Myanmar Biodiversity

Conservation Investment Vision

Ministry of Environmental Conservation and Forestry
MOECAF

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WILDLIFE CONSERVATION SOCIETY

Myanmar Biodiversity Conservation Investment Vision

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Foreword

Myanmar is one of the most biologically diverse countries in Asia. This biodiversity is a gift of our geographical location linking Southeast Asia to South Asia and the Himalayas to the Andaman Sea. As the Union Minister of the Ministry of Environmental Conservation and Forestry I oversee the management and conservation of these great resources. During my tenure as Minister, MOECAF has developed a number of policies to achieve effective biodiversity conservation and sustainable landuse in our country.

The thirty year National Forest Master Plan sets a goal for 10% Protected Area coverage across the country as does the Myanmar National Biodiversity Strategy and Action Plan. Under our obligations as a signatory of the Convention on Biological Diversity we will strive to protect 17% of land and 10% of Coastal and Marine areas. Biodiversity is not protected because of plans or international agreements we protect biodiversity because millions of Myanmar citizens rely on it for their daily needs, food, shelter and livelihoods.

Biodiversity is not just Tigers and Elephants it is much, much more. Our rice and our fish, the teak houses of the rich and the bamboo houses of the poor, the watersheds for our hydropower to the scenic splendors and world travelers now come here to see. From the medicinal plants of the snow-capped Hkakaborazi to the great Teak forests of Sagaing and Bago Regions to the Bay of Bengal teeming with marine life, our citizens rely on biodiversity our natural treasure; and like any treasure it cannot be left untended if we expect it to grow, nor can it be left unprotected. This great treasure has built our Country and if managed well it will ensure that we shall continue to prosper.

The Ministry of Environmental Conservation and Forestry collaborated with a broad range of key stakeholders in this visioning exercise for Myanmar Biodiversity Conservation in January 2012. This document is a significant output of this exercise laying out priority species, sites and corridors, as well as highlighting the threats, and root causes of those threats that these conservation priorities face. This information was compiled to envision a strategic direction for the country. The Myanmar Biodiversity Conservation Investment Vision does not set out to have all the answers. In fact, I am sure that there are still many questions to come but as the title states it is a vision. A vision that states we must carefully plan for our future use of biodiversity. That acknowledges the need for an inclusive and integrated approach since the Government cannot manage this great wealth alone and that these resources are vital for all citizens to adapt to the future uncertainty of climate change.

I thank the staff of all relevant departments, experts from universities and the many members of the civil society organizations from Myanmar and abroad. Please join me to work together and protect our great natural treasure, biodiversity, not just for the few but for all citizens and the generations yet to come.

H.E. U Win Tun
The Union Minister
Ministry of Environmental Conservation and Forestry
The Republic of the Union of Myanmar

Foreword

The Wildlife Conservation Society (WCS) has worked in partnership with the Myanmar Forest Department and other national and international organisations to help conserve the Myanmar's wildlife and wild places since 1993. It is therefore great pleasure now to be involved in working with our local and global conservation partners to help produce the Myanmar Biodiversity Conservation Investment Vision, a critical resource at such an incredibly important time in the country's history.

At the crossroads of the Himalayas and South-east Asia, Myanmar is a true regional hotspot for a wealth of unique biodiversity. Take tortoises and freshwater turtles for example, a group of animals that WCS takes a specific interest in. Myanmar has 26 species, eight of which are endemic - found nowhere else on the planet. Yet tragically, despite having been around since before the time of the dinosaurs, they are now under great threat of extinction due to over exploitation and more than half of the species found in Myanmar are now globally classified as Critically Endangered or Endangered by IUCN.

This one group of animals epitomizes not only the degree of urgency for conservationists in Myanmar but also the opportunity in what is possible. In Myanmar for example a core of local turtle biologists has created one of the world's most successful turtle conservation projects. The endemic Myanmar Roofed Turtle, previously though extinct, was rediscovered in 2002, a resident population is now successfully protected on the Upper Chindwin River and in two captive assurance colonies of adult and juvenile animals elsewhere in the country. With this commitment the total known world population has risen from less than 10 to over 600 individuals in ten years.

The challenge now facing Myanmar, as the country opens to global investment in a way never seen before, is to build on such efforts and secure the long-term future of the country's endangered biodiversity and unique habitats at a scale on which they, and a large percentage of Myanmar's human population, depend. Much of the success of the country's future economic development and environmental sustainability will depend on sensible and strategic land-use planning decisions.

Through working together and, among other things, collating and making available critical information on the value and distribution of Myanmar's biodiversity, the conservation community has a critical role to play in the country's development, and the information contained herein the Myanmar Biodiversity Conservation Investment Vision is just a first step.

WCS looks forward to continuing to work with all our partners in Myanmar on the next steps in this process and joining together in a vision for Myanmar that firmly places the environment and biodiversity conservation at the core of the country's economic development.

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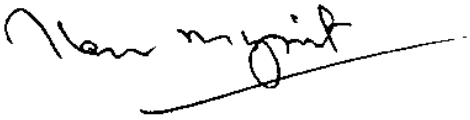
We also wish to thank U Aye Myint Maung, Deputy Minister for Environmental Conservation and Forestry, U San Lwin, Director General (Retired) and U Tin Tun, Director General of the Planning and Statistic Department, as well as Dr. Nyi Nyi Kyaw, Director General of the Forest Department, for their invaluable assistance in hosting this meeting and supporting directions for wide distribution of its results for the betterment of biodiversity conservation in the country.

In particular we thank U Win Naing Thaw, Director of the Nature and Wildlife Conservation Division who contributed his knowledge and ideas and continues to strive to improve the management of the country's protected areas as the cornerstone for biodiversity conservation.

From the Department of Fisheries we are grateful to U Khin Ko Lay, Director General as well U Mya Than Tun, Assistant Director for their commitment to the conservation of Myanmar's aquatic resources.

We appreciate the active involvement of all participants from universities, both local and international non-governmental organizations, UN agencies and the private sector for their extensive contributions to the workshop and follow-up activities.

This process was made possible through the support of the John D. and Catherine T. MacArthur Foundation and we look forward to their continuing support for conservation as well as the support of donor organizations such as Blue Moon Fund, AusAID, USAID and SwissAID for the conservation of Myanmar biodiversity.



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Executive Summary

Geographically, Myanmar is situated on the dividing line between the Indian sub-continent and South-east Asia, and holds incredibly rich biodiversity and habitats. Since independence in 1948 the country has virtually stood still, and this isolation, coupled with has resulted in an exceptional diversity of habitats and a rich biodiversity that has escaped the path of over-exploitation followed by its more developed neighbors. Myanmar is undergoing a rapid transition from one of the world's most isolated countries to an emerging democracy and opening up to the world through increased international investment. Therefore, environmental conservation in parallel with economic development opportunities is one of the greatest challenges for Myanmar in the 21st Century.

In January 2012, the Wildlife Conservation Society with the support of the John D. and Catherine T. MacArthur Foundation, assembled over 80 of the country's environmental experts from civil society and government to discuss the current status of the country's biodiversity, the threats it faces and the priorities for future investment to ensure that it is sustained. The results of this are the first steps in a process of government and civil society working together for environmental conservation in Myanmar.

The process identified all species of conservation concern found in the country, as currently assessed by the Red List of IUCN. This includes over 100 species classified as globally Endangered and Critically Endangered. In many cases the remaining habitats in Myanmar are globally important for these species survival because large tracts of habitat still remain. Many other species groups are too poorly studied and insufficiently known to understand their true status.

Using international criteria stakeholders also identified and prioritized 132 Key Biodiversity Areas (KBAs) throughout the country. These sites are defined as areas holding significant populations of species of high conservation concern. The information used to identify and prioritize KBAs is still patchy and often outdated, new information is needed to update priority KBAs. At present only 25% of these areas are afforded any legal protection.

Such sites cannot function as separated entities and connectivity is required to ensure that the full range of environmental services continue to function, and, following a standard process, sites were grouped together to identify conservation corridors, which cover almost 60% of the country. These corridors have been defined as the cornerstone of biodiversity conservation in Myanmar. In moving ahead, connectivity and compatible land uses need to be planned to keep natural systems intact for biodiversity and human well-being.

However, this rich biodiversity is under increasing threat. Through this process stakeholders identified human encroachment, commercial over-exploitation of animals and fish, agricultural expansion and logging as the greatest current threats. The additional threat of climate change is poorly understood, and although not identified as a high concern currently this is likely to change in the near future. The roots causes of these threats were also discussed extensively, of particular concern were low conservation awareness, poverty, weak systematic biological monitoring systems, low grassroots support for conservation and weak law enforcement.

Moving forward government and civil society actors prioritized the following actions through this process:

- *Expand Conservation Action in KBAs* – This includes the improvement and expansion of the national protected area system, as well as piloting new management systems engaging communities and the private sector in conservation.

- *Mainstream Biodiversity Conservation into National Development Planning* – Renewed interest in foreign investment in the country will result in new infrastructure, industry and expanded agricultural production. Biodiversity and environmental services need to be carefully considered in relation to these developments.

- *Target Conservation Actions for Priority Species* – Despite effective conservation across KBAs certain species (eg tiger, Asian elephant and Irrawaddy dolphin) need specific conservation action immediately. Many of these species are specifically targeted by illegal trade or are poorly known and further research is necessary to understand how they can be effectively conserved.

- *Increase Public Participation and Awareness* – Biodiversity conservation cannot be achieved solely through government run programs. The participation of the citizens of Myanmar is an integral part of the process and a broader engagement of civil society is necessary to achieve conservation success.

- *Identify No-regrets Actions for Ecosystem-based Global Climate Change Adaptation* – Future consequences of global climate change is difficult to predict but all stakeholders agreed it is better to err on the side of caution, expanding the protected area network to maintain viable populations, maximize adaptive capacity and potentially capture *refugia*. This process should prioritize large intact landscapes and ensure functional connectivity beyond protected areas.

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ACRONYMS

AB	:	Absent
AHP	:	ASEAN Heritage Park
AZE	:	Alliance for Zero Extinction
BANCA	:	Biodiversity and Nature Conservation Association
CEPF	:	Critical Ecosystem Partnership Fund
CBD	:	Convention on Biological Diversity
CO	:	Confirmed Occurrence
CR	:	Critically Endangered
DD	:	Data Deficient
DoF	:	Department of Fisheries
EIA	:	Environmental Impact Assessment
EN	:	Endangered
EbA	:	Ecosystem-based Adaptation
FD	:	Forest Department
GAD	:	General Administration Department
GT	:	Globally Threatened
GCM	:	Global Circulation Models
IBA	:	Important Bird Area
INGO	:	International Non Governmental Organization
IPCC	:	Intergovernmental Panel on Climate Change
IUCN	:	International Union for Conservation of Nature and Natural Resources
KBA	:	Key Biodiversity Area
LC	:	Least Concern
LNGO	:	Local Non Governmental Organization
MOECAF	:	Ministry of Environmental Conservation and Forestry
MTE	:	Myanma Timber Enterprise
NCEA	:	National Commission for Environmental Affairs
NI	:	No Information
NPA-A	:	Notified Protected Area – Aquatic
NPA-T	:	Notified Protected Area – Terrestrial
NT	:	Near Threatened
NTFP	:	Non Timber Forest Product
NWCD	:	Nature and Wildlife Conservation Division
PAS	:	Protected Area System
PES	:	Payment for Ecosystem Services
PPA-A	:	Proposed Protected Area – Aquatic
PPA-T	:	Proposed Protected Area – Terrestrial
PPF	:	Public Protected Forest
RAMSAR	:	Ramsar Wetlands of International Importance
RF	:	Reserve Forest
SEA	:	Strategic Environmental Assessment
SIA	:	Social Impact Assessment
SO	:	Suspected Occurrence
UK	:	Unknown
VU	:	Vulnerable
WCS	:	Wildlife Conservation Society
YCDC	:	Yangon City Development Committee

1. Introduction

In 2004 the Critical Ecosystem Partnership Fund (CEPF), through Biodiversity and Nature Conservation Association (BANCA) and Birdlife Interntional, supported a priority setting exercise to better understand biodiversity conservation priorities in Myanmar, resulting in the publication of *Myanmar: Investment Opportunities in Biodiversity Conservation 2005* (Tordoff *et al*. 2005). This document builds on and updates that earlier work to provide a current review of priorities and biodiversity conservation investment opportunities in 2012 and beyond.

The Wildlife Conservation Society (WCS), with the financial support of the John D. and Catherine T. MacArthur Foundation, coordinated this process. The process began with structured interviews of key stakeholders from government agencies, local and international NGOs, universities and private citizens. The results of the interviews were compiled and used as the starting point for a two-day workshop held in Yangon on January 17-18, 2012. The results of the stakeholder process and the workshop discussions were then assembled into the results presented herein.

85 stakeholders participated in the January 2012 workshop of those 44 participated in the interview process. For a complete list see **Appendix 2**.

2. Current Situation

In the past 18 months Myanmar has experienced a rapid shift towards democracy and is well on the way to ending years of isolation from the international community. The new government has paid special attention to environmental issues and taken several noteworthy actions to postpone publically opposed infrastructure projects based on public outcry. Many believe that this is just the beginning of more positive changes yet to come.

For the purposes of this report we consider two primary government agencies, the Forest Department and the Department of Fisheries.

The Forest Department is the primary department of the Ministry of Environmental Conservation and Forestry. This department is in charge of all management of forestlands including logging and protected areas. The ministry is newly renamed, it was previously the Ministry of Forestry, to highlight the increased role it will play in conservation of the environment in the future. The Environmental Conservation Law adopted on 30 March 2012 created a new Environmental Conservation Department. This new department will conduct Environmental Impact Assessments (EIAs) and Social Impact Assessments (SIAs) as well as the required environmental planning and monitoring of a growing number of future development projects in the country. The exact structure and role is outlined in the Environmental Conservation Law. Under the new law an Environemental Conservation Committee, headed by the minister, will be formed to develop, implement and oversee environmental conservation activities. The committee will take on the role of what was formally known as the National Commission for Environmental Affairs (NCEA).

Within the Forest Department, the Nature and Wildlife Conservation Division (NWCD) oversees the management of protected areas in the country as well as information pertaining to flora and fauna.

The Department of Fisheries, in the Ministry of Livestock and Fisheries, is just recently exploring a more active role in the conservation of aquatic resources. They have now created several protected areas and work closely with LNGOs and INGOs to manage these areas.

3. Conservation Outcomes

Conservation Outcomes are considered for Species, Key Biodiversity Areas and Conservation Corridors.

3.1. Species

Priority species for conservation were assessed based on four criteria:

- Globally Threatened (GT) species
- GT species with a globally significant population in Myanmar
- GT species with globally significant populations in the area and society can have a meaningful role in their conservation
- GT species with globally significant populations in the area and society can have a meaningful role in their conservation and/or it is urgent that current/committed contributions are stepped up

The criteria follow those used by CEPF to assess species across the Indo-Burma Hotspot (Tordoff *et al.* 2011). In a few cases species that are not considered Globally Threatened but are at significant risk in the region, and have significant populations within Myanmar, are highlighted as conservation priorities for the country.

Table 1: Priority Species for Conservation

Species Groups	CR	EN	VU
Mammals	3 (4)	21 (9)	25 (26)
Birds	7 (4)	11 (8)	29 (33)
Reptiles	7 (4)	11 (10)	9 (7)
Plants	18 (13)	16 (12)	16 (13)
Amphibians	-	-	-
Fishes	3	3	105
Aquatic Invertebrates	-	3	44
Totals	**38**	**65**	**228**

Notes: (X) indicate numbers from Tordoff *et al*. 2005
Conservation status (CR, EN, VU) is based on IUCN 2011 as accessed November 1, 2011

3.1.1. Mammals

Myanmar has 49 Globally Threatened mammal species as well as 16 Near-Threatened and 26 Data Deficient mammal species. This assessment considers Myanmar's diverse marine mammal fauna as well as its terrestrial fauna. Of these species 19 have been chosen as priorities based on the criteria outlined above.

Sumatran Rhinoceros *Dicerorhinus sumatrensis* and Javan Rhinoceros *Rhinoceros sondaicus* are listed as Critically Endangered but are probably extinct in Myanmar (Rabinowitz *et al.* 1995; Choudhury 1997; Rabinowitz & Saw Tun Khaing 1998).

Although occasional reports of rhinos are still heard none of these has been substantiated. There are a few pockets of forest that remain off limits because of security concerns and these areas should be surveyed when it is safe to do so. However, discussions with key stakeholders suggest that both species appear to have gone from all accessible areas of suitable habitat. Another species, Indian Water Buffalo *Bubalus arnee* is listed, as Endangered but it is unclear if any truly wild population still exists. This species has had considerable overlap with the widespread domesticated form of this species and all remaining populations may descend, at least in part, from feral domestic animals rather than truly wild ones (Hedges *et al.* 2008; Aryal *et al.* 2011).

The recently described Myanmar Snub-nosed Monkey *Rhinopithecus strykeri* is a recently discovered species from the mountains near the Chinese border in eastern Kachin State. This species is considered Critically Endangered, making it the only Critically Endangered mammal still confirmed to be extant in the country (Geissmann *et al.* 2010). This species is the subject of intensive research and its small known global range is being proposed for protected area status. Two other restricted range primates Shortridge's Langur *Trachypithecus shortridgei*, and Western Hoolock Gibbon *Hoolock hoolock* are considered in need of more directed conservation action although there are ongoing programs in portions of their known range (Mittermeier *et al.* 2007; Ngwe Lwin *et al.* 2011). A third species Tenasserim Lutung *Trachypithecus barbei* is currently considered Data Defecient although its small known range and limited numbers of recent field sightings suggest that it is likely to be Globally Threatened once it can be assessed and is therefore included as a current priority (Geissmann *et al.* 2004).

Two species that might turn out to be widespread but are presently known from very few recent records across the country are Hog Deer *Axis porcinus* and Fishing Cat *Prionailurus viverrinus*. These species occur in non-forested areas usually outside existing protected areas and have possibly been under recorded by recent fieldwork. Specific conservation action targeting these species and their fragmented habitats is urgently needed (Than Zaw *et al. in prep*).

Another two species, Banteng *Bos javanicus* and Eld's Deer *Rucervus eldii* are tied almost exclusively in the country to the deciduous forests of central Myanmar (Mcshea *et al.* 2001). Both species have been heavily hunted and have seriously fragmented populations. Populations of both species have not been assessed recently (Myint Aung *et al.* 2001).

The two species of pangolin found in the country: Sunda Pangolin *Manis javanica* and Chinese Pangolin *Manis pentadactyla* are severely threatened by intensive harvesting for trade to China. This is occurring across the entire species range and it is likely that much of the Myanmar population has already been significantly reduced (Duckworth *et al.* 2008).

Asian Small-clawed Otter *Aonyx cinerea* and Smooth-coated Otter *Lutrogale perspicillata* are currently listed as Vulnerable, while a third species Hairy-nosed Otter *Lutra sumatrana* is listed as Endangered. These species have been harvested primarily for their fur, which was used for traditional clothing by ethnic Tibetan communities in China. Recent reports indicate that this trade may be declining, but otter populations have already been almost eradicated across much of the country (Rao *et al.* 2005; Than Zaw *et al.* 2008; Rao *et al.* 2010).

In the eastern Himalayas in the far north of the country the species of greatest concern is the Black Musk deer *Moschus fuscus* which is heavily poached and traded for medicinal use in China (Than Zaw *pers comm*). According to local reports this species has been

heavily hunted across northern Myanmar and is now rarely encountered (Rao *et al.* 2011).

In the marine realm Irrawaddy Dolphin *Orcaella brevirostris* and Dugong *Dugong dugon* are both considered priorities. The dolphin has an inland population on the Ayeyawady River that is already receiving intensive conservation support but coastal populations are still in need of action (Han Win 2012). The Dugong has also had a few short-term surveys looking at its sea grass habitat but is yet to receive any directed conservation action (Mya Than Tun *pers comm*; Ilangakoon & Tint Tun 2007).

Two other species that are at risk across the Indo-Burma Hotspot are considered as priorities for Myanmar. Asian Elephant *Elephas maximus* is still widespread across the country in small, decreasing populations. This species, like elsewhere in the region, is of great cultural value to the country and significant numbers of wild caught animals are still domesticated annually (WCS 2011). Tiger *Panthera tigris* is perhaps the greatest recipient of current conservation funding although even this considerable investment is not succeeding in conserving them. The Tiger population in Myanmar has been drastically reduced due to direct poaching, prey depletion and habitat loss in recent years and only two or three small populations are believed to persist (Lynam *et al.* 2009; MOECAF 2010; Myint Maung 2011).

3.1.2. Birds

There are 47 Globally Threatened bird species in Myanmar with seven listed as Critically Endangered. Two of these species are probably extinct in the country, of which one is possibly globally so. The formerly widespread White-shouldered Ibis *Pseudibis davisoni* has not been seen in Myanmar since the 1940s (Birdlife International 2012). The Pink-headed Duck *Rhodonessa caryophyllacea* was the focus of several intensive searches in the early 2000s, which did not produce any reliable records despite visiting most of the remaining superficially suitable habitats (Tordoff *et al.* 2008).

In addition, the country holds six endemic species. These include Jerdon's Minivet *Pericrocotus albifrons,* Hooded Treepie *Crypsirina cucullata,* Burmese Bushlark *Mirafra microptera,* Burmese Tit *Aegithalos sharpie,* White-throated Babbler *Turdoides gularis,* and White-browed Nuthatch *Sitta victoriae.*

The country still has important populations of five Critically Endangered species. This includes White-bellied Heron *Ardea insignis* a species formerly found through northern and western Myanmar but now restricted in the country to the most remote waterways in the eastern Himalayas (Thet Zaw Naing *et al. in prep*). Myanmar hosts possibly the largest wintering population of Spoon-billed Sandpiper *Eurynorhynchus pygmeus*; this very unique and charismatic species is threatened by incidental hunting on its coastal wintering grounds as well as a series of other poorly understood threats along its long migration path (Pain *et al.* 2011). Myanmar is also still home to several populations of Critically Endangered vultures including White-rumped Vulture *Gyps bengalensis*, Slender-billed Vulture *Gyps tenuirostris*, and Red-headed Vulture *Sarcogyps calvus,* these species are all wide-ranging and heavily reliant on dead domestic animals to feed on. This reliance on livestock in human dominated landscapes highlights the need to consider conservation action beyond protected areas and consider threats and opportunities in the wider landscape to ensure these species can survive (Htin Hla *et al*. 2010).

There is a suite of rare but widespread species reliant on undisturbed forested streams, including White-winged Duck *Cairina scutulata*, Masked Finfoot *Heliopais personatus*,

and Green Peafowl *Pavo muticus*. Each of these species is threatened by human disturbance and hunting. Their shy and retiring nature as well as their remaining distribution is primarily remote areas makes their true population status difficult to assess. White-winged Duck and Green Peafowl appear to be still widespread in the northwest of the country (Tordoff *et al.* 2007). But there are very few recent records of Masked Finfoot despite considerable searching in areas they were regularly found in only a few years ago (Tordoff *et al.* 2007; Birdlife International 2012).

Myanmar is home to the bulk of the world's population of Gurney's Pitta *Pitta gurneyi*. In the 1990s this species was known only from a very small population in southern Thailand but survey work in the past ten years has shown the bird to be relatively widespread in Taninthayi Region. This discovery resulted in the down listing of the species by Birdlife International from Critically Endangered to Endangered in 2008. Despite the larger population the species is still at great risk from the conversion of its forest habitat to oil palm and other land uses (Eames *et al.* 2005; Donald *et al.* 2009).

Of Myanmar's six endemic birds, White-browed Nuthatch *Sitta victoriae* is considered the most threatened. It is found in oak woodland on the peak of Natmataung (Mount Victoria) and nearby peaks in the Chin Hills. Although this habitat is under limited threat, forest fire is a regularly occurring threat as it expands from nearby shifting cultivation plots and such a localized species may have only a very limited ability to adapt to climate change (Thet Zaw Naing 2003).

As elsewhere in the region large water birds have decreased greatly across the country and continue to be threatened by persecution and human disturbance to their nesting and feeding areas. This includes Greater Adjutant *Leptoptilos dubius*, Lesser Adjutant *Leptoptilos javanicus*, and Sarus Crane *Grus antigone*. A fourth species Black-necked Stork *Ephippiorhynchus asiaticus* is not considered Globally Threatened but it has declined dramatically in all neighboring countries. It is currently only listed as near threatened because of a large and relatively stable population in Australia and southern New Guinea. Important populations of most of these species still occur in Kachin State, Sagaing Region and in the Ayeyawady Delta, although the current status of Greater Adjutant in the country is unknown (Birdlife International 2012).

Two species restricted to large sandy rivers have also decreased dramatically in recent years. Indian Skimmer *Rynchops albicollis* and Black-bellied Tern *Sterna acuticauda* once nested on the Ayeyawady and its major tributaries but recent sightings have been few and decreasing. It is possible that both species have almost completely disappeared from their former range in Myanmar but more information is still needed. The Black-bellied Tern is still only listed as near threatened but it is likely to be uplisted in the near future since it is in continued decline in India and has almost totally been lost from Southeast Asia (Birdlife International 2012).

Two poorly known and difficult to find babbler species are also of conservation priority in the country. Rufous-rumped Grass-babbler *Graminicola bengalensis* was previously found in Taninthayi (Tennasserim) but has not been found in recent times. Jerdon's Babbler *Chrysomma altirostre* was formerly found across the Ayeyawady and Sittaung Plains but has not been seen since the mid-1940s. It has been suggested that the race of Jerdon's Babbler once found in Myanmar is extinct but no recent surveys have been undertaken to confirm this (Robson *in litt*). The Rufous-rumped Grass-babbler is included in the list, although only currently listed as near threatened, because it has not been found recently in Myanmar and its population in Thailand is thought to be extinct. Recent taxonomic research also suggests that the population in the country is

taxonomically distinct from the taxon found in India and more closely linked to birds found in southern China (Leader *et al.* 2010).

3.1.3. Reptiles

Tortoises

Four species of tortoises are known to occur in Myanmar: *Geochelone platynota, Manouria emys, Manouria impressa,* and *Indotestudo elongata*. Of these, all are threatened to some extent by a combination of subsistence and commercial harvesting, over-collection for the pet trade, and to a lesser extent, habitat destruction. Conversion of natural vegetation to agricultural land is primarily a threat to tortoises in the Dry Zone. Elsewhere in Myanmar, tortoises often inhabit secondary vegetation that invades abandoned swidden fields, suggesting habitat destruction is a lesser threat provided tortoises can avoid subsistence hunters.

Geochelone platynota, a species endemic to the Dry Zone now appears to be "ecologically extinct" in the wild (Platt *et al.* 2011b). However, the species adapts well to captivity and given appropriate husbandry methods, reproduces readily. At present over 1100 are maintained in assurance colonies and plans to reintroduce *G. platynota* to Minzontaung Wildlife Sanctuary and perhaps elsewhere are being developed (Platt *et al.* 2011a).

Indotestudo elongata apparently occurs throughout much of the country in a variety of habitats ranging from desert-like scrub of the Dry Zone to moist evergreen forest in the Rakhine Yomas. Healthy populations remain in some remote areas (e.g., Rakhine Yomas; Platt & Khin Myo Myo 2009), although this tortoise is subject to subsistence harvesting wherever it occurs in close proximity to humans. Moreover, large numbers are illegally exported to markets in southern China (Platt *et al.* 2000). Current harvest levels are clearly unsustainable and field surveys suggest many populations are declining, particularly in the Dry Zone (Platt *et al.* 2001b).

The current conservation status of *M. emys* and *M. impressa* remains poorly known. Although *M. emys* is known from mountain ranges in western and eastern Myanmar, there are few recent records from anywhere in the country (Platt *et al.* 2001a). All available evidence indicates this large tortoise is subject to intense exploitation wherever found. Indeed the only recent records of known provenance are shells of tortoises eaten by villagers. Furthermore, recent confiscations of tortoises at border crossings suggest large numbers are being harvested for illegal export to China. Collectively these pressures constitute a serious threat to the continued viability of wild populations, and conservation action for *M. emys* is urgently warranted. There is little information on the conservation status of *M. impressa* and even its distribution within Myanmar is poorly known. *M. impressa* is apparently confined to mountain ranges in western and eastern Myanmar (Iverson 1992; Platt *et al.* 2001c), although only a handful of specimens exist. Shells recovered in villages and confiscations at border crossings indicate *M. impressa* is subject to both subsistence and commercial harvesting.

River Turtles

Two large river turtles, *Batagur baska* and *Batagur trivittata*, are known from Myanmar. Both species were historically common in the larger rivers (Thanlwin, Sittaung, Ayeyawady , and Chindwin) and estuaries of Myanmar (Thorbjarnarson *et al.* 2000a; Platt *et al.* 2006). However, because these turtles nest colonially on undisturbed sandbanks and eggs were sought for domestic consumption and sale in local markets, population declines due to chronic egg collecting were noted over 100 years ago. Moreover, fishermen ate adult turtles, the most demographically important segment of

the population, and sandbank nesting habitat was destroyed by seasonal cultivation during the dry season. Consequently, these two species are considered to be among the most endangered turtles in the world (Rhodin *et al.* 2011). Currently, a small remnant population of *B. trivittata* consisting of <20 reproductive females is known to inhabit a restricted stretch of the upper Chindwin River where it is threatened by beach destruction, gold mining, and incidental take by fisheries activities (Rhodin *et al.* 2011; Platt *et al.* 2012a). The status of a smaller population found on the Dokhtawady River (tributary of the Ayeyawady) in 2001 is unclear; however, inundation of this stretch of river by a hydropower dam does not bode well for its continued survival (Platt *et al.* 2005; Kuchling *et al.* 2006). Captive-breeding efforts have been quite successful to date, and almost 500 *B. trivittata* are maintained in assurance colonies at Yadanabon Zoological Garden, Lawkanandar Wildlife Sanctuary, and a remote camp on the Chindwin River. Plans to reintroduce *B. trivittata* in appropriate habitat are being developed. The continued existence of *B. trivittata* remains threatened by recurring proposals to construct a massive hydropower dam on the upper Chindwin River that would impound the only stretch of river inhabited by the last known wild population (Rhodin *et al.* 2011). The current status of *B. baska* in Myanmar is virtually unknown. Populations in the Ayeyawady River were extirpated by the late 1970s, although a few scattered individuals might yet persist (Thorbjarnarson et al. 2000a). Likewise, remnant populations might still occur in coastal mangroves of Rakhine State (Platt *et al.* 2007). Surveys of coastal Taninthayi Region suggest the existence of several small nesting populations in areas contested by local insurgent groups; these reports await verification (Platt *et al.* 2008). Captive-assurance colonies of this species are urgently needed (Platt *et al.* 2006).

Soft-shelled Turtles

Six species of trionychid (soft-shelled) turtles occur in Myanmar (*Amyda cartilaginea*, *Nilssonia formosa*, *Chitra vandijki*, and *Lissemys scutata, L. punctata, and Dogania subplana*), three of which are endemic (*N. formosa*, *C. vandijki*, *L. scutata*) and therefore of obvious conservation importance. Of the trionychids, only *L. scutata* is currently secure. Although widely exploited for export to markets in southern China, its small size, rapid growth rate, frequent reproduction, and ability to live in anthropogenic habitats, appear to make *L. scutata* one of the few turtles capable of sustaining moderate levels of harvest. All other soft-shelled turtles are heavily exploited for export to food markets in southern China (Platt *et al.* 2000; Kuchling *et al.* 2004). The high price paid by illegal wildlife traders for softshell turtles (often the equivalent of an individual's annual income) mean it is economically worthwhile to seek out the last remaining turtles in an area. Consequently populations throughout Myanmar seem to be in a downward spiral. Moreover, populations are threatened by accidental drowning in fishing gear, destruction of nesting beaches by seasonal cultivation, and nest losses due to trampling by livestock.

Arakan Forest Turtle

The Arakan Forest Turtle *Heosemys depressa* is endemic to the Rakhine Hills of western Myanmar where it inhabits a variety of habitats including dense bamboo brakes, and deciduous and evergreen forest (Platt *et al.* 2003; 2010a & 2010b). The species remains poorly studied and even its geographic distribution has yet to be fully resolved. Earlier suggestions that *H. depressa* occurred in the southern Chin Hills now seem unfounded (Platt *et al.* 2012b). The species is heavily exploited for food by indigenous hill people, and confiscations from wildlife traders suggest some demand by markets in southern China. However, despite being considered Critically Endangered, *H. depressa* seems secure in remote areas of this sparsely populated region (Platt *et al.* 2003; 2010a & 2010b). Plans are currently underway to establish captive assurance colonies, and further field studies are warranted (Platt *et al.* 2011).

Burmese Eyed Turtle

The Burmese Eyed Turtle *Morenia ocellata* is endemic to Myanmar, although virtually nothing is known regarding its life history, distribution, or conservation status. Previously the species was thought confined to lower Myanmar, but records are available from as far north as Mandalay and the Shweli River (Iverson 1992; Platt *et al.* 2005). The species is generally assumed secure and has consequently received little attention although the massive numbers exported from Myanmar are cause for concern. Although apparently common in some areas, current levels of trade are clearly unsustainable and future population declines are inevitable. This situation is particularly alarming because *M. ocellata* is extremely difficult to maintain in captivity making effective *ex-situ* conservation unlikely. Basic field studies of this poorly known species are urgently needed (Platt *et al.* 2000).

Big-headed Turtle

The Big-headed Turtle *Platysternon megacephalum* is confined to hill ranges of eastern Myanmar (Iverson 1992; van Dijk 1993). Because much of this area remains off-limits to biological prospecting, little is known regarding the life history or conservation status of this enigmatic species. Several large confiscations of *P. megacephalum* have been made suggesting trade is a significant factor in the conservation of this species. These turtles are apparently in great demand by Chinese markets. Field surveys of Shan, Mon and Kayah States are urgently needed to clarify the conservation status of *P. megacephalum* in Myanmar.

Marine Turtles

Large concentrations of nesting marine turtles are known from several locations along the coast of Myanmar and on offshore islands (Thorbjarnarson *et al.* 2000c). With few exceptions these nesting beaches are unprotected and subject to extensive egg collecting. Turtle eggs are consumed locally and also sent to more distant urban markets. Furthermore, large numbers of marine turtles drown in poorly designed shrimp trawls, become entangled in fishing gear, and succumb after ingesting anthropogenic debris such as plastic bags. Additionally, some fishing communities deliberately harvest marine turtles for food. Conservation action targeting all life stages of marine turtles and their habitats is urgently needed in Myanmar.

Crocodiles

The Estuarine crocodile *Crocodylus porosus* is the only species of crocodilian known to currently occur in Myanmar. Although once common and widespread throughout coastal regions (Platt *et al.* 2001d; Thorbjarnarson *et al.* 2006), extant populations are now confined to the Ayeyawady Delta, and coastal Taninthayi and possibly Rakhine State (Platt *et al.* 2001d; Thorbjarnarson *et al.* 2006). The only viable population is found in Meinmahla Kyun Wildlife Sanctuary and adjacent reserved forests of the Ayeyawady Delta. Surveys conducted in 1999 and again in 2003 found large numbers of juveniles, suggesting population recruitment is occurring (Thorbjarnarson *et al.* 200b & 2006); however, more recent data are lacking and additional surveys are warranted. The conservation status of *C. porosus* in other coastal regions has yet to be determined, although anecdotal data suggests populations are depressed and remain subject to exploitation (Platt *et al.* 2001d; Thorbjarnarson *et al.* 2006).

The Gharial *Gavialis gangeticus* is the only other species of crocodilian known from Myanmar; a single adult was reportedly shot and another observed in the Shweli River in 1927. However, *G. gangeticus* now appears extinct in Myanmar, although a recent survey suggests a few individuals may yet remain on the upper reaches of this river (Win Ko Ko *in prep*). Unfortunately, present security concerns preclude fieldwork in this region. Although *Crocodylus siamensis*, *C. palustris*, and *Tomistoma schlegelii* have all

been said to occur in Myanmar, verified records for these species are lacking (Thorbjarnarson *et al.* 2006).

3.1.4. Fish

The conservation status of fish in Myanmar is poorly understood. Most species that have been assessed are widespread marine species. There are two fish species that are listed as Critically Endangered. The Irrawaddy River Shark *Glyphis siamensis* is possibly extinct it is only known from a single specimen collected in 1896 near Yangon (Barnett *et al.* 2009). The other species is Toli Shad *Tenualosa toli*, which is a more widespread, but heavily harvested estuarine species found across the Bay of Bengal.

Three other species are listed as Endangered. These are Hilsa Shad *Tenualosa ilisha*, Indian Threadfin *Polynemus indicus*, and Four-finger Threadfin *Eleutheronema tetradactylum*. Each of these species is heavily harvested for food along the coasts of Myanmar in addition they have probably suffered due to loss of habitat, *P. indicus* in particular is found in seagrass beds which have been severely disturbed along the Myanmar coast. *E. tetradactylum* is also at risk of accumulated pollutants from its primarily crustacean diet. There are over 100 fish species listed as vulnerable many of them are species of sharks. Most species of shark are threatened by intensive fishing pressure for fins and meat. The Department of Fisheries has made a special effort to create marine protected areas primarily to conserve sharks.

Allen *et al.* (2010) in their status assessment of freshwater biodiversity in the eastern Himalayas highlight that much of the Ayeyawady Basin is species rich but still poorly known with numerous species still considered Data Deficient for threat assessments.

3.1.5. Plants

There are totally 50 threatened plant species – 18 CR, 16 EN and 16 VU. The following table indicates that Dipterocarpaceae is the most threatened plant family with 16 CR species, 7 EN species and 2 VU species out of 19 threatened plant families. The main threats for plant species were identified as overexploitation by legal and illegal logging, and habitat loss, degradation and fragmentation by commercial plantations and inappropriate land uses.

Table 2: Number of Threatened Plant Species by Family

Family	CR	EN	VU
Bombacaceae	1	-	-
Caesalpiniaceae	-	2	1
Cephalotaxaceae	-	-	1
Cycadaceae	-	-	2
Dipterocarpaceae	16	7	2
Ebenaceae	-	1	-
Euphorbiaceae	-	1	-
Fabaceae	-	1	2
Hydrocharitaceae	-	-	1
Magnoliaceae	-	-	2
Mimosaceae	-	-	1
Myristicaceae	-	-	1
Myrtaceae	-	1	-
Pinaceae	-	1	-
Sonneratiaceae	1	-	-
Sterculiaceae	-	2	-
Taxodiaceae	-	-	1
Theaceae	-	-	1
Thymelaeaceae	-	-	1
Total	**18**	**16**	**16**

Myanma Timber Enterprise (MTE) has extracted *Dipterocarpus spp, Shorea spp* and *Hopea spp*. The total amount of hard wood extraction by MTE has increased 5-6% annually between 1996 and 2006 (Central Statistical Organization 2008). Domestic consumption of Dipterocarp species has also significantly increased, particularly, in places where large infrastructure has been developed.

Large-scale use of *Shorea assamica* can be observed in Kachin State and northern Sagaing Region. The species is being overexploited for large boat making for transportation along the northern part of the Chindwin River. As the wood grain of this species is interlocked, it provides more strength than Teak *Tectona grandis* to resist underwater obstacles and rocks. Since the boats made of this species only last a maximum of two years, the replacement rate is massive and this has lead to the species becoming increasingly rare in all accessible areas of Kachin State. Other noticeable overexploited species are *Aquilaria malaccensis* an aromatic non-timber forest product and *Taiwania cryptomerioides* a species known locally as coffin wood, which is sold in China.

In Taninthayi Region and Kachin State where extensive commercial plantation concessions for palm oil and tapioca have been established, plant species from the following families - Caesalpiniaceae, Dipterocarpaceae, Magnoliaceae, Myristicaceae, Myrtaceae, Taxodiaceae, Theaceae, Thymelaeaceae – have been highly threatened by habitat loss, degradation and fragmentation. Remaining forested landscapes in Kachin State, Taninthayi Region, Chin State, Rakhine State and northern Sagaing Region should be prioritized for conservation of threatened plant species.

While new plant species have been discovered, their conservation status are still in question (e.g. Kress & Thet Htun 2003; Peters *et al.* 2007). In particular, the

conservation status of Myanmar orchids is virtually unknown (Saw Lwin *pers comm*). In the marine realm the sea grass species *Halophila beccarii* is considered the most vulnerable among 11 sea grass species, known to occur along the Myanmar coast (Soe-Htun *et al.* 2008; Novak *et al.* 2009).

3.1.6. Other Groups

There are several other species groups that are poorly known or have not yet had their conservation status assessed. This includes over twenty species of frogs considered Data Deficient as well as a long but incomplete list of terrestrial and marine invertebrates including corals. Additional studies and in depth technical study is needed to truly understand priority actions to conserve these species.

3.2. Sites (Key Biodiversity Areas)

Myanmar Agenda 21 highlighted that the existing Protected Area System (PAS) was not representative and comprehensive (NCEA 1997). Particularly, there is a considerable conservation gap for marine ecosystems. A broader and more comprehensive gap analysis was recommended to develop a representative and comprehensive PAS (NCEA 1997; Myint Aung 2007).

In the 30-Year Forestry Master Plan, targets were set to have 5% expansion of PAS from 2001-02 to 2005-06 and 10% from 2007-08 to 2016-17 to fulfill the 1995 Forest Policy (MOF 2001). Myanmar is also obliged, as a signatory, to meet the objectives of the Convention of Biological Diversity (CBD) to expand their PAS. The identification of Key Biodiversity Areas (KBA) is considered to be a suitable approach to identify appropriate areas for further study and evaluation for PA status.

The KBA approach is identified as a tool to address the goal of the Program of Work on Protected Areas in the CBD "to establish and strengthen national and regional systems of protected areas integrated into a global network as a contribution to globally agreed goals" (Langhammer *et al.* 2007). The KBA approach requires identifying sites of global biodiversity significance in each country to determine which sites are currently not represented in protected area systems, and prioritization of conservation actions among sites. In addition, this process provides high local ownership and participation because identifying, assessing and prioritizing KBAs is conducted through a multi-stakeholder consultation. The KBA approach helps conservationists, managers and investors to make urgent conservation decisions in the face of accelerating threats and pressures. This approach also allows the application of a gap analysis framework based on additional information when received.

In the Myanmar context, KBAs fall in different land management categories such as protected areas, reserve forests, public protected forests, community-conserved forests, community forests and other resource and land use areas. Therefore, KBAs accommodate different management systems including government, private, community-led and joint management. For this process KBAs were reviewed and updated in order to identify and prioritize investment opportunities for biodiversity conservation in Myanmar.

3.2.1. Identifying and Updating KBAs

KBAs were initially identified and updated based on stakeholder interviews, expert consultation and a literature review. A total of 76 KBAs were originally identified by Tordoff et al. 2005 (not including marine areas which were not considered), and a further 74 KBAs were identified by the stakeholder interviews conducted from October-December 2011. Information for these 150 KBAs was collated, analyzed and the preliminary results presented at the January 2012 stakeholder workshop. During the workshop information gaps were identified and follow-up information was collected. Based on this the KBAs were then reassessed and additional information collected.

Finally, a total of 132 KBAs were identified for Myanmar.

3.2.2. Assessing KBAs

KBAs were prioritized based on two criteria – Species-based Vulnerability and Site-based Vulnerability. KBAs were then assessed using the following information received from stakeholders. This information was then verified through expert consultations.

- National status (Notified Protected Area – Terrestrial (NPA-T), Proposed Protected Area – Terrestrial (PPA-T), Notified Protected Area – Aquatic (NPA-A), Proposed Protected Area – Aquatic (PPA-A), Reserve Forest (RF), Public Protected Forest (PPF), etc.)
- International status (ASEAN Heritage Park (AHP), Ramsar Wetlands of International Importance (RAMSAR), Important Bird Area (IBA), Alliance for Zero Extinction (AZE), etc.)
- Management (Managed by Nature and Wildlife Conservation Division (NWCD), Forest Department (FD), Department of Fisheries (DoF), General Administration Department (GAD) etc.)
- Key species of mammals, birds, reptiles, plants and fishes in each KBA and their IUCN Red List status were identified. For each Red Listed species the occurrence of species were verified using the following four conditions:
    - Confirmed Occurrence (CO)– reliable records by a reliable observer, positive identifications of calls or specimen records of known provenance, older records with insignificant threats
    - Suspected Occurrence (SO)– uncertain records by a reliable observer, anecdotal reports from local people, historical records with significant threats or model prediction
    - Absent (AB)– the site with insufficient habitat to support a population and exhaustive surveys have failed to record the species
    - Unknown (UK) – the status of the species is unknown although its occurrence was confirmed previously
- Levels of different threats were assessed giving scores of: Very High (5), High (4), Medium (3), Low (2), Very Low (1) and Unknown (0).

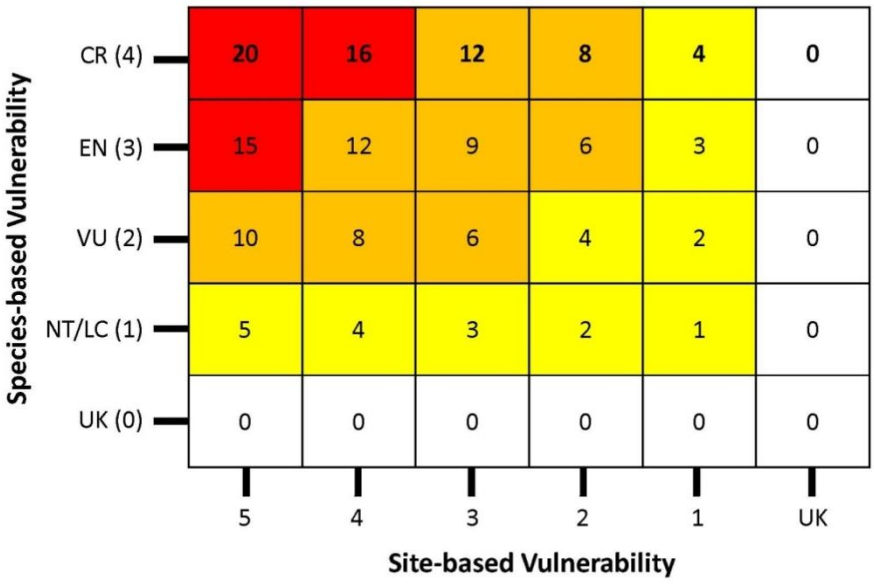
3.2.3. Prioritizing KBAs

Under the ideal situation, KBAs are prioritized using complete information of the following three criteria – Irreplaceability, Species-based Vulnerability and Site-based Vulnerability. As information is always limited in reality, information on key species population of all KBAs – irreplaceability - is not available for the Myanmar context. Therefore, KBAs were prioritized based on the available information of two criteria – Species-based Vulnerability and Site-based Vulnerability. Consequently, the priorities of KBAs can be subjected to reassessment in a gap analysis framework when additional information is received.

KBAs were prioritized based on the following steps.

- Species-based Vulnerability or species scores were given as; Critically Endangered (CR) = 4, Endangered (EN) = 3, Vulnerable (VU) = 2, Near Threatened/ Least Concern (NT/LC) = 1 and Unknown/ No Information (UK) = 0
- Site-based Vulnerability or threat scores were given as: Very High = 5, High = 4, Medium = 3, Low = 2, Very Low = 1 and Unknown/ No Information (UK) = 0
- Site score is calculated by multiplying "species score" by "threat score"
- KBA priorities are assigned as High (site score range 13-20), Medium (site score range 6-12.9), Low (site score range 1-5.9) and Need more information (site score is 0) as shown in Figure 1.

Figure 1: Site Priority Matrix Developed from Species-based Vulnerability (Species Score) and Site-based Vulnerability (Threat Score)



3.2.4. Status of 132 Key Biodiversity Areas

Table 3: National Status of KBAs

Particulars		KBAs
Notified Protected Area - Terrestrial	=	32
Proposed Protected Area - Terrestrial	=	6
Notified Protected Area – Aquatic	=	3
Reserve Forest	=	20
Other Land Management Category	=	71
TOTAL	**=**	**132**

Table 4: International Status of KBAs

Particulars		KBAs
ASEAN Heritage Park	=	6
RAMSAR Site	=	1
Important Bird Area	=	53
Alliance for Zero Extinction Site	=	3

Table 5: Management Status of KBAs

Particulars		KBAs
Nature & Wildlife Conservation Division	=	21
Forest Department	=	37
Department of Fisheries	=	21
General Administration Department	=	7
Yangon City Development Committee	=	2
Other types of management	=	44
TOTAL	**=**	**132**

Table 6: Priority KBAs

Particulars		KBAs
High Priority KBAs	=	42
Medium Priority KBAs	=	56
Low Priority KBAs	=	1
More Information needed KBAs	=	33
TOTAL	**=**	**132**

Figure 2: Key Biodiversity Areas

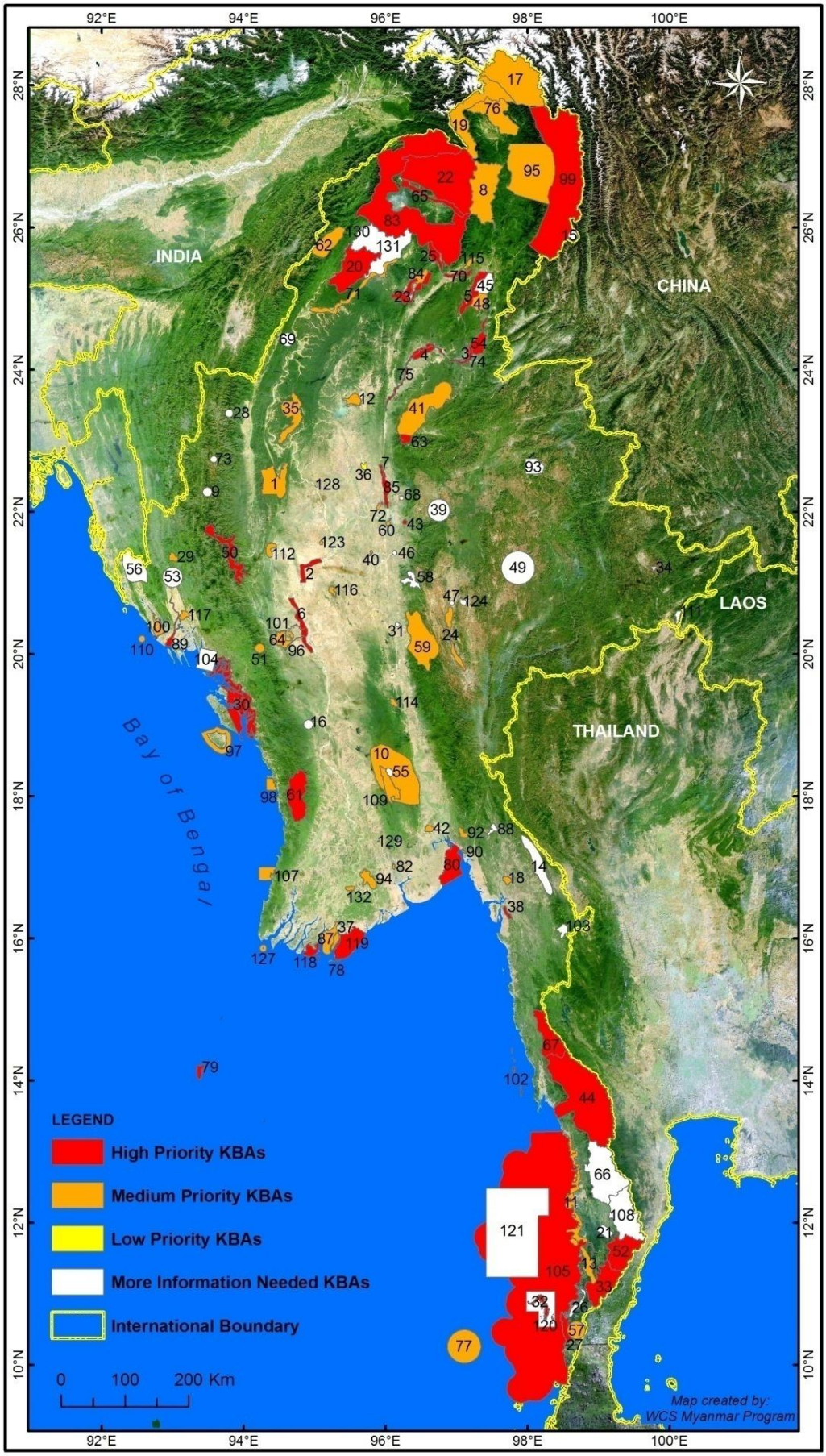


Table 7: List of Key Biodiversity Areas

No	KBA Name	Priority	Area km²
1	Alaungdaw Kathapa N.P	Medium	1,433
2	Ayeyarwady River (Bagan Section)	High	342
3	Ayeyarwady River (Bhamo to Shwegu Section)	High	200
4	Ayeyarwady River (Moda Section)	High	303
5	Ayeyarwady River (Myitkyina to Sinbo Section)	High	578
6	Ayeyarwady River (Sinbyugyun to Minbu Section)	High	540
7	Ayeyarwady River (Singu Section)	High	75
8	Bumhpabum W.S	Medium	2,939
9	Bwe Pa	More information needed	152
10	Central Bago Yoma	Medium	3,951
11	Central Tanintharyi Coast	Medium	3,318
12	Chatthin W.S	Medium	284
13	Chaungmon-Wachaung	Medium	516
14	Dawna Range	More information needed	1,264
15	Fen-shui-ling Valley	More information needed	146
16	Gyobin	More information needed	161
17	Hkakaborazi N.P	Medium	4,313
18	Hpa-an	Medium	115
19	Hponkanrazi W.S	Medium	2,803
20	Htamanthi W.S	High	2,542
21	Htaung Pru	More information needed	285
22	Hukaung Valley W.S	High	6,483
23	Indawgyi W.S	High	737
24	Inlay Wetland W.S	Medium	554
25	Kamaing	High	588
26	Karathuri	More information needed	238
27	Kawthaung District Lowlands	High	414
28	Kennedy Peak	More information needed	108
29	Kyaukpantaung W.S	Medium	129
30	Kyaukphyu (Wunbike)	High	2,591
31	Kyee-ni Inn	More information needed	37
32	Lampi Island Marine N.P	High	274
33	Lenya N.P	High	1,846
34	Loimwe P.A	More information needed	43
35	Mahamyaing W.S	Medium	1,204
36	Mahanandar Kan	Low	78
37	Mainmahla Kyun W.S	Medium	145
38	Mawlamyine	High	90
39	Mehon (Doke-hta Wady River)	More information needed	881
40	Minzontaung W.S	Medium	17
41	Momeik-Mabein	Medium	2,821
42	Moyungyi Wetland W.S	Medium	103
43	Myaleik Taung	High	37
44	Myinmoletkhat	High	8,131

No	KBA Name	Priority	Area km²
45	Myitkyina-Nandebad-Talawgyi	More information needed	554
46	Myittha Lakes	More information needed	37
47	Nadi Kan	More information needed	37
48	Nam Sam Chaung (Kachin State)	Medium	458
49	Nam San Valley (Shan State)	More information needed	2,003
50	Natmataung N.P	High	1,100
51	Nat-yekan	Medium	160
52	Ngawun/ Lenya N.P (Extension)	High	1,851
53	Ngwe Taung	More information needed	733
54	Ninety-six Inns	High	587
55	North Zarmayi	More information needed	99
56	Northern Rakhine Yoma	More information needed	1,303
57	Pachan	Medium	608
58	Panlaung Pyadalin Cave W.S	More information needed	349
59	Paunglong Catchment Area	Medium	2,550
60	Peleik Inn	Medium	37
61	Rakhine Yoma Elephant Range	High	1,713
62	Saramati Taung	Medium	1,065
63	Shwe U Daung W.S	High	183
64	Shwesettaw W.S	Medium	497
65	Tanai River	High	636
66	Taninthayi N.P	More information needed	3,663
67	Taninthayi N.R	High	1,619
68	Taung Kan at Sedawgyi	More information needed	37
69	Thaungdut	More information needed	325
70	Upper Mogaung Chaung Basin	High	188
71	Uyu River	Medium	844
72	Yemyet Inn	Medium	42
73	Zeihmu Range	More information needed	81
74	Ayeyarwady River (Bhamo)	High	102
75	Ayeyarwady River (Shwegu)	High	373
76	Babulon Htan	Medium	1,896
77	Burmabank	Medium	2,139
78	Gayetgyi Island	High	13
79	Great Coco Island	High	161
80	Gulf of Mottama	High	1,307
81	Hlawga Park	Medium	6
82	Hlawga Reservior	Medium	23
83	Hukaung Valley W.S (Extension)	High	11,348
84	Indawgyi grassland and Indaw chaung wetland	Medium	258
85	Irrawaddy Dolphin P.A	High	326
86	Kadongalay Island	Medium	10
87	Kadonkani	Medium	647
88	Kahilu W.S	More information needed	127

No	KBA Name	Priority	Area km²
89	Kaladan River	High	199
90	Kelatha W.S	Medium	25
91	Khaing Thaung Island	High	14
92	Kyaikhtiyoe W.S	Medium	137
93	Lwoilin/ Ginga mountain	More information needed	548
94	Maletto Inn	Medium	386
95	Mali Hka Area	Medium	5,129
96	Man Chaung	Medium	3
97	Manaung Kyun (Marine)	Medium	766
98	Maw She	Medium	222
99	May Hka Area	High	10,090
100	May Yu	Medium	311
101	Mone Chaung	Medium	15
102	Moscos Kyun W.S	High	57
103	Mulayit W.S	More information needed	214
104	Myebon	More information needed	793
105	Myeik Archipelago	High	31,664
106	Nantha Island	High	11
107	Ngwe Saung	Medium	411
108	North Lenyar	More information needed	2,650
109	North Zarmayi Elephant PA	Medium	710
110	Oyster Island	Medium	80
111	Parsar P.A	More information needed	117
112	Pauk Area	Medium	195
113	Payagyi	Medium	2
114	Phokyar Elephant Camp	Medium	100
115	Pidaung W.S	Medium	150
116	Popa Mountain Park	Medium	98
117	Pyaungbya River	Medium	154
118	Pyin-ah-lan	High	295
119	Pyindaye	High	1,323
120	Shark P.A	More information needed	1,706
121	Shark P.A	More information needed	11,734
122	Sheinmaga Tawyagyi	High	0
123	Shinmataung	Medium	24
124	Taunggyi B.S	More information needed	70
125	Taungtaman Inn	Medium	7
127	Thamihla Kyun (Marine)	Medium	86
127	Thamihla Kyun W.S	Medium	2
128	Twintaung	More information needed	8
129	U-do	Medium	5
130	Upper Chindwin (Kaunghein-Padumone)	High	45
131	Yaybawmee	More information needed	3,213
132	Yelegale	Medium	83

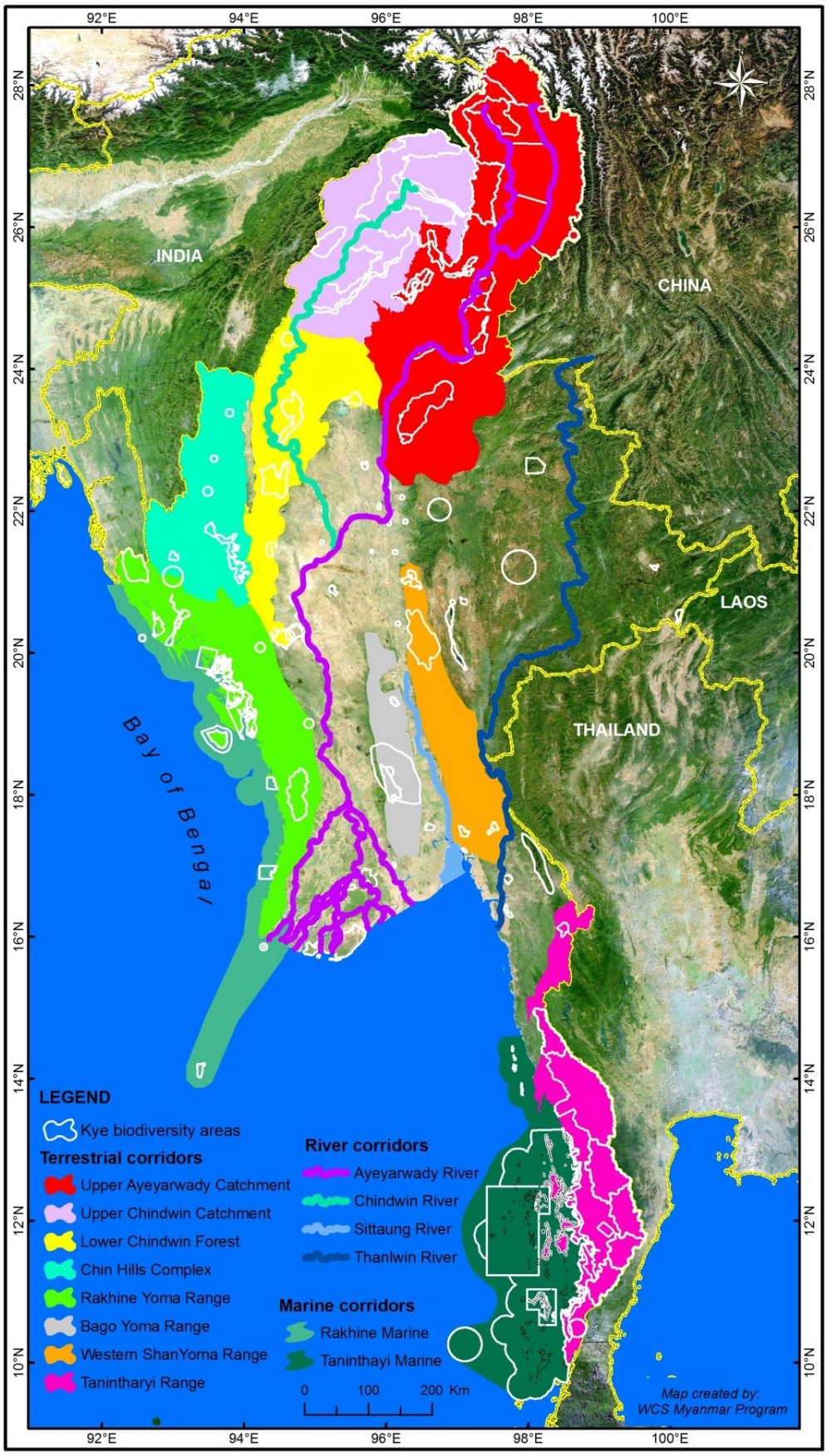
3.3. Conservation Corridors

A total of 15 conservation corridors originally identified in Tordof *et al.* 2005 were revised and updated through the stakeholder workshop. A total of eight terrestrial conservation corridors, four river conservation corridors and two marine conservation corridors were updated taking into account: landscape connectivity, maintaining connectivity between two or more KBAs, maintaining evolutionary and ecological processes and safeguarding against the potential impacts of climate change. Corridors are shown in Figure 3 and listed in Table 8.

Table 8: List of Conservation Corridors

No	Name	Corridor Type	Area km^2
1	Chin Hills Complex Corridor	Terrestrial	36,272
2	Bago Yoma Range corridor	Terrestrial	16,143
3	Western Shan Yoma Range Corridor	Terrestrial	27,742
4	Upper Chindwin Catchment Corridor	Terrestrial	50,156
5	Lower Chindwin Forest Corridor	Terrestrial	40,087
6	Taninthayi Range Corridor	Terrestrial	42,880
7	Rakhine Yoma Range Corridor	Terrestrial	47,914
8	Upper Ayeyawady Catchment Corridor	Terrestrial	101,394
9	Thanlwin River Corridor	River	7,692
10	Chindwin River Corridor	River	5,299
11	Ayeyawady River Corridor	River	19,798
12	Sittaung River Corridor	River	3,048
13	Taninthayi Marine Corridor	Marine	58,606
14	Rakhine Marine Corridor	Marine	40,698
	Total Area		**497,729**

Figure 3: Updated Conservation Corridors



4. Threats

Threats were initially assessed using semi-structured interviews. The list was based on the threats originally discussed in Tordof *et al.* 2005 and supplemented with other threats highlighted by stakeholders. Threats were scored on a 5-point scale in relation to KBAs and conservation priority species. Threats were then ranked by frequency and intensity and used during the stakeholder workshop to discuss interventions needed to reduce the most frequent and intense threats.

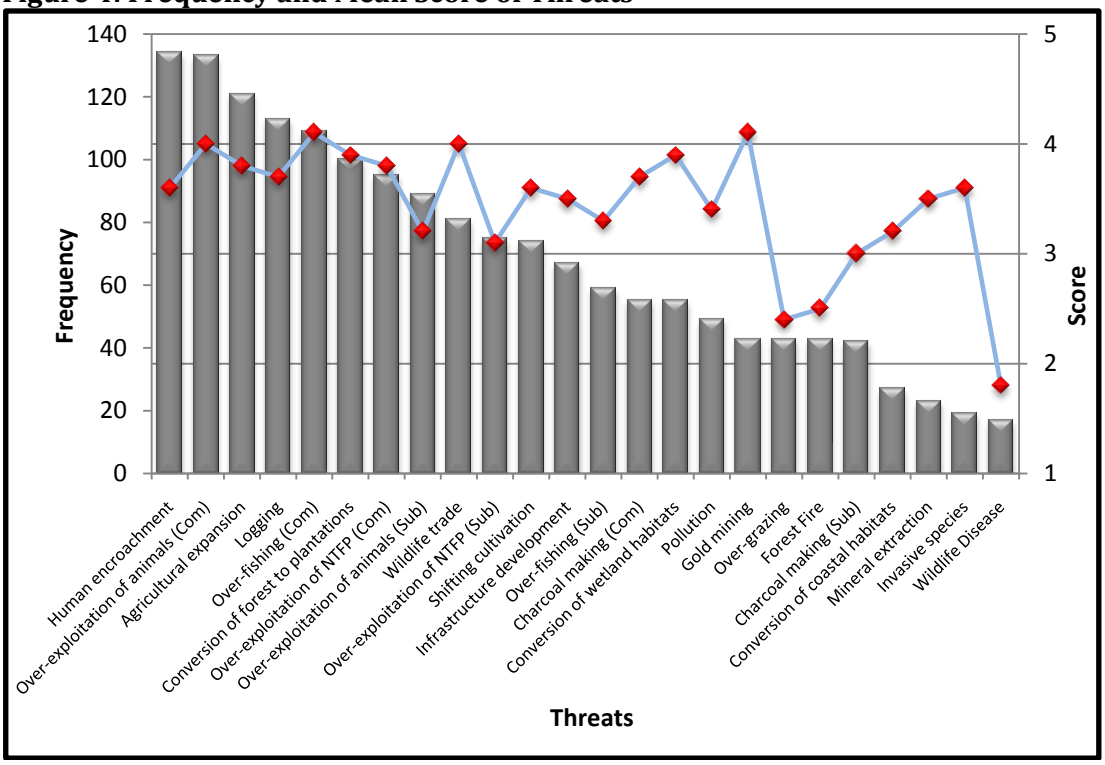
Primary threats identified included the commercial and subsistence exploitation and trade of natural resources including wildlife, timber, fish and non-timber forest products. Stakeholders also highlighted the expansion of the human footprint across the country. In particular human settlements, agriculture and plantations are considered the greatest threats at this time although the potential threat of expanding infrastructure development is expected to become much greater in the near future. More specific threats such as gold and other mineral extraction are more localized and therefore were not reported as frequently. Stakeholders considered the lowest threats to be invasive species and wildlife diseases.

Table 9: Threat Frequency and Intensity

Threats	Frequency	Score
Human encroachment	134	3.6
Over-exploitation of animals (Com)	133	4
Agricultural expansion	121	3.8
Logging	113	3.7
Over-fishing (Com)	109	4.1
Conversion of forest to plantations	100	3.9
Over-exploitation of NTFP (Com)	95	3.8
Over-exploitation of animals (Sub)	89	3.2
Wildlife trade	81	4
Over-exploitation of NTFP (Sub)	75	3.1
Shifting cultivation	74	3.6
Infrastructure development	67	3.5
Over-fishing (Sub)	59	3.3
Charcoal making (Com)	55	3.7
Conversion of wetland habitats	55	3.9
Pollution	49	3.4
Gold mining	43	4.1
Over-grazing	43	2.4
Forest Fire	43	2.5
Charcoal making (Sub)	42	3
Conversion of coastal habitats	27	3.2
Mineral extraction	23	3.5
Invasive species	19	3.6
Wildlife Disease	17	1.8

Notes: (Com) Commercial, (Sub) Subsistence

Figure 4: Frequency and Mean Score of Threats



5. Root Causes

Root Causes were assessed using the same system for threats listed above. Stakeholders identified and scored root causes for priority sites and for priority species. Intensity of root causes was based on a five-point scale with five being the most intense.

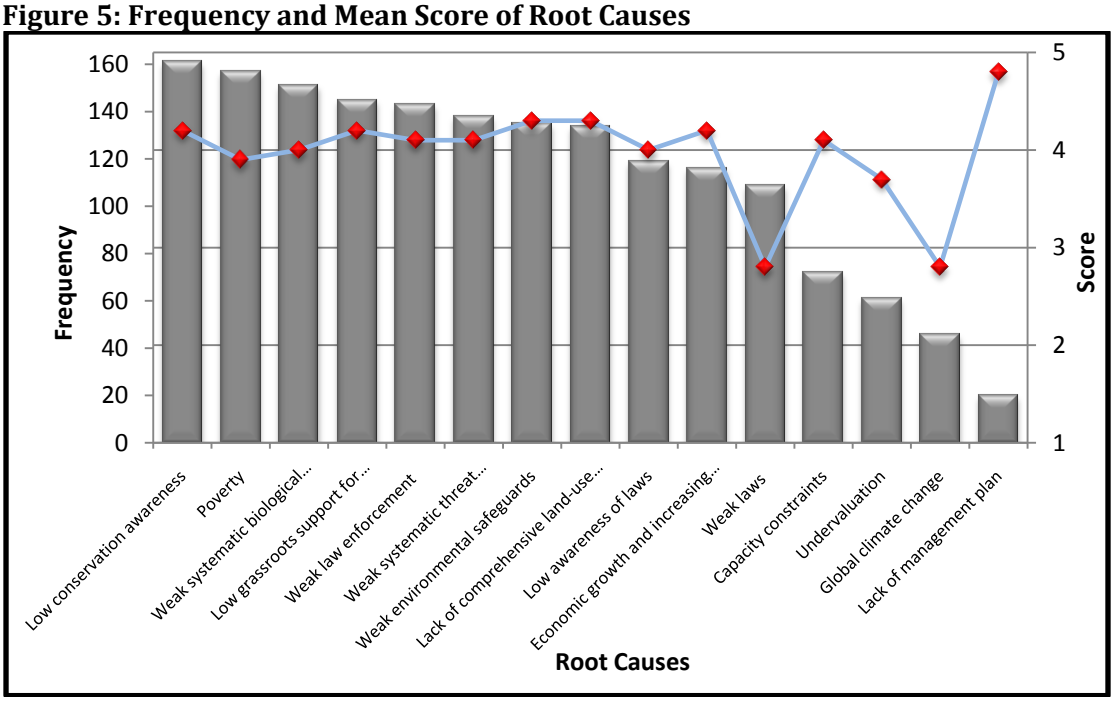
Poverty and the general lack of awareness of environmental issues are seen as the most frequent root causes of biodiversity loss. Although there are a broad range of weak policies combined with the lack of understanding and enforcement of these policies that are considered to also be at the root of biodiversity loss.

Of particular interest is the position of global climate change, which was mentioned infrequently and was considered by many to currently be of low intensity. This reflects the current situation in Myanmar where awareness of climate change issues continues to be low and impacts are not currently being linked to climate change. There is a clear need to increase awareness on this important issue so that it can be fully considered and planned for.

Table 10: Root Causes Frequency and Intensity

Root Causes	Frequency	Score
Low conservation awareness	161	4.2
Poverty	157	3.9
Weak systematic biological monitoring systems	151	4
Low grassroots support for conservation	145	4.2
Weak law enforcement	143	4.1
Weak systematic threat monitoring systems	138	4.1
Weak environmental safeguards	135	4.3
Lack of comprehensive land-use policies and planning	134	4.3
Low awareness of laws	119	4
Economic growth and increasing consumption	116	4.2
Weak laws	109	2.8
Capacity constraints	72	4.1
Undervaluation	61	3.7
Global climate change	46	2.8
Lack of management plan	20	4.8

Figure 5: Frequency and Mean Score of Root Causes



6. The Threat of Climate Change

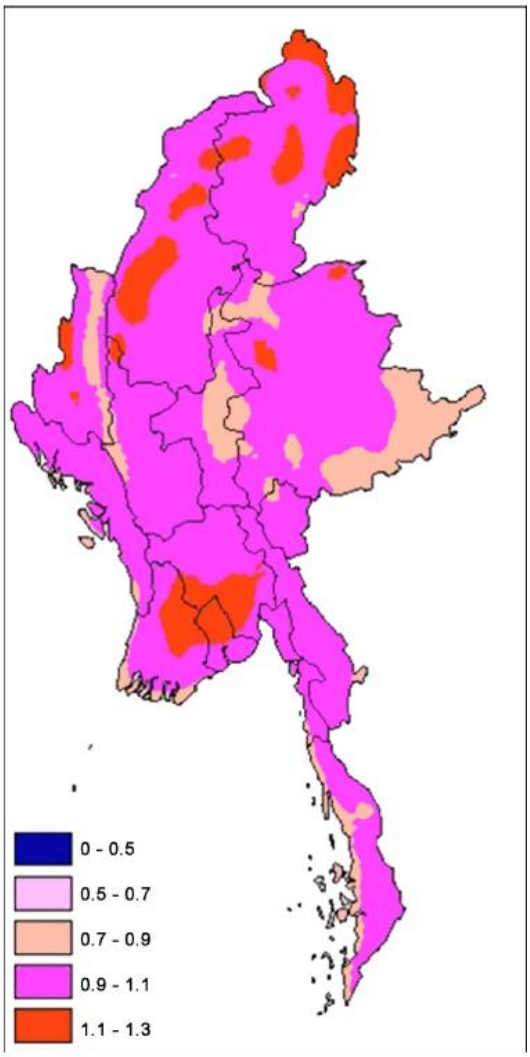
There is increasing evidence that human-forced climate change is having short and long term consequences for ecosystems and human communities (IPCC 2007a). Global mean temperatures have increased 0.2˚C per decade since the 1970s, and global mean precipitation increased 2% in the last 100 years with a high probability of warming of more than 2˚C over the next century (IPCC 2007a). In the short term, the frequency of extreme weather events such as cyclones, drought, heat waves and floods is expected to increase. According to the Germanwatch Global Climate Risk Index, Myanmar was one of

the countries most affected by extreme weather events from 1990 to 2009 (Harmeling 2010). For example, the severe impacts of cyclone Nargis in 2008 resulted in the loss of over 100,000 human lives and the destruction of coastal ecosystems (Government of Union of Myanmar *et al.* 2008).

Myanmar is likely to be faced with temperature rising in several areas (Figure 12 in MOECAF 2012). According to climate scenario analysis done by an initial national communication project under the United Nations Framework Convention on Climate Change, temperature is going to increase over 1 degree Celsius in most part of the country within the next 30 years and this will have potential effects on agriculture, forestry, biodiversity, water resources, natural disasters, human migration, disease and human health as shown in Figure 6 (MOECAF 2012).

Regional climatological studies also highlight the impacts climate change may have on Myanmar's ecosystems and people. Simulations using downscaled regional climate models show changes in annual mean *T*max (daily maximum temperature) range between 0.5 and 1.0 °C over most parts of Myanmar in the cool-dry season. In the hot–dry season however, larger warming is simulated over southern Myanmar. By contrast, only slight warming (<0.5 °C), is simulated in high elevation areas of northern Myanmar. More advanced climate modeling studies are critical to understanding climate change at relevant spatial and temporal scales in Myanmar.

Figure 6: Potential Temperature Rise in Myanmar from 1970 to 2039



Potential Temperature Rise in Myanmar during 1970 and 2039.
Source: NCEA (2011).

6.1. Impacts of Climate Change on Biodiversity

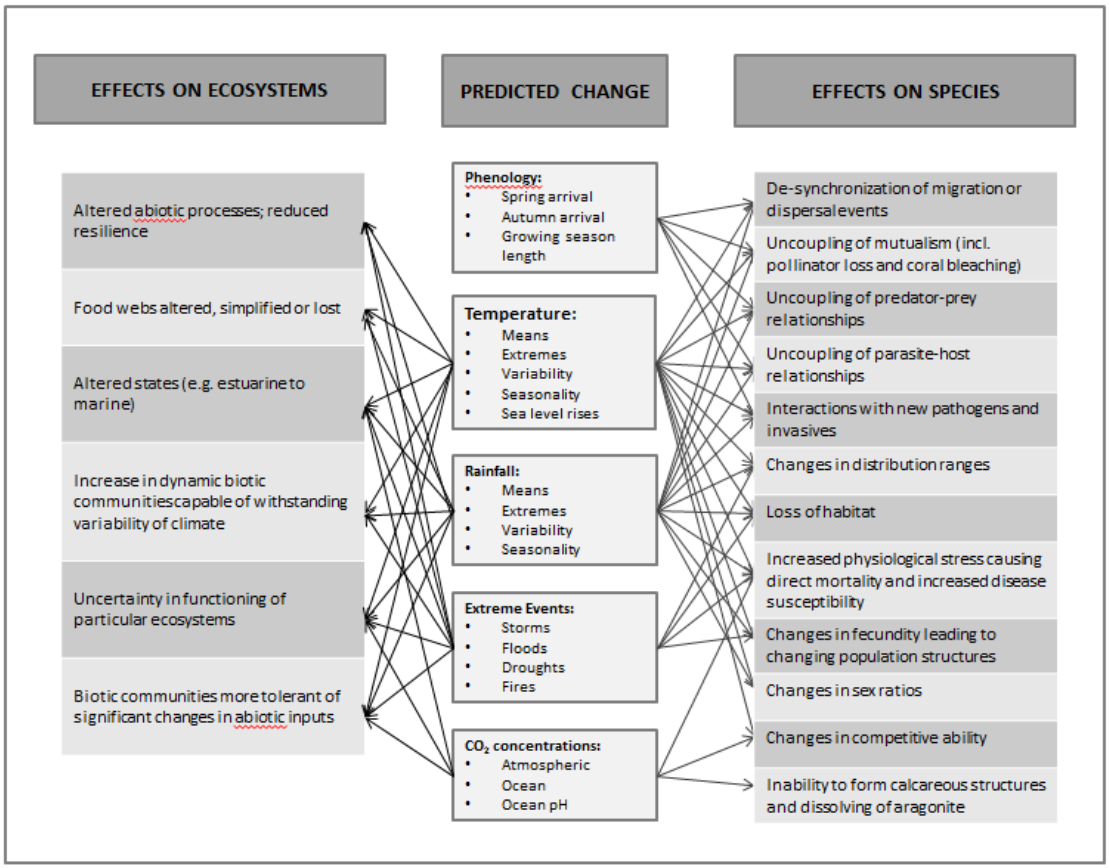
Climate change poses major new challenges to biodiversity conservation, as species will be exposed to climate changes at a rate and magnitude seldom previously experienced, with direct consequences for ecosystem assemblages and the services they provide to humanity (Watson *et al.* 2011b). The impacts of climate change on biodiversity can be divided into discrete acute impacts, principally extreme weather related events (e.g., storms, droughts, fires, extreme rainfall events), and continuous chronic impacts, such as gradual increases in mean temperatures or decreases in seasonal rainfall, occurring over decades. There is some uncertainty about even the gradual chronic impacts, as possibilities exist for abrupt climate shifts, affecting ecosystem states.

Tropical species may be particularly vulnerable to climate change because they experience minimal fluctuations in annual temperature and are already near their maximum thermal tolerance (Tewksbury *et al.* 2008; Corlett 2011). Species unable to adapt or move will face local or global extinction and this is more likely to happen to species with narrow climatic and habitat requirements and limited dispersal abilities, such as amphibians and reptiles. In forested areas, birds may be less affected by range-shift gaps than some plants, insects, reptiles and amphibians that are poor dispersers.

There is still much to learn before we can assess accurately the impacts of climate change on biodiversity in Myanmar. Few field studies on the potential impacts of climate change to biodiversity have been conducted in the Indo-Myanmar Hotspot and there are currently no studies on biodiversity and climate change in Myanmar. A global Hotspot analysis estimated that, depending on different modeling scenarios, between 1.9 and 40.5 percent of endemic plant and vertebrate species in the Indo-Myanmar Hotspot may become extinct due to climate change over the next century (Malcolm *et al.* 2006). Approximately 20 to 30% of plant and animal species assessed so far are *likely* to be at increased risk of extinction if increases in global average temperature exceed 1.5 to 2.5˚C over 1980-1999 levels.

The interactions and consequences of climate change on biodiversity are complex and multidimensional in nature. However, it is possible to represent some of the likely impacts on the three broad realms, terrestrial, freshwater and marine ecosystems (Fig. 7).

Figure 7: Climate change impacts and their predicted effects on species



Source: Kingsford & Watson 2011, adapted from Foden et al. 2008

6.1.1. Terrestrial

There are many different ways in which terrestrial ecosystems are impacted by climate change (Fig. 7). As discussed in previous sections, there is considerable uncertainty in the magnitude and rate of the change and consequent impacts, given little knowledge of the resilience of ecosystems and their species to these rapid changes. The synergistic effects of other threats further complicate this but there are some basic generalities and specific examples for impacts on terrestrial ecosystems. Most terrestrial ecosystems are drying, as average high temperatures increase but these changes are likely to be exacerbated by occasional extremely high daily temperatures, which will test physiological tolerances of some species. Climate patterns are already affecting migration patterns of species of birds (Beaumont *et al.* 2006). Analysis of the elevational distributions of Southeast Asian birds over a 28-year period provides evidence for a potential upward shift for 94 common resident species regardless of habitat specificity (Peh 2007).

Lowland Forest Ecosystems

In the tropical lowlands, there is no source of species adapted to warmer conditions, so species lost as a result of warming will not be replaced (Feeley & Silman 2010). Movements of lowland forest species will be impeded by the cleared and fragmented nature of most lowland forests such that dispersal would require crossing cultivated landscapes and degraded riverine corridors. Under these circumstances, populations of many species may be extirpated. Wetter wet seasons and drier dry seasons could change the structure and composition of terrestrial vegetation communities (Blate

2010), possibly causing declines in food and breeding resources for some species or benefiting others, including the invasion of pest species, and causing a cascade of ecological effects. Most of the high and medium priority KBAs identified in Myanmar are terrestrial forest ecosystems and these can anticipate significant impacts of climate change.

6.1.2. Freshwater

The impacts of climate change on freshwater ecosystems are not particularly well known or understood in most places on earth. Freshwater ecosystems are globally among the most sensitive to climate change, due to predicted impacts to hydrology (Bates *et al.* 2008). The productivity of large rivers and floodplains is regulated by distinctive seasonal flow regimes. Rivers will be also sensitive to two indirect consequences of climate change.

First, many are impaired already by other pressures with which climate interacts. These include eutrophication, organic pollution, sediment release, acidification, impoundment, urbanization, hydropower development, flood-risk and invasion by exotic species (Ormerod & Durance 2009).

Second, climate will affect river conditions and processes indirectly by changing the human use of river catchments, riparian zones and floodplains. Climate change is anticipated to alter seasonal flow regimes and the timing, extent and duration of flooding, but predictions are confounded by modeling limitations and natural hydrological variability (Kingston *et al.* 2010).

Hotter and drier conditions, especially toward the end of the dry season, could result in the drying out of small floodplain water bodies and the contraction of shallow-water zones in lakes such as Inle Lake in Myanmar. These habitats support some of the most threatened fauna in the hotspot. For seasonally flooded grasslands such as those in the Hukaung Valley Wildlife Sanctuary, a critically endangered habitat, hotter dry seasons and rising CO_2 concentrations could facilitate fire and the invasion of woody plants. Altered seasonal flow levels could impact habitat quality for freshwater populations of Irrawaddy Dolphin *Orcaella brevirostris* and their prey in the Ayeyawady River.

Climate change impacts in Myanmar's wetlands are of particular concern given the critical ecosystem services they provide for human populations and biodiversity. Further, climate change impacts in the Greater and Eastern Himalayas can be expected to have repercussions for the flow of the Ayeyawady River and its tributaries that support important rice-growing regions of Myanmar.

6.1.3. Marine

The impacts of climate change on marine ecosystems are reasonably well known, particularly in relation to sea level rise, rising temperatures and acidification (Fig. 7; Grantham *et al*. 2011). Sea-level rise will exacerbate the impacts of more intense tropical cyclones predicted under global warming (IPCC 2007a). Myanmar is ranked 12 out of 20 countries in terms of population at risk due to sea-level rise. 4.6 million people will be at risk in 2050 (up from 2.8 million in 2008). The Ayeyawady River in Myanmar is one of the "key low-lying river deltas in tropical Asia that are most vulnerable to sea-level rise" (IPCC 2007b).

In the nearer term, sea-level rise and increased water temperatures are projected to accelerate beach and coastal erosion and cause degradation of mangroves and coral

reefs. These would in turn negatively influence human communities through impacts on water supply and fisheries productivity. Myanmar hosts 8.8% of the total mangrove forests area of South East Asia with, 46% of the total area of mangroves located in Ayeyawady Region, 37% in the Taninthayi Region and 17% in the Rakhine State (Giesen *et al.* 2006). They are all considered already under threat from human activities such as pollution, harvesting and coastal development. Problems will be exacerbated for mangrove stands where landward migration is restricted by topography or human developments.

In addition to impacts on mangroves, sea-level rise is expected to impact globally threatened species of migratory shorebirds through the loss of intertidal mud flats (Tordoff *et al.* 2002; Buckton & Safford 2004; Tordoff et al. 2005). Breeding colonies of seabirds and turtles may be particularly vulnerable to sea-level rise (Duffy 2011).

Global climate change through ocean acidification poses a substantial risk to the biodiversity, ecosystem functioning and productivity of coral reefs in Myanmar and thus threatens their socioeconomic value to dependent human communities. Increasing ocean acidification leads to a reduction in coral calcification and affects coral reefs, which provide habitat for about a quarter of all marine species and are the most diverse among marine ecosystems (Roberts *et al.* 2002). Coral reefs are extensive on the south west coast of Myanmar and around the islands, extending further south into Thailand, covering 1,870 km^2, with the majority of coral reefs found in the Myeik Archipelago of the Taninthayi Region. Coral reefs in Myanmar need to be more fully surveyed, better protected and monitored for climate change impacts since they provide many functions, services and goods in terms of coastal protection and sediment retention, nurseries and habitats for aquatic organisms and feeding grounds for economically important species of fish.

6.2. People, Biodiversity and Climate Change

The short and long term impacts of climate change will exacerbate existing threats to biodiversity in Myanmar through direct mechanisms as listed in Figure 7 as well indirectly, through its impacts on humans and their dependence on the products and services produced by terrestrial, freshwater and marine ecosystems. Climate change is anticipated to impact human populations through the loss of agricultural lands (e.g. Johnston *et al.* 2010a; 2010b; MRC & ICEM 2009), aquaculture (e.g. Kam *et al.* 2010), shortages of food and fresh water, reduced income, damage to property and infrastructure, disease and other health issues, and the need for resettlement away from lands affected by sea-level rise or floods (e.g. Hoanh *et al.* 2010; Wassmann *et al.* 2004).

Poor populations are among the most vulnerable to climate change, due to their reliance on natural resources and limited technical or financial resources for adaptation. Declines in fish productivity due to climate change and hydropower development could result in food shortages for many (e.g. Baran *et al.* 2008; Welcomme *et al.* 2010). Myanmar's freshwater ecosystems form an integral part of agricultural production systems, which will be impacted by climate change.

The response of human populations to climate change will almost certainly place greater pressures on Myanmar's biodiversity. In upland areas, crop failure due to warming conditions may force communities to clear forests and establish crops at higher elevations; slash and burn practices under drier conditions might also increase the incidence of forest fires. In coastal areas, sea-level rise would force communities to clear and occupy new lands. In the lowlands generally, declining fish catches would force communities to seek alternative protein sources, and hunting of wildlife would probably

increase. As species shift ranges and habitat compositions change in response to climate change, animals that are generalists such as invasive species may have greater competitive success than native species. Invasive animal species tend to be generalists, which may increase their success and threaten native species. An important impact of climate change for wild populations as well as human communities is the increased risk of disease such as malaria and dengue (Daszak *et al.* 2000; Harvell *et al.* 2002).

In all regions, increased conflict with protected areas is virtually certain, as displaced communities seek new lands to settle in. Governments may inadvertently facilitate such impacts as they are forced to seek land solutions for displaced populations. In coastal regions, the need to shift some infrastructure inland (such as coastal roads) to avoid sea-level rise may require the clearance, or further fragmentation, of remnant habitats. The scale of these impacts is potentially huge, involving millions of people, and human biogeography will thus be critical to conservation planning under climate change (Woodruff 2010).

6.3. Climate Change Adaptation for Biodiversity

6.3.1. Challenges

There are clear challenges associated with uncertainty of forecasts, variability of climate impacts, and limited understanding of climate change impacts on biodiversity that influence our ability to develop strategies aimed at making species and ecosystems resilient to climate change in Myanmar.

First, although the physics of global warming are well known and understood, the predictive power is poor for how this process affects terrestrial, marine and freshwater ecosystems at different scales, essential for effective conservation action. There is significant variability in relevant downscaled forecasts from different global circulation models (GCMs) which must form the basis for adaptation planning for climate change impacts on biodiversity (Wiens & Bachelet 2010).

Second, in addition to key, direct threats that climate change poses to biodiversity (e.g., sea-level rise, the impacts of severe droughts) there are less obvious impacts that affect ecosystems that are hard to predict. Key abiotic characteristics, the basic building blocks of a species' fundamental niche (e.g. temperature, rainfall, evapotranspiration) will change and affect distribution and abundance of many species in unknown ways. Consequently, given both the uncertainty in projecting future climates and the uncertainty inherent in most relevant ecological forecasting approaches, conservation managers must become comfortable undertaking conservation actions within realms of uncertainty (Watson *et al.* 2011a & 2011b).

Third, the impacts of climate change are not simply those of average temperature increase or sea-level rise: the extremes may be far more important. Conservation planning and adaptation needs to consider discrete impacts principally extreme weather events (e.g., storms, droughts, fires) that drastically alter the resilience and persistence of ecosystems and species.

7. Investment Priorities

Table 11: Strategic Directions and Investment Priorities

Strategic Direction	Investment Priorities
Expand conservation action in KBAs	Conduct a gap analysis of KBAs and protected areas and expand the national protected area network
	Strengthen law enforcement to deal with the increasing amount of commercial hunting and international wildlife trade being conducted in the county
	Formalize the role of local communities to manage natural resources
	Clarify regulations regarding revenue collection and revenue sharing by and in protected areas
	Develop new models for community or privately managed protected areas and KBAs
Mainstream biodiversity conservation into national development planning	Conduct comprehensive land use planning taking into account the existing protected area network and other KBAs.
	Develop a stricter regulatory framework covering major infrastructure programs including the use of Strategic Environmental Assessment for major development sectors especially Hydropower, Agriculture and Mining.
	Implement publically accessible EIA and SEA for all development projects
	Develop policy to consider payment for ecosystem services as an integral part of development projects
Target conservation actions for Priority Species	Conduct more extensive biodiversity surveys to fully understand the importance of poorly known KBAs
	Conduct surveys on poorly known taxonomic groups such as fishes, plants, amphibians and invertebrates
	Develop ex-situ conservation approaches especially for Critically Endangered turtle and tortoise species.
Increase public participation and awareness	Expand the role of national media to increase awareness and inform policy decisions
	Improve conservation awareness for target groups such as migrant workers and gold prospectors
Identify no-regrets actions for ecosystem-based climate change adaptation and conservation outcomes	Undertake vulnerability assessments on climate change on key species, ecosystems and ecosystem services
	Undertake assessments of how climate change is likely to affect current threatening processes to biodiversity and ecosystem services

7.1. Expand Conservation Action in KBAs

Conservation action is currently limited to a few protected areas that either have or have had outside financial and technical support to conduct activities. Overall only two thirds of KBAs have some protected legal status but less than 20% of those are staffed and out of these only a handful have sufficient budget for regular activities. There is a significant need for increased government investment as well as outside donor support to effectively protect these areas of global conservation importance.

This system has been developed in an ad hoc fashion over time beginning from a series of royal and colonial hunting reserves and gradually expanding as species of conservation importance have been found to occur. To date no systematic review of the distribution of Myanmar's biodiversity and ecosystems has been conducted to identify gaps in the protected area network. In particular, marine and riverine sites are underrepresented. A gap analysis looking at the full range of species and ecosystems is needed to ensure comprehensive coverage of Myanmar's rich biodiversity. This should be linked to more field surveys to provide up to date information on priority species as well as poorly known taxonomic groups. The results of this gap analysis should be integrated with national land use plans to limit conflicting land uses and maximize connectivity across conservation corridors.

Within the protected area system there is a need for much stronger law enforcement. The existing legal framework is quite clear and recent changes have increased the penalties for environmental crimes. Unfortunately, enforcement is still weak. This will require increased collaboration between the Forest Department and Department of Fisheries with police, customs and the military, as well as dealing with the widespread and complex issue of corruption.

Even with increased government staffing and improved relations with other law enforcement agencies, the budgetary and logistical constraints alone of working across large landscapes necessitates an increased role for local communities in protected area management. This role needs to be legally defined in more detail to overcome the existing ambiguity in the wildlife law. Policies are also needed that clarify how local communities can legally manage and benefit from natural resources including timber and other minor forest products. Increased cooperation between the Forest Department and local communities should lead to increased protection as well as socioeconomic benefits for forest residents.

With the expansion of infrastructure development and increased international tourism the opportunities for protected areas to generate revenue will increase dramatically. This revenue should be used by the Forest Department to improve and expand biodiversity conservation. Currently, no such systems exist and in most cases protected areas are not allowed to collect entry fees or any other type of revenue. Policies need to be changed to allow revenue collection, with a system in place that ensures funds are reinvested in protected areas rather than used for external costs. As private investment and interest in potential carbon revenues increases, there may be a potential for some areas to be able to raise a substantial amount of their budget locally.

Despite the best efforts of the relevant agencies it is unlikely that the government will be able to directly manage all KBAs. There is a need to develop other models of conservation that engage local communities or the private sector to achieve conservation goals. These systems should be held to the same standards as government managed protected areas and should have a clear legal framework to adhere to.

7.2. Mainstream Biodiversity Conservation into National Development Planning

Myanmar is a huge country with an outdated policy of land use. Although the original British land use system continues to be followed in some areas much of this system is out-of-date and no longer representative of true land use. To ensure that a comprehensive protected area network can be developed and conserve Myanmar's incredible biodiversity land use planning policy across the country needs to be revised. Such an overhaul should consider the conservation corridors across the country and how they can keep large ecologically intact areas to provide ecosystem services as well as maximize the opportunities for adaptation in relation to global climate change.

Of particular importance at this stage in Myanmar's development are the environmental policies related to large infrastructure projects currently being developed. Hydropower plants, deep sea ports, gas pipelines and increased road and train networks all require careful planning as well as a strict regulatory framework to ensure that environmental and social impacts are minimized and mitigated. The use of Strategic Environmental Assessment (SEA) to understand the cumulative effects of such large projects is especially needed.

Although the large infrastructure projects receive the most attention there are numerous smaller development projects that also need to be carefully studied to insure that social and environmental impacts are understood and minimized. In particular EIA and SEA that are publically accessible and open for public debate are needed to ensure effective sustainable development.

With the economic opportunities presented by the increasing number of development projects in the country there is a need to include valuation of environmental services and biodiversity in development planning. Following the examples from neighboring countries the use of a Payment for Ecosystem Services (PES) approach could be used to increase funding for environmental protection.

7.3. Target Conservation Actions for Priority Species

Despite the extensive work done by the Government and a number of national and international NGOs and institutions there are still huge areas of the country where no serious biological survey work has been conducted in recent history. In addition many groups are poorly known and seriously under surveyed making conservation priorities extremely difficult to understand. As some of the more remote corners of the country become more accessible there is a need for further systematic survey work to fill in gaps in knowledge of priority species and improve understanding of conservation priorities, particularly for under studied groups such as fish, amphibians, plants and invertebrates.

While many priority species in Myanmar can effectively be conserved in-situ using the protected area network there is also a, more limited, role for specific targeted ex-situ programs to ensure some of the country's rarest species do not become extinct. Ex-situ conservation has already been shown to be effective in conserving some of the Critically Endangered endemic turtle and tortoise species living in Myanmar and this program is likely to expand in coming years and cover more species. The development of such assurance colonies could also be applicable to other species in the country although none are currently being considered.

There is also a greater role for temporary holding facilities for wildlife confiscated in trade. This is being developed for turtle confiscations but there is an opportunity to

expand facilities to provide for a wider range of confiscated species. As much as possible species taken from trade should be returned to native habitats and animals that can not be returned to the wild should be used where appropriate for captive breeding purposes. Such schemes need to also carefully understand the risk of disease transmission and the potential threats of mixing species from widely separated populations.

7.4. Increase Public Participation and Awareness

Following the 2010 elections the Myanmar Government has increasingly engaged with civil society and shown a willingness to listen to public opinion. This has been especially evident in the government's recent decisions on the Myitsone Dam and the Dawei Deep Sea Port Project. Following these examples there is clearly a role for the broader public to participate in debates about policy and development decisions and their effects on the environment. It is clear that this constituency could become a powerful force in supporting biodiversity conservation and there are needs to keep the public informed as well as increase their participation in conservation activities. Government agencies and both local and international NGOs need to work more closely with the national media to ensure that the public continues to be informed and can continue to participate in this important debate.

There is also the need to provide more focused awareness raising to key target groups that are involved in environmentally destructive practices. In particular, economic migrants within Myanmar as well as neighboring countries that participate in mining and other types of resource extraction need to clearly understand environmental laws and that their activities have negative consequences and are often illegal.

7.5. Climate Change Adaptation Strategies

Within the context of the challenges outlined above, the following is a description of *adaptations strategies* that are aimed at overcoming some of the threats to climate change. There are two distinct categories of actions in adaptation planning:

The **first** set of actions involves 'no regret' actions in the absence of good forecast data based on the fact that climate change is a natural phenomenon and that species have overcome past climate change events (Heller & Zavaleta 2009; Watson *et al.* 2009, 2011b).

One strategy for conserving regional biodiversity in a dynamic climate is to conserve the full spectrum of geophysical settings (Beier & Brost 2010). If geophysical diversity helps to maintain species diversity, then conserving representative examples of geophysical settings could potentially protect biodiversity under both current and future climates (Beier & Brost 2010). Importantly, reducing or removing the effects of non-climate-related threats such as habitat loss and degradation, and overexploitation will increase the ability of species and ecosystems to respond to climate change. Improving management and restoration of existing protected areas and ensuring adequate representation and replication within protected area networks will facilitate resilience. Increasing functional landscape connectivity is the most commonly cited climate change adaptation strategy for biodiversity management (Heller & Zavaleta 2009) and refers to management actions that facilitate dispersal of species among natural areas, for example, through the establishment of landscape corridors or stepping-stone reserves or through actions that increase matrix permeability. A widely applicable example of pre-emptive conservation planning to increase connectivity would be preserving (or restoring) forest continuity along altitudinal gradients, maximizing the opportunity for

low-altitude species populations to retreat to cooler refuges in response to warming (Hughes *et al.* 2010; Corlett 2011).

Based on the above, a series of best practice principles have been actively promoted for adaptation planning:
(1) Significantly expanding the current protected area estate to maintain viable populations of species and maximize adaptive capacity;
(2) Significantly expanding the current protected area estate so as to capture refugia;
(3) Assign priority to protecting large, intact landscapes; and
(4) Ensure functional connectivity is maintained beyond protected areas.

The **second** category of actions involves undertaking vulnerability analyses for species and ecosystem services, modeling future ecological states (accepting uncertainties) and integrating into a holistic planning framework that includes human responses to climate change impacts. A first step is to build critically important knowledge and capacity to make climate change adaptation of conservation management effective in the absence of data. Subsequently, scenario building exercises with scientists and stakeholders may be used to consider how outcomes may vary and what actions would be appropriate for different combinations of factors driving environmental responses to climate change. It is critical to recognize that this second category is climate adaptation (as defined by the IPCC), as relying solely on no-regrets actions (first category above) is unlikely to overcome all the short and long term threats climate change presents.

7.6. Ecosystem-based Adaptation

Strong linkages between the impacts and responses of people and biodiversity to climate change indicate the need to develop coherent strategies that seek to conserve biodiversity while maintaining ecosystem services that human communities depend upon. In recent years, Ecosystem-based Adaptation (EbA) has been developed by members of the conservation community as a key approach that uses biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change (Andrade *et al.* 2010). The goal of EbA is to sustainably manage both target and non-target species by preserving or restoring habitat quality to maintain ecosystem services (Rosenberg & MacLeod 2005). EbA will play an important role in climate change adaptation in Myanmar.

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Appendices

Appendix 1: IUCN Red Listed Species for Myanmar

NON-MARINE MAMMALS			
No	**Scientific Name**	**Common Name**	**IUCN-2011**
1	*Dicerorhinus sumatrensis*	Sumatran Rhinoceros	CR
2	*Rhinoceros sondaicus*	Javan Rhinoceros	CR
3	*Rhinopithecus strykeri*	Myanmar Snub-Nosed Monkey	CR
4	*Axis porcinus*	Hog Deer	EN
5	*Bos javanicus*	Banteng	EN
6	*Bubalus arnee*	Indian Water Buffalo	EN
7	*Cuon alpinus*	Dhole	EN
8	*Elephas maximus*	Asian Elephant	EN
9	*Hapalomys longicaudatus*	Greater Marmoset Rat	EN
10	*Hoolock hoolock*	Western Hoolock Gibbon	EN
11	*Hylobates lar*	Lar Gibbon	EN
12	*Lutra sumatrana*	Hairy-nosed Otter	EN
13	*Manis javanica*	Sunda Pangolin	EN
14	*Manis pentadactyla*	Chinese Pangolin	EN
15	*Moschus fuscus*	Black Musk Deer	EN
16	*Panthera tigris*	Tiger	EN
17	*Prionailurus viverrinus*	Fishing Cat	EN
18	*Rucervus eldii*	Eld's Deer	EN
19	*Tapirus indicus*	Malayan Tapir	EN
20	*Trachypithecus germaini*	Indochinese Lutung	EN
21	*Trachypithecus phayrei*	Phayre's Leaf-monkey	EN
22	*Trachypithecus shortridgei*	Shortridge's Langur	EN
23	*Ailurus fulgens*	Red Panda	VU
24	*Aonyx cinerea*	Asian Small-clawed Otter	VU
25	*Arctictis binturong*	Binturong	VU
26	*Bos gaurus*	Gaur	VU
27	*Budorcas taxicolor*	Takin	VU
28	*Craseonycteris thonglongyai*	Hog-nosed Bat	VU
29	*Helarctos malayanus*	Sun Bear	VU
30	*Hemigalus derbyanus*	Banded Civet	VU
31	*Hoolock leuconedys*	Eastern Hoolock Gibbon	VU
32	*Lutrogale perspicillata*	Smooth-coated Otter	VU
33	*Macaca arctoides*	Stump-tailed Macaque	VU
34	*Macaca leonina*	Northern Pig-tailed Macaque	VU
35	*Naemorhedus baileyi*	Red Goral	VU
36	*Naemorhedus griseus*	Chinese Goral	VU
37	*Neofelis nebulosa*	Clouded Leopard	VU
38	*Nycticebus bengalensis*	Bengal Slow Loris	VU
39	*Pardofelis marmorata*	Marbled Cat	VU
40	*Petinomys setosus*	Temminck's Flying Squirrel	VU
41	*Petinomys vordermanni*	Vordermann's Flying Squirrel	VU
42	*Rusa unicolor*	Sambar	VU
43	*Trachypithecus pileatus*	Capped Langur	VU

No	Scientific Name	Common Name	IUCN-2011
44	*Ursus thibetanus*	Himalayan Black Bear	VU
45	*Viverra megaspila*	Large-spotted Civet	VU
46	*Arctonyx collaris*	Hog Badger	NT
47	*Callosciurus quinquestriatus*	Anderson's Squirrel	NT
48	*Capricornis milneedwardsii*	Southwest China Serow	NT
49	*Capricornis rubidus*	Red Serow	NT
50	*Elaphodus cephalophus*	Tufted Deer	NT
51	*Lutra lutra*	Eurasian Otter	NT
52	*Macaca assamensis*	Assam Macaque	NT
53	*Nycteris tragata*	Malayan Slit-faced Bat	NT
54	*Panthera pardus*	Leopard	NT
55	*Pardofelis temminckii*	Asiatic Golden Cat	NT
56	*Presbytis femoralis*	Banded Surili	NT
57	*Pteropus vampyrus*	Large Flying-fox	NT
58	*Ratufa bicolor*	Black Giant Squirrel	NT
59	*Trachypithecus obscurus*	Dusky Leaf-monkey	NT
60	*Viverra zibetha*	Large Indian Civet	NT
61	*Belomys pearsonii*	Hairy-footed Flying Squirrel	DD
62	*Berylmys mackenziei*	Kenneth's White-toothed Rat	DD
63	*Berylmys manipulus*	Manipur White-toothed Rat	DD
64	*Diomys crumpi*	Crump's Mouse	DD
65	*Eudiscopus denticulus*	Disk-footed Bat	DD
66	*Harpiocephalus mordax*	Greater Hairy-winged Bat	DD
67	*Hipposideros grandis*	Grand Leaf-nosed Bat	DD
68	*Melogale personata*	Large-toothed Ferret Badger	DD
69	*Muntiacus feae*	Fea's Muntjac	DD
70	*Muntiacus gongshanensis*	Gongshan Muntjac	DD
71	*Muntiacus putaoensis*	Leaf Muntjac	DD
72	*Neodon forresti*	Forrest's Mountain Vole	DD
73	*Pipistrellus anthonyi*	Anthony's Pipistrelle	DD
74	*Pipistrellus joffrei*	Joffre's Pipistrelle	DD
75	*Pipistrellus lophurus*	Burmese Pipistrelle	DD
76	*Pteropus intermedius*	Andersen's Flying Fox	DD
77	*Trachypithecus barbei*	Tenasserim Lutung	DD

MARINE MAMMALS			
No	**Scientific Name**	**Common Name**	**IUCN-11**
1	*Balaenoptera musculus*	Blue Whale	EN
2	*Dugong dugon*	Dugong	EN
3	*Neophocaena phocaenoides*	Finless Porpoise	VU
4	*Orcaella brevirostris*	Irrawaddy Dolphin	VU
5	*Sousa chinensis*	Indo-pacific Hump-backed Dolphin	NT
6	*Balaenoptera edeni*	Bryde's Whale	DD
7	*Feresa attenuata*	Pygmy Killer Whale	DD
8	*Globicephala macrorhynchus*	Short-finned Pilot Whale	DD
9	*Kogia breviceps*	Pygmy Sperm Whale	DD
10	*Kogia sima*	Dwarf Sperm Whale	DD

No	Scientific Name	Common Name	IUCN-2011
11	*Mesoplodon densirostris*	Blainville's Beaked Whale	DD
12	*Orcinus orca*	Killer Whale	DD
13	*Pseudorca crassidens*	False Killer Whale	DD
14	*Stenella longirostris*	Spinner Dolphin	DD
15	*Tursiops aduncus*	Indo-pacific Bottlenose Dolphin	DD

BIRDS			
No	**Scientific Name**	**Common Name**	**IUCN-2011**
1	*Ardea insignis*	White-bellied Heron	CR
2	*Eurynorhynchus pygmeus*	Spoon-billed Sandpiper	CR
3	*Gyps bengalensis*	White-rumped Vulture	CR
4	*Gyps tenuirostris*	Slender-billed Vulture	CR
5	*Pseudibis davisoni*	White-shouldered Ibis	CR
6	*Rhodonessa caryophyllacea*	Pink-headed Duck	CR
7	*Sarcogyps calvus*	Red-headed Vulture	CR
8	*Aythya baeri*	Baer's Pochard	EN
9	*Cairina scutulata*	White-winged Duck	EN
10	*Ciconia stormi*	Storm's Stork	EN
11	*Ciconia boyciana*	Oriental Stork	EN
12	*Heliopais personatus*	Masked Finfoot	EN
13	*Leptoptilos dubius*	Greater Adjutant	EN
14	*Mergus squamatus*	Scaly-sided Merganser	EN
15	*Pavo muticus*	Green Peafowl	EN
16	*Pitta gurneyi*	Gurney's Pitta	EN
17	*Sitta victoriae*	White-browed Nuthatch	EN
18	*Tringa guttifer*	Spotted Greenshank	EN
19	*Aceros nipalensis*	Rufous-necked Hornbill	VU
20	*Aceros subruficollis*	Plain-pouched Hornbill	VU
21	*Alcedo euryzona*	Blue-banded Kingfisher	VU
22	*Apus acuticauda*	Dark-rumped Swift	VU
23	*Aquila clanga*	Greater Spotted Eagle	VU
24	*Aquila hastata*	Indian Spotted Eagle	VU
25	*Aquila heliaca*	Eastern Imperial Eagle	VU
26	*Calidris tenuirostris*	Great Knot	VU
27	*Chrysomma altirostre*	Jerdon's Babbler	VU
28	*Columba punicea*	Pale-capped Pigeon	VU
29	*Emberiza aureola*	Yellow-breasted Bunting	VU
30	*Gallinago nemoricola*	Wood Snipe	VU
31	*Grus antigone*	Sarus Crane	VU
32	*Haliaeetus leucoryphus*	Pallas's Fish-eagle	VU
33	*Leptoptilos javanicus*	Lesser Adjutant	VU
34	*Lophophorus sclateri*	Sclater's Monal	VU
35	*Megapodius nicobariensis*	Nicobar Megapode	VU
36	*Mulleripicus pulverulentus*	Great Slaty Woodpecker	VU
37	*Otus sagittatus*	White-fronted Scops-owl	VU
38	*Pycnonotus zeylanicus*	Straw-headed Bulbul	VU
39	*Rynchops albicollis*	Indian Skimmer	VU

No	Scientific Name	Common Name	IUCN-2011
40	*Sitta formosa*	Beautiful Nuthatch	VU
41	*Sitta magna*	Giant Nuthatch	VU
42	*Spizaetus nanus*	Wallace's Hawk-eagle	VU
43	*Stachyris oglei*	Snowy-throated Babbler	VU
44	*Tragopan blythii*	Blyth's Tragopan	VU
45	*Treron capellei*	Large Green-pigeon	VU
46	*Turdoides longirostris*	Slender-billed Babbler	VU
47	*Turdus feae*	Grey-sided Thrush	VU
48	*Aceros comatus*	White-crowned Hornbill	NT
49	*Actenoides concretus*	Rufous-collared Kingfisher	NT
50	*Aegithina viridissima*	Green Iora	NT
51	*Aegypius monachus*	Cinereous Vulture	NT
52	*Alcedo hercules*	Blyth's Kingfisher	NT
53	*Anas falcata*	Falcated Duck	NT
54	*Anhinga melanogaster*	Oriental Darter	NT
55	*Anorrhinus austeni*	Austen's Brown Hornbill	NT
56	*Anorrhinus tickelli*	Tickell's Brown Hornbill	NT
57	*Anthreptes rhodolaemus*	Red-throated Sunbird	NT
58	*Arborophila atrogularis*	White-cheeked Partridge	NT
59	*Arborophila charltonii*	Chestnut-necklaced Partridge	NT
60	*Argusianus argus*	Great Argus	NT
61	*Aythya nyroca*	Ferruginous Duck	NT
62	*Brachypteryx hyperythra*	Rusty-bellied Shortwing	NT
63	*Buceros bicornis*	Great Hornbill	NT
64	*Caloenas nicobarica*	Nicobar Pigeon	NT
65	*Caloperdix oculeus*	Ferruginous Partridge	NT
66	*Calyptomena viridis*	Asian Green Broadbill	NT
67	*Chloropsis cyanopogon*	Lesser Green Leafbird	NT
68	*Circus macrourus*	Pallid Harrier	NT
69	*Coturnix japonica*	Japanese Quail	NT
70	*Crypsirina cucullata*	Hooded Treepie	NT
71	*Cuculus vagans*	Moustached Hawk-cuckoo	NT
72	*Dicrurus andamanensis*	Andaman Drongo	NT
73	*Dinopium rafflesii*	Olive-backed Woodpecker	NT
74	*Enicurus ruficapillus*	Chestnut-naped Forktail	NT
75	*Ephippiorhynchus asiaticus*	Black-necked Stork	NT
76	*Esacus giganteus*	Beach Thick-knee	NT
77	*Eurylaimus ochromalus*	Black-and-yellow Broadbill	NT
78	*Falco jugger*	Laggar Falcon	NT
79	*Garrulax nuchalis*	Chestnut-backed Laughingthrush	NT
80	*Graminicola bengalensis*	Rufous-rumped Grassbird	NT
81	*Harpactes duvaucelii*	Scarlet-rumped Trogon	NT
82	*Harpactes wardi*	Ward's Trogon	NT
83	*Ichthyophaga humilis*	Lesser Fish-eagle	NT
84	*Ichthyophaga ichthyaetus*	Grey-headed Fish-eagle	NT
85	*Indicator xanthonotus*	Yellow-rumped Honeyguide	NT
86	*Iole olivacea*	Buff-vented Bulbul	NT

No	Scientific Name	Common Name	IUCN-2011
87	*Ixos malaccensis*	Streaked Bulbul	NT
88	*Limnodromus semipalmatus*	Asian Dowitcher	NT
89	*Limosa limosa*	Black-tailed Godwit	NT
90	*Lophura ignita*	Crested Fireback	NT
91	*Luscinia pectardens*	Firethroat	NT
92	*Malacocincla malaccensis*	Short-tailed Babbler	NT
93	*Malacopteron magnum*	Rufous-crowned Babbler	NT
94	*Megalaima mystacophanos*	Red-throated Barbet	NT
95	*Megalaima rafflesii*	Red-crowned Barbet	NT
96	*Meiglyptes tukki*	Buff-necked Woodpecker	NT
97	*Mycteria leucocephala*	Painted Stork	NT
98	*Numenius arquata*	Eurasian Curlew	NT
99	*Oriolus xanthonotus*	Dark-throated Oriole	NT
100	*Pelargopsis amauroptera*	Brown-winged Kingfisher	NT
101	*Pelecanus philippensis*	Spot-billed Pelican	NT
102	*Pericrocotus igneus*	Fiery Minivet	NT
103	*Phaenicophaeus diardi*	Black-bellied Malkoha	NT
104	*Phaenicophaeus sumatranus*	Chestnut-bellied Malkoha	NT
105	*Philentoma velata*	Maroon-breasted Philentoma	NT
106	*Pitta caerulea*	Giant Pitta	NT
107	*Pitta granatina*	Garnet Pitta	NT
108	*Pitta megarhyncha*	Mangrove Pitta	NT
109	*Platylophus galericulatus*	Crested Jay	NT
110	*Platysmurus leucopterus*	Black Magpie	NT
111	*Ploceus hypoxanthus*	Asian Golden Weaver	NT
112	*Polihierax insignis*	White-rumped Falcon	NT
113	*Psittacula longicauda*	Long-tailed Parakeet	NT
114	*Psittinus cyanurus*	Blue-rumped Parrot	NT
115	*Pycnonotus cyaniventris*	Grey-bellied Bulbul	NT
116	*Pycnonotus eutilotus*	Puff-backed Bulbul	NT
117	*Pycnonotus squamatus*	Scaly-breasted Bulbul	NT
118	*Rhinoplax vigil*	Helmeted Hornbill	NT
119	*Rhizothera longirostris*	Long-billed Partridge	NT
120	*Rollulus rouloul*	Crested Partridge	NT
121	*Sphenocichla roberti*	Chevron-breasted Babbler	NT
122	*Sterna acuticauda*	Black-bellied Tern	NT
123	*Syrmaticus humiae*	Hume's Pheasant	NT
124	*Threskiornis melanocephalus*	Black-headed Ibis	NT
125	*Treron fulvicollis*	Cinnamon-headed Green-pigeon	NT
126	*Trichastoma rostratum*	White-chested Babbler	NT
127	*Acrocephalus orinus*	Large-billed Reed-warbler	DD
128	*Anas formosa*	Baikal Teal	LC
129	*Falco naumanni*	Lesser Kestrel	LC

TURTLES & TORTOISES			
No	**Scientific Name**	**Common Name**	**IUCN-2011**
1	*Chitra vandijki*	Burmese Narrow-headed Softshell Turtle	CR
2	*Dermochelys coriacea*	Leatherback Turtle	CR
3	*Eretmochelys imbricata*	Hawksbill Turtle	CR
4	*Geochelone platynota*	Burmese Starred Tortoise	CR
5	*Heosemys depressa*	Arakan Forest Turtle	CR
6	*Batagur baska*	Four-toed Terrapin	CR
7	*Batagur trivittata*	Burmese Roofed Turtle	EN
8	*Chelonia mydas*	Green Turtle	EN
9	*Chitra indica*	Indian Narrow-headed Softshell Turtle	EN
10	*Cuora mouhotii*	Jagged-shelled Turtle	EN
11	*Indotestudo elongata*	Yellow-headed Tortoise	EN
12	*Manouria emys*	Burmese Mountain Tortoise	EN
13	*Nilssonia formosa*	Burmese Peacock Softshell	EN
14	*Pelochelys cantorii*	Frog-faced Softshell Turtle	EN
15	*Platysternon megacephalum*	Big-headed Turtle	EN
16	*Heosemys spinosa*	Spiny Turtle	EN
17	*Amyda cartilaginea*	Southeast Asian Soft Shell Turtle	VU
18	*Cuora amboinensis*	Southeast Asian Box Turtle	VU
19	*Heosemys grandis*	Giant Asian Pond Turtle	VU
20	*Lepidochelys olivacea*	Olive Ridley	VU
21	*Manouria impressa*	Impressed Tortoise	VU
22	*Morenia ocellata*	Bengal Eyed Terrapin	VU
23	*Siebenrockiella crassicollis*	Black Marsh Turtle	VU
24	*Malayemys subtrijuga*		VU
25	*Cyclemys dentata*	Brown Stream Terrapin	NT
26	*Melanochelys trijuga*	Indian Black Turtle	NT

CROCODILES			
No	**Scientific Name**	**Common Name**	**IUCN-2011**
1	*Gavialis gangeticus*	Gharial	CR

SNAKES			
No	**Scientific Name**	**Common Name**	**IUCN-2011**
1	*Enhydris vorisi*	Voris's Water Snake	EN
2	*Ophiophagus hannah*	King Cobra	VU
3	*Dryocalamus gracilis*	Scarce Bridal Snake	DD
4	*Enhydris maculosa*	Blanford's Spotted Water Snake	DD
5	*Gongylosoma scripta*	Common Ring-neck	DD
6	*Hydrophis cantoris*	Gunther's Sea Snake	DD
7	*Hydrophis nigrocinctus*	Daudin's Sea Snake	DD
8	*Hydrophis stricticollis*	Collared Sea Snake	DD
9	*Oligodon planiceps*	Flat-headed Kukri Snake	DD
10	*Oligodon torguatus*	Garlanded Kukri Snake	DD
11	*Protobothrops kaulbacki*	Kaulback's Lance-headed Pitviper	DD
12	*Scincella punctatolineata*	Burma Smooth Skink	DD
13	*Sibynophis bistrigatus*	Gunther's Many-tooth Snake	DD

No	Scientific Name	Common Name	IUCN-2011
14	*Python molurus*	Asiatic Rock Python	NT

LIZARDS and GECKOS			
No	**Scientific Name**	**Common Name**	**IUCN-2011**
1	*Cyrtodactylus annandalei*	Annandale's Bent-toed Gecko	DD
2	*Cyrtodactylus Ayeyawady ensis*	Ayeyawady Bent-toed Gecko	DD
3	*Cyrtodactylus brevidactylus*	Short-toed Bent-toed Gecko	DD
4	*Cyrtodactylus chrysopylos*	Shan State Bent-toed Gecko	DD
5	*Cyrtodactylus feae*	Feae's Bent-toed Gecko	DD
6	*Cyrtodactylus wakeorum*	Wakes's Bent-toed Gecko	DD
7	*Lygosoma anguinum*	Burmese Supple Skink	DD

AMPHIBIANS			
No	**Scientific Name**	**Common Name**	**IUCN-2011**
1	*Amolops bellulus*		DD
2	*Amolops kaulbacki*		DD
3	*Amolops longimanus*		DD
4	*Chiromantis punctatus*		DD
5	*Duttaphrynus crocus*		DD
6	*Duttaphrynus stuarti*		DD
7	*Fejervarya altilabris*		DD
8	*Humerana oatesii*		DD
9	*Hylarana margariana*		DD
10	*Kurixalus carinensis*		DD
11	*Limnonectes doriae*		DD
12	*Limnonectes limborgi*		DD
13	*Limnonectes macrognathus*		DD
14	*Nanorana feae*		DD
15	*Odorrana livida*		DD
16	*Philautus cinerascens*		DD
17	*Philautus tytthus*		DD
18	*Rhacophorus taronensis*		DD
19	*Rhacophorus turpes*		DD
20	*Scutiger adungensis*		DD
21	*Theloderma phrynoderma*		DD
22	*Bufo pageoti*		NT
23	*Glyphoglossus molossus*		NT
24	*Limnonectes blythii*	Giant Asian River Frog	NT
25	*Nanorana arnoldi*		NT

FISHES			
No	**Scientific Name**	**Common Name**	**IUCN-2011**
1	*Schizothorax grahami,*	Kunming Snout Trout	CR
2	*Tenualosa toli*	Toli shad	CR
3	*Glyphis siamensis*	Irrawaddy river shark	CR
4	*Tenualosa ilisha*	Hilsa shad	EN
5	*Polynemus indicus*	Indian threadfin	EN

No	Scientific Name	Common Name	IUCN-2011
6	*Eleutheronema tetradactylum*	Four finger threadfin	EN
7	*Upeneus sulphureus*	Sulphur/Yellow goatfish	VU
8	*Upeneus moluccensis*	Gold band goat fish	VU
9	*Trichiurus lepturus*	Largehead hairtail	VU
10	*Thunnus tonggol*	Long tail tuna	VU
11	*Thunnus albacares*	Yellow fin tuna	VU
12	*Thryssa mystax*	Moustached thryssa	VU
13	*Stolephorus commersonii*	Commerson's anchovy	VU
14	*Sphyrna zygema*	Round headed hammer head shark	VU
15	*Sphyrna mokarran*	Great hammerhead	VU
16	*Sphyrna lewini*	Scalloped hammerhead	VU
17	*Sphyrna blochii*	Arrow headed hammer head shark	VU
18	*Sillago sihama*	Silver sillago	VU
19	*Sillaginopsis panijus*	Flatheaded sillago	VU
20	*Shyraena barracuda*	Great barracuda	VU
21	*Scomberomorus guttatus*	Indo-Pacific Spanish mackerel	VU
22	*Scomberomorus commerson*	Narrow barred Spanish mackerel	VU
23	*Scomberoides commersonianus*	Talang queen fish	VU
24	*Scoliodon laticaudus*	Spadenose shark	VU
25	*Saurida undosquamis*	Brushtooth lizardfish	VU
26	*Saurida tumbil*	Greater lizardfish	VU
27	*Sardinella gibbosa*	Gold stripe sardinella	VU
28	*Rhynchobatus djeddensia*	White spotted guitar fish	VU
29	*Rhizoprionodon oligolinx*	Gray sharpnose shark	VU
30	*Rhizoprionodon acutus*	Milk shark	VU
31	*Rhincodon typus*	Whale shark	VU
32	*Rastrelliger kanagurta*	Indian mackerel	VU
33	*Rastrelliger brachysoma*	Short bodied mackerel	VU
34	*Pterotolithus maculatus*	Blotched tiger toothed croaker	VU
35	*Psettodes erumei*	Indian halibut	VU
36	*Protonibea diacanthus*	Spotted croaker	VU
37	*Pristis zijson*	Green saw fish	VU
38	*Pristis microdon*	Small tooth saw fish	VU
39	*Pristis cuspidatus*	Pointed saw fish	VU
40	*Pomadasys kaakan*	Javelin/Grunter	VU
41	*Polynemus paradiseus*	Paradise fish/Mango fish	VU
42	*Pennahia anea*	Donkey croaker	VU
43	*Pampus chinensis*	Chinese pomfret	VU
44	*Pampus argenteus*	Silver pomfret	VU
45	*Otolithoides biauritus*	Broozed croaker	VU
46	*Otolithes ruber*	Tiger tooth croaker	VU
47	*Osteogeniosus militeris*	Soldier sea catfish	VU
48	*Nemipterus nematophorus*	Double whip threadfin bream	VU
49	*Nemipterus japonicus*	Japanese threadfin bream	VU
50	*Megalapsis cordyla*	Torpedo/Hard tail scad	VU
51	*Lutjanus russelli*	Russell's snapper	VU
52	*Lutjanus malabaricus*	Malabar blood snapper	VU
53	*Lutjanus johnii*	John's snapper	VU
54	*Lutjanus bohar*	Two spot redsnapper	VU
55	*Loxodon macrorhinus*	Sliteye shark	VU

No	Scientific Name	Common Name	IUCN-2011
56	*Lethrinus ornatus*	Ornate emperor	VU
57	*Lethrinus lentjan*	Redspot emperor	VU
58	*Lepturacanthus savala*	Small head hairtail	VU
59	*Leiognathus equulus*	Common pony fish	VU
60	*Lehtrius nebolosus*	Pig face emperor	VU
61	*Lates calcalifer*	Barramundi / giant sea bass	VU
62	*Lactarius lactarius*	False trevally / White milky fish	VU
63	*Katsuwonus pelamis*	Skipjack tuna	VU
64	*Johnius belangerii*	Belanger's croaker	VU
65	*Johnius amblycephalus*	Bearded croaker	VU
66	*Ilisha megaloptera*	Bigeye ilisha	VU
67	*Harpadon nehereus*	Bombay duck	VU
68	*Glyphis gangetis*	Ganges shark	VU
69	*Galeocerdo cuvier*	Tiger shark	VU
70	*Formio niger*	Black pomfret	VU
71	*Euthynnus affinis*	Eastern little tuna	VU
72	*Eusphyra blochii*	Winghead shark	VU
73	*Epinephalus areolatus*	Areolated grouper	VU
74	*Dussumieria acuta*	Rainbow sardine	VU
75	*Drepane punctata*	Spotted sickle	VU
76	*Dasyatis uarnak*	Banded whip tail stingray	VU
77	*Dasyatis sephen*	Cow tail sting ray	VU
78	*Dasyatis kuhlii*	Blue spotted sting ray	VU
79	*Dasyatis bleekeri*	Bleeker's sting ray	VU
80	*Cyoglossus lingua*	Tongue sole	VU
81	*Cromileptes activelis*	Hump back sea bass	VU
82	*Congresox talabonoides*	Indian pike conger	VU
83	*Congresox talabon*	Yellow pike conger	VU
84	*Coilia dussumeria*	Gold spotted grenadier anchovy	VU
85	*Chrysochir aureus*	Reeve's croaker	VU
86	*Chirocentrus dorab*	Dorab wolf herring	VU
87	*Chioscyillium griseum*	Ray bambooshark	VU
88	*Chioscyillium punctatum*	Brownbanded bamboo shark	VU
89	*Chaenogaleus macrostoma*	Hooktooth shark	VU
90	*Carcharhinus sorroh*	Grey shark	VU
91	*Carcharhinus sorrah*	Spottail shark	VU
92	*Carcharhinus sealei*	Shark	VU
93	*Carcharhinus plumbeus*	Sandbar shark	VU
94	*Carcharhinus parasorroh*	Blue shark	VU
95	*Carcharhinus minisorrah*	Grey fin shark	VU
96	*Carcharhinus melanopterus*	Blacktip reef shark	VU
97	*Carcharhinus limbatus*	Brown shark	VU
98	*Carcharhinus leucas*	Bull shark	VU
99	*Carcharhinus dussumieri*	Whitecheek shark	VU
100	*Carcharhinus brivipinna*	Spinner shark	VU
101	*Carcharhinus borneensis*	Borneo shark	VU
102	*Carcharhinus amblyrhynchoides*	Graceful shark	VU
103	*Carcharhinus falciformis*	Silky shark	VU
104	*Carcharhinus albimarginatus*	Silvertip shark	VU
105	*Carangiodes malabaricus*	Malabar's cavalla	VU

No	Scientific Name	Common Name	IUCN-2011
106	*Bahaba taipingensis*	Chinese bahaba	VU
107	*Auxis thazard*	Frigate mackerel	VU
108	*Arius bilineatus*	Twoline sea catfish	VU
109	*Anodontostoma chacunda*	Chacunda gizzard shad	VU
110	*Aetobatis nichofi*	Bull ray	VU
111	*Aetobatis narinari*	Spotted eagle ray	VU
112	*Stegostoma fasciatus*	Zebra shark	NT
113	*Scoliodon walbeehmi*	Milk shark	NT
114	*Scoliodon sorrakowah*	Yellow dog fish	NT
115	*Rhinoptera javanica*	Javanese cow ray	NT
116	*Rhina ancyclostoma*	Bow mouth guitar fish	NT
117	*Narcine timlei*	Electric ray	NT
118	*Mobula diabolus*	Lesser devil ray	NT
119	*Haploblepharus edwardsi*	Dog fish	NT
120	*Gymnura micrura*	Short tail butterfly ray	NT
121	*Atelomyceterus marmoratus*	Marble cat shark	NT
122	*Amphostitius zugei*	Stellate sting ray	NT

FRESHWATER PRAWNS			
No	**Scientific Name**	**Common Name**	**IUCN-11**
1	*Macrobrachium malcolmsonii*	Monsoon river prawn	EN
2	*Macrobrachium idae*	Orana river prawn	VU
3	*Macrobrachium mirabile*	Short leg river prawn	VU
4	*Macrobrachium rosenbergii*	Giant freshwater prawn	VU
5	*Macrobrachium rude*	Hairy river prawn	VU
6	*Macrobrachium scabriculum*	Goda river prawn	VU
7	*Macrobrachium villosimanus*	Dimua river prawn	VU

MARINE SHRIMPS			
No	**Scientific Name**	**Common Name**	**IUCN-11**
1	*Exopaelamon stilyferus*	Rohna prawn	VU
2	*Nematopaelomon (Palaemon) tenuipes*	Spider prawn	VU
3	*Metapenaeopsis barbata*	Sand prawn/Whiskered velvet prawn	VU
4	*Metapenaeopsis barbeensis*	Sand prawn	VU
5	*Metapenaeopsis mogiensis*	Sand prawn	VU
6	*Metapenaeopsis stridulens*	Sandprawn/Fidder prawn	VU
7	*Metapeneus tolomensis*	Tolo velvet prawn	VU
8	*Metapeneus affinis*	Pink / Jinga prawn	VU
9		Yellow prawn	VU
10	*Metapenaeus dobsoni*	Golden/Kadal prawn	VU
11	*Metapeneus ensis*	Greasy back prawn	VU
12	*Metapeneus lysianasa*	Small white / Bird prawn	VU
13	*Metapeneus monoceros*	Pink / Speckle prawn	VU
14	*Parapenaeopsis hardwickii*	Sharp rostrum / Spear prawn	VU
15	*Parapenaeopsis maxillipedo*	Sharp rostrum/Kiddi prawn	VU
16	*Parapenaeopsis probata*	Sharp rostrum/Parole prawn	VU
17	*Parapenaeopsis sculptilis*	Rainbow prawn	VU

No	Scientific Name	Common Name	IUCN-11
18	*Parapenaeopsis stylifer*	Sharp rostrum/Kiddi prawn	VU
19	*Parapenaeopsis fissurus*	Neptune rose prawn	VU
20	*Parapeneus longipes*	Flamingo	VU
21	*Penaeus canaliculatus*	White prawn/Striped prawn	VU
22	*Penaeus indicus*	Indian white prawn	VU
23	*Penaeus japonicus*	Kuruma prawn	VU
24	*Penaeus latisulcatus*	Western King prawn	VU
25	*Penaeus merguiensis*	White / Banana prawn	VU
26	*Penaeus monodon*	Giant tiger prawn	VU
27	*Penaeus penicillatus*	Red tail/Banana prawn	VU
28	*Penaeus semisulcatus*	Green tiger prawn/ Flower prawn	VU
29	*Trachypenaeus curvirostris*	Big head sand prawn	VU
30	*Trachypenaeus fulvus*	Big head King prawn/ Brown rough prawn	VU
31	*Trachypenaeus pescardoriensis*	Big head King prawn	VU
32	*Acetes indicus*	Jawla paste prawn	VU
33	*Solenocera alticarinata*	Ridge back prawn	NT
34	*Solencera indica*	Red prawn	NT
35	*Solenocera melantho*	Red prawn	NT
36	*Solencera subnuda*	Red prawn	NT

MARINE ROCK LOBSTERS (SHALLOW WATER AND COASTAL AREAS)			
No	**Scientific Name**	**Common Name**	**IUCN-11**
1	*Panurilus versicolor*	Painted spiny lobster	EN
2	*Panurilus polyphagus*	Mud spiny lobster	EN
3	*Panurilus homarus*	Scallop spiny lobster	VU
4	*Panurilus ornatus*	Ornate spiny lobster	VU
5	*Panurilus pennicillatus*	Double spine lobster	VU
6	*Panurilus longipes*	Blue spot / white whisker lobster	VU
7	*Thenus orirantalis*	Bug / Slipper lobster	VU

MARINE DEEPSEA SHRIMPS (200-400 M DEPTH)			
No	**Scientific Name**	**Common Name**	**IUCN-11**
1	*Heterocarpus gibbosus*	Humpback nylon shrimp	DD
2	*Heterocarpus sibogae*	Mino nylon shrimp	DD
3	*Heterocarpus woodmasoni*	Indian nylon shrimp	DD
4	*Parapandalus spinipes*	Oriental narwal shrimp	DD
5	*Presionika off ensis*	Golden shrimp	DD

MARINE DEEPSEA LOBSTERS (200-400 M DEPTH)			
No	**Scientific Name**	**Common Name**	**IUCN-11**
1	*Linpuparus samipsus*	Deepsea lobster	DD
2	*Puerulus sewelli*	Arabian whip lobster	DD

MARINE CRABS (BRACKISH WATER)			
No	**Scientific Name**	**Common Name**	**IUCN-11**
1	*Charybdis feriata*	Coral crab	VU
2	*Portunus pelagicus*	Blue swimming crab	VU
3	*Portunus sanguilentus*	Repspot swimming crab	VU
4	*Ranina ranina*	Spanner / frog crab	VU
5	*Scylla serrata*	Mango / mud crabChar	VU

MARINE SQUIDS AND CUTTLE FISHES			
No	**Scientific Name**	**Common Name**	**IUCN-11**
1	*Loligo duvauceli*	Indian squid	VU
2	*Sepia aculeata*	Needle ink cuttle fish	VU
3	*Sepia pharoanis*	Pharoah cuttle fish	VU

PLANTS			
No	**Scientific Name**	**Comman Name**	**IUCN-11**
1	*Anisoptera curtisii*	Kaungmu	CR
2	*Anisoptera scaphula*	Taung-sagaing	CR
3	*Bombax insigne*	Didu/ Taung-letpan	CR
4	*Dipterocarpus baudii*	Kanyin	CR
5	*Dipterocarpus dyeri*	Ka-nyin	CR
6	*Dipterocarpus grandiflorus*	Kanyin/ Kanyin-byan	CR
7	*Dipterocarpus kerrii*	Kanyin-byan	CR
8	*Dipterocarpus retusus*	Kanyin-ni	CR
9	*Dipterocarpus tuberculatus*	In	CR
10	*Dipterocarpus turbinatus*	Kanyin-ni	CR
11	*Hopea apiculata*	No common name	CR
12	*Hopea helferi*	Thingan-net	CR
13	*Hopea sangal*	Thingan-magalay	CR
14	*Parashorea stellata*	Thingadu	CR
15	*Shorea assamica*	Kyilan	CR
16	*Shorea farinosa*	Thingan-phyu	CR
17	*Sonneratia griffithii*	Laba	CR
18	*Vatica lanceaefolia*	Pan-thitya	CR
19	*Afzelia xylocarpa*	Pyin-padauk	EN
20	*Anisoptera costata*	Kaban-bok	EN
21	*Cleidiocarpon laurinum*	No common name	EN
22	*Cynometra ramiflora*	Myinga	EN
23	*Dalbergia oliveri*	Tamalan	EN
24	*Diospyros crumentata*	Taung-bok	EN
25	*Dipterocarpus alatus*	Kanyin-phyu	EN
26	*Dipterocarpus costatus*	Kanyin-ywet-thay	EN
27	*Heritiera fomes*	Kanazo	EN
28	*Heritiera littoralis*	Pinle-Kanazo	EN
29	*Picea farreri*	No common name	EN
30	*Shorea gratissima*	U-ban-kaya	EN
31	*Shorea henryana*	Kaban-than-gyin	EN
32	*Shorea roxburghii*	Kaban-ywet-thay	EN
33	*Syzygium zeylanicum*	Tha-bye-bauk	EN
34	*Vatica cinerea*	No common name	EN
35	*Acacia ferruginea*	Sha-byu	VU

No	Scientific Name	Comman Name	IUCN-11
36	*Aquilaria malaccensis*	Thit-hmwe	VU
37	*Cephalotaxus mannii*	No common name	VU
38	*Cycas pectinata*	Mondaing madai	VU
39	*Cycas siamensis*	Mondaing	VU
40	*Dalbergia fusca*	Yinsat	VU
41	*Halophila beccarii*	No common name	VU
42	*Hopea griffithii*	No common name	VU
43	*Hopea odorata*	Thangan	VU
44	*Intsia bijuga*	Saga-lun	VU
45	*Magnolia nitida*	No common name	VU
46	*Magnolia rostrata*	No common name	VU
47	*Myristica malabarica*	Taw-zadeik-po	VU
48	*Pterocarpus indicus*	Pan-padauk	VU
49	*Schima wallichii*	Laukya	VU
50	*Taiwania cryptomerioides*	Tayok-khaung-pin	VU
51	*Aegialitis rotundifolia*	Pinle-sa	NT
52	*Brownlowia tersa*	No common name	NT
53	*Ceriops decandra*	Ma-da-ma	NT
54	*Ceriops tagal*	Ma-da-ma	NT
55	*Excoecaria agallocha*	Kayaw/ Thayaw	NT
56	*Gnetum oblongum*	No common name	NT
57	*Blyxa quadricostata*	No common name	DD
58	*Butea monosperma*	Pauk	DD
59	*Excoecaria indica*	No common name	DD
60	*Hopea oblongifolia*	Tanyin-byan	DD
61	*Hydnocarpus kurzii*	Kalaw	DD
62	*Leucomeris decora*	Phet-pya	DD
63	*Magnolia griffithii*	No common name	DD
64	*Quercus rex*	Dowaing	DD
65	*Taxus wallichiana*	Kyauk-htinyu	DD

Appendix 2: Stakeholders

1. Government Departments

No	Name	Designation	Organization
1	U Tin Tun	Deputy Director General	Planning and Statistics Department, Ministry of Environmental Conservation and Forestry
2	U Win Naing Thaw	Director	Nature and Wildlife Conservation Division, Forest Department
3	U Tint Swe	Project Director	Taninthayi Nature Reserve Project, Forest Department
4	U Mya Than Tun	Assistant Director	Department of Fisheries
5	U Maung Maung Lwin	Assistant Director	Department of Fisheries
6	Dr. Maung Maung Gyi	Professor	Yangon University
7	Dr. Khin Maung Swe	Professor	Dagon University
8	Daw Nyo Nyo Lwin	Lecturer	Yangon University

2. Civil Society and Private Sector (Alphabetical Organization)

No	Name	Designation	Organization
1	Dr. Htin Hla	Chairman	Biodiversity and Nature Conservation Association
2	U Zau Lunn	EC member	Biodiversity and Nature Conservation Association
3	U Ngwe Lwin	Coordinator	Biodiversity and Nature Conservation Association
4	U Nyo Maung	EC member	Biodiversity and Nature Conservation Association
5	U Myint Kyaw Thuya	Member	Biodiversity and Nature Conservation Association
6	Dr. Ei Ei Phyo	Member	Biodiversity and Nature Conservation Association
7	Daw Thida Nyein	Member	Biodiversity and Nature Conservation Association
8	U Aung Than	Rector (Rtd.)	Eco-based Sustainable Natural Resources Development Interest Group
9	U Win Myo Thu	Managing Director	Economically Progressive Ecosystem Development (EcoDev)
10	Dr. Kyaw Tint	President	Ecosystem Conservation and Community Development Initiative (ECCDI)
11	Daw Yin Yin Kyi	Deputy Director (Rtd.)	Forest Department
12	U Ohn	Vice Chairman	Forest Resources, Environment, Development and Conservation Association (FREDA)
13	U Myint Aung	Program Coordinator	Indo-Myanmar Conservation & Friends of Wildlife Myanmar

No	Name	Designation	Organization
14	Daw Thandar Khin	Administrator	ISTITUTO OIKOS Myanmar
15	U Win Sein Naing	Chairman	Mangrove Service Network
16	U Tint Tun	Chairman	Marine Science Association Myanmar
17	Dr. Swe Thwin	Patron	Marine Science Association Myanmar
18	U Soe Nyunt	Chairman	Myanmar Bird and Nature Society
19	U Khin Myaung Swe	Project Coordinator	Myanmar Egress/ Network Activity Group
20	Dr. Win Maung	Chairman	Myanmar Environment Institute
21	Dr. Saw Lwin	Central Executive Committee	Myanmar Floriculturist Association
22	Dr. Nyan Tun	Vice President	National Academy of Forestry Science
23	Dr. Maung Maung Than	Coordinator	Pyoe Pin Program
24	Prof. Saw Win	Central Executive Committee	Renewable Energy Association Myanmar
25	Daw Sane Sane	Central Executive Committee	Renewable Energy Association Myanmar
26	U Saw Hudson	Environmental Officer	Total Company Myanmar
27	Dr. Kalyar Platt	Coordinator	Turtle Survival Alliance Myanmar
28	Daw Me Me Soe	Researcher	Turtle Survival Alliance Myanmar
29	Dr. Thein Aung	Advisor	Zoos and Gardens Business Unit – Htoo Group of Companies

3. Donors and International Participants (Alphabetical Organizations)

No	Name	Designation	Organization
1	U Aung Kyaw Kyaw	Senior Program Officer	AusAID
2	Dr. Ji-Qiang Zhang	Vice President	Blue Moon Fund
3	Mr. Billy McCarthy	Program Manager	Blue Moon Fund
4	Dr. Nigel Clark	Representative	British Trust for Ornithology
5	Mr. Frank Momberg	Director of Program Development	Flora and Fauna International
6	Mr. Milo Todeschini	Country Director	ISTITUTO OIKOS (Myanmar)
7	Mr. Tom Hensleigh	Country Director	PACT Myanmar
8	Mr. James Bampton	Program Coordinator	RECOFTC (Bangkok)
9	Daw Kyawt Kyawt Khaing	Program Officer	SwissAID
10	Mr. Zhu Le	Advisor	The Nature Conservancy (China)

No	Name	Designation	Organization
11	Dr. Min Htut Yin	Assistant Resident Representative	UNDP Myanmar
12	Mr. Joseph D'Cruz	Regional Advisor	UNDP, Bangkok
13	Ms. Joanna Ribbens	Program Manager	USAID
14	Dr. Geoff Hilton	Representative	Wildfowl and Wetland Trust

4. Wildlife Conservation Society

No	Name	Designation	Organization
1	Mr. Colin Poole	Director, Regional Conservation Hub	WCS-Asia Program
2	Mr. Robert Tizard	Technical Advisor	WCS-Myanmar Program
3	Dr. Steven G. Platt	Herpetologists	WCS-Asia Program
4	U Than Myint	Country Director	WCS-Myanmar Program
5	U Saw Htun	Deputy Country Director	WCS-Myanmar Program
6	U Win Ko Ko	Turtle Coordinator	WCS-Myanmar Program
7	U Than Zaw	Site Manager (Hkakborazi NP)	WCS-Myanmar Program
8	U Kyaw Thinn Latt	Remote Sensing & GIS Coordinator	WCS-Myanmar Program
9	Daw Myint Myint Oo	Education Outreach & Coordinator	WCS-Myanmar Program
10	U Hla Naing	Tiger Coordinator	WCS-Myanmar Program
11	Daw Khin Myo Myo	Deputy Turtle Coordinator	WCS-Myanmar Program
12	U Thet Zaw Naing	Bird Coordinator	WCS-Myanmar Program
13	U Naing Lin	Project Manager(Bird Survey)	WCS-Myanmar Program
14	Daw Annie Chit	Office Manager	WCS-Myanmar Program
15	Daw Nan San San Win	Accountant	WCS-Myanmar Program
16	U Kyaw Zay Ya	Asst. Project Manager(CBNRM)	WCS-Myanmar Program
17	Daw Hnin Pale`	Assistant Librarian	WCS-Myanmar Program

5. Observers (Alphabatical Organizations)

No	Name	Designation	Organization
1	Mr. Geoff Hillen	Observer	Diplomatic School
2	U Yu Zin Htoon	Observer	Diplomatic School
3	Daw Khin La Pyae	Observer	Myanmar Floriculturist Association
4	Daw Htet Htet Hlaing	Observer	Myanmar Floriculturist Association
5	Daw Wint Ma Ma Myo	Observer	Myanmar Floriculturist Association
6	Daw Zun Pwint Nwe	Observer	Myanmar Floriculturist Association
7	U Zaw Oo Wai	Observer	Myanmar Floriculturist Association

6. Media (Alphabatical Media)

No	Name	Designation	Media
1	Daw Aye Mya Kyaw	Editor	7Days News Journal
2	U Kyaw Zay Ya	Reporter	Business Today Journal
3	Daw Myo Sandar Aung	Reporter	Envoy Journal
4	Daw Suu Sha	Reporter	Myanandar Journal
5	Daw Ei Ei Toe Lwin	Reporter	Myanmar Times Journal
6	U Htet Khine	Reporter	The Mirror Newspaper
7	U Aye Min Soe	Reporter	The New Light of Myanmar Newspaper
8	U Kyaw Zin	Reporter	The Street View Journal
9	Daw Mya Hnin Aye	Editor	The Voice Journal
10	U Nay Linn Aung	Reporter	World Street Myanmar

Summary

No	Description	Total number of participants
1	Government Departments & Universities	8
2	Civil Society - Myanmar	29
3	Donors and International Participants	14
4	Wildlife Conservation Society	17
5	Observers	7
6	Media	10
Total		**85**