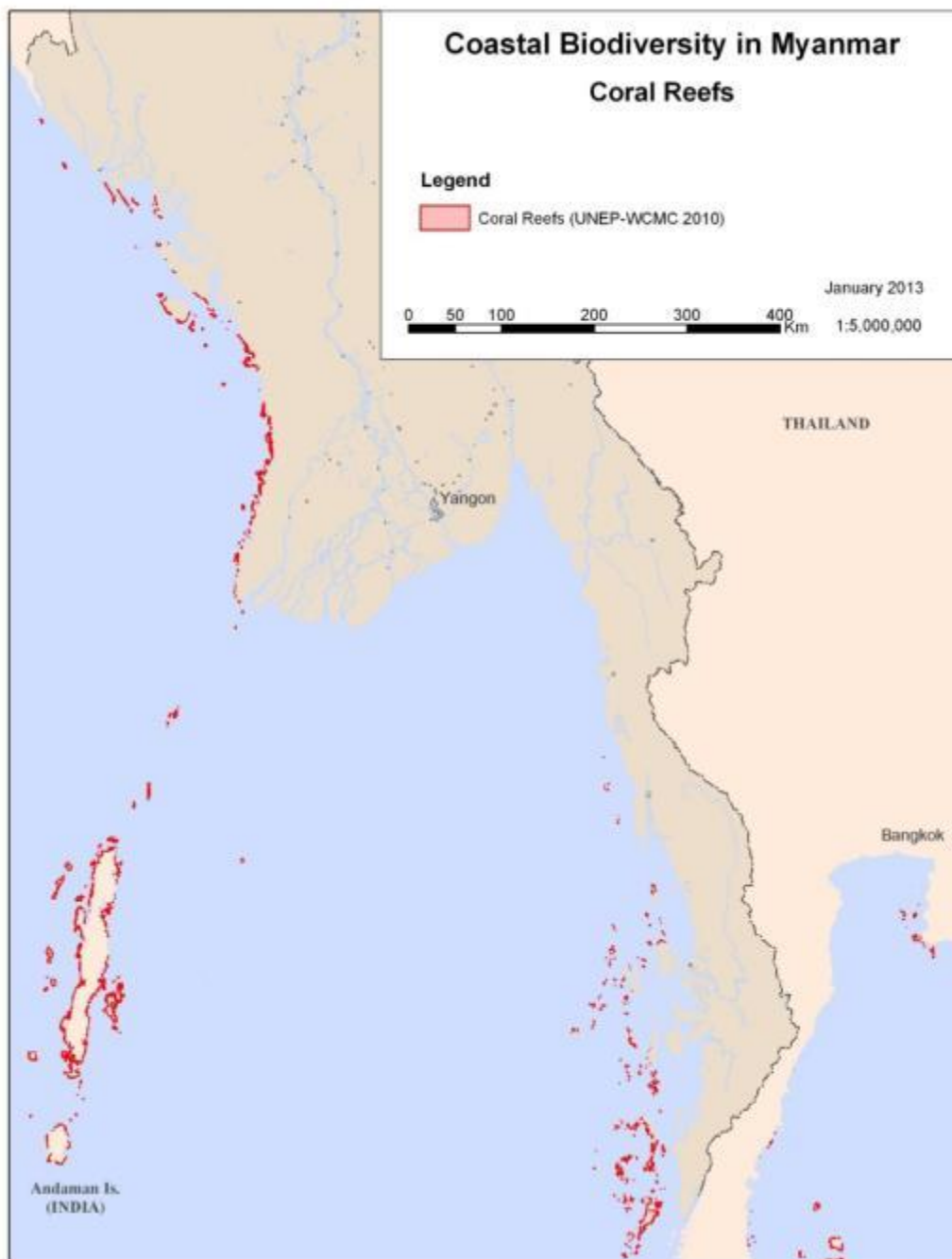


Figure 8. Distribution of coral reefs in Myanmar (UNEP-WCMC 2010)

Coral reefs are a resource of immense importance for local people. They provide many benefits, particularly abundant food from reef fish, and recreation for tourists. It is important to realize that healthy coral reefs are vitally important to the sustainability of two industries, fisheries and tourism. In the light of the recent development of an open door market economy in Myanmar, many tourists have been able to visit the southern islands of the Myeik Archipelago with their corals and wealth of marine life through the Kawthoung border point with Thailand. The little known coral reefs of the Myeik Archipelago have emerged as having rich potential for the tourist industry. A substantial growth in tourist visits via Phuket in Thailand to the southern coral islands of Myanmar have resulted in increases in foreign exchange earnings. The most attractive offshore islands for tourism include Burma Bank, Western Rocky, Three Islets, High Rock, Black Rock, North Twin, South Twin and Roe Bank. All island reefs are the fringing type. No coral reef islands in Myanmar have yet been developed into resorts. The Coral reefs in Myeik may also serve as particularly important refuge and help repopulate damaged coral reefs in Thailand (Tun *et al.* 2008)

Threats to coral reefs

Although coastal development has been slow, most corals have been targeted by dynamite fishing and are also threatened by over-exploitation through unsustainable fisheries. No further information is available and validation and expansion of the database on coral reefs in the country are urgently required. Unsustainable development of tourism also can jeopardise coral reef communities (Spalding *et al.* 2001) and the Myeik Archipelago is especially threatened by increasing boat traffic, disturbance and pollution resulting from high levels of tourist visits that might come from neighboring Thai tourist resorts.

Two large Protected Areas cover coral reefs. Lambi Park was established in 1994 and consists of up to 800 small islands covering 3,890 km². The Moscos islands near Dawei was designated as a 49 km² Wildlife Sanctuary for sea turtle conservation in 1927.

2.2.4 Seagrass beds

There is little information on the status and distribution of seagrasses in Myanmar. UNEP-WCMC created a global distribution map but the distribution assigned to Myanmar appears to be very coarse and requires updating (see Figure 9 and Green *et al.* 2002). Seagrass beds possibly extend much further south in Rakhine than indicated on the map.

Based on the data prepared by Soe Htun *et al.* (2001), Myanmar has 9 species of seagrass. These are *Cymodocea rotundata*, *C. serrulata*, *Halodule pinifolia*, *H. uninervis*, *Syringodium isoetofolium*, *Enhalus acoroides*, *Halophila beccarii*, *H. decipiens* and *H. ovalis*. Of these, *Cymodocea rotundata*, *C. serrulata* and *Enhalus acoroides* are dominant in the seagrass beds. Though not many seagrasses occur along the Myanmar coast, seagrass beds found in Gwa and Maung – Shwe – Lay-Gyaing in Rakhine and Pyinsabu Island in Myeik Archipelago are sizable and dense, supporting a large number of marine fish and shrimp larvae, especially the post larval stages of *Penaeus semisulcatus*. No seagrasses are found in the Ayeyarwaddy Delta or Mon State coastal zone.

Seagrass beds are normally found in shallow areas and intermingle with both mangrove and coral reef communities (Figure 9). They are productive and valuable resources for local people, which provide crucial feeding, spawning and nursery grounds for many species of fish, marine turtles and invertebrates. The Sea Cow *Dugong dugon*, which is recognised by IUCN as Globally Threatened in the category Vulnerable still survives in small populations in the Kyauk Phyu seagrass area.

The primary commercial value of seagrass beds lies in this role as essential habitat for lucrative commercial fisheries, such as those for tiger prawn in the northeast of Australia (Coles and Long, 1985). Local people from Myanmar call seagrass "Leik-Sar-Phat-Myet", which means the food of marine turtles. Seagrass beds also assist coastal stabilization, and filter and export organic nutrients to the nearby coral reef and mangrove ecosystems.

A recent study in the Myeik archipelago found 11 species of seagrass in the Lambi NR alone (Oikos and BANCA 2011).

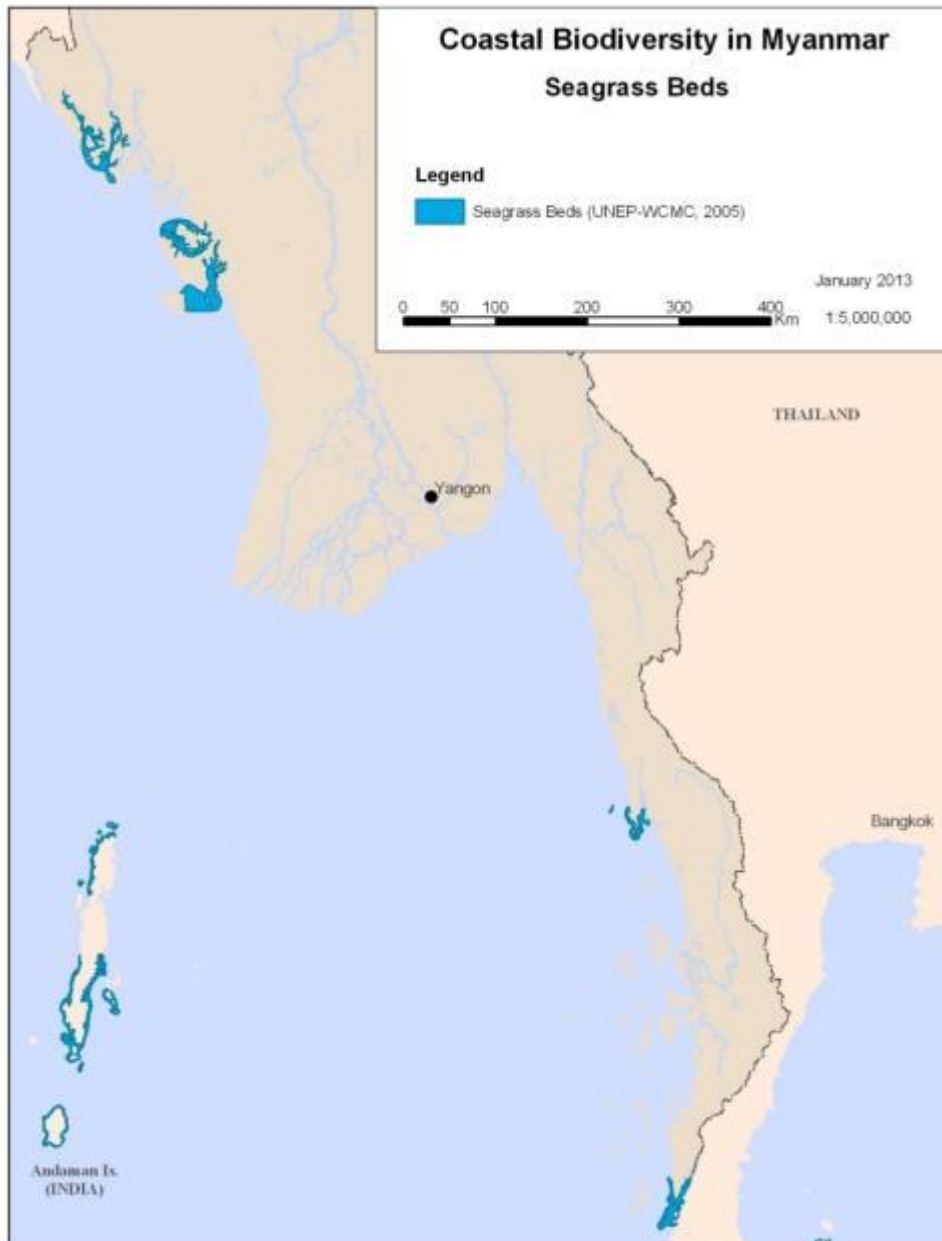


Figure 9. Distribution of seagrass beds in Myanmar (UNEP-WCMC 2005)

Threats to seagrass beds

Pollution by industrial or intensive agricultural practices is the main threat to seagrass beds. Illegal and unsustainable fishing practices also threaten them with physical damage, and bivalve fishing can be especially harmful (Green & Short 2003).

Successful conservation practices have been applied and involved persuading local fishermen to stop using beach and push nets in seagrass areas. They can now use only fish traps in these areas with mutual benefits for the environment and the income of the fishermen due to healthier seagrass beds with larger fish yields (Supanwanid & Lewmanomont 2003).

Mining activities near coasts or estuaries within the mining catchment areas have been reported as a major threat for sensitive seagrass species in Thailand, Malaysia and other countries. No information is available from Myanmar, but sediment analyses and mining activities upstream suggest that careful assessment of pollution from upstream mining activities is a necessary part of the conservation of seagrass bed ecosystems.

2.2.5 Turtles and marine mammals (Irrawaddy Dolphin, Dugong) – Distribution and threats

Marine Turtles

The Myanmar coast harbours many species of marine turtles. Five species breed regularly on Myanmar's beaches. They are the Olive Ridley Turtle (*Lepidochelys olivacea*) (In Myanmar -Leik Lyaung), Loggerhead Turtle (*Caretta caretta*) (In Myanmar – Leik Khway), Green Turtle (*Chelonia mydas*) (In Myanmar – Pyin Tha Leik), Hawksbill Turtle (*Eretmochelys imbricata*) (In Myanmar – Leik Kyet Tu Yway), and Leatherback Turtle (*Dermochelys coriacea*) (In Myanmar – Leik Zaung Lyar). The latter two species are considered extremely rare. The Hawksbill Turtle and Leatherback Turtle, which were occasionally reported by fishermen from some parts of Rakhine and Tanintharyi Coastal areas have totally disappeared from the Ayeyarwaddy Delta Coastal areas. All species were abundant in the past. The beaches of "Tha-mi-hla Kyune" (Daimon island 15° 51' N, 94° 17' E), an island at the mouth of the Patheingyi River, host the nesting Green Turtle and Loggerhead Turtle. "Kaing – Thaung – Kyune" (Kaing-Thaung Island) (15° 44' N, 95° 04' E) and "Taung-Ka-Done-Kyune" (Taung-Ka-Done Island) (15° 43' N, 95° 18' E), two small islands, situated at the mouths of the Ayeyarwaddy and Bogalay Rivers, respectively, host the nesting Olive Ridley Turtle and Loggerhead Turtle (Myint 2003), see also Figure 10 for the distribution of marine turtles species in Myanmar). However, many areas in the north of Rakhine region do not seem to be captured in the map and it is likely that major areas with nesting sites of marine turtles have not been depicted and remain undisclosed.

According to the Bay of Bengal Report (Myint Pe 2002), Maxwell (1911) conducted extensive investigation of the "turtle banks" of coastal areas in Myanmar, as part of a review under the Burmese Fisheries Act of 1902. At that time 1.5 million Olive Ridley Turtle eggs and 1.6 million Green Turtle eggs were harvested annually. Based on this egg harvest and several assumptions regarding female fecundity, Maxwell estimated a nesting population of 5,000 Green Turtles and 3,750 Olive Ridley Turtles. According to the data from the Department of Fisheries, the total number of nests in the region is currently about 300 annually, indicating a drastic reduction in regional turtle populations during the 20th century. Most nesting is by Olive Ridley Turtles (70%), followed by Loggerhead Turtles (20%) and Green Turtles (10%).

The Department of Fisheries initiated the conservation of turtles and biodiversity of marine ecosystems in 1905 by promulgation of "The Fisheries Act". This has theoretically protected all species of sea turtle. However, enforcement is difficult and at places impossible. On Nan Thar Island, ArcCona helped to protect Olive Ridley Turtles through awareness and incentives through the local NGO SNCA, which is based in Sittwe. Constant presence at these sites is necessary to sustain viable populations.

Protection for turtles and their hatching areas was included in the Fisheries Act (111-1905) and those who trespassed on those areas without official consent were effectively penalized. In 1924, the Government of Burma, Agriculture (Forest Department) Notification No.1 made an official announcement, not to trespass within a three mile radius of the turtle hatching areas. In 1991, Myanmar drafted a new "Freshwater Fisheries Law" due to the greatly changing conditions. In 1993, the Department of Fisheries enacted "Notification No 2/93 for Sea Turtle Conservation"(Myint Pe 2002).

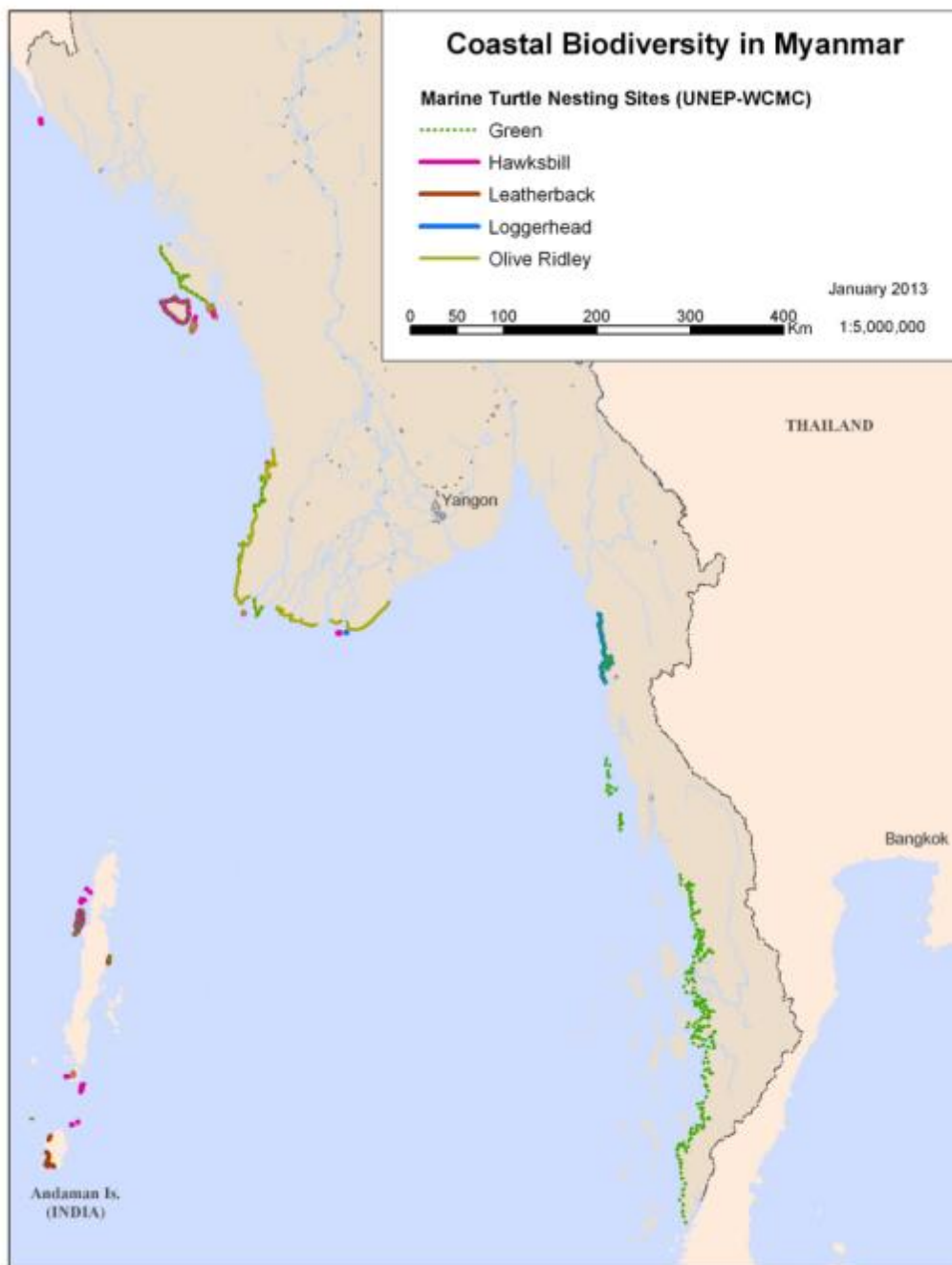


Figure 10. Distribution of marine turtle nesting sites according to UNEP-WCMC database

The objectives of Sea Turtle Conservation and Management under the 1993 law are as follows:

- To restore feeding and nesting habitats;
- To make nesting beaches acceptable to turtles by eliminating the impact of artificial lighting through technology, ordinances (Law) and publications

The Loggerhead Turtle (*Caretta caretta*), and Green Turtle (*Chelonia mydas*) (both Endangered under IUCN Red List Criteria), and the Olive Ridley Turtle (*Lepidochelys olivacea*) (Vulnerable under those criteria) have been recorded in the seagrass meadows and breed on beaches in the Myeik Archipelago (BANCA & Oikos 2011).

Threats to marine turtles

The number of sea turtles in Myanmar has decreased markedly over a long period (Myint Pe 2002) for the following reasons:

1. The use of sea turtles and their eggs as food in the past. The numbers of young sea turtles released were too low to replenish the wild populations.
2. The sale of sea turtle products.
3. The disturbance and destruction of nesting habitats.
4. The incidental capture of sea turtles in offshore waters. Sea turtles are frequently caught by commercial fishing gear, such as trawls, drift nets and longline hooks.
5. Insufficient legislature and weak law enforcement.

According to Myint Pe (2002) the Department of Fisheries has noticed the declining trend in numbers of eggs from natural turtle nests. Since 1986, it has given a higher priority to conservation measures, and in that year established a turtle nursery and research facilities at Turtle Island/Diamond Island/Tha-Mee-Hla (Beautiful Daughter Island). In 1989, the Government included conservation of turtles in the fishery laws.

The highest number of marine turtle eggs are laid in the Ayeyarwaddy Delta areas, mainly in three places. Three turtle-hatching stations have been established in these areas, with a view to conservation of marine turtles, namely:

- (i) Turtle Island off the coast, in Nga Pu Taw township; and in Bogalay Township there are two stations
- (ii) Gayet Gyi Island; and
- (iii) Gadongalay Island. The last two turtle egg hatching stations are very close to the mainland and due to this, are more disturbed by human activities.

There has been a significant decline in the collection of marine turtle eggs in the Ayeyarwaddy Delta areas. Availability of turtle eggs for the three hatching stations in the Ayeyarwaddy Delta between 1998 and 2002 was as follows:

| Turtle Island | | | | Gayet Gyi Island | | | | Gadongalay Island | | | |
|---------------|------------|---------------|-----------------|---------------------|------------|--------------|-----------------|---------------------|------------|--------------|-----------------|
| Green Turtle | | | | Olive Ridley Turtle | | | | Olive Ridley Turtle | | | |
| Year | No. nests | No. eggs | Hatch. released | Year | No. nests | No. eggs | Hatch. released | Year | No. nests | No. eggs | Hatch. released |
| 1991 | - | 34334 | 26939 | 1998 | 171 | 19330 | 14017 | 1998 | 161 | 17337 | 12733 |
| 2000 | 231 | 45673 | 43472 | 1999 | 82 | 8882 | 7474 | 1999 | 60 | 4225 | 4225 |
| 2001 | 102 | 46680 | 43590 | 2000 | 97 | 11019 | 8256 | 2000 | 201 | 18978 | 18978 |
| 2002 | 122 | 11549 | 9133 | 2001 | 71 | 7727 | 6418 | 2001 | 107 | 11363 | 11363 |
| 2003 | 55 | 5170 | 3308 | 2002 | 41 | 4272 | 3846 | 2001 | 68 | 7420 | 7420 |
| Total | 510 | 143406 | 126442 | | 462 | 51530 | 40011 | | 597 | 59323 | 54719 |

Table 2. Situation of turtle egg collection at three hatching stations (1998-2002)

Source: Department of Fisheries (cited by Myint 2002)

During 2000, a total of 231 turtle nests were recorded at Turtle Island, however, in the year 2003, nesting was reduced to 55 nests, only 53% of the total in 2000. Similarly, in the same period, the numbers of turtle eggs collected were reduced from 45,673 to 5,170; 11% of the 2000 total. In Gayet Gyi Island turtle egg hatching centre, in the five year period from 1998 to 2003, the nesting of turtles decreased from 171 nests to 41, only 24% of the total five years earlier. In the same period, the number of eggs collected decreased from 19,330 to 4,272, representing only 22% of the first year.

Likewise, at Gayet Galay hatching centre, nesting sites decreased from 161 to 68 nests, a reduction to 42% of the level five years previously. Similarly, collection of eggs fell in the same period from 17,337 to 7,420, a reduction to 43% of the level five years earlier. The rapidly decreasing totals of nests and availability of eggs for collection indicate that there is an urgent need to step up conservation measures for marine turtles in Myanmar, particularly, in places such as Gayet- Gyi Island where nesting and egg collection have decreased to around 20% of their levels just five years ago.

Similarly, on Nan Thar Island (not shown in Figure 10) Olive Ridley Turtles have been harvested and numbers of nesting turtles declined (Yan Naung Soe *in litt.*). Overharvesting seems to remain a widespread issue and requires addressing by environmental education and providing alternative livelihood support.

According to our own research within this project by SNCA, we discovered that four different species of marine turtles still live in healthy populations on beaches of Man Aung Island west of Kyauk Phuy Island. These are Olive Ridley, Loggerhead, Hawksbill and Green Turtles. However local people are said to still persecute the turtles, both animals and eggs (Yan Naung Soe pers. Comm.). Hunting by local fishermen seems to have a long tradition and takes place mainly in November, December and January. Local people appear committed to continuing with the hunting despite its illegality.

Dugong

There is very little recent information on the distribution and abundance of the Globally Threatened Dugong or Sea Cow in Myanmar. According to the NBSAP (Government of Myanmar 2011) the Dugong still seems to be common in seagrass beds between Gwa in the south of Rakhine up to Ramree and Manaung Island in central Rakhine region. More recent information has been obtained between 2005 and 2008 when the Dugong was rediscovered in the Rakhine region:

http://www.edgeofexistence.org/community/project_info.php?id=25

Man Aung in Rakhine is reported to have the highest dugong population in Myanmar (Ilangakoon and Tun 2007). Dugongs are regularly observed around the island, especially on the north, west, and south shores. For example local fishermen on Man Aung Island confirmed the presence of this rare marine mammal as recent as 2013. Previous rumours from Kyauk Phuy have not yet been confirmed (Yan Naung Soe *in litt.*). According to local fishermen, seven deaths were reported between 1994 -2004. It is not clear if some of the animals are hunted deliberately for meat and further investigations are needed (NBSAP 2011). According to our own research, local fishermen confirmed that some of them are actually hunting Dugong for food. Alternative livelihood support seems to be important to address the persecution of marine turtles and dugongs on Man Aung Island (Yan Naung Soe *in litt.*). The presence of Dugong in Tanintharyi Region has not been confirmed.

Cetaceans

According to the NBSAP (2011) 16 species of cetacean have been recorded in Myanmar coastal waters. Among them the Blue Whale and the Irrawaddy Dolphin are listed as Globally Threatened in the category Vulnerable. The Irrawaddy Dolphin is distributed along the Rakhine coast. Fig 11 shows the observations that were made during the Spoon-billed Sandpiper surveys on the Rakhine coast in 2008-2012 (Zöckler 2008).

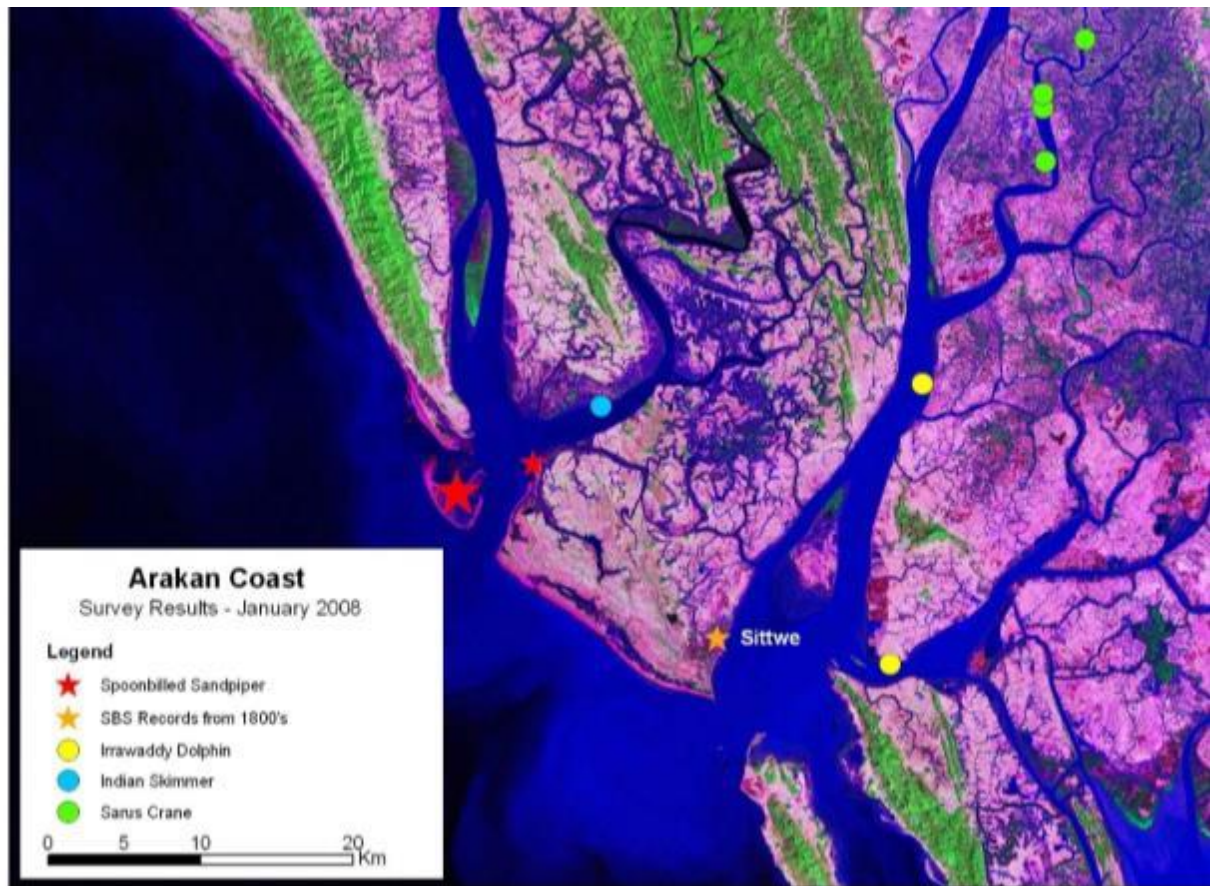


Fig 11: Location of Irrawaddy Dolphin And other Globally Threatened species in coastal waters near Sittwe, Rakhine region (Zöckler 2008)

There is little recent information about the distribution of Dugong and for Irrawaddy Dolphin only few recent data are available.

2.2.6 Ecosystem services and economic value of biodiversity

Ecosystem Services and Values

A huge range of services are provided by healthy coastal ecosystems. Mangroves, reefs and intertidal mudflats provide nurseries for fish and crabs which support rural livelihoods, as well as timber and leaves for building and cooking. Less obvious and often not immediately perceived as vital services are the carbon storage facilities in coastal ecosystems, mainly mangroves, reefs and seagrass beds. Even more crucial are the coastal protection against erosion, storm and flood protection, buffer effects, climate regulation, climate and water balance, sea level rise mitigation and water purification and last but not least the huge potential for eco-tourism.(UNEP 2006).

Mangroves afford protection for coastal areas from tidal waves and cyclones. Healthy mangroves are among the most carbon-rich forests in the tropics (Cornforth *et al.*, 2013). In the face of rising sea levels and changing climates and more severe tropical storms, coastal buffering against negative impacts of wave action will become critical and will play an important role in climate change adaptation.

Distributed across the entire coast of Myanmar, mangroves provide shoreline protection and an array of ecosystem services. They support nutrient and organic-matter processing, sediment control for other inshore habitats (e.g. seagrass beds and coral reefs), and a source of wood and food for coastal communities. As a habitat for commercially valuable marine species, it is estimated that almost 80% of global fish catches are directly or indirectly dependent on mangroves (Ellison *et al.*, 2008; Sullivan, 2005). Thus, the food security of many indigenous coastal communities is closely linked to the health of mangrove ecosystems (Horwitz *et al.*, 2012). As much as 7% of the carbon dioxide reduction required to keep atmospheric concentrations below 450 ppm could be achieved simply by protecting and restoring mangroves, salt marshes and seagrass communities (Nellemann *et al.*, 2009). Mangroves sequester up to 25.5 million tonnes of carbon per year and contribute more than 10% of essential organic carbon to the world's oceans (Dittmar *et al.*, 2006). Seagrass beds sequester 83g of carbon per m² per yr. At a global level this translates to 27-40 million tonnes of carbon per year (Kennedy & Björk 2009), almost double that of mangroves and a significant contribution to the global carbon balance. In addition, seagrass beds serve as coastal protection, water purification, fish nurseries, and are home to the Dugong. Unfortunately, the extent of seagrass beds in Myanmar is not fully known and the map provided by UNEP-WCMC (2007 (Figure 9) appears incomplete.

Storm protection

Mangroves can reduce storm surge water levels by slowing the flow of water and reducing surface waves. Figure 12 shows the factors which effect these reductions. Mangroves can therefore potentially play a role in coastal defence and disaster risk reduction, either alone or alongside other risk reduction measures such as early warning systems and engineered coastal defence structures (e.g. sea walls)(UNEP 2006).

Measured rates of storm surge reduction through mangroves range from 5 to 50 centimetres water level reduction per kilometre of mangrove width. In addition, surface wind waves are expected to be reduced by more than 75% over one kilometre of mangroves.

By reducing water levels and wave energy, mangroves can save lives and reduce storm-surge related damage to infrastructure: during a typhoon in north-east India in 1999, mangroves reduced the number of lives lost, as well as reducing damage to houses, crops and possibly coastal defence structures. Mangroves can also help people recover after coastal disasters by providing firewood, building materials and food sources (e.g. fish and shellfish that live among mangrove aerial roots).

Cyclones and storm surges also impact mangroves themselves; some trees may be defoliated or uprooted. Extreme events with very high water levels and wind speeds may severely damage or destroy mangrove areas, rendering them less effective at reducing surge heights. Natural recovery can take many years to decades; restoration projects may speed up recovery. (McIvor *et al.* 2012)

Figure 12. Factors affecting wave energy in mangroves (McIvor *et al.*, 2012).

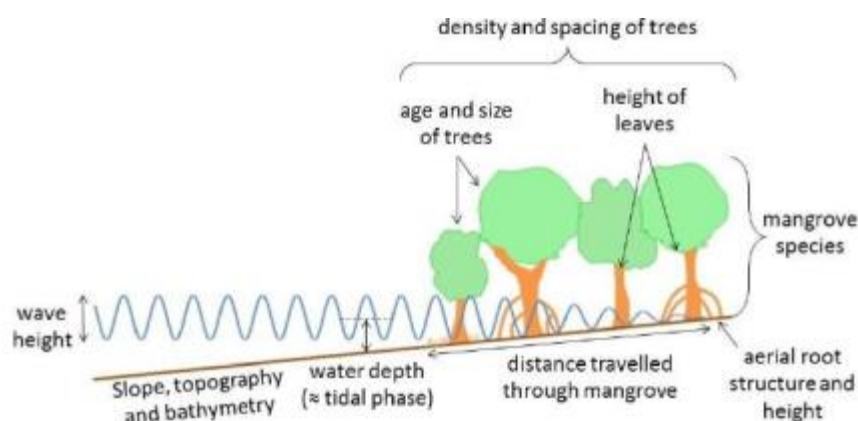


Table 3. Examples of the human and financial costs of tropical storms

| Name | Year | Location | Surge PWL (m) | Wind speed Km/H | Category | Deaths | Losses (US \$) | References |
|---|------|-----------------------------|---------------|-----------------|----------|---------|----------------|---|
| Tropical cyclones – Atlantic Ocean | | | | | | | | |
| Hurricane Carol | 1954 | Rhode Island | 5 | 185 | 3 | 60 | 41 million | Garrison, 1999 |
| Hurricane Camille | 1969 | Mississippi coast | 7 | 305 | 5 | 256 | 1.4 billion | Garrison, 1999; Pugh, 2004; Garrison, 1999; |
| Hurricane Andrew | 1992 | South Florida and Louisiana | 5.1 | 280 | 5 | 26 | 30 billion | Pugh, 2004; NHC 2012b |
| Hurricane Katrina | 2004 | Gulf coast | 8.5 | 190 | 3 | 1200 | 125 billion | Kron, 2008, NHC; 2012b |
| Tropical cyclones – Indian Ocean | | | | | | | | |
| Cyclone Bhola | 1970 | Bangladesh | 10 - 12 | 222 | 3 | 300,000 | | Garrison, 1999 |
| Cyclonic storm BOB 01 | 1991 | Bangladesh | 5 - 8 | 225 | 4 | 138,000 | | Matsuda, 1993; Bern <i>et al.</i> , 1993 |
| Cyclone 05B | 1999 | Orissa, India | 7 to 8 | 250 | 4 | 10,000 | | Pugh, 2004 |
| Cyclone Nargis | 2008 | Myanmar | 5 | 210 | 4 | 138,000 | 10 billion | Fritz <i>et al.</i> 2009 |

Value of coastal ecosystems

The value of mangroves has been estimated in the range of 200,000 to 900,000 USD per km² per year. Estimates of the area of mangroves remaining in Myanmar vary between 240,000 km² (WCMC) and 430,000 km² (FAO), suggesting a total value of mangroves in the country of 50 – 400 million USD per year. Equivalent values for coral reefs add up to 100,000-600,000 USD per km² per year. These values include coastal protection, maintaining fisheries and tourism (Constanza *et al.* 2008), but are probably much higher taking all services that are difficult to assess into account. Considering an estimated global loss of mangroves of over 56% in the decades before 2001 (NBSAP 2011) and losses over 80% in some areas (FREDA&ACTMANG 2012) these values have dropped significantly and are now worth only a fraction of their former levels, maybe several tens of millions of USD per year. The correlation between loss of habitat and value is not proportional, as at certain stages, crucial tipping points can be surpassed. This has been demonstrated in the case of Cyclone Nargis, when the protecting mangrove belt and structure was diminished, causing villages, people and livelihoods to be exposed to the forces of the storm surge, causing over 130,000 deaths and damage worth an estimated 10 billion USD (Fritz *et al.* 2009). On the other hand, regeneration and restoration of coastal ecosystems is also having strongly growing benefits and values in the longer term, and thus provides an investment for the future. Ecosystems also serve as a kind of eco-insurance. Short term gains, such as those from e.g. shrimp farms are more profitable and act as a stimulus for the continuing conversion of mangroves and intertidal mudflats, but in the long term, vital ecosystem services and the long term value of these ecosystems are jeopardised.

In some cases, the provisioning benefits of mangroves may be worth even more than their coastal protection value. The 1,800 hectares of Ream National Park in Cambodia was valued at US \$300,000

per year for storm protection and erosion services alone. The additional provisioning services of the park, such as breeding grounds for fish, firewood, medicinal plants and construction materials, were valued at US \$600,000 per year (Emerton *et al.*, 2002). Moreover, the park's ecosystem service benefits far exceed the value of clear cutting the area for timber and shrimp ponds (Horwitz *et al.*, 2012).

A study by the Prince of Wales International Sustainability Unit calculated that when all the economic costs and benefits were taken into account, the shrimp industry, rather than generating a profit, generated a total global economic loss of 262 million USD annually. The costs included all kinds of ecological damage, including loss of fish spawning areas, loss of carbon, polluted water, diseases and diminished coastal protection.

2.3 Other long/term threats and risks to the Myanmar coastal zone

2.3.1. Land use changes

There are few available data on land use changes in Myanmar, and existing data may conflict.

Table 4. Land use changes between 1996 and 2002

| Land use type | As of 1996 | | As of 2002 | | Changes in 6 years | |
|-------------------------|----------------|------------|----------------|------------|--------------------|---------------|
| | Sq: km | % | Sq: km | % | Sq: km | % |
| Net sown areas | 87,663 | 12.96 | 157,831 | 23.33 | +70,168 | +10.37 |
| Fallow Lands | 13,747 | 2.03 | 8,972 | 1.33 | -4,775 | -0.7 |
| Cultivable wastelands | 81,290 | 12.01 | 74,759 | 11.05 | -6,531 | -0.96 |
| Permanent Forest Estate | 103,090 | 15.24 | 173,739 | 25.68 | +70,649 | +10.44 |
| Unclassified Forests | 240,677 | 35.57 | 180,008 | 26.61 | -60,669 | -8.96 |
| Other lands | 150,110 | 22.19 | 81,268 | 12.01 | -68,842 | -10.18 |
| Total | 676,577 | 100 | 676,577 | 100 | +140,817 | +20.81 |
| | | | | | -140,817 | -20.8 |

Source: Forestry in Myanmar, Forest Department, 2003

Note: Other lands include residential areas and unclassified land not suitable for crop cultivation.

In the coastal zone, the major deforestation threat comes from clearing and cutting mangroves for fuelwood and charcoal production, and the scale and effects of this have been covered in section 2.2.1

Conversion of Mangrove forest to agricultural land not just for shrimp ponds has been noticed in many parts, mostly in Rakhine. Most of the 30% of mangrove conversion has been due to rice paddy development.

2.3.2 Logging

Illegal logging is a well-known challenge in Myanmar, mostly in border areas with China and Thailand. According to the Ministry of Environmental Conservation and Forestry, 69,000 tons of illegal logs were seized by the authorities between April 2011 and June 2013 (Asia News Network 21 July 2013). Logging inland affects siltation in the major rivers with profound impacts on mangrove growth in the central Delta region. The mangroves in the coastal zone are also affected

by commercial logging, as well as a number of other unsustainable activities (see section 2.2.1).

Curbing deforestation may be more effective than reforestation. In the last decade, a study in Thailand found that the cost of restoring mangroves was US \$946 per hectare, while the cost for protecting existing mangroves was only US \$189 per hectare (Ramsar Secretariat, 2001). Values might be lower but the ratio should be similar for Myanmar. There are two mangrove protected areas at present, but the potential for expansion is huge, especially with the involvement of community forest groups and eco-tourism development.

Risks

2.3.3 Physical and environmental constraints: Susceptibility to climate change, sea-level rise and extreme weather events.

Myanmar is very susceptible to extreme weather events and sea-level rise related to current and predicted future climate change. Coastal erosion and flooding are further risks which are predicted to grow. Tropical storms occur regularly and there are occasional cyclones. On 2 May 2008, Cyclone Nargis made landfall in Myanmar, crossing the south of the country over two days, and devastating the Ayeyarwaddy Delta region. According to official figures, 84,500 people were killed and 53,800 went missing, a total death toll of over 130,000 people (see also Table 3). A total of 37 townships were significantly affected by the cyclone. The UN estimates that as many as 2.4 million people were affected.

<http://www.ifrc.org/en/news-and-media/news-stories/asia-pacific/myanmar/myanmar-cyclone-nargis-2008-facts-and-figures/#sthash.oOB3gXh4.dpuf>

As global temperatures continue to increase, weather patterns will grow increasingly unstable and sea levels will continue to rise, causing more coastal erosion and flooding. One of the most effective policies for mitigating all these risks is the maintenance of a buffer zone of mangrove forest along the coast. Coral reefs can have similar effects. This policy should be implemented within a wider framework of disaster risk management policy. Myanmar has prepared a National Adaptation Programme of Action (NAPA) as part of a process for Least Developed Countries (LDCs) to identify priority activities that respond to their urgent and immediate needs to adapt to climate change. <http://www.adaptationlearning.net/category/programs/napa>

2,3,4 Political uncertainty and social unrest

Myanmar has three conflict zones which are a risk to security, but in the coastal zone this risk is probably decreasing. Rakhine State has seen repeated violence between the Buddhist Rakhine and Muslim Rohingya communities, and official and semi-official policies of discrimination against the Muslim population. In June 2012, some 75,000 people were forced to flee their homes. <http://www.unhcr.org/pages/49e4877d6.html>

On 12 July 2013, President Thein Sein issued notification no. 59/2013 abolishing the Nasaka border security force, which has been active mainly in Rakhine State and in particular along the border with Bangladesh. In this area, it was the most prominent state authority, and as such was charged not only with securing the border, but also with enforcing the various discriminatory policies against the Rohingya. The abolition of this force is regarded as a very positive move.

<http://www.crisisgroupblogs.org/resolvingconflict/2013/07/16/myanmars-nasaka-disbanding-an-abusive-agency/>

There is also unrest in south-eastern Myanmar, where UNHCR supports some 239,000 people affected by displacement through protection monitoring and advocacy with the Government for improved access to essential services. Hostilities continue between the government and the forces of the Kachin Independence Organization, and while this contributes to national insecurity, the coastal zone is largely unaffected by this conflict.

<http://www.unhcr.org/pages/49e4877d6.html>

3. Threats of Large-scale unsustainable development

3.1 Coastal industrial and infrastructure development

Currently, three major centres for industrial development have been identified by the Government of Myanmar (Figure 13). These are widely spread across the coastal region covering three different provinces (Yangon, Tanintharyi and Rakhine) It is not yet clear in detail which industry will be developed at each of these sites.

All three zones are at different stages of planning. The Dawei region in the south has been on hold for further development but roads connecting the region to Thailand have been built already and further development is likely once funding is secured. The adjacent oil refinery in Launglon has also been planned.

The Kyauk Phyu development area is the most potentially damaging because it comprises a huge industrial complex with oil refineries, deep sea port and transport infrastructure, including offshore oil drilling and pipelines. As the second largest connected mangrove, seagrass beds and other important coastal biodiversity is immediately threatened by the development, the focus of sustainable development should be on this site. Figure 14 shows the various plans for future development and road and pipeline constructions in Rakhine (Arakan).

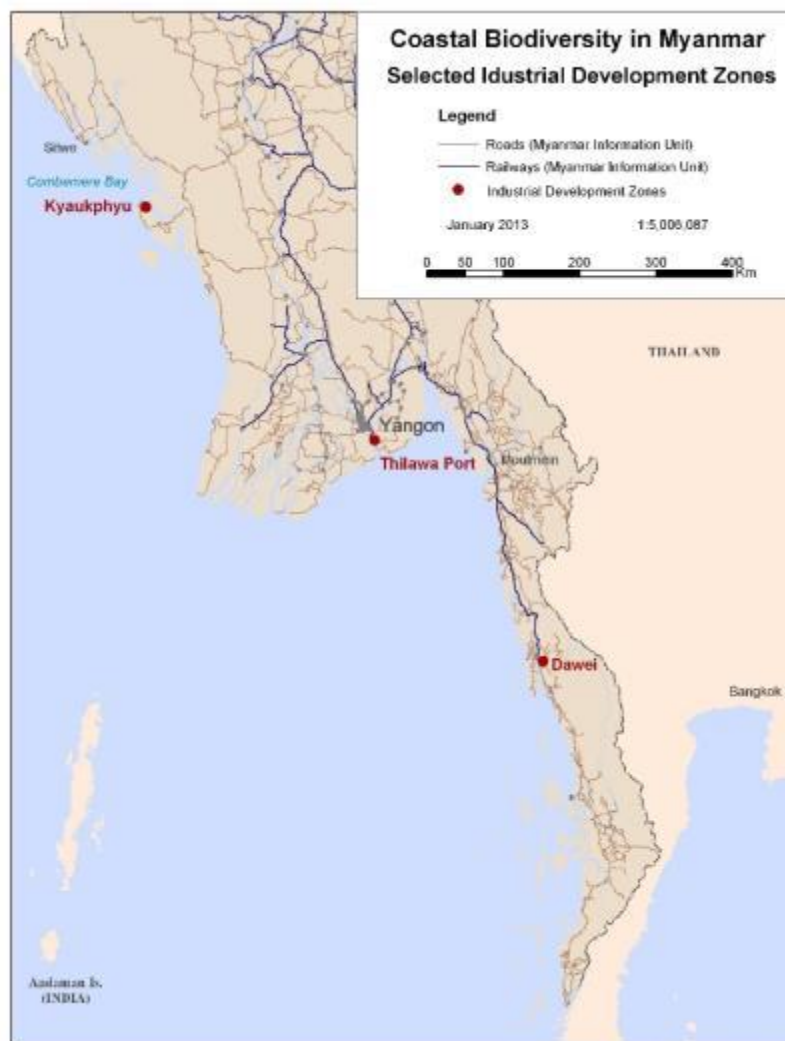


Fig 13 : Industrial zones on Myanmar Coast 2013

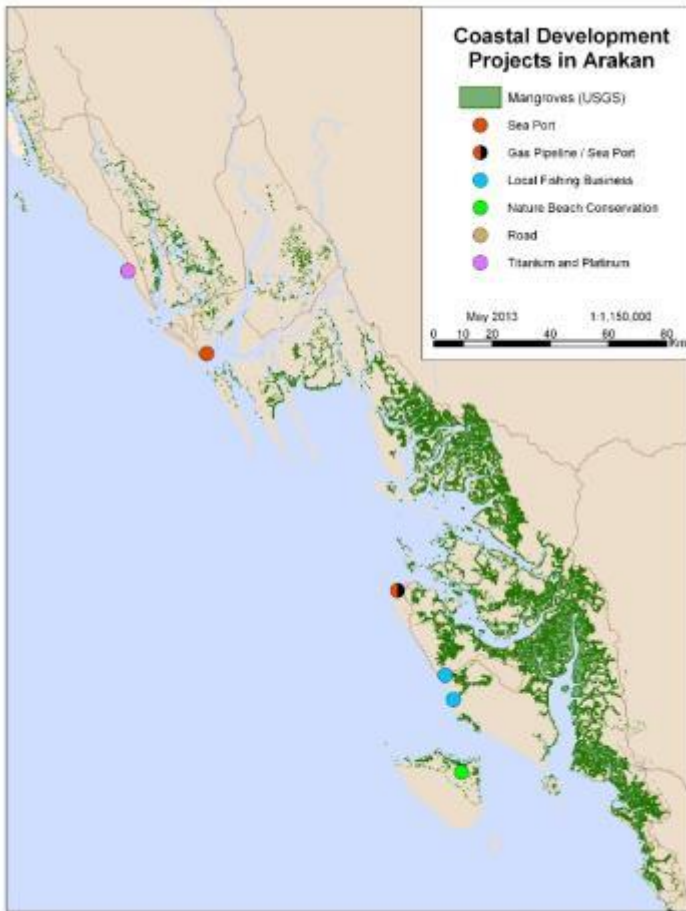


Figure 14. Recent planned or implemented projects based on research by SNCA in 2013

The Kaladan River is Rakhine’s largest river and the life and support line for many thousands of people living in the region. Its high value for biodiversity is highlighted by the occurrence of Irrawaddy River Dolphins (see Figure 11) and Wintering Bar-headed Geese as well as breeding Sarus Cranes on the river banks. Any kind of construction for ship transport should take these and other biodiversity values into account.



Figure 15: Kaladan river transport Project by Indian Investor

4. The Legal, administrative and institutional framework

The Government of Myanmar has historically taken good initiatives on wild animal and plant species protection, as well as the declaration of protected areas in representative biomes – with the exception of coastal areas. Key Multi-lateral Environmental Agreements (MEAs) include the international Convention on Biological Diversity (CBD); Ramsar Convention on Wetlands, the Convention on Migratory Species (CMS, Bonn Convention) and the Convention on International Trade in Endangered Species (CITES). Implementation of these valuable Agreements, and the legal interpretation of their objectives at national level, is proving difficult and rapid improvement is necessary if the country is serious about its commitment to sustainable development.

4.1 Protected Areas and Key Biodiversity Areas

The current distribution of Protected Areas in Myanmar shows incomplete coverage of coastal sites (see figure 16). According to the World Database on Protected Areas (WDPA) only six areas are protected at present.

The only sizeable marine sites designated so far are at Meinmahla Kyun, Lambi, Moscos and Thamihla Island, all of which are mangrove and coral reef reserves. This means that the total Myanmar coastline is currently less than 0.1% protected. This might, however, change and the government initiative to expand coastal protection by including the Gulf of Martaban and potentially other sites such as Nan Thar island in the Ramsar sites register is most welcome. We propose, however, that the protected area network should be expanded much more widely to include most of the Tanintharyi coast and much of the Rakhine coast. This is necessary to ensure the protection of vital ecosystem services, the last remaining marine turtle and dugong breeding sites and other important sites for wintering waterbirds. All these will provide essential economic incentives for the development of sustainable tourism.

The Key Biodiversity Areas (KBAs) were introduced by IUCN in 2010 as an extension of BirdLife International's Important Bird Area (IBA) concept. KBAs are places of **international** importance for the conservation of biodiversity through protected areas and 'other governance mechanisms'. They are the building blocks for implementing the ecosystem approach to conservation and maintaining effective ecological networks. Although KBAs cover large parts of the Myanmar coast, the network lacks many areas rich in biodiversity, such as mudflats on the Eastern side of the Gulf of Martaban and mangroves in the Dawei region. This is a reflection of the lack of information on coastal biodiversity in Myanmar.

At present there is an initiative by IUCN to explore a tentative list of potential World heritage Sites on behalf of UNESCO. Although these are still in draft form (IUCN in prep) two large marine corridors are listed. The Rakhine Marine Corridor is the largest area with over 40,000 km². The second area, the Myeik Archipelago is even larger with over 45,000 km². Both areas would cover large parts of the Myanmar coast and the extension of World Heritage status to these areas would be most welcome. It will provide a unique opportunity for the country and the local communities to develop the coastal area sustainably for the benefit of biodiversity and the long term security of the local people that live in these areas.

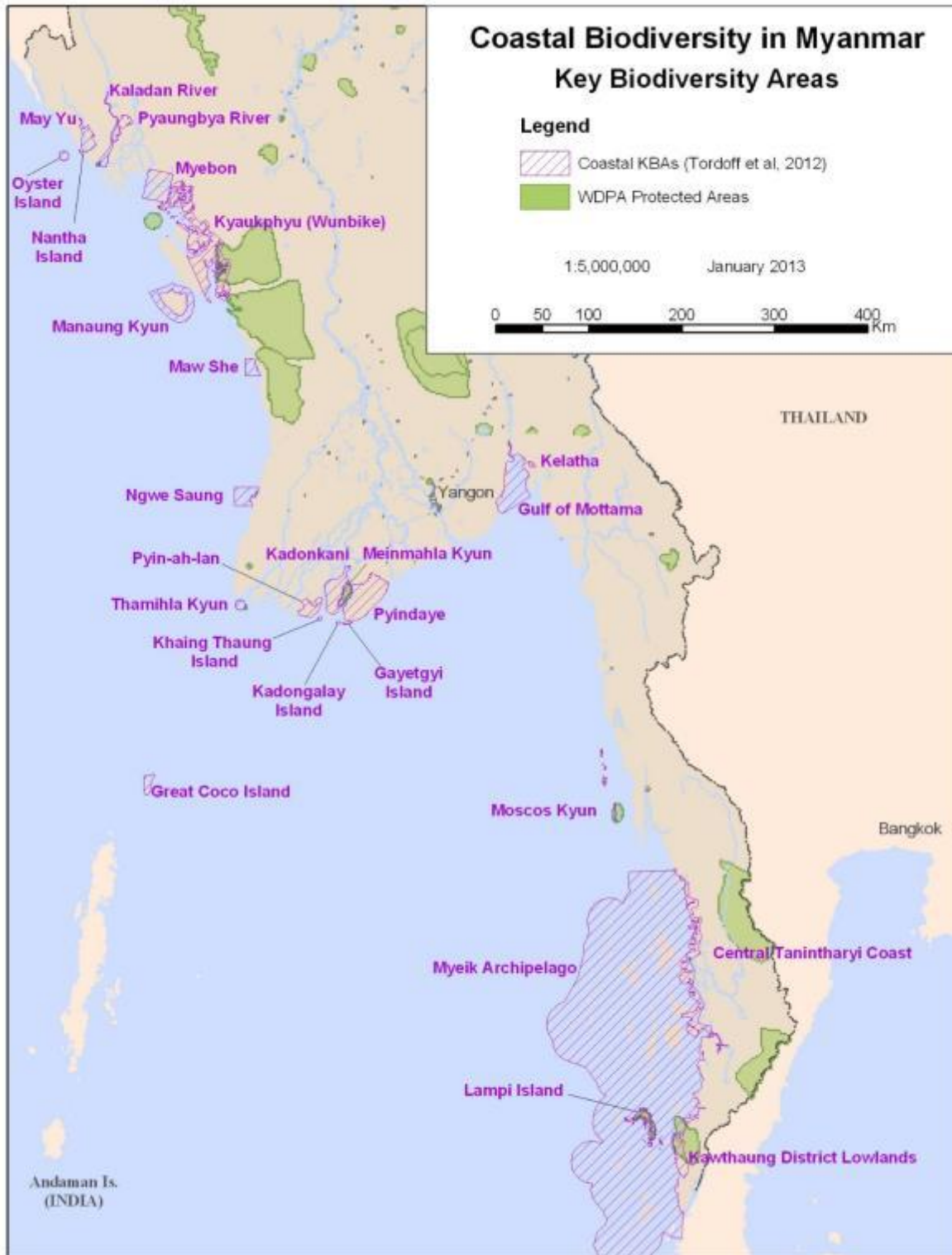


Figure 16: Key Biodiversity Areas (IUCN 2012) and Protected Areas from the World Database on Protected Areas (2012, compiled by ArcCona 2013)

4.2. Political, legal and administrative regime, (National and international law, policy and regulatory mechanisms)

There has been a praiseworthy history of enacting protective wildlife legislation in Myanmar. Legislation has been extended to cover more species and more land through the decades. Research showing negative changes in the status of wild animals and plants stimulated further protective legislation. Pressures on species include hunting, and habitat loss. The creation of new wildlife management institutes and improved surveying and research techniques contributed to better understanding of the population dynamics of species. A UNDP/FAO project in 1984 seems to have given a new level of coherent policy making and momentum to the identification of important bio-geographic areas as key centres of biodiversity importance, and protected area networks. The Myanmar National Environmental Policy was developed in 1994 and the Myanmar Agenda 21 (both arising from the Rio Earth Summit in 1992) was developed in 1997. This encompassed strengthening protected area management, developing biodiversity databases, strengthening sustainable use of natural resource practices, and studying economic issues relating to biodiversity. Since that time, and more recently, in the last few years, the government has been reviewing wildlife legislation, often in the context of international stimuli, including the Multilateral Environmental Agreements (MEAs) to some of which the government is now a party.

The Convention on Biological Diversity (CBD) is one of the key Multilateral Environment Agreements all governments should aim to implement. Myanmar has signed the convention, but has not yet ratified it –the step necessary for the convention to become legally binding in the country.

Myanmar is not a member of the Convention on Migratory Species (CMS) but has engaged in working groups with respect to Agreements under the Convention on Dugongs and the marine turtles of the Indian Ocean and South East Asia (IOSEA). Myanmar is a critical country for the CMS linked East Asian - Australasian Flyway Partnership (EAAFP) – which aims to engage all countries on this migratory flyway in efforts to achieve improvements in protection for key migratory bird sites, including those in Myanmar. The country has yet to become a member of this partnership.

Myanmar is a Party to the Ramsar Convention on Wetlands and has designated the Moeyungyi wetland site in Bago province as a Ramsar Site. There are many coastal sites which would benefit from Ramsar designation which encourages sustainable use. The government is at present preparing to designate 10 more sites of which at least two are coastal (Gulf of Mottama and Nan Thar/Kaladan River mouth).

Myanmar is also a signatory to the Convention on International Trade in Endangered Species (CITES) which includes coastal species, for example marine turtles, in the Appendices preventing or controlling international trade as live specimens or their products.

Myanmar is a signatory to both the World Heritage Convention and the Man and the Biosphere Convention, but has yet to designate any natural sites under these MEAs. Some of its naturally beautiful and outstanding sites definitely would qualify for listing and the designation would increase the attractiveness of these sites to tourists.

The UN Commission on Sustainable Development has provided Myanmar with the opportunity to join those countries which have introduced a National Sustainable Development Strategy. This document, together with all government public statements concerning the sustainable management of natural resources generically, ‘for the well-being and happiness of the Myanmar people’ give a strongly progressive account of the government’s commitment to ensuring the country steers a sustainable development path.

It is encouraging that the Government of Myanmar has made these commitments to international Agreements, but it will need to follow these up with practical work on the ground to resolve the many conflicts of interest which are always manifest in land development. Usually, the longer term, less

immediately commercial initiatives win over the need to constrain, for example, oil palm development in Taninthayri and to acknowledge the high existence value of extremely rare wild species. (Further threats to this area arise from road and rail infrastructure being developed to link Thailand with Myanmar, through the Taninthayri forest.).

4.3 Environment and Social Protection

To prevent negative social and environmental impact, the 2012 Environmental Conservation Act requires governmental departments, organizations or individuals to conduct environmental and social impact assessments for their intended projects and programmes. The 2013 Foreign Investment Rules also require large investment projects to conduct SIA and EIA assessments.

The existing Mining Laws and regulations have some provisions on preventing hazardous mining operations.

4.4 Conservation partners and their roles

Myanmar does not have a tradition of NGOs or any conservation organisations. Some organisations had a partial governmental status and only very few have a remit for outreach. The following list is not complete and focusses on national and regional organisations with a focus or agenda on coastal biodiversity conservation.

1. BANCA

The Biodiversity and Nature Conservation Association (BANCA), is based in Yangon with a project portfolio extending across the entire country. See: <http://www.banca-env.org/> Its coastal work started with the first Spoon-billed Sandpiper survey work coordinated by ArcCona in 2008, and has culminated in the protection of the Gulf of Mottama and the community based work there. Its commitment to the site protection of the Gulf of Mottama is ongoing and promising. BANCA is the affiliate partner of the BirdLife International partnership.

2. MBNS

Myanmar Bird and Nature Society (**MBNS**) was established in early 2000. Former Forest Department (FD) staff members founded an organisation focussing on nature research, education and conservation. The name "Myanmar Bird and Nature Society" was chosen, so that although today the main focus is ornithology, future projects on other branches of natural history may be planned. In June 2001 MBNS applied for government registration, and this was granted on 21 November 2003. It is the first national NGO concerned with bird and nature conservation. Still in its infancy, MBNS does not yet have a general membership but is a rather loose organisation of mainly FD and university staff members and some foreign birdwatchers.

The organisation does not have a special focus on the coast but has been known to conduct surveys along the Ayerawaddy delta coast and also near the Mon state coast. Its recent focus has been much more inland on mountain forests.

3. FREDA

Forest Resource Environment Development and Conservation Association (FREDA) is a non-political, non-profit and non-government organization in the forestry sector of Myanmar. See: <http://fredamyanmar.com/>

Its strengths are expertise, dedication and dynamism. Founded in 1996, FREDA is currently composed of 409 members, comprising foresters, botanists, agronomists, zoologists, veterinary scientists, hydrogeologists, engineers, timber businessmen, journalists, artists, etc. Membership is open to any citizen of Myanmar over the age of 18, except those in active government service.

FREDA is the country Focal Point for Myanmar in the ten nation South East Asia Civil Society Environment Alliance (SEACSEA) formed in May 2007 to promote environmental protection and sustainable development in the ASEAN region.

FREDA has a forest focus and as such is involved in the protection and plantation of coastal mangrove forests. It has been engaged in a wide range of activities working with local communities in reforestation and forest conservation, promotion of sustainable forest management, introduction of appropriate methodology for improved land use systems for rural community development, the restoration of degraded mangrove ecosystem in the central Delta region, and many other projects inland. The projects and programmes are primarily implemented with the co-operation of international NGOs and UN agencies. FREDA has been actively engaged in some activities with the collaboration of the Japan Overseas Forestry Consultants Association (JOFCA), Japan Wildlife Research Centre (JWRC), Nagao Natural Environmental Foundation (NEF) of Japan, Action for Mangrove Reforestation (ACTMANG) of Japan, David Shepherd Wildlife Foundation (DSWF) of UK, Gesellschaft zur Forderung konkreter Entwicklung-sprojekte e.V (GFE) of Germany, Diakonie Katastrophenhilfe (DKH) of Germany, UNDP, the Embassy of Japan in Myanmar and the Embassies of USA, UK and Germany in Myanmar.

With its coastal conservation engagement, its work with local communities and its focus on sustainable development, FREDA appears to be a naturally strong partner for further advancing coastal biodiversity conservation and sustainable development.

4. FFI

See: <http://www.fauna-flora.org/explore/myanmar/>

FFI works with emerging grass roots organisations which are being established to address issues of environmental governance and human welfare, particularly in Chin and Kachin states. FFI also works closely with its local partner, Biodiversity and Nature Conservation Association (BANCA, see above). FFI is focusing on building the skills in these organisations in forest and protected area management. FFI also offers guidance to state-run protected area management authorities on how to work alongside these grass roots organisations to tackle the many and mounting threats faced by the country's natural resources, such as illegal logging, hunting and shifting agriculture.

WCS

In 1993, the Wildlife Conservation Society (WCS) became the first international conservation organization to initiate a long-term program in Myanmar. It conducts biological surveys, monitors populations of key wildlife species, aid in the establishment of protected areas, and assists protected area staff with landscape management. WCS is particularly active in the northern forest zone, and runs conservation programmes for the Irrawaddy Dolphin and endangered endemic turtles.

Regional NGOs

5. SNCA

The Sittwe Nature Conservation Association SNCA was established in 2009 following the increased involvement of local conservationists on Nan Thar island. See:

<http://www.mmtimes.com/2012/news/613/news61311.html>

They were recruited from an active group of mangrove protectors that were collecting plastic to prevent the remaining mangroves surrounding Sittwe from suffocating.

SNCA continues to monitor and guard the island of Nan Thar with continuing support from the Lighthouse Foundation in Germany and is still an important grass-roots organisation in a region where no other NGO is currently active. SNCA remains an important partner in achieving sustainable development on the coast in Sittwe and other places in Rakhine region.

6. DRA

The Dawei Research Association (DRA) is a local research and conservation group based in Dawei in the northern part of Tanintharyi Province. See:

<http://www.mmtimes.com/2011/news/605/news3160513.html>

DRA also provided us for this scoping paper with a report on the situation in Tanintharyi (see Annex 2)

Eco-tourism operators

1. WATT

Wild Bird Adventure Travel Tours (WATT), established in 1994, specialises in bird watching, nature adventure and trekking tours and expeditions to remote areas of Myanmar such as Mt. Victoria, Bwepar Mt. and Kyaukpantaung Wildlife Sanctuary of the Chin State, Phonganrazi Wildlife Sanctuary, Hkakaborazi National Park, Hukaung Tiger Reserve, Indawgyi Bird Sanctuary, Emowbon and Majed mountain range of Kachin State, Mt. Saramati of Naga area and easily accessible areas such as Pyay, Bagan, Inlay, Kalaw, Shwesettaw Wildlife Sanctuary, Moeyungyi Bird Sanctuary, Alaungdawkathapha National Park of Central Myanmar and Shan State, and the Sundiac forest of Tenneserim (Tanintharyi) Division. See: <http://www.wildmyanmar.com/> Since 2010 it has also included an eco-tourism tour to Nan Thar island to promote alternative livelihood support for the local island population and has been extending its portfolio to include the Gulf of Mottama as an alternative coastal eco-tourist destination.

2. SST

By the end of 1999 a number of foreign birdwatchers had visited Myanmar using SST (Supreme Service Team) Tourism Company as their travel agent. See:

<http://www.sstmyanmar.com/>

With little up-to-date information on the birds of Myanmar, a lot of guesswork was involved in planning these trips. Visitors were impressed by the country's natural riches but expressed concerns about the lack of infrastructure and the need for conservation. SST was encouraged to promote eco-tourism but it was also clear that, to be successful, more information was needed. SST is still operating today with an increasing tour portfolio that does also include coastal sites.

Most of the NGOs detailed in the preceding section would be appropriate partners for projects involving sustainable coastal zone management in Myanmar.

Potential government partners

At present, for protected area and species conservation, the Ministry of Environmental Conservation and Forestry (MOECAF) has a key and leading role in promoting sustainable coastal development and will function as liaison with other relevant ministries.

Other ministries also play a key role in developing sustainable fisheries, infrastructure projects and tourism and need to be involved at an early stage.

Potential government partnerships

Myanmar Government ministries with a potential interest in sustainable coastal zone management include:

Ministry of Commerce

Ministry of Construction

Ministry of Livestock-Fisheries

Ministry of Hotels and Tourism

Ministry of Environmental Conservation and Forestry
Minsistry of Industry
Ministry of Transport
<http://www.myanmar.cm/myanmar-government-info/ministries-in-myanmar.html>

Local Government

UNDP Capacity Development

Efforts have been made to strengthen local government and develop its capacity for contributing to social and economic development. On 28 August 2013, a National Workshop coordinated by UNDP proposed a plan to assist the Government of Myanmar in strengthening good local governance and delivering people-centered services.

<http://www.mm.undp.org/NewsandPressreleases/NarNewsandPressreleases/Pressreleases/LocalgovWS.html>

Inventory of relevant existing national and international programmes, projects and plans related to sustainable development in coastal Myanmar

The Republic of the Union of Myanmar – National Biodiversity Strategy and Action Plan

<http://www.cbd.int/doc/world/mm/mm-nbsap-01-en.pdf>

The NBSAP of Myanmar is a recent and rather up to date document highlighting a seven point, five-year action plan that addresses coastal and marine biodiversity under section 5.2.4, as follows:

Five-year Action Plan Towards Sustainable Management of Coastal, Marine and Island ecosystems

With the focus of enhancing conservation of coastal, marine and island ecosystems and the sustainable harvesting of marine living resources, the following activities are to be implemented within the next five years:

1. Protect and check environmental damage to coastal areas of Myanmar.
2. Stop fishing for species at risk until they are restored to their normal numbers or status.
3. Ban destructive fishing practices such as dynamiting, poisoning, electrocution, and using unauthorized fishing methods and gear; develop new practices to replace them.
4. Conduct constant patrols and encourage research and long-term monitoring of unauthorized fishing.
5. Establish a coastal and marine research centre using university of marine science as a nucleus.
6. Conduct a survey of fish diversity.
7. Develop participatory approaches for community based fishery resource conservation and management.

Most of the other action items in the NBSAP do not feature or link to marine or coastal issues and hence the plan is lacking focus when addressing urgent actions to secure coastal and marine resources. The actions under 5.2.4 capture a number of urgent activities to protect and secure sustainable development on the Myanmar coast. It has naturally a strong focus on fisheries. But taking into account that fishery is only one though important ecosystem service that coastal biodiversity provides the action plan fails to provide guidance and action on the many other services that coastal habitats provide. As mangroves might be covered in the action plan under 5.2.1 it is not specifically

mentioned. Mangroves are the most vulnerable, most threatened and most declining first type in Myanmar and as such deserve special attention which government resources and organisations such as FREDAs already provide. It would be advantageous if these would feature more strongly and specifically in the 5-year action plan of a revised version. Likewise, there is no or little mention of coral reefs and other habitats. In particular the potential for Eco-tourism should be explored and explicitly mentioned as a specific activity to safeguard those vulnerable coastal ecosystems. The promotion of eco-tourism, though devoted to a separate section under 5.2.7 does not fully capture the full role eco-tourism could play in conservation of coastal and marine ecosystems. Cross-referencing and linking both sections of the 5-year action plan could enhance possibilities for addressing actions that can help the sustainable development of coastal ecosystems, by engaging local communities and providing alternative income sources as well as serving as 'place-holders' to manage traditionally aggressive development options.

Bay of Bengal Large Marine Ecosystem <http://www.eoearth.org/view/article/150447/>

Dwivedi 1993 carried out an extensive review of the Bay of Bengal ecosystem and used his findings to suggest the need for a national and regional framework for conservation and sustainable development (Dwivedi *et al.* 1998). A GEF-supported project examined the issues of sustainable fisheries and food security. <http://www.eoearth.org/view/article/150447/#sthash.JDwsABVa.dpuf>

The final report (Myint Pe 2002) identified the following proposed priority actions to address environmental impact on coastal and marine environment and its living marine resources:

1. Monitoring and Assessment of Impact on Fisheries of Pollution in Coastal Waters.
2. Methodologies for Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA) in Coastal Aquaculture.
3. Assessment of Offshore and High Seas Fisheries Resources.
4. Monitoring and Assessment of Impact of Mangrove Forest.

The full report is available online:

http://www.boblme.org/documentRepository/Nat_Myanmar.pdf

5. Sustainable Coastal Zone management- Opportunities for coastal communities and biodiversity conservation in Myanmar

When discussing the sustainable development of the coastal zone, it is important to distinguish between two main drivers that push development and potentially threaten coastal biodiversity. On one side we have and have had for a long time, the human pressure of a growing human population on the coastal zone, which poses a threat to over-harvesting and unsustainable use of coastal biodiversity. On the other hand, along with the democratic opening of the country to foreign and national investors, the fragile coastal ecosystems are exposed to large scale development, such as oil and gas exploration infrastructure projects and industrial development. Each requires a different approach, but they will both have to be based on integration of all stakeholders and the principles of sustainability in the planning process. This might often be taken for granted, yet it is frightening to see how often these simple principles of coastal zone planning and management are not taken on board by investors but also planning authorities. The principles of strong local community involvement seem to have been applied already and are strong indicators for success when implementing sustainable development in Myanmar.

This section on issues of corporate investment in Myanmar focuses on tourism to showcase the methodology and tools available but also highlights the most promising development potential that addresses concerns of biodiversity conservation together with the need for sustainable development for the welfare of the local people.

One of the difficulties is that there is little practical evidence of what is proposed by investors and what sustainability investment measures have been taken to date. Corporate Social Responsibility in Asia (CSR Asia) has published a report recently on Responsible and Inclusive Business in Myanmar which is important and helpful to know about, but although strong in emphasising biodiversity it does not seem to clearly outline or provide guidelines on how to adopt the principles of sustainability in practice. It also seems not to be very suitable for the coastal zone.

It is frustrating that the global audit company KPMG, for example, has written a report on infrastructure investment in Myanmar completely ignoring any consideration of sustainability. They do quote the government's intention for SIA and EIA for the port development, but do not offer anything themselves.

5.1 Large scale investment in the coastal zone

There has been rapid, recent, global recognition of the wealth of Myanmar's renewable and non-renewable natural resources. This has led to intense activity by potential investors to explore investment options in land development, for example for plantation crops, metals mining, gemstones, forest resources, fossil fuels, urban development, tourism and other industrial and commercial sectors.

Investor activity and interest is crucial to Myanmar's future economic success. However, the prevailing highly competitive investing activity is based on much publicised references to Myanmar's natural resources as being 'limitless'; 'boundless'; 'inexhaustible'; 'abundant', and similar misleading adjectives and impressions. There seems to be very limited understanding by national governments and investors sponsored and encouraged by them that unless investment is based on sustainable principles, the contribution natural resources can make to the economy of Myanmar will be limited, and, as important, much damage will be done to the resources themselves resulting in loss of biological diversity and impact on ecological services such as water provision. Currently, the race under way between investors to be the first to lay claim to a resource, is being run, generally with inadequate regard to anything other than gaining financial returns as soon as possible.

Myanmar's national regulations governing investment and land use planning in ways that encourage investing with sustainable principles is progressive, but can only achieve so much. Much will depend

on the approach the companies themselves decide to take, and on this depends the culture of investing companies. In the west, companies in the last twenty years have become much more progressive in terms of their businesses demonstrating strong sustainable principles and practices – encouraged or compelled to do this by shareholders and other stakeholders including NGOs. For investors and developers in developing and emerging economies there has been less compulsion to take any interest in sustainable practices – however this is changing and there is evidence now that some companies in these regions are adopting responsible corporate approaches.

As the race to invest in Myanmar intensifies, substantial effort is being made by a range of stakeholders including the country's local (and affected) communities, NGOs, development institutions, and corporate sustainability groups, in many countries including Myanmar itself, to examine from a sustainability view point, what development options are the most appropriate for the country. The need for investors to recognise the long term value of taking environmental, social and governance factors into account in investment strategies is paramount.

The view has been promoted for decades now by environmental economists that any economic development must take place *within* the ecological context and is not separate from it. Underpinning this sustainability concept are documents such as Myanmar's National Biodiversity and Action Plan 2011 and Myanmar's National Sustainable Development Strategy 2009. The former document presents a full account of the country's natural resources including its bio-geography, and the latter, published with the United Nations Environment Programme (UNEP) stresses amongst many other sustainability principles, the need for integrated development goals. These documents are essential background information for investors who wish their investments to be profitable in the long term.

The nature of investor activity will be perhaps most critical for the resources of Myanmar's long coastal zone. Here, deep sea ports, oil pipelines, transport links, other infrastructure and industrial free zones are on the drawing board, and, are being built. At the same time, the natural resources of the coastal zone, for example mangroves, and currently fairly extensive lowland hardwood forests, are important for coastal resilience to storms as well as providing many other beneficial ecological services of fundamental importance to Myanmar's future. Myanmar has nine 'international' ports and it is proposed that some of these can be up-graded to deep sea ports, greatly increasing their capacity for trade. It is also said that deep sea port development can only take place following environmental and social impact studies. It has yet to be tested whether this condition of approval for the development is applied and leads to more effort to address and counter impacts. Strategic Environmental Assessment (SEA) indicating that social and environmental impact assessment takes place within a broad 'landscape' or 'ecosystem' framework is increasingly the criterion for funding of major developments in the west and should certainly be a criterion for investment in developing and emerging economies. The government of Myanmar must insist on SEA for developments, or similar criteria. An improved knowledge base of the coastal zone with a full account of its biodiversity, its local communities' livelihoods and its potential for soft development options is a vital pre-requisite for any successful SEA.

Tourism is described in government and other institutions' documents as a key development sector for Myanmar. Again, hyperbole is used to describe the potential for Myanmar to attract visitors - phrases such as 'the next frontier for Asia tourism' – 'the fragile beauty' of areas, the existence of 'exquisite unvisited beaches' for example are freely used. A tourism Master Plan was announced by the government of Myanmar in June 2013. Greatly increased numbers of visitors are forecast from present levels and revenues, currently about US\$500mn plus to US\$10bn by 2020.

Myanmar's National Sustainable Development Strategy promotes the idea of eco-tourism. However, all tourism development should be ecologically and socially based and should only be permitted if a thorough Strategic Environmental Assessment has been implemented. Consideration of limiting water use, ensuring appropriately sensitive waste disposal, disturbance to wildlife and limiting energy use should always be of fundamental concern to any tourism developer. Nature tourism proposals based on core activities associated with viewing or contact with wild animals and plants should be screened

with extra care. The Myanmar Hotel and Tourism Law was passed in 1993 and states that there should be no damage to the cultural heritage and natural scenic beauty of Myanmar.

In view of the attraction of the country's coastal resources to visitors, which include undeveloped sandy beaches, tropical islands, coral reefs, culturally interesting local communities, and forests rich in animal and plant species, pressure is building for tourism development on the coast.

Myanmar's coastal areas and their resources offer great potential for sensitive tourism, which insensitive tourist development will destroy. An example of the latter is the pressure already being felt in some parts of the 800 island Myeik Archipelago as uncontrolled access by visitors in ocean going motor boats increases; those who don't arrive in their own vessels can hire large and luxurious motor boats to tour the islands. Other visitors, for example from Scandinavia, are arriving to review tourism development options on the islands.

There have been several decades of experience in many countries of tourism development focussed on resources such as marine turtles, and coral reefs and islands. Perhaps a way forward would be to identify those natural resources most desired for tourism development, and most susceptible to unsustainably planned development, and develop specific resource based strategies. This would provide the opportunity to look, with regard to marine turtles, at how can the five species so valuably still nesting on Myanmar's beaches receive all protection but also become accessible for tourist viewing – some progressive tourism development taking account of advice from marine biologists, is now taking place on the basis of ensuring that the life cycles of turtles come first, and sensitive hotel development is planned round survival priorities for marine turtles.

The same development principle can be applied to coral reefs (it seldom has been up to now) where the long term future of the resource and the local communities whose lives depend on it, is of paramount importance. Only by implementing in a thorough way a SEA and accommodating in development its findings can a sustainable outcome be achieved.

As tour operators and hotel developers enter the initial stages of investing in coastal areas, (as well as other areas for development) the government should consider as an urgent necessity, the creation of partnerships with them, to ensure the most appropriate development takes place.

5.2 Community based management of Protected Areas and ecosystem services

Two case studies are highlighting the benefits of involving local communities in the management of coastal ecosystems. In the Ayeyarwaddy Delta FREDa (FREDa and ACTMANG 2012) established mangrove Forest User Groups (FUC) and in the Gulf of Mottama BANCA has been working with local communities to mitigate or abolish the hunting pressure on migratory and wintering waterbirds in the Gulf (BANCA 2013).

Mangrove Forest User Groups

Mangrove restoration projects made a leap in the Ayeyarwaddy Delta when the Forest Department, together with FREDa, established the Community Forestry Instruction CFI in 1995 to engage with local communities. The project was carried out in collaboration within five organisations of Myanmar and Japan, but mostly with Forest Users' Groups (FUG) of the local communities in the delta, two NGOs, the Forest Department of Myanmar Government (FD) and the private sector of Tokyo Marine (FREDa & ACTMANG 2012).

The main aim of the project was to restore mangrove forests where they were degraded and denuded. The first instruction, which was issued in 1995, was ground-breaking, because reforestation activities were no longer only carried out by the FD but also by local communities. The benefit for the local communities is obtaining the right to use the forest for thirty years under the condition of its sustainable management. However, there were problems. The Management Plan that was requested by FD was too difficult to write for the villagers because of lack of experience. On the other hand, FD had no time to assist the villagers. In this project the problem was solved by FREDa helping the

villagers to develop the plan. Finally, the villagers from initially 10 villages and 310 households and later 14 villages of 375 households, organised in FUGs, carried out 1,289.2 ha of mangrove reforestation in total, and they obtained the right to utilise the forests. Most of the villagers in project villages became members of FUGs. A management Committee was constituted with 5 people including a Chairperson and a Secretary for each FUG. The Management Committee plays decisive roles in the success of FUG because they are responsible for decision making, implementation and monitoring and evaluation of the activities of FUGs. Capacity building for FUGs has been recognised as essential and will be crucial for the success of the project (FREDA & ACTMANG 2012).

Local Community Groups in the Gulf of Mottama and Nan Thar Island

Since 2010, BANCA has been involved in the mitigation of hunting and trapping of migratory shorebirds, which threatens in particular Globally Threatened species such as the Spoon-billed Sandpiper (Zöckler et al. 2010). BANCA has been working for the past three years with local communities from over 50 villages on both sides of the Gulf. Former hunters were not only provided with alternative livelihoods, but also became socially stronger through raising of their social status, allowing better integration into their communities. This way the entire communities take stronger responsibilities on board and it becomes very difficult for former hunters to fall back into old habits. This has been proven very successfully, but consistent attention and accompanying education and awareness projects by BANCA have been necessary. Currently BANCA is establishing Local Conservation Groups (LCGs) that have specific objectives:

- Acknowledge the benefits of natural resources and biodiversity and conserve them for the long term sustainable use by local people;
- To manage the natural resources sustainably for the next generation.

By summer 2013 there were four Local Conservation Groups in the Gulf of Mottama, a pioneer group Koe-tae-su Birds Conservation Group (KBCG), another group is the Nature Environment Conservation Group (NECG), a third is the Aung-kan-thar Nature Conservation Group (ANCG) which are all at the eastern Gulf of Mottama and a fourth group is the Sar-ta-lin Environment Conservation Group (SECG) which is from the western Gulf of Mottama. These were all newly established LCGs and Aye Ko, a former hunter and his colleagues were actively involved as volunteers at the Spoon-billed Sandpiper conservation project. Further actions in 2013 will include capacity building and bird-watching training for LCGs, regular monitoring for bird-hunting in the high season and patrol at Mottama Gulf (BANCA 2013).

Hunting mitigation has been implemented in a similar way with SNCA on the Island of Nan Thar in Rakhine region. Together with the local island population, alternative livelihoods have been arranged but mainly eco-tourism developed that provides a regular and secure income for the local community. Unfortunately the recent social unrest has affected the island as well as impacted the tourists that are no longer permitted to travel to this part of the region.(Yan Naung Soe 2012).

All these case studies show that the involvement of the local people is essential in the development of sustainable coastal zone management and the protection of biodiversity, and the long term income sources for local people with securing vital ecosystem services for local people and communities at large.

Each region requires a slightly different approach and when developing alternative, more sustainable income sources, the ecological context of the community/region needs to be taken into account. This is not only important for promoting sustainable fisheries or mangrove harvest schemes but also for developing eco-tourism and planning infrastructure schemes.

5.3. Land use policy and land ownership

Land use policy, and in particular, the availability of long-term leases, is crucial in engaging with local communities but generally for any coastal zone planning. Long term leases have been demonstrated as great incentives for local communities to take responsibilities for themselves, as has been shown in the Ayeyarwaddy Delta. All land in Myanmar including the inshore waters belongs to the state, and land-use rights are granted for specific periods, depending upon use. Land-tenure systems are based on customary rights under local institutions (Eberhardt 2003), which are not upheld under national law and can be leased for a period of up to 30 years (e.g. NanThar Island). As a result, local communities are vulnerable to losing access to land through such processes as establishment of commercial developments by tourist companies or other developers and businesses, and appropriation of land for other uses, under the self-reliance policy. This is further compounded by a lack of a specific land-use policy to settle disputes over land tenure (Eberhardt 2003). Loss of land and land rights can force local communities to turn to less sustainable harvest types and methods and can cause environmental degradation.

The introduction of comprehensive land-use policies and land-use planning, consistent with sustainable livelihoods of the local communities and biodiversity conservation, will be a crucial instrument for the sustainable development of the coastal zone in Myanmar.

A process involving all stakeholders of the Myanmar coastal zone in the development of a national land use policy will lead to:

- A better land use policy now and in the future;
- Improved public trust in local and national Government;
- A better informed Government;
- A land use policy that has ownership and legitimacy in the coastal communities of Myanmar;
- A greater likelihood of sustainable economic growth;
- Improved resilience to Climate change and other ecological stressors;
- Proper valuation of natural capital and protection of ecosystem services; and,
- Greater political and social stability in the country.

While the use of a public awareness campaign and related consultation process takes more time and effort, the end results justify the effort. Members of the donor community, and certainly also the potential investor and corporate partner, would undoubtedly be willing to support such a process of public consultation, if the Government is willing to steer a process of consultations and an awareness raising campaign that clearly sets out how the process would be implemented.

This process should be applied for the development of the coastal zone, but can be used for any other policy development processes in the country.

In addition, it should be recognised that Government policies are living documents that need to change and adapt over time as the real situation in the country changes. As such, the public awareness and consultation process never ends. Government agencies ultimately responsible for developing and implementing policies should understand that policies should be updated on a frequent basis as new information is discovered based on various pilot projects and research initiatives that can feed into an ongoing policy development process, but should not digress from the basic principles of the three pillars of sustainability (social, economic and environmental) .

The following basic steps in the Public Awareness Campaign and Consultation Process have been developed by US AID (US AID *in litt.*) for terrestrial land use policy in Myanmar, but can be easily adapted to the coastal zone.

Note: An overall budget for the consultation process should be developed, broken down into cost estimates to support the various steps, so that donors or NGOs can offer support for specific activities.

1. Initially, informing the public about efforts to develop a land use policy, and the purpose of having a land use policy (public outreach/public awareness campaign).
2. Clearly informing the public about the process that will be used to develop the land use policy (including pilot projects and research initiatives) and also the process for soliciting comments on the draft land use policy that is developed (public outreach/public awareness campaign).
3. Developing a draft policy for comment, based on the unique situation of coastal Myanmar and the problems faced and concerns of those that use land in the country, but also learning lessons from the international community and other countries in the region.
4. Making the first draft land use policy available for review among concerned stakeholders and citizens, including the media.
5. Providing a mechanism where comments on the first draft policy can be submitted.
6. Organising a national level consultation event where presentations on the draft land use policy will be given (overview of provisions), and verbal comments recorded. Participants should include national level Union Government representatives, members of Parliament, advisors, the donor community, NGOs, civil society groups, various concerned associations or trade groups, business community representatives and local Government representatives.
7. Based on comments received, amending provisions of the draft land use policy (second draft).
8. Making the second draft land use policy available for review among concerned stakeholders and citizens, including the media.
9. Using the second draft of the land use policy for public consultations held in every State and Division at the local level (precise locations to be determined) in order to get feedback from people that are actually using and administering the land at the local level (farmers, community groups, landless citizens, forest dependent communities, local businesses, local government officials, etc.).
10. Also compiling any comments on the second draft submitted to the draft land use policy e-mail address.
11. Based on the local consultation process and written comments submitted to the e-mail address, revising the draft land use policy.
12. Making the third draft land use policy available for review among concerned stakeholders and citizens, including the media.
13. Holding a final national level workshop on the draft land use policy.
14. Submitting land use policy to Parliament for approval in principle, as the policy will help guide development of a comprehensive Land Law.
15. If there are still issues that need to be addressed, revising and updating the draft land use policy as appropriate.
16. Government formally adopting the land use policy for a period no longer than five-years (i.e. 2016-2021). It is understood and acknowledged in the policy that a process of continuous research, monitoring and evaluation will be used to feed into the ongoing land use policy development process. Land use policy is updated every five years.

The purpose of the following matrix is to highlight needs and monitor ongoing activities in order to identify gaps in knowledge that need to be filled. It can be used by Government, donor community and NGOs to ensure better coordination and areas of needed funding.

5.4 Similar and related projects in South-east Asia

UNEP SIDA COBSEA Project

The Coordinating Body on the Seas of East Asia (COBSEA) was initiated as a United Nations Environment Programme (UNEP) Regional Seas Programme for the East Asian Seas region in 1981. COBSEA currently includes ten member countries: Australia, Cambodia, People's Republic of China, Indonesia, Republic of Korea, Malaysia, Philippines, Singapore, Thailand and Viet Nam. A project under COBSEA (UNEP, SIDA, COBSEA, 2011) had the overall goal of reducing and preventing the

impacts of natural disasters, climate change and sea level rise and promoting sustainable development of the coastal areas in COBSEA member countries through the application of spatial planning for integrated coastal zone management (ICZM) and Ecosystem Based Management (EBM).

In achieving the overall goal, the specific objectives were:

1. To develop the Regional Policy, Resource and Guidance document “Spatial Planning in the Coastal Zone of the East Asian Seas Region: Integrating Emerging Issues and Modern Management Approaches”.
2. To strengthen national capacities in sustainable coastal spatial planning through the application of the adaptation of the Document into national needs and capacities for the COBSEA countries for spatial planning and disaster risk reduction.
3. To enhance the capacity of countries to integrate the consideration of recent concepts such as climate change, ecosystem based management, disaster risk reduction and integrated land-sea planning into their existing national spatial planning procedures and systems.

The spatial plan is not a development plan, a management plan, or an environmental plan. It is a management tool that will be used alongside other management tools.

Philippines UNEP/GEF Project

A UNEP/GEF Project titled ‘Reversing environmental degradation trends in the South China Sea and Gulf of Thailand’ (Philippines Department of Environment and Natural Resources, 2005) describes a process of site prioritization and selection and presents a final inventory of sites for sustainable management on the west coasts of the Philippines. The approaches adopted should be assessed for their relevance to site selection for management in Myanmar.

Viet Nam-Netherlands Integrated Coastal Zone Management Project

Hua Chien Thang *et al.* (2002) describe the 2000-2006 Vietnam-Netherlands ICZM Project and its predecessors. The report describes the approaches adopted by the Vietnamese and the collaborative efforts with the Netherlands in preparing the framework and executing coastal projects during the last two decades. The success of these endeavours can be measured by the self-reliant and ongoing efforts of the Vietnam government to start the ICZM process in an increasing number of provinces, with the support of the Vietnamese Ministry of Natural Resources and Environment.

Viet Nam Technology needs assessment for Climate change mitigation

Quach Tat Quang *et al.* (2012) summarised, assessed and prioritized the technological requirements for Viet Nameese climate change mitigation policy needs in energy, agriculture and so called ‘Land Use, Land Use Change and Forestry’ (LULUCF).

Under LULUCF “Using the Multi-Criteria Decision Aid (MCDA) method, five Greenhouse Gas mitigation technologies were assessed for the LULUCF sector, out of which three technologies were prioritized, including sustainable forest management, afforestation and reforestation, and mangrove rehabilitation”.

6. Outlook and future perspectives for the Myanmar coastal zone

This Scoping Paper outlines current knowledge of the Myanmar coastal zone, the status of its biodiversity and the threats that endanger it. The next phase of the project is likely to focus on two areas. Firstly, building and expanding the existing knowledge base on coastal biodiversity. Secondly, enhancing the legal and administrative framework and the tools and mechanisms that need to be developed to promote sustainable coastal development. This will build the basis for any kind of sustainable development and requires a Strategic Environment Assessment (SEA). A wide range of options and expertise are required.

We propose the development of a network of protected areas and finally we consider the promotion of eco-tourism to be an attractive and sustainable development option that can showcase the sustainability principles in supporting biodiversity conservation and promoting the livelihoods of local communities. The following sections will outline the basis for further options for proposals.

6.1 Improving the knowledge base (threat assessment for coastal biodiversity)

There is considerable data and information available on biodiversity, outlined in earlier sections of this report. Without intending to provide a comprehensive assessment, the report illustrates a wide range of information on coastal biodiversity, but also clearly identifies the following gaps:

- Recent data on mangrove extent and mangrove diversity;
- Recent assessment of extent and nature of coral reefs;
- Clearly defined extent of intertidal mud and sand flats and data on their value for biodiversity;
- Recent data on the numbers and distribution of all marine turtle species;
- Recent data on numbers and distribution of the Dugong and the Irrawaddy Dolphin;
- A clearly defined habitat classification map of coastal Myanmar; and,
- A comprehensive evaluation of coastal ecosystem services.

6.2. Developing a coastal network of Protected Areas

Based on existing information on coastal biodiversity, the present coverage of protected areas is insufficient to protect Myanmar's most valuable and fragile coastal biodiversity. Recent efforts in securing large areas of the Gulf of Mottama and also intentions to secure the area around Nan Thar as protected areas are encouraging. Strategically, however, it is important to prioritise coastal areas for biodiversity conservation as has been emphasised in the NBSAP (2011). In this respect the coast has been under-represented and requires substantial recognition. Many more areas can and should be included in the protected area network. We recommend to focus in particular on Kyauk Phuy Island and Manamaung Island in Rakhine state, and most of the southern and central coastal zone in the Tanintharyi region.

The NBSAP mentions the KBA approach and the corridors as interconnected landscape sites. The KBA approach identifies almost 30% of the coast as worth protecting, even though the baseline for biodiversity information is still thin (NBSAP 2011). In particular the Rakhine Yoma Range and the Sundaic Subregion (Tanintharyi has been highlighted for significant improvement in site protection.

A wide range of many different forms of protected areas is available at national and international level. Most importantly, the community based user approach within these protected sites is crucial when it comes to outline and propose new sites. The Gulf of Mottama is a visible example of how these modern conservation approaches can be applied to the coastal zone of Myanmar.

Some of the proposed sites deserve an international recognition and protection status. The Ramsar site designation process is an appropriate tool for this. It explicitly allows and encourages the wise use principles and hence a strong local community and user involvement.

Most importantly, all the sites serve as assets for the local population that can sustainably use these sites and promote sensitive eco-tourism and invite the rest of the world and showcase what sustainable development really can look like!

6.3 Opportunities for sustainable development

The sustainable development of Eco-tourism is the most reliable option for the promotion of sustainable coastal development without jeopardising the wealth of coastal biodiversity and ecosystem services. Hence, in this section we focus on the development of this activity rather than others, partly also as we feel other areas such as fisheries require a different set of skills in promoting sustainable approaches and criteria.

The government of Myanmar's statements imply that all tourism development should be 'eco' or preferably 'sustainable'. The main, and predictable problem will be that the capacity to deliver on all these sustainability promises, will be threatened by the intensive new wave of tourist oriented and related developments that are proposed. It is therefore of utmost importance to stress a planning process that automatically involves all three sustainability pillars, to really ensure sustainability. The tourism related development can and should be a good test case. We propose to jointly develop a framework that sets out the approaches and criteria to promote a process of developing eco-tourism. It will be best to develop this framework with all partners who have a vested interest in the protection of coastal biodiversity and the livelihoods of local communities, and also with regional and national government agencies. ArcCona and its partners will be happy to assist in facilitating a process that will enable the sustainable development of eco-tourism.

Tourism

As has been demonstrated in this report, the coastal areas of Myanmar have impressively rich and diverse natural resources. However, they are often being depleted, or threatened, by industrial development and unsustainable activities. These threats need to be addressed, with the full commitment of all stakeholders if a new kind of sensitive tourism is to develop in the country.

The government makes reference in published statements to the value of encouraging 'eco-tourism'. However, if the government's own commitment to 'eco-tourism' is to be implemented practically, all tourism development should take account of a range of factors which would make every tourism initiative 'sustainable' and success should not just derive from establishing 'eco-tourism' niche development.

In 2013 the government announced a Master Plan for tourism, aiming for over 3m arrivals in 2015 and 7.5 m by 2020 (arrivals by air in 2012 were nearly 600,000). The Plan focusses strongly on 'sustainability' and 'social responsibility' as well as equitable payment of benefits arising from higher levels of tourism. It also focusses on the need for new and up-graded roads and other infrastructure in order to accommodate the needs of tourists.

The National Sustainable Development Strategy states very clearly the Government's desire and commitment to, for example, the development of tourism in certain protected areas. One of the most prominent, and attracting increasing international interest, serves as an example of the potential, but of problems to be resolved also. Any eco-tourism development should involve the local communities right from the start to ensure strong buy-in and also engage the communities as local guardians for 'their' biodiversity assets. Beach Management Units can be established that secure the well being of tourists as well as a direct income source for the local community from eco-tourism. This approach also prevents the alienation that arises when only foreign investors benefit from such developments.

The Lampi Marine National Park in the Myeik (Mergui) Archipelago is one of many national parks the government wishes to promote as places to visit. Lampi island is 11km by 50km and the protected marine area includes its inshore waters. Lampi island is one of about 800 in the Mergui Archipelago, covering over 36,000 square kilometres, and geographically associated with the Surin Islands of Thailand. The local people, the Moken, are glamourised in the western press as 'sea gypsies'. Reports have shown that Lampi island and the surrounding marine areas are being impacted by over fishing with dynamite and other means, wild animal trapping and other problems. However, the Mergui Archipelago is being promoted strongly by tourism agents, in Europe for example, as a wonderfully pristine area where it is possible (the implication is) to go unhindered or constrained by any sustainability principle. The islands of the Mergui Archipelago are widely dispersed and very vulnerable to intensifying random tourism. The growing sales of high powered and large ocean going private boats - their new owners attracted by the Mergui marine landscape, for example, demonstrates the urgent need for a practical sustainable development strategy for coastal and other areas such as these.

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Annex 1

Waterbird numbers at selected key intertidal flat sites in Coastal Myanmar

A series of waterbird counts at major inter-tidal mud flats were conducted and coordinated by ArcCona between 2008 and 2013. The following accounts and tables summarize the results. Scientific names of species are listed in Table 1.8 (P. 60).

Nan Thar island

The mudflats around the island are important for the Critically Endangered (CR)(IUCN 2013) Spoon-billed Sandpiper, the second largest roost site in Myanmar and possibly the entire wintering region with a maximum of up to 36 (2008) and regularly 20 individuals (Zöckler *et al* 2010). The area also regularly hosts 3-5 Nordmann's Greenshank (Zöckler & Frew 2011) and is a night roosting site for up to 1,400 Bar-headed Geese (Zöckler *et al* 2012). In the adjacent coastal mudflats at the Kaladan River mouth, up to 27 Indian Skimmers were recorded in 2008 and 9 in 2012, but none were seen in 2013. Table 1 gives a summary of all waterbirds counted at Nan Thar island in the years 2008-2012. A total of 7,000-8,000 waterbirds were recorded each year, half of them waders and terns with the other half comprising ducks and geese.

Table 1.1. Waterbirds counted at Nan Thar island, 2008-2012

| Species | 2008 | 2009 | 2010 | 2011 | 2012 |
|-------------------------------|-----------|-----------|-----------|-----------|-----------|
| Spoon-billed Sandpiper | 34 | 14 | 14 | 22 | 25 |
| Bar-headed Goose | 400+ | 1400 | 900 | ? | 1100 |
| Ruddy Shelduck | 2 | 92 | 4 | | |
| Northern Pintail | 1500 | 1600 | 3000 | | |
| Eurasian Wigeon | ? | 1150 | 1200 | | |
| Northern Shoveler | - | - | 10 | | |
| Garganey | - | 1 | - | | |
| Tufted Duck | - | - | 2 | | |
| Garganey | - | - | 2 | | |
| Grey Heron | | 7 | ? | | |
| Great Egret | 6 | 11 | ? | | |
| Intermediate Egret | | 2 | ? | | |
| Little Egret | | 31 | ? | | |
| Black-headed Ibis | | 13 | 20 | | |
| Great Thick-knee | 8 | - | - | | - |
| Grey Plover | 52 | 195 | 40 | | |
| Pacific Golden Plover | 12 | 30 | ? | | |
| Greater Sandplover | 440 | 250 | ? | | |
| Lesser Sandplover | 380 | 1000 | ? | | |
| Kentish Plover | 55 | 13 | ? | | |
| Little Ringed Plover | | 2 | ? | | |
| Common Ringed Plover | 1 | - | | | |
| Pintail Snipe | | 1 | - | | |
| Eurasian Curlew | 41 | 69 | 20 | | |
| Whimbrel | 10 | 10 | 14 | | |
| Black-tailed Godwit | 326 | 1800 | 400 | | 250? |
| Bar-tailed Godwit | 4 | 5 | 2 | | |
| Northern Greenshank | 7 | 20 | 10 | | |
| Marsh Sandpiper | 1 | 1 | - | | |
| Common Redshank | 335 | 300 | 60 | | |
| Spotted Redshank | - | - | 5 | | |
| Terek Sandpiper | 50 | 85 | 20+ | | |

| | | | | |
|------------------------|-----|-----|-----|-----|
| Nordmann's Greenshank | | 2 | 5 | 4 |
| Wood Sandpiper | | | | 1 |
| Great Knot | 13 | 40 | - | 30 |
| Red Knot | 3 | 8 | - | 35 |
| Broad-billed Sandpiper | 63 | 330 | 80 | 100 |
| Curlew Sandpiper | 87 | 130 | 150 | 32? |
| Red-necked Stint | 68 | 280 | 200 | 200 |
| Dunlin | | 1 | 1 | 2 |
| Sanderling | 90 | 215 | 20 | 45 |
| Ruddy Turnstone | 19 | 35 | | |
| Pallas's Gull | 54 | 18 | 75 | |
| Brown-headed Gull | 50 | 340 | | |
| Gull-billed Tern | 97 | 130 | 60 | |
| Little Tern | 200 | 365 | 100 | |
| Common Tern | 1 | 1 | 10 | |
| Greater Crested Tern | 35 | 1 | 1 | |
| Lesser Crested Tern | 2 | 20 | | |
| Caspian Tern | 2 | 1 | 3 | |
| Whiskered Tern | 103 | 14 | 200 | |
| Small Pratincole | | 3 | | 14 |

Hunters Bay

The area around Hunters Bay was visited in 2009 and surveyed for Spoon-billed Sandpiper with waterbird counts for the most important mudflats. The species composition was slightly different from Nan Thar and only about 1000 waterbirds were observed, reflecting also that the site is close to mangrove areas of varying extent. The record of 6 Lesser Adjutant Storks as well as the breeding of Sarus Crane in the area was noteworthy.

Table 1.2. Waterbird Species and numbers in January 2009 at A Thar Byar Isl (Hunters Bay)

| Species | | 2009 |
|-----------------------|----|------|
| Bar-headed Goose | | 19 |
| Ruddy Shelduck | | 33 |
| Sarus Crane | VU | 2 |
| Lesser Adjutant Stork | VU | 6 |
| Little Cormorant | | 250 |
| Grey Heron | | 1 |
| Great Egret | | 70+ |
| Cattle Egret | | 200+ |
| Little Egret | | 50+ |
| Indian Pond Heron | | 20+ |
| Little Heron | | 2 |
| Black-headed Ibis | VU | 48 |
| Grey-headed Lapwing | | 10 |
| Pacific Golden Plover | | 35 |
| Lesser Sandplover | | 150 |
| Kentish Plover | | 10 |
| Eurasian Curlew | | 40+ |
| Whimbrel | | 60+ |
| Northern Greenshank | | 6 |
| Wood Sandpiper | | 1 |
| Common Sandpiper | | 30+ |
| Common Redshank | | 300+ |
| Spotted Redshank | | - |

| | |
|----------------------|----|
| Terek Sandpiper | 2 |
| Red-necked Stint | 10 |
| Brown-headed Gull | + |
| Gull-billed Tern | 2 |
| Little Tern | + |
| Common Tern | 1 |
| Greater Crested Tern | 1 |
| Lesser Crested Tern | 4 |
| Caspian Tern | 2 |
| Whiskered Tern | 20 |

Natkan

In Natkan, to the south of Hunters Bay, is a small but valuable mudflat area surrounded by sound agricultural fields with mangroves to the north. Although the area holds only 1000 waterbirds, it has at least 1 Spoon-billed Sandpiper and 5 Great Knots. Most remarkable is the record of 750 Lesser Crested Terns at the entrance to the Sin Guang Chuang River mouth.

Table 1.3. Waterbird counts at Natkan, Rakhine January 2009

| Species | 2009 | |
|-------------------------------|-----------|----------|
| Spoon-billed Sandpiper | CR | 1 |
| Grey Heron | | 7 |
| Great Egret | | 7 |
| Intermediate Egret | | 3 |
| Cattle Egret | | 2 |
| Little Egret | | 80 |
| Indian Pond Heron | | 20 |
| Black-headed Ibis | VU | 1 |
| Grey Plover | | 27 |
| Pacific Golden Plover | | 2 |
| Greater Sandplover | | 100+ |
| Lesser Sandplover | | 400 |
| Kentish Plover | | 17 |
| Eurasian Curlew | | 8 |
| Whimbrel | | 14 |
| Bar-tailed Godwit | | 1 |
| Northern Greenshank | | 7 |
| Marsh Sandpiper | | 1 |
| Common Redshank | | 20 |
| Spotted Redshank | | - |
| Terek Sandpiper | | 53 |
| Nordmann's Greenshank | | 2 |
| Common Sandpiper | | 6 |
| Great Knot | VU | 5 |
| Curlew Sandpiper | | 40 |
| Red-necked Stint | | 107 |
| Ruddy Turnstone | | 4 |
| Pallas' s Gull | | 18 |
| Brown-headed Gull | | 270 |
| Greater Crested Tern | | 1 |
| Common Tern | | 2 |
| Lesser Crested Tern | | 750 |

Manaung island

Mudflats around the island of Manaung have been reported by local people as holding tens of thousands of waders. This island has not yet been visited so that numbers are not verified, and future visits are essential.

Ayeyarwaddy Delta

The Ayeyarwaddy Delta holds many huge mudflats and several tens of thousands of waterbirds are estimated to occur. No clear estimates are available, but, estimates and species composition have been compiled for some parts (Thet Zaw Naing *et al.* 2008), V. Morozov in litt.) Morozov estimated about 10,000-15,000 birds in the Eastern part of the delta.

Table 1.4. Waterbird counts in Eastern Ayayewaddy Delta near Kei-ye-gy Island. And Kaing Thaug Island. in January 2010 (Morozov & Archipov in litt.)

| Species | 2010 |
|------------------------|--------|
| Ruddy Shelduck | 4 |
| Grey Heron | 30 |
| Great Egret | 70 |
| Intermediate Egret | 16 |
| Little Egret | ? |
| Black-headed Ibis | VU 120 |
| Grey Plover | 60 |
| Pacific Golden Plover | 30 |
| Greater Sandplover | 30 |
| Lesser Sandplover | 3500 |
| Kentish Plover | 40 |
| Eurasian Curlew | 190 |
| Whimbrel | 10 |
| Black-tailed Godwit | 400 |
| Bar-tailed Godwit | 110 |
| Northern Greenshank | 50 |
| Marsh Sandpiper | 8 |
| Common Redshank | 600 |
| Terek Sandpiper | 150 |
| Nordmann's Greenshank | EN 8 |
| Great Knot | VU 600 |
| Red Knot | 120 |
| Broad-billed Sandpiper | 200 |
| Curlew Sandpiper | 150 |
| Red-necked Stint | 90 |
| Sanderling | 20 |
| Ruddy Turnstone | 40 |
| Pallas' s Gull | 850 |
| Brown-headed Gull | 2800 |
| Gull-billed Tern | 2 |
| Little Tern | 100 |
| Common Tern | 10 |
| Greater Crested Tern | 170 |
| Caspian Tern | 5 |
| Whiskered Tern | 800 |

Gulf of Martaban (Mottama)

The Gulf of Martaban or Mottama has the most extensive intertidal mudflats in Myanmar and among the most extensive in SE Asia. During various counts between 2008-2012 an estimated 150,000 waterbirds, mostly waders and egrets were recorded in the Gulf. Table 1.5 summarises the most important waterbird numbers (Clark & Zöckler in prep). The site is the key wintering site for the Spoon-billed Sandpiper, hosting more than half of the global population in winter. It regularly holds good numbers of a further six globally threatened species and has regularly held more than 1% of a flyway population of 11 species, among them Broad-billed Sandpiper and Red-necked Stint.

The site is proposed as a designated Ramsar site. It fulfils several criteria.

Table 1.5. Waterbird counts at the Gulf of Martaban, 2008-2012 (Zöckler *et al.* in prep)

| Species | | 2008 | 2009 | 2010 | 2011 | 2012 | Estimated average annual Total (2008-2012) |
|-------------------------------|-----------|-------------|--------------|--------------|------|------|--|
| Spoon-billed Sandpiper | CR | 48 | (75) | 199 | | | 140-220 |
| Little Cormorant | | | | 40 | | | 40-100 |
| Bar-headed Goose | | | | 1 | | | 1 |
| Ruddy Shelduck | | 950 | 118 | 24 | | | 1200 |
| Common Shelduck | | | 1 | | | | |
| Northern Pintail | | 80 | | | | | 150 |
| Eurasian Wigeon | | | 284 | | | | 300 |
| Northern Shoveler | | | | | | | |
| Garganey | | | | | | | |
| Tufted Duck | | | | | | | |
| Lesser Whistling Duck | | | | 2400 | | | 2400 |
| Grey Heron | | 4 | 203 | 20 | | | 200-400 |
| Purple Heron | | | | 11 | | | 40 |
| Great Egret | | 3 | 285 | 120 | | | 300-600 |
| Intermediate Egret | | | 10 | 370 | | | 400-800 |
| Little Egret | | 5 | 150 | 140 | | | 150-300 |
| Indian Pond Heron | | 13 | 11 | 140 | | | 150-300 |
| Painted Stork | | 140 | | | 4 | 4 | 150 |
| Asian Openbill | | | 2 | | | | 10 |
| Black-headed Ibis | VU | | 133 | 6 | | | 150-300 |
| Glossy Ibis | | | | | | 80 | 80 |
| Little Heron | | | | 3 | | | 10 |
| Night Heron | | | 6 | 30 | | | 200 |
| Pied Avocet | | | 1 | | | | - |
| Red-Wattled Lapwing | | 6 | 1 | | | | - |
| Grey Plover | | 9 | 224 | 220 | | | 250-500 |
| Pacific Golden Plover | | 1013 | 7726 | 250 | | | 8000-10000 |
| Greater Sandplover | | 1320 | 418 | 1102 | | | 1,000-1,500 |
| Lesser Sandplover | | 8963 | 18032 | 13850 | | | 25000-40000 |
| Kentish Plover | | 2504 | 8131 | 7193 | | | 10000-20,000 |
| Little Ringed Plover | | 348 | 606 | 8 | | | 800-2000 |
| Common Ringed Plover | | 1 | 12 | 1 | 1 | | 1 |
| Common Snipe | | 12 | | | | | |
| Eurasian Curlew | NT | 965 | 2141 | 770 | | | 2200-4000 |
| Whimbrel | | 1597 | 969 | 140 | | | 1.500-2500 |

| | | | | | | | |
|-------------------------------|----|-------------|-------------|-------------|-------------|--------------------|------------|
| Long-billed Dowitcher | | | 42 | | | 40 | |
| Black-tailed Godwit | NT | 252 | 3405 | | | 3,500-5,000 | |
| Bar-tailed Godwit | | 136 | 227 | | | 250-400 | |
| Northern Greenshank | | 372 | 1776 | 90 | | 2000-3500 | |
| Marsh Sandpiper | | 70 | 149 | 40 | | 150-300 | |
| Common Sandpiper | | 211 | 43 | 152 | | 300-400 | |
| Common Redshank | | 1958 | 4617 | 640 | | 4500-8000 | |
| Spotted Redshank | | | 1312 | 190 | | 1400-2000 | |
| Terek Sandpiper | | 317 | 316 | 1 | | 320-500 | |
| Nordmann's Greenshank | EN | 2 | 7 | 1 | 1 | 7-20 | |
| Wood Sandpiper | | 12 | 11 | 6 | | 20 | |
| Green Sandpiper | | 3 | 3 | 1 | | 10 | |
| Great Knot | VU | | 458 | | | 500-1000 | |
| Red Knot | | 3 | 18 | 2 | | 20-40 | |
| Broad-billed Sandpiper | | 1734 | 1224 | 2121 | 4000 | 4,000-5,000 | |
| Curlew Sandpiper | | 2323 | 6762 | 5728 | | 7000-12000 | |
| Red-necked Stint | | 4245 | 6353 | 4801 | | 7000-12000 | |
| Dunlin | | | 2 | 2 | 1 | 2 | |
| Long-toed Stint | | | 4 | | 80 | 150 | |
| Temminck's Stint | | 8 | 23 | 8 | | 40-100 | |
| Sanderling | | 12 | 12 | | | 20-40 | |
| Ruff | | | 33 | 6 | | 50-100 | |
| Ruddy Turnstone | | 17 | 29 | | | 30-60 | |
| Pallas' s Gull | | 2473 | 521 | 405 | | 2,500-3,000 | |
| Brown-headed Gull | | 43 | 667 | 250 | | 1000-2500 | |
| Gull-billed Tern | | | 125 | 15 | | 120-250 | |
| Little Tern | | | 68 | 120 | | 250-400 | |
| Common Tern | | | | | | 50 | |
| Greater Crested Tern | | | | | | | |
| Lesser Crested Tern | | | | | | | |
| Caspian Tern | | 25 | 56 | 15 | | 60-80 | |
| Whiskered Tern | | 715 | 7345 | 615 | 4000 | 4000 | 7500-15000 |
| White-winged Tern | | | 2815 | 225 | | 3000 | 3000-5000 |
| Black Tern | | | | 10 | | 10 | |
| Small Pratincole | | 145 | 123 | | | 120-250 | |

Species in bold fulfil 1% Ramsar criteria

Ahlat (Salween-Thanwlin River mouth)

In Ahlat on the southern edge of the Gulf of Martaban in the Salween/ Thanwlin River mouth three to four, and possibly as many as eight Spoon-billed Sandpipers were recorded among 4000 small waders mostly Lesser Sandpipers and Kentish Plovers. Table 1.6 provides an overview of the species composition observed there in 2012.

The mudflats around the Island of Baliu Kyun and south near Kjunkami host more big flocks of waders. Most of these have not been surveyed and could hold many more waders and herons in particular.

Table 1.6. Waterbird counts at Ahlat, Salween River mouth, 2011-2013

| Species | 2011 | 2012 | 2013 |
|-------------------------------|-------------|------------|----------|
| Spoon-billed Sandpiper | CR ? | 4-8 | 3 |
| Ruddy Shelduck | | | |
| Grey Heron | | | |
| Great Egret | | | 50 |
| Intermediate Egret | | | |
| Little Egret | | | |
| Black-headed Ibis | VU | 60 | |
| Grey Plover | | | |
| Grey headed Lapwing | | | 2 |
| Pacific Golden Plover | | | 40 |
| Greater Sandplover | | | 200 |
| Lesser Sandplover | | 300 | 1500 |
| Little Ringed plover | | | 65 |
| Kentish Plover | | 500 | 500 |
| Eurasian Curlew | NT | | 15 |
| Whimbrel | | | 20 |
| Black-tailed Godwit | NT 10 | 33 | 57 |
| Bar-tailed Godwit | | | |
| Northern Greenshank | | 35 | 15 |
| Marsh Sandpiper | | | 2 |
| Common Redshank | | | 200 |
| Spotted Redshank | | | 20 |
| Terek Sandpiper | | | 4 |
| Great Knot | VU | | 2 |
| Red Knot | | | 1 |
| Broad-billed Sandpiper | | | 50 |
| Curlew Sandpiper | | | 25 |
| Red-necked Stint | | | 120 |
| Sanderling | | | 10 |
| Ruddy Turnstone | | | 1 |
| Pallas' s Gull | | | |
| Brown-headed Gull | | | 230 |
| Gull-billed Tern | | | 3 |
| Little Tern | | | |
| Common Tern | | | |
| Greater Crested Tern | | | |
| White-winged Tern | | | 60 |
| Whiskered Tern | | | 200 |

Dawei River estuary

Further south in the Dawei River estuary near Dawei lies another big mudflat area adjacent to mangroves with many water birds. The mudflats extend from the south of Dawei 30 miles south to the village of Kennet Thiri and host approximately 3000 waterbirds. Table 1.7 shows the species and abundance observed in February 2011.

Table 1.7. waterbird counts in the Dawei River estuary, 2011

| Species | | 2011 |
|------------------------|----|---------|
| Little Cormorant | | 30 |
| Indian Pond Heron | | 30 |
| Great Egret | | 20 |
| Little Egret | | 45 |
| Lesser Adjutant Stork | VU | 6 |
| Black-headed Ibis | VU | 12 |
| Grey Plover | | 50 |
| Red-wattled Lapwing | | 10 |
| Pintail Snipe | | 2 |
| Pacific Golden Plover | | 45 |
| Greater Sandplover | | 500 |
| Lesser Sandplover | | 700 |
| Kentish Plover | | 45 |
| Eurasian Curlew | NT | 350-450 |
| Whimbrel | | 160-180 |
| Bar-tailed Godwit | | 30 |
| Northern Greenshank | | 15 |
| Common Sandpiper | | 40 |
| Common Redshank | | 45 |
| Terek Sandpiper | | 280 |
| Great Knot | VU | 6 |
| Broad-billed Sandpiper | | 50 |
| Curlew Sandpiper | | 15 |
| Red-necked Stint | | 80 |
| Ruddy Turnstone | | 100 |
| Brown-headed Gull | | 300 |
| Gull-billed Tern | | 3 |
| Little Tern | | 250 |
| Greater Crested Tern | | 100 |
| Lesser Crested Tern | | 20 |
| Whiskered Tern | | 30 |

Table 1.8 Scientific names of species listed in tables 1.1 – 1.7

| Species | Scientific name |
|------------------------------|-------------------------------------|
| Spoon-billed Sandpiper | <i>Eurynorhynchus pygmeus</i> |
| Little Cormorant | <i>Phalacrocorax niger</i> |
| Sarus Crane | <i>Grus antigone</i> |
| Lesser Adjutant Stork | <i>Leptoptilos javanicus</i> |
| Bar-headed Goose | <i>Anser indicus</i> |
| Ruddy Shelduck | <i>Tadorna ferruginea</i> |
| Common Shelduck | <i>Tadorna tadorna</i> |
| Northern Pintail | <i>Anas acuta</i> |
| Eurasian Wigeon | <i>Anas penelope</i> |
| Northern Shoveler | <i>Anas clypeata</i> |
| Garganey | <i>Anas querquedula</i> |
| Tufted Duck | <i>Aythya fuligula</i> |
| Lesser Whistling Duck | <i>Denrocygna javanica</i> |
| Grey Heron | <i>Ardea cinerea</i> |
| Purple Heron | <i>Ardea purpurea</i> |
| Great Egret | <i>Casmerodius Albus/Ardea alba</i> |
| Intermediate Egret | <i>Egretta intermedius</i> |
| Little Egret | <i>Egretta garzetta</i> |
| Indian Pond Heron | <i>Ardeola grayii</i> |
| Painted Stork | <i>Mycteria leucocephala</i> |
| Asian Openbill | <i>Anastomus oscitans</i> |
| Black-headed Ibis | <i>Threskiornis melanocephalus</i> |
| Glossy Ibis | <i>Plegadis falcinellus</i> |
| Little Heron | <i>Butorides striata</i> |
| Night Heron | <i>Nycticorax nycticorax</i> |
| Great Thick Knee | <i>Burhinus recurvirostris</i> |
| Small Pratincole | <i>Glareola lactea</i> |
| Pied Avocet | <i>Recurvirostra avosetta</i> |
| Red-Wattled Lapwing | <i>Vanellu indicuss</i> |
| Grey-headed Lapwing | <i>Vanellus cinereus</i> |
| Grey Plover | <i>Pluvialis squatarola</i> |
| Pacific Golden Plover | <i>Pluvialis fulva</i> |
| Greater Sandplover | <i>Charadrius leschenaultii</i> |
| Lesser Sandplover | <i>Charadrius mongolus</i> |
| Kentish Plover | <i>Charadrius alexandrinus</i> |
| Little Ringed Plover | <i>Charadrius dubius</i> |
| Common Ringed Plover | <i>Charadrius hiaticula</i> |
| Common Snipe | <i>Gallinago gallinago</i> |
| Pintail Snipe | <i>Gallinago stenura</i> |
| Eurasian Curlew | <i>Numenius arquata</i> |
| Whimbrel | <i>Numenius phaeopus</i> |
| Long-billed Dowitcher | <i>Limnodromus scolopaceus</i> |
| Black-tailed Godwit | <i>Limosa limosa</i> |
| Bar-tailed Godwit | <i>Limosa lapponica</i> |
| Northern Greenshank | <i>Tringa nebularia</i> |
| Marsh Sandpiper | <i>Tringa stagnatilis</i> |
| Common Sandpiper | <i>Tringa (Actitis) hypoleucos</i> |
| Common Redshank | <i>Tringa tetanus</i> |
| Spotted Redshank | <i>Tringa erythropus</i> |
| Terek Sandpiper | <i>Xenus cinereus</i> |
| Nordmann's Greenshank | <i>Tringa guttifer</i> |

| | |
|------------------------|-------------------------------|
| Wood Sandpiper | <i>Tringa glareola</i> |
| Green Sandpiper | <i>Tringa ochropus</i> |
| Great Knot | <i>Calidris tenuirostris</i> |
| Red Knot | <i>Calidris canutus</i> |
| Broad-billed Sandpiper | <i>Limicola falcinellus</i> |
| Curlew Sandpiper | <i>Calidris ferruginea</i> |
| Red-necked Stint | <i>Calidris ruficollis</i> |
| Dunlin | <i>Calidris alpine</i> |
| Long-toed Stint | <i>Calidris subminuta</i> |
| Temminck's Stint | <i>Calidris temminckii</i> |
| Sanderling | <i>Calidris alba</i> |
| Ruff | <i>Philomachus pugnax</i> |
| Ruddy Turnstone | <i>Arenaria interpres</i> |
| Pallas' s Gull | <i>Larus ichthyaetus</i> |
| Brown-headed Gull | <i>Larus brunnicephalus</i> |
| Gull-billed Tern | <i>Sterna nilotica</i> |
| Little Tern | <i>Sterna albifrons</i> |
| Common Tern | <i>Sterna hirundo</i> |
| Greater Crested Tern | <i>Sterna bergii</i> |
| Lesser Crested Tern | <i>Sterna bengalensis</i> |
| Caspian Tern | <i>Sterna caspia</i> |
| Whiskered Tern | <i>Chlidonias hybrida</i> |
| White-winged Tern | <i>Chlidonias leucopterus</i> |
| Black Tern | <i>Chlidonias niger</i> |
| Indian Skimmer | <i>Rynchops albicollis</i> |

Annex 2

Natural Resources, Challenges and Opportunities for Environmental Conservation in Tanintharyi Region

Dawei Research Association (DRA)
June 2013
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1. Introduction:

Total area of Myanmar is about 261228 sq-miles and widest measurement from east to west is about 582 miles and longest measurement from south to north is about 1275 miles. Total length of border line is about 5200 miles and length of terrestrial border line with neighboring countries such as Bangladesh, China, Laos and Thailand is about 3808 miles. Coastal line start from Naff River in the north bordering to Bangladesh and Pachan River near Kawthaung in the south bordering to Thailand and total length is about 1385 miles.

Area of Tanintharyi Region is about 16735.56 sq-miles (10710757 acres) and covering 6.37% of the total area of Myanmar. Tanintharyi Region is bordering with Mon State in Myanmar in the northern part, Thailand in the eastern and southern parts and Andaman Sea in the western part. Total length from south to north is about 550 miles and the length of the widest part is about 68 miles.

Tanintharyi Region is composed of 3 districts such as Dawei, Myeik and Kawthaung, 10 townships and 6 sub-townships. The townships situated in each district and area of each township is shown in Table (1).

Table (1): Area of Townships in Tanintharyi Region.

| Sr. | District | Township | Area (sq-miles) |
|-----|-----------|------------------------|-----------------|
| 1 | Dawei | Dawei | 1647.99 |
| | | Laung lon | 355.92 |
| | | Thayet chaung | 829.62 |
| | | Ye byu | 1585.41 |
| | | Kalein aung (Sub-T/S) | 640.62 |
| | | Myittar (Sub-T/S) | 988.15 |
| 2 | Myeik | Myeik | 547.45 |
| | | Kyunsu | 1838.48 |
| | | Tanintharyi | 4380.15 |
| | | Pulaw | 1016.92 |
| | | Palauk (Sub-T/S) | 378.97 |
| 3 | Kawthaung | Kawthaung | 1041.39 |
| | | Boke pyin | 2504.08 |
| | | Kha mauk kyi (Sub-T/S) | 504.36 |
| | | Kara thuri (Sub-T/S) | 942.29 |

| | | | |
|--|--|-----------------------------|--------|
| | | Pyi gyi man naing (Sub-T/S) | 818.41 |
|--|--|-----------------------------|--------|

According to 2012-13 censuses, population of Tanintharyi Region is about 2 million and religions are Buddhism, Christian, Islam and Hindu. Majority of the population is Bamar (Dawei) and Karen.

2. Natural Resources:

According to geographical condition of Tanintharyi Region, plenty of monsoon rain available throughout the year. It has a long coastal line on the main land and many islands in the Andaman Sea those are covering with tropical rain forests and mangrove forests. Biodiversity is rich in those forests and various kinds of aquatic organisms can be found in the sea.

63.85 % of total area of the Tanintharyi region is covered by various kinds of forest types and 31.16 % of total area of the Tanintharyi Region is protected as Reserved Forests and Protected Public Forests and 32.69 % is situated outside the reserved forest as unprotected forests.

Tanintharyi Region has total 38 of Reserved Forests, Protected Public Forests and proposed reserved forests covering 5214.87 sq-miles (3337516.54 acres). Reserved, Public Protected and proposed reserved forests and covering areas are shown in Table (2).

Table (2): Reserved forests, Protected Public Forest and proposed Reserved Forests and covering areas in each township.

| Sr. | District | Township | Reserved Forest | Area (acres) | Area (sq-miles) |
|-----|----------|-----------|-----------------------------------|--------------|-----------------|
| 1 | Dawei | Dawei | Lu waing | 116490 | 182.01 |
| | | | Nwar la boe | 31320 | 41.94 |
| | | | Heindar (Protected Public Forest) | 19200 | 30.00 |
| | | Ye byu | Lu waing (remaining forest) | 91750 | 143.36 |
| | | | Kalein aung-Hein ze | 180701 | 282.35 |
| | | | Ba war | 44282 | 69.19 |
| | | | Pann din in | 1728 | 2.70 |
| | | | Tanintharyi Nature | 420076 | 656.37 |
| | | Laung lon | Laung lon | 40031 | 62.55 |
| | | | Maung magan | 255 | 0.39 |
| | | | Mee pya | 538 | 0.84 |

| | | | | | | | |
|---------------------|--|---------------|--|-------------|---|--------|--------|
| | | | Nghet thaik island | 216 | 0.34 | | |
| | | | Hmyaw yit Nature | 17672 | 27.61 | | |
| | | | Maung magan (Protected Public Forest-proposed) | 10042 | 15.69 | | |
| | | Thayet chaung | Min thar | 68113 | 106.43 | | |
| | | | Nwar la boe (remaining forest) | 38175 | 59.65 | | |
| | | | Pa wut | 9104 | 14.22 | | |
| | | | Taung pyaut | 1241 | 1.94 | | |
| | | 2 | Myeik | Myeik | Panar taung | 5922 | 9.25 |
| | | | | | Nat talin taung | 6922 | 10.82 |
| | | | | | Bo taung | 338.54 | 0.53 |
| | | | | | Ywar thit | 937 | 1.46 |
| | | | | | Myeik mangrove forest (Protected Public Forest) | 6827 | 106.69 |
| | | | | Tanintharyi | Taung pharu | 44696 | 69.84 |
| | | | | | Mayin kyi | 12897 | 20.15 |
| Nga wun | 297420 | | | | 464.72 | | |
| Nga wun (extension) | 161682 | | | | 252.63 | | |
| Tha kyat | 410606 | | | | 641.57 | | |
| Thein khon | 245222 | | | | 383.16 | | |
| Kyunsu | Auckland | | | 44995 | 70.30 | | |
| | Yay aye nghet thaik | | | 491 | 0.77 | | |
| | Katan (Protected Public Forest) | | | 85912 | 134.24 | | |
| | Kyunsu mangrove forest (Protected Public Forest) | 64000 | 100 | | | | |

| | | | | | |
|---|-----------|-----------|---------------------|--------|--------|
| | | Pu law | Mali nget thaik | 918 | 1.43 |
| 3 | Kawthaung | Kawthaung | Pa chan | 358780 | 560.59 |
| | | | Kaw ngar nget thaik | 33 | 0.05 |
| | | Boke pyin | Le nyar | 436480 | 682 |
| | | | Aung bar nget thaik | 53 | 143.36 |

3. Challenges:

The followings are major challenges for nature conservation implementations in Tanintharyi Region.

a. Industrial use plantations:

Main problem of deforestation in Tanintharyi Region is industrial use plantation projects of oil palm and rubber. Total of oil palm plantation allowed to Myanmar nationalities in Tanintharyi Region is 1896970 acres (2964.01 sq-miles). Oil palm plantations areas of 32854 acres (51.33 sq-miles) in Dawei District, 408221 acres (637.84 sq-miles) in Myeik District and 1455895 acres (2274.83 sq-miles) in Kawthaung District are allowed to companies owned by Myanmar nationalities. Until 2012-13, 19790 acres (30.92 sq-miles) in Dawei District, 38410 acres (60.01 sq-miles) in Myeik District and 269200 acres (420.62 sq-miles) were planted for oil palm. Remaining areas for oil palm plantation in Dawei District is 13064 acres (20.41 sq-miles), in Myeik District is 369811 acres (577.81 sq-miles) and in Kawthaung Districts is 1186695 acres (1854.21 sq-miles).

For rubber plantation, total areas of 298356 acres (466.18 sq-miles) were planted in Tanintharyi Region such as 119248 acres in Dawei District, 129565 acres in Myeik District and 49543 acres in Kawthaung District.

Shifting cultivations along the region is cultivated rice and sticky rice for basic consumption for local population. Other important plantation of betel nut is planted using traditional method along the region extensively.

b. Mining:

Mining has a long history in Tanintharyi Region. Out of 40 mining plants, renowned mining plants in the region are Heinda, Kyaukme taung, Her myin gyi, Ka lon htar, Nan thilar, Yadanarponand Thein daw. Main mining minerals are tin, wolfram, iron, diamond, gold and coal.

c. Constructions:

For objectives of convenient transportation and efficient border trade, various road networks such as Ye-Dawei-Myeik-Kawthaung, Nat ain taung, Myittar, Maw taung, Yadanarpon are constructing in the region.

New city development projects in the region are one of the main deforestation problems and inland forests and mangrove forest forests are destroyed by those projects. Other deforestation

problems concerned are business developments for factory constructions, industrial development zones such as Dawei Industrial Development Zone, expansion of military base and construction of military camps.

d. Timber production:

Timber production in Tanintharyi Region is implemented officially by Myanmar Timber Enterprise (MTE) under Ministry of Environmental Conservation and Forestry (MOECAAF). Official allowance by government, more than 30000 cubic tons is produced in each districts and townships in quota. Extracted timbers are used in local consumption, in country and for export.

Local consumptions are used in fish meal industries, dried prawn business, dried squid business, coal making business and residence constructions.

e. Development projects:

The biggest industrial development project in South East Asia and globally, Dawei Industrial Zone project covers 50992 acres (79.68 sq-miles). 220 meters (660 feet) wide and more than 100 miles long highway road is under construction in the region in the northern part of Tanintharyi Region and one dam is constructing to support for road construction.

Oil refinery project in Laung lon Township, Maw taung border trade and industrial development zone projects, hydropower projects on Tanintharyi River main stream and tributaries, deep seaport project in Boke pyin Township, oil palm and rubber plantations and mining projects by giant business companies are developing very rapidly in the region.

f. Fisheries industries:

Inshore and offshore fisheries are operating along Tanintharyi coastal region extensively. Various kinds of trawlers and squid fishing boats are using for fishing on several kinds of aquatic organisms such as fish, shrimp, squid, rays and crabs. Mesh size of trawlers are using illegal sizes to catch even small size organisms. Fish meal industries, dried shrimp business, dried squid business and fish/prawn cracker businesses are depending on firewood extensively. For those businesses, mangrove forests along the coastal region are cleared and destroyed in the region.

4. Opportunities in Environmental Conservation:

According to geographical location and natural resources, Tanintharyi Region is important along the history. Tanintharyi Region is rich in natural resources such as many islands, coastal regions, mangrove forests, terrestrial forests, rivers and watershed areas along the rivers, biodiversity, cultural heritages and customs or traditions of local ethnic groups.

a. Cultural heritages and customs or traditions of local ethnic groups:

Ancient cities such as Thargara, Hsin seik, Mottee, Wedi in Dawei District, Tanintharyi, Maw tone and Ban shaung in Myeik District are well-known in the region. Pre-historical evidences such as stone age weapons, bronze age weapons, ancient paintings on the stone in Ye kan aw

village in Kyunsu Township, Pyu Dynasty evidence, Bagan Dynasty evidence are found in the region.

Famous traditions of local ethnic groups such as Dawei Dain chin, Ye oe ywet (pot carrying) dance, Dawei language, Dawei loom in Dawei District, Tiger dance, believe in Tanintharyi shinma aung thar nat (spirit), Myeik language, locally believe in various kinds of nats (spirits), traditional cultures, traditional festivals in Myeik District are different from other parts of Myanmar. Such cultural and historical heritages are opportunities for development of cultural tourism in the region.

b. Pearl culture and Nghet thaik (bird nest) business:

Pearl culture and nghet thaik are well known businesses in the region in Myanmar. Well known pearl of South China Sea pearl was product of Myeik (Mergui) archipelago. Joint venture companies owned jointly by Myanmar nationality companies and Japan companies are operating pearl farms in Magyipin saung kyun, Zin yaw kyun, Do mei kyun and Sein hla kyun in Myeik archipelago. World biggest pearl was got from Mac cloud area in Kawthaung District in 2001.

Nghet thaik business is prominent business in Tanintharyi Region. Nghet theik (bird nest) is collected from the nest of the small kind of birds locally known as zewazoe. This business is running by licensed companies mainly in Mali island in Myeik District and Kaw ngar island in Kawthaung District. Myeik and some inland areas along the region are collecting nghet theik by attracting to the birds using artificial sound.

c. Fisheries:

Million dollar values of aquatic products from Tanintharyi coastal region are extracting every year. Lobster business is running by business persons in Sakhan thit, Kanmaw, Moe maline kyun, La ae, We kyun, Pyin sabu kyun, Hsin kyun. Soft shell crab business is operating in Ga nan kyun and Pahtaw-Pahtet kyun, Seaweed farming is running in Kyunsu Township, Grouper culture is running in Mawtone village in Kyunsu Township by business persons. Tiger shrimp hatchery is running by Department of Fisheries, Ministry of Livestock and Fisheries in Kyunsu Township. Lampi island has been protected as Marine Protected Area and ASEAN Heritage Park since 1996 by Forest Department. This is only one Marine National Park in Myanmar. Rich biodiversity, coral reefs and tropical rain forests on 804 islands in the Myeik (Mergui) archipelago and mangrove forests and various kinds of aquatic organisms along the coastal region are essential to implement effective conservation immediately.

d. Forest conservation:

There are 38 kinds of Reserved Forests, Protected Public Forests and Proposed Reserved Forests covers 3337516.54 acres (5214.87 sq-miles) in the Tanintharyi Region. Total area of 63.85 % of the Tanintharyi Region is covered by various kinds of forest types and 31.16 % of total area of the region is designated as Reserved Forests and Protected Public Forests and 32.69 % of total area is designated as outside Reserved Forests in the region.

Elephant, tapir, tiger, Gurney's pitta and horn bill can be found in the terrestrial forests, various kinds of fish and shrimp species, tortoise and turtles, 6 feet tortoise and crocodiles can be found in the freshwater and marine areas, various kinds of orchids, plant species can be

found in the forests, various kinds of bats can be found in the karst lime stone caves in the region. One of the prehistoric forest types of Sundaic Forest can be found in the southern part of the Tanintharyi Region.

Hot springs near famous Maung magan beach in Laung lon Township, Pe dat hot springs in Thayet chaung Township, Sin koe yat waterfall in Kalein aung Township, Nawa htat waterfall in Kyunsu Township, Karst lime stone caves near Thara bwin in Tanintharyi Township and Phayar htan in Boke pyin Township, Nghet thaik islands and other beautiful islands in remote areas are very good opportunity for ecotourism business in the region. Myinmo lat khat environs, Tanintharyi environs, Le nyar National Park environs and Tanintharyi Nature Reserve environs are the best areas for implementation in environmental conservation.

e. International NGOs and local civil societies working in the region:

The followings are international NGOs and local civil societies who are working in the region.

1. UNDP, UNHCR, UNICEF
2. Physicians' medical care group
3. PSI
4. Yetagon civil society group formed by oil and gas companies based in Kan bauk
5. DDA, DRA, ESNRD, CSLD, ADFB, ALC, Banchaung Development Committee, Taninthary River Watch Committee, Takapaw-Karen group, Kalone htat Village Development Committee, Young Members of Buddhism Association, more than 50 local religious and civil associations in Dawei region
6. 88 generation, Myeik District Nature Conservation Association, Freelance physicians association, Tanintharyi old city conservation committee, more than 30 local religious and civil associations in Myeik region

These organizations are doing activities as their objectives in civil societies, nature conservations, literacy and cultural conservations, capacity buildings among the public, human rights, land conflicts, medical cares, educations, public awareness raisings and media.

5. Discussion & Comments:

Tanintharyi Region is included in Myanmar's least developed States and Regions. Main facing problems of the region and local communities are instability of the region caused by political situation among the ethnic groups, remote from the governing by national government, inaccessibility of roads, few media available in the region, low implementation in education and health care developments, most of local communities are working illegally in the neighboring countries and low law enforcement in the border areas.

Many wars happened in the region along the history because of geographical situation and natural resources. At the present moment, oil palm and rubber plantations, mining, construction of basic infrastructures, logging and fisheries are implementing by business companies. For official land ownership, not only national companies but also international companies such as ITD are trying in the government.

Population density in the region is only about 30/ sq-mile. Only 2 million populations are living in 16735.56 sq-miles area of the region. Beautiful scenes, rich biodiversity and numerous natural resources along 500 miles long coast line and 804 islands in the Myeik archipelago are prominent features of the region. Most of the forest covered and beautiful scenes, rich biodiversity and natural resources were destroyed by above projects and business companies in the region.

The remaining good forest cover areas in the region are remote areas near border, formerly political conflict areas and areas where no law enforcement by government authority such as Myinmo let khat environs, Tanintharyi environs, Le nyar environs and islands in the Myeik Archipelago. Environmental conservation projects should be implemented immediately in those areas.

The southernmost part of Tanintharyi Region in Myanmar has long history of traditional cultures, different socioeconomic conditions among local stakeholders, different religious and believe in, islands in the Myeik Archipelago, long coast line, rivers and watershed areas, mangrove forests, high mountains and tropical rain forests, sea and forests on the islands and rich in biodiversity.

Nature conservation projects and ecotourism business are good potentials for implementation of development of the region. Development of basic infrastructures such as peace development of the national government with ethnic groups, changing of political situation, development in nature conservation capacity among the local communities, good communications, etc are good support for implementation of green growth economy in the region and also in the country.

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7. Interviewees:

1. Ministry of Environmental Conservation and Forestry, Regional, District and Township level departments

2. Myanmar perennial crop department, Ministry of Agriculture and Irrigation, Regional and District level departments
3. Land Record Department, Ministry of Agriculture and Irrigation, Regional level department
4. Local communities of Kawthaung District
5. Local communities of Myeik District
6. Local communities of Dawei District

Dawei District

| Sr. | Village | Township | Lat. (N) | Lon (E) |
|-----|---------------|-------------------|-------------|-------------|
| 1 | Myittar | Myittar (sub-T/S) | 14° 09' 50" | 98° 31' 33" |
| 2 | Ban chaung | Myittar (sub-T/S) | 13° 54' 35" | 98° 37' 28" |
| 3 | Thapu chaung | Myittar (sub-T/S) | 14° 14' 10" | 98° 25' 38" |
| 4 | Myay khan baw | Myittar (sub-T/S) | 14° 17' 38" | 98° 27' 20" |
| 5 | Bawa pin | Dawei | 14° 09' 42" | 98° 23' 65" |
| 6 | Wa kone | Dawei | 14° 11' 02" | 98° 23' 08" |
| 7 | San lan | Laung lon | 13° 56' 35" | 98° 05' 03" |
| 8 | Ka lone htar | | 14° 17' 14" | 98° 16' 43" |

Myeik District

| Sr. | Village | Township | Lat. (N) | Lon (E) |
|-----|--|-------------|-------------|-------------|
| 1 | Tanintharyi | Tanintharyi | 12° 05' 09" | 99° 00' 49" |
| 2 | Myanm Naing Myint company | Tanintharyi | 12° 08' 53" | 98° 57' 35" |
| 3 | Pyae Phyo Tun company | Tanintharyi | 12° 46' 13" | 98° 43' 17" |
| 4 | Shwe Kanbawza company | Tanintharyi | 11° 57' 28" | 99° 03' 05" |
| 5 | Taung pine shwe yaung alin tan company | Tanintharyi | 11° 51' 23" | 99° 06' 53" |
| 6 | Vintage company | Myeik | 12° 40' 33" | 98° 43' 38" |
| 7 | Maw taung | Tanintharyi | 11° 47' 45" | 99° 37' 42" |

Kawthaung

| Sr. | Village | Township | Lat. (N) | Lon (E) |
|-----|--------------------|-----------------------------|-------------|-------------|
| 1 | Yuzana | Kawthaung | 10° 52' 25" | 98° 43' 23" |
| 2 | Po kaung | Kawthaung | 10° 41' 03" | 98° 34' 59" |
| 3 | Annawar Tun | Kawthaung | 10° 44' 33" | 98° 35' 43" |
| 4 | Aung zin mar | Kawthaung | 10° 44' 27" | 98° 35' 39" |
| 5 | Taung Dagon | Boke pyin | 11° 06' 51" | 98° 44' 02" |
| 6 | Taw win shwe pale | Pyi gyi man naing (Sub-T/S) | 11° 42' 30" | 99° 04' 50" |
| 7 | Star International | Kawthaung | 11° 21' 51" | 98° 36' 19" |
| 8 | Htoo company | Boke pyin | 11° 45' 45" | 99° 06' 43" |