Inland capture fisheries are divided into two main categories: lease-able fisheries and open fisheries. Lease-able fisheries establish private plots, traditionally auctioned every year, on floodplains where fish are caught in private traps designed to capture fish migrating off floodplains at the beginning of river drawdown. Open fisheries relate to all other areas and include all types of fishing operations. The right to fish in these areas is licensed by DOF, and all fishing gears require a license, although in practice licenses for small scale subsistence fishing are not enforced. Threats to inland capture fisheries have not been extensively investigated and are likely to relate primarily to unsustainable harvesting practices and pollution of key water bodies. DOF has recently extended leasing periods at some lease-able fisheries to 9 years to try to encourage long-term sustainable practices and improve management of these fisheries.

The Bay of Bengal Large Marine Ecosystem Project (BOBLME) national report on sustainable management of the coastal and marine areas identifies key existing and emerging threats to coastal and marine fisheries in Myanmar (see Target 10). The greatest threat to marine fisheries is **unsustainable harvesting,** both legal and illegal. The major factors behind the decline in coastal fisheries include the use of intensive and destructive fishing gear, little respect for seasonal closures, local and foreign trawlers illegally entering near-shore areas, and loss of mangroves, seagrass, coral reefs, and other ecosystems essential for the survival of fish at different stages in their life cycle. The **shrimp sector** has been particularly hard hit. In northern Rakhine State, the area of shrimp farming increased from 34,000 hectares in 2001, to 63,000 hectares in 2005, and to 45,000 hectares by 2010. Meanwhile, productivity declined from 200 kg/hectare/year to less than 20 kg/hectare/year, the inevitable result of massive loss of mangroves, which provide a natural nursery habitat for shrimp larvae.

This situation was confirmed by the Norwegian marine research vessel RV Fridtjof Nansen, which returned to Myanmar after a 30-year gap to survey 145 locations across its Exclusive Economic Zone. The preliminary results show that there have been dramatic declines in fish populations with the biomass of pelagic (open ocean) and demersal (which live on or near the ocean bottom) **fish declining by 90% and 60%,** respectively, since the previous survey in 1980. This decline is almost certainly the result of massive overfishing. The DOF is the government agency primarily responsible for enforcing fisheries legislation. DOF faces the difficult task of enforcing laws in, as well as collecting revenues from, poorly serviced, isolated fishing communities. One of its primary activities is issuing fishing licenses, which may be issued to the highest bidder, rather than based on long term fisheries management. This precludes community participation and since the licenses are often re-auctioned to several operators, increasing the price of the license and increasing pressure on fish stocks.

To address illegal and unregulated fishing, DOF has established 13 checkpoints for in-shore fishing vessels (within 10 nautical miles, 18.5 km, of the shoreline). There has been little action, however, to address illegal fishing by off-shore vessels. Effective action off-shore would require cooperation with the navy, which has the most effective marine enforcement capacity in Myanmar. A new threat, which could massively impact future harvests, is that **juvenile fish**, which were previously of no commercial value, are now being harvested using light boats and fine trawl nets and sold as fish feed to aquaculture and livestock farms in Thailand.

Lessons from other countries in the region (e.g. Philippines) show that when fishing communities are given more responsibility and authority for managing their local fisheries, either alone **(community-based management)** or in cooperation with government **(co-management)**, compliance with rules and regulations increases, leading to more sustainable fishing practices. Regional experience also shows that when communities are given more control over their resources and the ability to exclude outsiders and reap the benefits of sustainable management, they invest their own time and effort in protecting the resources and enforcing regulations on use. Community management can be established through Locally Managed Marine Areas (LMMAs; see Target 11) and locally managed freshwater fisheries. These management tools include gear restrictions, along with seasonal and spatial regulations on fishing, including Fish Conservation Zones (FCZ) to protect important breeding, spawning and nursery habitats.

The laws governing fisheries are the Law Relating to the Fishing Rights of Foreign Fishing Vessels (1989, amended in 1993), Aquaculture Fisheries Law (1989), Myanmar Marine Fisheries Law (1990, amended in 1993) and Freshwater Fisheries Law (1991). Drafted with minimal public consultation, these laws were not tailored to local conditions and have proved ineffective at halting the decline in fish stocks. In response, the Rakhine State parliament approved a **Freshwater Fisheries Law** in September 2014. The key insight of the law is that the principal solutions to sustainable fisheries are not technical, but rather are driven by governance. Building on regional experience, the law allows the formation of community-based fisheries associations (e.g. Community Fishery User Groups, CFiUGs) and the negotiation of co-management agreements. The Rakhine Fisheries Law could serve as a model for other states/regions embarking on similar reforms.

Similar laws could help address pressures on freshwater fisheries in the rest of the country, where large lakes and rivers are harvested unsustainably with destructive gear and illegal fishing practices. In the Ayeyawady River, electrofishing has emerged as a major threat, decimating fisheries as well as impacting species that depend on them, and causing direct fatalities to the Critically Endangered sub-population of the Irrawaddy Dolphin found north of Mandalay.

Ecosystem-based fishery management integrates management of human and natural systems to improve the health of marine ecosystems and the sustainability of marine fisheries. Development of these management plans for Myanmar will require increased data collection including on species life cycles and habitat use, habitat mapping, and socio-economic data on fishing pressures and livelihoods. Governance of marine resources, including revisions to laws and development of institutional coordinating mechanisms, is also part of an integrated management approach. The establishment of MPAs and LMMAs (see Target 10) to protect key habitats, including coral, seagrass, and mangrove areas, is part of a nested approach to fisheries management. The Myeik Archipelago, with its rich marine diversity and valuable coral reefs, has emerged as a priority area for developing an ecosystem-based fisheries management plan.

It is necessary to prevent trawlers illegally entering the 10-mile near-coastal exclusion zone. Enforcement of the coastal exclusion zone against trawlers is critical for the recovery of marine fisheries and to avoid conflict with local fishers. The private sector, especially the Myanmar Fisheries Federation, can play a critical role by encouraging its members to respect the law in their own long-term interests. This is a complex case to make and requires pressure from all

levels of government, bodies such as the multi-stakeholder Rakhine Fisheries Partnership, and the media. The installation of Vessel Monitoring Systems (VMS) is being used in Thailand to regulate fishing and is being piloted in Myanmar.

Table 17: National targets and priority actions for Aichi Target 6.

Target and Action		Lead
Target 6.1:	**By 2020, states/regions have approved laws allowing for community and/or co-managed fisheries**	
Action 6.1.1	Amend state/regional fisheries legislation to create legal support for locally-managed freshwater fisheries and establish legal status for CFiUGs	DOF
Action 6.1.2	Register 400 additional CFiUGs and explore further capacity development, including through partnerships	DOF, Universities
Action 6.1.3	Expand area under CFiUG management to cover 10,000 hectares through establishment of locally-managed fishery management zones	DOF
Action 6.1.4	Develop guidelines for sustainable management of CFiUG and provide support to communities in following the guidelines	DOF, I/NGOs
Action 6.1.5	Implement projects demonstrating benefits of integrated mangrove aquaculture	DOF, Universities
Target 6.2:	**By 2020, total commercial marine catch reduced to more sustainable levels**	
Action 6.2.1	Develop an ecosystem-based fishery management plan for the Myeik Archipelago and begin to establish LMMAs at key sites	DOF, NGOs, MOECAF, Universities
Action 6.2.2	Identify and establish species- and site-specific closed seasons through coordination of government and private sector	DOF, NGOs, Universities, MFFed

Mangrove forest

4.6.7 Aichi Target 7: By 2020 areas under agriculture, aquaculture, and forestry are managed sustainably, ensuring conservation of biodiversity

Globally, agricultural and environmental policy has historically tended to reactionary rather than precautionary. In an effort to increase production and drive development many governments have encouraged expansion and intensification of the agriculture, aquaculture, and timber sectors. Later, after significant environmental impacts have occurred, modified practices are legislated or incentivized to restore impacted areas. Although much of the work on 'green growth' in the region has focused on energy, Myanmar will benefit from plans to address some of the worst impacts from these other sectors before they occur.

The agriculture, aquaculture, and forestry sectors are dominant in Myanmar, currently providing the vast majority of employment, and a significant proportion of export earnings. Agriculture alone accounts for 36% of output, two-thirds of the country's employment, and 25–30% of exports by value (UNDP 2011a). An abundance of land, water, and low-cost labour contribute to the output of the sector and drive its contribution to the economy. Furthermore, Myanmar's

agriculture sector is relatively untapped: only a fifth of the country's total land area is used for crop production and only 18.5% of this is irrigated. The same numbers for Thailand are 42% and 29% and for Vietnam are 34% and 42%. Enhancing agricultural productivity and access to food is also important to enhance food security for the growing population in Myanmar. Agricultural exports can be an important source of foreign exchange earnings in the early stage of transition.

Functional ecosystems, including forests, are fundamental for the continued viability of agricultural systems. Forests help to maintain hydrological and soil systems that are essential to agricultural production. Proximity to forests increases pollination and yields of some crops, while the birds and bats and insects found in greater numbers near forests help to control pests. Cultivated landscapes in turn play essential role in biodiversity conservation. Agricultural systems, including agroforestry and silvo-pastoral systems, connect forest fragments by providing corridors for the dispersal and migration of species. Agricultural lands can also support high biodiversity themselves: some shifting cultivation systems and agroforests rival nearby forests in biodiversity and the number of species of potential conservation concern found within.

The integration of conservation and agriculture in multi-functional landscapes, with policies that affirm smallholder farmers as the backbone of agricultural production, is essential for achieving the goals of agricultural growth, poverty reduction, and biodiversity conservation. This integration plays out over multiple scales depending on local realities of tenure and crop needs, from the landscape level to the sustainable management of farms and forests. Models can be found in traditional management systems as well as modern precision agriculture techniques.

Smallholder farmers are the backbone of Myanmar's agricultural sector and are together the country's largest investors in agriculture. Agricultural policies should support these farmers' security and profitability, while minimizing environmental impact where possible. Support for post-harvest processing technology can increase product quality and profitability. Decreasing post-harvest spoilage and improving food transport, including cold-chains, can increase the efficiency of farms by minimizing waste.

Certification schemes, including organic certification, can provide incentives for sustainable agriculture and improving food and farmer safety. Farmers' organisations and cooperatives can minimize the cost of certification and provide bargaining power and other economies of scale to members. Integrated Pest Management (IPM) is a method to control potentially damaging pests through a variety of complementary tools, rather than only calendar-based pesticide application, for example. IPM can include a mix of mechanical (tilling, manual removal), biological (beneficial insects or biological insecticides), and spatial 'push-pull' (plants that repel or attract pests from primary crops) methods. Extension programmes currently include IPM, and farmer extension services supporting IPM, organic farming, and other sustainable farming methods should hold trainings more frequently and reach more farmers.

In the 1950s, Myanmar was the world's leading rice exporter. However, 30 years of central planning saw a collapse in production. Since economic reforms started in the late 1980s, rice production has more than doubled, the result of an expansion in paddy area and increased

yields. The production of pulses, Myanmar's second most valuable crop, has undergone even more dramatic increases in production, area, and yields (see Table 18).

Table 18: Area and production of rice and beans.

Crop	2009/10	2010/11	2011/12	2012/13	2013/14
Rice					
Area ('000 hectares)	8,067	8,047	7,593	7,241	7,280
Production ('000 tons)	32,681	32,579	29,010	27,704	28,320
Productivity (tons/hectare)	4.06	4.07	3.83	3.84	3.90
Pulses					
Area ('000 hectares)	4,383	4,501	4,417	4,449	4,534
Production ('000 tons)	5,584	5,896	5,506	5,800	5,900
Productivity (tons/hectare)	1.27	1.31	1.25	1.30	1.32

Source: Myanmar Agriculture in Brief 2013, MOAI.

Traditionally, rice in Myanmar has followed low-intensity cultivation practices, taking advantage of the natural monsoon cycle to provide water and high nutrient silt carried with floods. At 5 kg NPK/ha, fertilizer use in Myanmar is very low and has fallen by 75% since 1995. There is therefore scope to increase productivity and production.

Focus on reclaiming Myanmar's position as the largest rice producer in Southeast Asia, including transitioning to a shorter crop cycle to increase exports, bears great risks. However, regional experience shows that such 'hyper intensification' is a serious threat to both biodiversity and rice production. This risk is exemplified in the Mekong Delta in Vietnam where starting in the 1990s the government built high dikes (or polders) to allow the production of three rice crops per year, instead of the traditional one to two crops per year. The consequences of the three rice crop policy have been significant: massive increase in use of fertilizer and pesticides to compensate for the lost sediment and nutrient delivery previously provided by the annual flood pulse of the Mekong), increased flooding downstream (because of constriction of the floodplain by the high dikes), loss of capture fisheries (because the high dikes function as mini-dams and block fish migration and recruitment), health hazards (because of the unregulated use of pesticides), and poverty (because farmers are trapped into growing low-value rice and have to use more and more fertilizer to maintain yields).

The **environmental impacts of rice** include: groundwater depletion, reduced stream flows, water logging and salt build up, biodiversity loss, soil health deterioration, agrochemical pollution, and agrochemical damage (to soil microorganisms, beneficial insects and human health). These impacts degrade natural resources, reduce ecosystem services, impose heavy costs on human health, and potentially jeopardize long-term food security.

Sustainable rice production practice seek to limit inputs through soil, water, and crop management. Tools including precision nutrient application, improved soil management, alternate

wetting and drying of paddy fields, and IPM minimize harmful inputs and increase yields and resilience. Another system for improving rice sustainability is the **System of Rice Intensification** (SRI), a suite of flexible cropping principles, including reducing the number of seeds planted, increasing spacing, and planting on drier fields instead of waterlogged paddy. The package is adaptable to local conditions, and is said to reduce inputs and increase yields and resilience to drought, though often while increasing labor requirements.

Integrating aquaculture and animal husbandry with rice cultivation can improve rural nutrition, diversify income, reduce the use of pesticides and herbicides, and increase the efficiency of nitrogen uptake. Labour and water availability are constraints to these integrated farming systems, which also increase on-farm biodiversity and can provide habitat for water birds. Seasonal rotation between salt-adapted rice and brackish water aquaculture may be viable adaptations to paddy salinization and sea level rise in coastal areas.

Climate change adaptation and mitigation should be mainstreamed into agricultural and rural development strategies to improve sustainability. Examples would include accounting for sea level rise in projections of rice production, helping farmers adapt to changing weather patterns in the Central Dry Zone and the Ayeyawady Delta, and conducting research on resilient crop varieties, including local landraces.

By regional standards, **aquaculture** is small but has grown rapidly. The sector provides promising export earnings for Myanmar, but uncontrolled growth of the sector could dramatically impact the natural environment. Half of Thailand's coastal mangroves were cleared for shrimp farms between 1975 and 1993, resulting in huge increases in exports, but also environmental losses of US$4 billion (World Bank 2015). In Myanmar, the area of aquaculture, predominantly freshwater fish ponds and shrimp farms, expanded from 12,300 hectares in 1991 to 181,600 hectares in 2013, and production rose from 6,400 tons to 944,800 tons over the same period, partly in response to declining marine catches. This expansion is expected to continue with the continued decline of wild catch, increased investment, and better access to foreign markets. The Myanmar Fisheries Federation has identified aquaculture as an investment priority, particularly for tilapia and other fast-maturing species.

Over half of the aquaculture area, 92,400 hectares, consists of **shrimp** farms. As in many countries, these have had a devastating impact on mangroves, particularly in Rakhine State and the Ayeyawady Delta. The impact in northern **Rakhine State** has been particularly severe. Starting around the year 2000, large areas of mangroves were cleared to construct ponds, which removed the vital environmental goods and services that mangroves provide: including nursery areas (food and shelter) for juvenile shrimp, crabs and fish, both inside and outside the ponds; and protection against storms. Because of this mangrove loss, the natural recruitment of shrimp declined sharply and the coastal population became more vulnerable to storms such as Cyclone Giri, which struck in 2010 and killed 157 and left 70,000 homeless.

Recovery of the shrimp sector, and the opportunity to participate in new export markets, would require **restoring mangroves** over tens of thousands of hectares of abandoned shrimp ponds. This would need multi-million dollar investments in pond management, hatcheries, landscaping to re-establish the tidal hydrology, and natural and assisted mangrove regeneration.

Aquaculture expansion and investment often causes privatization of previously common resources and risks increasing vulnerability of small scale fishermen and gleaners. Disputes between fishermen and aquaculture investors have been documented in both freshwater and coastal areas of Myanmar. Policies on granting aquaculture concessions and permits should recognize customary use, community management, and sustainable management, so that aquaculture investment does not fuel 'water grabs' that mirror ongoing conflict over land concessions.

Integration of aquaculture with mangroves or rice paddy could mitigate competition over coastal resources. Silvo-aquaculture systems have been piloted in communities in the delta to maintain mangrove cover. Research on mola fish production in rice paddy has been facilitated by the DOF and WorldFish.

The last large areas of commercially valuable forest are in northern Myanmar and in the Tanintharyi Region, which holds the largest remaining tracts of **lowland wet evergreen forest** in the biologically-rich transition zone between the Indochinese, and Sundaic biogeographical regions. The confluence of these biogeographic regions supports a unique assemblage of species, including the endemic Gurney's pitta and other globally threatened species, such as tigers and Malayan tapirs. Their lowland topography, one of the attributes that makes them so valuable for biodiversity, also renders them extremely vulnerable to logging, land speculation, hunting, and the expansion of agriculture, especially rubber and oil palm plantations.

A national target for edible oil production has led to the allocation of large **palm oil** concessions with a target of nearly 3,000 km2 of oil palm by 2030. Some concessions, including the largest yet granted, overlap with the proposed Lenya National Park and Lenya National Park Extension. Most concessions have not yet been cleared or planted with oil palm, especially in portions that are more difficult to access, although high valuable timber species are often removed regardless (Woods 2015). This provides an opportunity for strategic planning of the sector in order to minimize further environmental impact, particularly in areas of global conservation importance like Lenya National Park and its extension, which are on Myanmar's World Heritage Tentative List. Timber and Oil Palm sector standards on responsible management of **High Conservation Value Forest** (HCVF) may provide a useful tool for protecting these forests from conversion. HCVF is a Forest Stewardship Council (FSC) designation that describes forests with significant biodiversity values, that contain rare or threatened ecosystems, that have sufficient size to support species in a natural manner, that provide basic services such as watershed protection, or that provide for local communities' basic needs or cultural identity.

Table 19: National targets and priority actions for Aichi Target 7.

Target and Action		Lead
Target 7.1:	**By 2020, SRI and other forms of environmentally friendly rice production have been implemented in 10% of rice paddy area**	
Action 7.1.1	Develop sustainable rice cultivation guidelines and implement across 10% of rice cultivation area, including SRI, IPM, and improved soil and water management	MOAI
Action 7.1.2	Hold agricultural extension events to train farmers in sustainable rice cultivation techniques and certification	MOAI
Target 7.2:	**By 2020, 5% of fish and shrimp aquaculture by volume follows international best practices for sustainable management**	
Action 7.2.1	Establish extension programme for sustainable aquaculture management	DOF
Action 7.2.2	Develop pilot shrimp aquaculture projects meeting international certification standards for sustainable aquaculture and food safety export standards	DOF
Action 7.2.3	Develop alternatives to fish feed for domestic aquaculture, including soy-based feed	DOF

Common Palm Civet (Paradoxurus hermaphroditus)

4.6.8 Aichi Target 8: By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity

Despite having relatively low levels of pollution compared to many other countries in Asia, Myanmar faces increasing threats to ecosystem function and biodiversity from pollution. The draft Myanmar State of the Environment Report identifies significant pollution issues including toxic wastes from small and large-scale mining, release of untreated industrial waste, release of untreated sewage, inadequate disposal of solid urban waste and excessive use of agrochemicals.

Research on the impacts of pollution on ecosystems and biodiversity in Myanmar is currently limited. Known pollution impacts on ecosystem function and biodiversity relate primarily to the contamination and eutrophication of sensitive aquatic ecosystems and include: threats to the Irrawaddy dolphin resulting from bioaccumulation of mercury released by extensive gold panning and mining in the upper reaches of the Ayeyawady and Chindwin Rivers; declines in native invertebrate fauna and fish in Inlay Lake caused by excessive fertilizer and pesticide use on floating tomato gardens; eutrophication and sedimentation of rivers and other water bodies caused by release of untreated sewage as well as nutrient and sediment releases from large scale deforestation. Research conducted by the Smithsonian Institution indicates rapid and extensive expansion of mining in the Sagaing Region, which is likely to have significant implications for pollution discharges, and similar expansion is likely to be occurring elsewhere in Myanmar (ALARM et al. 2015).

Artisanal and small-scale gold mining is the largest anthropogenic source of mercury emission world-wide; the second largest source is from coal-fired power plants. Large quantities of artisanal and small-scale gold mining operations have been observed in Kachin, Shan, Kayah and Kayin States and Sagaing, Bago, Mandalay and Tanithayi Regions. Informal artisanal and small-scale gold mining operations should be formalized and properly regulated, and the supply of mercury into the country should be restricted. Outreach and education programmes on the dangers of mercury poisoning and methods for reducing and eliminating mercury in gold mining operations should be held with artisanal gold miners around the country. Positively, the 2013 Minimata Convention on Mercury is expected to be signed in Myanmar within the next year, which will require that significant measures are taken to reduce, or where possible eliminate, mercury emissions.

A number of chemicals used for veterinary purposes, as pesticides, and as fuel additives are known to have catastrophic impacts on ecosystems and are unregulated in Myanmar, although the extent to which these chemicals are used is not known. Accumulation of organochlorines (typically used as pesticides) is known to threaten raptors. Veterinary use of diclofenac severely affects populations of vultures, and, in addition to widely recognized impacts on human health, lead pollution resulting from the continued use of tetraethyl lead in fuel causes toxicity in plants, destroys natural communities of micro-organisms and can accumulate to toxic levels in animals. Regulation of such chemicals, consistent with international environmental standards, is a priority to minimize impacts on biodiversity.

A review of sources and types of pollution that have a high risk of threatening sensitive ecosys-

tems or leading to biodiversity loss is a high priority for understanding and ultimately reducing the existing effects of pollution on biodiversity in Myanmar. Monitoring of pollution levels and impacts on biodiversity in high risk environments is important to inform the development of management strategies, and also to provide a basis for assessing the potential impacts of proposed developments. The establishment of a community water quality monitoring network would permit cost-effective basic water quality monitoring to be implemented over large areas. Such a monitoring programme would enable identification of waterways where ecosystems are threatened and potentially allow point sources of pollution to be identified.

Rapidly accelerating development following recent political and economic reforms is likely to significantly increase the threat to ecosystems and biodiversity from pollution. Sewage and solid urban waste will increase due to growing urban populations and consumption; industrial pollution will rise due to rapid growth in industrial development, particularly around special economic zones; mining waste will increase due to increased access to mineral resources by large corporations; and agrochemical use will increase due to improved availability.

Development at industrial zones (IZs) and Special Economic Zones (SEZ) such as Dawei, Thilawa, and Kyaukphyu has significant potential to outpace the capacity to assess environmental impacts and apply appropriate environmental standards (Figure 8). The experience at some special industrial zones elsewhere in Asia indicates that these areas have a high risk of severe long-term pollution problems leading to impacts to human health, degradation of local ecosystems, and loss of biodiversity, and may be vulnerable to a race-to-the-bottom scenario where IZs compete for clients by providing lower environmental compliance costs and hence lower environmental standards. Good environmental planning, including an effective EIA process, transparent monitoring and consistent enforcement of environmental standards are critical to managing the impacts of pollution on ecosystems and biodiversity.

Rapid economic growth is occurring in the context of low levels of regulation of industrial and urban pollution, and limited capacity to apply or enforce environmental standards. Provisions relevant to the management and control of pollution are dispersed throughout different legislation and authority is divided between different government bodies. This lack of centralization reduces capacity to identify regulating authorities, reduces transparency of pollution control regulation, impedes the development of capacity to adequately address pollution impacts and undermines accountability of regulatory bodies. Even where requirements for wastewater or air pollution management are imposed, the required environmental standards may not be specified, such that standards are often dependent on regulator discretion, limiting effectiveness. Challenges relating to management of urban waste relate primarily to the lack of infrastructure and capacity. To adequately meet the needs of a growing urban population, and address the already substantial problems of urban wastewater and solid waste pollution, Myanmar will need to build public and private sector capacity, and clarify responsibility for managing and monitoring urban waste.

Figure 12: Industrial zones and special economic zones in Myanmar.

The ECL provides the basis for EIAs, establishes national environmental standards for industry, and allows for a 'polluter pays' model of environmental regulation. It also specifies that MOECAF should implement a comprehensive monitoring system for key sources of pollution. As the EIA Procedures are applied and refined, the next five years provides a critical opportunity. During this time the potential impacts of pollution on biodiversity should be integrated into the EIA Procedure, and compliance with conditions should be enforced to ensure that pollution emissions remain within acceptable environmental levels.

MOECAF is in the process of finalizing National Environmental Quality (Emissions) Guidelines (NEQG) which apply international standards to define recommended limits for noise and vibration, air emissions and effluent discharges. The guidelines will be applied as an interim measure while National Environmental Quality Standards (NEQS) are developed during the next few years. The next five years therefore also provide a critical opportunity to ensure that the NEQG are effectively implemented and that the NEQS incorporates consideration of potential biodiversity impacts in setting emissions thresholds.

Table 20: National targets and priority actions for Aichi Target 8.

Target and Action		Lead
Target 8.1:	**By 2020, understanding of the extent and severity of pollution in Myanmar and its impacts on biodiversity is significantly enhanced**	
Action 8.1.1	Undertake a desktop study of existing pollution issues in Myanmar and compile a priority list of ecosystems and species at risk	ECD
Action 8.1.2	Undertake targeted field research to determine the condition of sensitive ecosystems (such as rivers and lakes) at particular risk of being impacted by pollution (e.g. near industrial sites and mining operations) and for which only limited information is currently available	ECD
Target 8.2:	**By 2017, the EIA Procedure, NEQG, and NEQS include adequate provisions to ensure protection of biodiversity and ecosystem services**	
Action 8.2.1	Ensure draft EIA Procedure and NEQS are reviewed by independent biodiversity experts	MOECAF, MOST
Action 8.2.2	Conduct training on the potential impacts of pollution on biodiversity to ensure that the regulators responsible for review of EIA documentation and application of NEQG or NEQS have adequate understanding of biodiversity to assess the potential impacts of development	MOECAF
Target 8.3:	**By 2020, a water pollution monitoring network involving both government and local communities is operational at three critical freshwater sites and at existing or proposed SEZs**	
Action 8.3.1	Establish and enhance network of water pollution monitoring stations around Inlay Lake, Indawgyi Lake, and along the Ayeyawady River (particularly stretches frequented by the Irrawaddy dolphin)	MOECAF
Action 8.3.2	Develop a community-based water quality monitoring programme and provide training to support the development of a community water monitoring network, including participatory monitoring in and around SEZs	MOECAF

Action 8.3.3	Assist floating vegetable farmers in Inlay Lake to adopt ecologically-friendly practices that minimize the use of agrochemicals	MOAI
Target 8.4:	**By 2020, informal and artisanal minors have an enhanced understanding of pollution and toxicity of mercury and methods to reduce its use**	
Action 8.4.1	Establish education and outreach programme for informal and artisanal minors on mercury and other pollutants in at least three priority states/regions	MOM
Target 8.5:	**By 2020, the sale and use of fuel additives, agrochemicals and veterinary drugs that are known to have significant negative impacts on biodiversity and ecosystem services are effectively controlled and, where appropriate, banned**	
Action 8.5.1	Undertake a desktop study of known, internationally recognized, environmentally damaging chemicals to identify regulation gaps	MOECAF
Action 8.5.2	Regulate use of organochlorines and ban the veterinary use of diclofenac and other non-steroidal anti-inflammatory drugs known to kill vultures	MOECAF, MLFRD
Action 8.5.3	Ban use of tetraethyl lead as a fuel additive in Myanmar	MOECAF, Ministry of Energy

Sarus Crane (*Grus antigone*)

4.6.9 Aichi Target 9: By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment

Under the CBD, an Invasive Alien Species (IAS) is defined as a "species whose introduction and/or spread threaten biological diversity". IAS refer to any non-native species which, when introduced, can transform the structure and composition of ecosystems, either natural or man-made, by excluding native or desirable species either directly or indirectly. IAS may belong to any of the major groups of organisms, including vertebrates, invertebrates, plants, fungi and microorganisms. IAS have the potential to have catastrophic adverse impacts on the economy and the environment. Potential costs include not only direct expenses relating to management, but also indirect costs to both market and non-market values such as increased unemployment, damaged goods and equipment, loss of agricultural, forestry and aquaculture industries, water contamination, environmental degradation, loss of biodiversity, increased rates and severity of natural disasters and disease epidemics. Effectively addressing IAS can require natural resource managers to invest substantial resources in management operations and restoring ecosystems in order to reproduce their goods and services.

Limited information is available on the presence or impacts of IAS in Myanmar, as research on the identification of invasive species and the quantification of the impacts of invasive species is scarce. A review of information currently available, including the 2011 NBSAP and the Global Invasive Species Database, identifies 33 IAS occurring in Myanmar (see Annex 2, Table 46). Several socio-economic and environmental problems caused by IAS have already been identified: golden apple snail *(Pomacea canaliculata)* is a major threat to cultivated crops in Inlay Lake; pennisetum grass *(Pennisetum sp.)* suppresses commercial teak plantings, inhibits natural regeneration and increases fire risk; and water hyacinth *(Eichhornia crassipes)* degrades rivers and wetlands, threatening natural ecosystems and fisheries. Releasing fish into natural water bodies, such as during cultural ceremonies or to increase fish production, has to be considered very carefully to prevent introduction of non-native fish species. Invasive plants and fish are the leading threat to freshwater biodiversity in Myanmar's wetlands.

Further information is required to identify emerging IAS problems, ecosystems most threatened by IAS, and potential environmental or socio-economic impacts. This information would allow the prioritization of the allocation of resources to IAS management. Early identification of IAS allows the targeting of resources and control or eradication may be undertaken at significantly lower costs than would be required to manage the IAS once established. Currently, the capacity to undertake research on IAS is limited, and obtaining the resources and skilled staff to conduct research is likely to be a challenge. Providing relevant IAS training to biological science students could be one strategy for developing the future capacity to undertake IAS research.

While many IAS are already established in Myanmar, the potential for trans-boundary movement of new IAS into Myanmar is high along land borders shared with neighbouring countries such as India, Bangladesh, China, Lao PDR, and Thailand. New IAS also have the potential to be introduced into Myanmar by water and air transport. IAS may be introduced unintentionally by migrants, tourists or through the transport of cargo or movement of pets, plant parts,

seeds and residues, or introduced intentionally, for example for research, medicine, ornamental purposes, agricultural, forestry, biological control or industrial purposes. Due to institutional and political challenges, in many areas the potential for the government to effectively regulate transboundary movement within the next five years may be limited. Identifying key threats, building the capacity of relevant authorities and providing appropriate information to authorities and communities is likely to be a realistic approach to managing the risk of the transboundary introduction of IAS in the short term.

Legislation and regulations relating to the control and management of IAS have not yet been enacted in Myanmar. The Forest Law (1992), the Protection of Wildlife and Protected Areas Law (1994), and the Plant Pest Quarantine Law (1993, amended in 2011) provide regulations to control IAS, but these are inadequate to respond to the threats posed by IAS. Development of targeted legislation relating to controlling the introduction, movement and management of IAS, as well as the strengthening of quarantine laws and enforcement, will be an important long-term component of IAS management.

A low awareness of IAS and their potential environmental and socioeconomic impacts among communities, land managers and government will be a key impediment to the control of IAS. Increasing the awareness of IAS amongst communities and land managers, and providing accessible information relating to the identification and threats of IAS, will be important strategies for gaining support for IAS management and to increase community involvement in reporting of IAS. The capacity of land managers and governments to effectively manage IAS is also limited, due to the absence of a coordinating agency, limited availability of information, restricted resources and limited staff capacity. Identifying the roles of different stakeholders and assigning responsibility for the coordination of IAS management to a single agency could improve the ability to efficiently and effectively control IAS threats.

In order to best utilize resources and minimize environmental and economic costs of IAS in the long term, Myanmar requires an effective and coordinated National IAS Action Plan (NIASP). Myanmar can utilize existing resources produced by national IAS programmes in neighbouring countries and the Global Invasive Species Programme (GISP). Regionally focused publications produced by the GISP, such as *Tropical Asia Invaded. The growing danger of invasive alien species, Prevention and Management of Invasive Alien Species: Proceedings of a workshop on Forging Cooperation throughout South and Southeast Asia and Invasive alien species: A toolkit of best prevention and management practices,* contain resources directly relevant to the development of a NIASP.

Table 21: National targets and priority actions for Aichi Target 9.

Target and Action		Lead
Target 9.1:	**By 2019, NIASP has been developed and approved, and is under active implementation with the support of civil society, local communities, the private sector and the international community**	
Action 9.1.1	Establish an IAS unit within the FD to help coordinate the activities of government, the private sector and non-governmental organisations	FD
Action 9.1.2	Based on desk research, targeted surveys and stakeholder consultations, identify IAS that should be prioritized for prevention, control and eradication	FRI, MOAI, Universities
Action 9.1.3	Identify the measures required to strengthen controls on potential transboundary movement of IAS	FRI
Action 9.1.4	Identify the priority capacity building needs of land managers and government authorities, in relation to IAS identification, prevention and management	FD
Action 9.1.5	Prepare a 10-year NIASP, through a participatory process involving government, civil society and the private sector	FD, MOAI

The Chinese Pangolin (Manis pantadactyla)

4.6.10 Aichi Target 10: By 2015 the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning

Understanding of the marine realm in Myanmar is a major scientific and policy gap. Important marine ecosystems in Myanmar identified by BOBLME are mangrove forests (see Target 5), coral reefs, and seagrass and seaweed beds. Of these, coral reefs are the most vulnerable to climate change and ocean acidification.

Coral reefs in Myanmar are estimated to cover approximately 187,000 hectares in the Myeik Archipelago, the Rakhine coast, and in restricted areas in the Ayeyawady coastal zone. The Myeik Archipelago, which extends for over 300 km north to south and comprises over 800 islands, is the most important area in Myanmar for hard and soft corals (see Figure 13). Elsewhere, along the Rakhine coast, coral reefs are reported to be less developed and consist of small patches found on rocky substrates. Reef formation in the Ayeyawady coastal zone is restricted to the Coco and Preparis Islands where there is no influence of river runoff. Coral reefs support high biodiversity and provide many ecosystem services which support small scale and commercial fisheries and growing tourism opportunities. Coral reefs also provide critical disaster reduction services by providing a buffer between the marine environment and coastlines. They are one of the ecosystems most vulnerable to climate change, as indicated by the catastrophic mass coral bleaching event in the Andaman Sea in 2010, which greatly affected the integrity of coral reefs across the region.

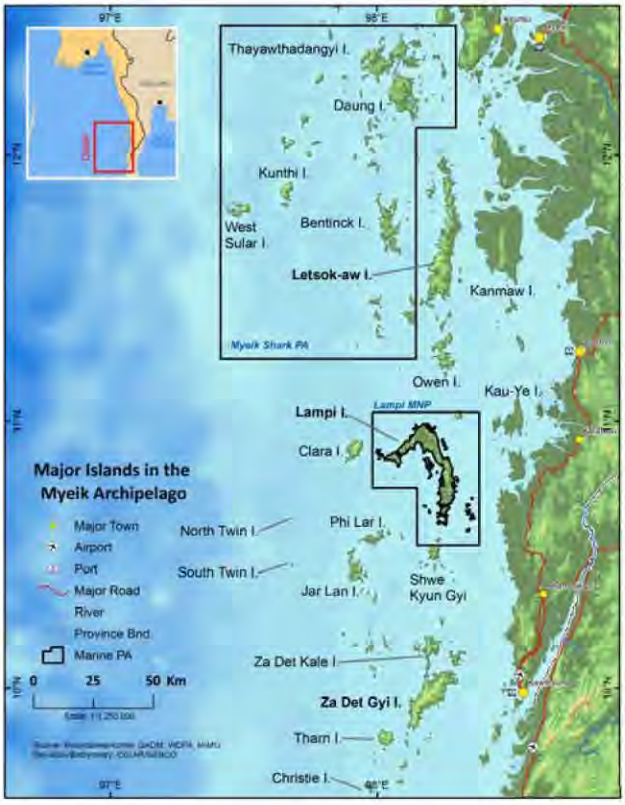

Figure 13: Major islands and protected areas in the Myeik Archipelago.

Coral community composition and health in the Myeik Archipelago were poorly known until recently. However, in 2013–2015, comprehensive literature reviews and surveys were carried out to assess coral reef condition and to establish biodiversity baselines in a variety of sites throughout the Archipelago. In 2014–15, IUCN, FFI, and Prince of Songkla University (PSU) in Thailand carried out four surveys of the archipelago. Corals identified during these surveys included three species listed as Endangered on the Red List (Acropora roseni, Acropora rudis, Parasimplastrea sheppardi), as well as 36 species listed as Vulnerable and four species listed as Data Deficient. The surveys indicated that many reefs have less than 10% live hard coral cover, and are dominated by corallimorphs (soft-bodied coral that do not build hard skeletons) and algae growing on dead coral and rubble. In the northern archipelago, conditions appear to be better with hard corals making up 33% of coral cover on average and up to 80% in some areas.

Box 3: The Bay of Bengal Large Marine (BOBLME) Project and Myeik Archipelago

The Myeik Archipelago in the Andaman Sea has emerged as a priority area for marine conservation and as a key region to address issues affecting transboundary coastal and marine ecosystems within the broader Bay of Bengal. Recognizing the importance of this region, a consortium of donors funded BOBLME to study marine resources and identify underlying causes of declines in marine ecosystem health in the region, including in the Myeik Archipelago. Between February 2014 and January 2015 BOBLME supported four liveaboard surveys as part of a cooperative effort by IUCN and FFI. The project conducted a rapid socio-ecological assessment to evaluate the condition of marine habitats and coastal communities' livelihoods, patterns of resources use, and perceptions and attitudes on resource condition and conservation. The project has highlighted the importance of cooperation between DOF, FD and a range of non-state actors, including local and international NGOs, and universities, for improved coastal and marine management in the archipelago

The synthesis of data from these joint operations contributed to the first comprehensive marine ecosystem map and analysis of current socio-ecological systems for this large marine area, a Situation Analysis of the Myeik Archipelago. The surveys show that ecosystem function is seriously threatened in many areas, owing to the cumulative and successive impacts of destructive and unsustainable resource extraction activities. At the same time, the surveys also revealed good coral reef biodiversity in many areas, which should be recognized and valued as biodiversity reservoirs. Many of these reefs have been assessed as highly resilient, and withstood the severe mass coral bleaching that occurred throughout the Andaman Sea in 2010.

Findings indicate that the Myeik Archipelago can recover with appropriate management that includes mosaics of protected areas, partnerships between the tourism industry and local people, and government efforts to combat illegal fishing.

While identifying high levels of diversity, these studies suggest that the archipelago's coral reef area has declined by over 56% in recent decades due to destructive fishing practices (i.e. blast fishing, near-shore trawling and light lure fishing), overfishing, unregulated marine resource extraction (e.g. sea cucumbers and clams) and mass coral bleaching. They also revealed the absence of large pelagic species including sharks and rays for which the area was known until quite recently. Reducing the multiple anthropogenic stresses and building reef resilience is a top priority to ensure sustainability of marine and coastal resources.

Seagrass beds are a productive and valuable resource that provide habitats and food supply for many commercially valuable species of fish, shrimps and cephalopods as well as species of high conservation importance such as dugong and sea turtles. They also provide a range of services such as coastal stabilization, filtration, and nutrient cycling, and sheltered habitats that are crucial feeding, spawning and nursery grounds for economically important species. Their primary commercial value lies in this role as essential forage and habitat for lucrative commercial fish species.

FFI-led surveys show that the Rakhine and the Taninthayi coastal regions support a high diversity of tropical marine seaweed. While these studies are incomplete, 122 genera and 307 species of seaweeds have been identified. These seaweed ecosystems are likely to be important nursery, shelter and foraging resources for many coastal fish species, and seaweeds are also eaten as vegetables or used as a source of agar.

Under the 1990 Marine Fisheries Law (amended in 1993), DOF has banned destructive fishing gear, including pair trawling, push-net, electrofishing, and fishing using poisons, chemicals or explosives. Trawling is banned within 10 nautical miles of the coastline. Law enforcement is virtually non-existent, however. The legal framework and enforcement system need to be substantially upgraded to permit the effective enforcement of regulations for the protection of marine ecosystems and fisheries. To improve effectiveness, professional law enforcement agencies, possibly including the navy, should be involved in suppressing illegal fishing. International cooperation, especially with Thailand, will also be needed.

Although some PAs with marine coverage have been established, there is a substantial gap in representation of marine ecosystems, especially coral reefs. Existing MPAs such as Lampi Marine National Park (under FD jurisdiction) and the shark protected areas (under DOF) provide neither effective management nor sufficient protection for coral reefs. There is an urgent need to expand the MPA system and to enhance connectivity to enhance the ecological resilience of reefs. In the Myeik Archipelago, surveys conducted by FFI and IUCN identified eight priority sites for protection: Torres Islands, Thayawthadangyi Island group, Langan Island group, Jaran Island group, Zardetgyi Island, Zardetnge Island, Mali Island and Moscos Island.

The ecological and socio-economic role of these sites should be assessed in order to develop appropriate strategies to ensure their effective protection. In some cases, co-operative management models such as Locally Managed Marine Areas (LMMAs) may be appropriate. These can be used to protect key ecosystems while supporting local communities by facilitating co-management with government and by strengthening community tenure over traditional resource areas. A pilot project to establish LMMAs in coral ecosystems in Taninthayi Region was

implemented by FFI in 2013, and this and similar efforts should be expanded. Low impact, reef-based tourism should also be piloted as a way to finance MPA or LMMA operations.

Mawlamyine University is one of the few universities in Myanmar to offer a degree in marine science. Enhancing its capacity as a national centre for marine science excellence will strengthen national research capacity and help make best use of international assistance.

Table 22: National targets and priority actions for Aichi Target 10.

Target and Action		Lead
Target 10.1:	**By 2020, 15 per cent of Myanmar's coral reefs conserved within MPAs, including LMMAs and other area-based conservation measures**	
Action 10.1.1	Carry out detailed feasibility assessments and public consultations at priority sites for establishing new LMMAs and MPAs	FD, DOF
Action 10.1.2	Enhance the capacity of Mawlamyine University as a national centre for marine excellence	Universities
Action 10.1.3	Establish a national coordination body to manage overlapping jurisdiction and coordinate activities	DOF, FD, navy
Target 10.2:	**By 2018, destructive fishing practices in coral reef areas banned and effectively enforced**	
Action 10.2.1	Develop an effective interagency law enforcement system for the marine environment and ensure adequate resources, funding and incentives	DOF, Navy
Action 10.2.2	Confiscate gear and issue appropriate fines engaging in illegal and destructive fishing practices	DOF, Navy

4.6.11 Aichi Target 11: By 2020, at least 17 per cent of terrestrial and inland water areas, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes

To date, Myanmar has designated 39 PAs covering 38,906 km2, 5.75% of Myanmar's land area. Seven additional areas have been proposed, which would cover a further 1.09%. Myanmar's 30-year National Forestry Master Plan set the national target for PA coverage at 10% of total land area by 2030. This target recognizes a variety of protection types, reflecting the diversity of conservation tools and approaches used internationally, and the diversity of conservation practices found in customary cultural practices. In Myanmar, these traditional practices include sacred forests, caves, lakes, and rivers, watershed protection forests, and traditional controls on hunting and fishing.

A key step for establishing an ecologically representative, effectively and equitably managed PA system is the adoption of management models that can recognize sustainable use and recognize co-management and community management. The IUCN PA management categories and governance types provide a framework for diversifying management options that can be adapted to local contexts. The Protection of Wildlife and Protected Areas Rules (2002) only recognizes one management type (IUCN Category II), and one governance type (management by government). Amending the Protected Area Law or Rules, or revising the relevant instructions, would provide the legal basis for these changes. Recognizing co-management, community conserved areas, and sustainable use will require revisions and modifications of both policy and practice.

Of the 132 terrestrial and coastal KBAs identified in 2012 (and which cover 65,304 km2, about 10% of land area), only 35 are in-part included within PAs. As currently under-surveyed regions and taxa receive more attention, additional KBAs are likely to be identified. Gap analyses of PA coverage indicate that a few large PAs, particularly in Kachin State and Sagaing Region, contribute disproportionately to national PA coverage. An assessment of ecoregion coverage also indicates which ecosystems are disproportionately well-represented, and which are under-represented. The following table shows that nine of the 14 **WWF ecoregions** found in Myanmar are significantly over or underrepresented in the PA system (see Table 23).

Table 23: Coverage of PAs for ecoregions of Myanmar.

Ecoregion	Protected	Currently Proposed Additions
Over represented		
Eastern Himalayan alpine shrub and meadow	96%	Inkhine Bum National Park
Northern Triangle subtropical forest	36.00%	None
Under represented		
Coastal mangroves	0.92%	None
Northern Indochina subtropical forest	0.90%	None
Kayah-Karen montane rain forest	0.60%	*Represented in wildlife sanctuaries designated by the KNU*
Irrawaddy dry forest	0.45%	Mahamyaing Wildlife Sanctuary
Coastal rainforest	0.44%	None
Irrawaddy freshwater swamp forest	0.04%	Incorporate small areas into Yangon urban development plans
Nujiang Langcang Gorge alpine conifer and mixed forest	0.00%	Imawbum National Park

Most globally threatened **mammal species** in northern Myanmar are found within existing PAs, exceptions being the Myanmar Snub-nosed Monkey (CR), Tufted Deer (NT), and Chinese goral (VU), all of which are found in far-eastern Kachin State. This gap could be filled by the establishment of Imawbum Wildlife Sanctuary. Several Sundaic mammal species in southern Myanmar, including the Banded Langur (NT), Dusky Langur (NT), and Banded Civet (VU) are not found inside existing PAs. Of the 37 globally threatened bird species that are found outside of PAs (out of 132 globally threatened **bird species** found nationally), the largest unprotected group is comprised of Sundaic species. This gap could be filled by the establishment of Taninthayi National Park, Lenya National Park, and Lenya National Park Extension, which together form a discontinuous Taninthayi Forest Corridor (TFC).

In **phase 1**, several species-focused PAs could be established: Mahamyaing Wildlife Sanctuary (home to 25% of the global population of the eastern Hoolock gibbon), Lenya National Park (Asian elephant, tiger, tapir) and Inkhine Bum National Park (Hoolock gibbon and gaur) (see Table 24). In **phase 2**, the new PAs would include Taninthayi National Park and Lenya National Park Extension of TFC and Pan Thi Taung National Park in Kayah State where there is no PA.

Imawbum National Park is the only known site of the Myanmar snub-nosed monkey. This site, along with the Southern Extension (SE) of Hkakaborazi National Park and Za Loon Taung Protected Area of Sagaing Region would be established in **phase 3**. The SE covers sub-tropical forest in the 900–1,500 m elevation range and is characterized by very high bird and plant diversity and endemism.

Establishment of new PAs should be carried out with public participation and approval, respecting customary tenure and striving to build feelings of local ownership. The current PA establishment procedure provides a framework for continued improvement of these processes.

Table 24: PA establishment plan in Myanmar up to 2020–2021.

Phase	Name	Area (km2)	Sub-total (km2)	Coverage (%)	Cumulative Coverage (%)
	39 existing PAs	38,906	38,906	5.75	5.75
1	Lenya National Park	1,766	3,246	0.48	6.23
	Mahamyaing Wildlife Sanctuary	1,180			
	Inkhine Bum National Park	300			
	Taninthayi National Park	2,590	4,223	0.62	6.85
2	Lenya National Park (extension)	1,399			
	Pan Thi Taung National Park	234			
	Imawbum National Park	1,563	6,557	0.97	7.82
3	Za Loon Taung Protected Area	216			
	Hkakaborazi National Park SE	4,778			
	Total	**52,932**	**52,932**	**7.82**	

Several ecoregions, notably the Irrawaddy freshwater swamp forest, coastal mangroves, coastal rain forest, and Northern Indochina subtropical forest are heavily impacted by human activities and are highly fragmented. While a useful tool for many forest and ecosystem types throughout Myanmar, community-based management, including ICCAs and community forests, may be particularly effective in these fragmented areas. In both cases, the value for securing ecosystem services and local community livelihoods will likely be significant. In more impacted areas, the emphasis should be on community control, sustainable use, and natural regeneration, rather than strict protection. In areas with more intact forests, ICCAs could provide protection without the need for more formal, centrally-managed PAs. Multiple legal tools can help to recognize ICCAs at the national, state and regional, and district levels, including revisions to implementing rules and regulations and integration into land use planning at all levels. ICCAs could be identified through participatory mapping processes and drafting of district level land use plans as described in the National Land Use Policy. Some kinds of ICCA may be recognized through CF certification. In other countries, ICCAs also include customary tenure areas and indigenous reserves. Establishment of a customary land type classification would greatly improve recognition and protection of ICCAs.

Effective and equitable management of PAs is an essential component of Target 11. There are currently serious deficiencies in national capacity for PA management, including budgeting, staffing, equipment and capacity to implement collaborative management approaches. The global standard for measuring PA management effectiveness is the Management Effectiveness Tracking Tool (METT). Developed by GEF, METT is intended to report progress regarding management effectiveness of a PA in terms of context, planning, inputs, processes, outputs, and outcomes. The completion of a METT by all PAs is a crucial first step in identifying the strengths and weaknesses of each site, and determining what steps should be taken in order to improve management quality.

Co-management, an internationally-recognized IUCN governance type, provides models for including communities in PA management, in order to increase management effectiveness and support community-based approaches to sustainable livelihoods. The Protection of Wildlife and Protected Areas Rules established the ability to designate buffer zones within PAs. Buffer zones should be established using participatory mapping and community-based natural resource management approaches developed in collaboration with communities living within and surrounding PAs. Co-management, community conservation agreements, and participatory mapping and monitoring can help to reduce conflict between PAs and communities, ensure that livelihood needs are met, and provide a framework for benefit sharing from PA designation.

To address unsustainable use, including hunting, whether for subsistence or trade, local authorities and PA managers need to be encouraged and rewarded to proactively engage local communities living in and around PAs. This means including community engagement in their job description. To engage successfully, natural resource managers need to collaborate with social scientists and NGOs who can work with local communities over an extended period of time to facilitate collaboration and mutual understanding. PMM can empower local communities, provide information, and encourage biodiversity conservation and sustainable development in line

with the local realities. NWCD is working with the NGO Spectrum to pilot PMM in Natmataung National Park.

The **Spatial Monitoring and Reporting Tool** (SMART) is the standard tool for measuring, evaluating, and improving the effectiveness of wildlife law enforcement patrols and site-based conservation activities. It is intended to be used by PA managers to plan, evaluate, and implement activities. WCS is working with NWCD to implement SMART in a small number of PAs. Expanding SMART to all major PAs would be an effective way of improving management effectiveness.

The 20 PAs under NWCD management have an average annual budget of about US$55,000; seven of these receive less than US$30,000 per year. By comparison, some large PAs in Thailand have annual budgets close to US$1 million. It is not realistic to expect a dramatic increase in funding for PAs in Myanmar before 2020. However, existing funds could be used more effectively. This requires ensuring that PA **budgets are linked to conservation priorities** through systematic management planning and NWCD oversight. In addition to funding gaps, there is a critical need for increased staffing, equipment, and capacity development to support implementation of international best practices for PA management.

MPAs remain a large gap in Myanmar's PA system. To date, one national park (Lampi Island Marine National Park), three wildlife sanctuaries, two shark and three crab protection areas have been established. In total, MPAs in Myanmar currently cover approximately 13,650 km2 (2.6% of Myanmar's Exclusive Economic Zone), and leave important fisheries and coral reef areas unprotected. New MPAs are urgently needed to protect Myanmar's coastal ecosystems, particularly of coral reef ecosystems in the Myeik Archipelago.

Myanmar joined the World Heritage Convention in 1994 but has only one **World Heritage Site** (WHS), Pyu Ancient Cities, which was inscribed as a cultural site in 2014. Despite its size and biological richness, Myanmar has no natural WHS. In 2014, seven natural sites were added to the WHS Tentative List (TL). Ayeyawady River Corridor; Hukaung Valley Wildlife Sanctuary; Indawgyi Lake Wildlife Sanctuary; Myeik Archipelago; Natmataung National Park; the Taninthayi Forest Corridor; and the Northern Mountain Forest Complex (NMFC, comprising Hkakaborazi National Park and the Southern Extension (SE), Hponkanrazi Wildlife Sanctuary, and planned Imawbum Wildlife Sanctuary; the SE is considered essential to the successful nomination of NMFC because it contains a forest type that has disappeared from the adjacent Three Parallel Rivers WHS in China.

Myanmar joined the Ramsar Convention in 2005 but has only one **Ramsar site**, Moeyungyi Wetland Sanctuary, which was designated in 2005. Indawgyi Lake Wildlife Sanctuary has been nominated as a Ramsar site and there are on-going initiatives to nominate parts of the Gulf of Mottama, but stakeholder consultations, particularly with local communities are needed.. Recognition of Ramsar wise-use principles in management in both policy and practice is essential for the successful management of these areas, which are under significant human use.

Box 4: International designations

World Heritage

The Convention concerning the Protection of the World Cultural and Natural Heritage (known as the World Heritage Convention or WHC) was adopted by the General Conference of UNESCO in 1972. To date, it has been signed by 163 States Parties. Using 10 criteria of Outstanding Universal Value, the WHC defines the characteristics of natural and cultural sites that can be considered for inscription on the World Heritage List (which currently includes 1,031 properties).

Myanmar has seven natural sites on its WHS Tentative List: Northern Mountain Forest Complex, Hukaung Valley Wildlife Sanctuary, Indawgyi Lake Wildlife Sanctuary, Natmataung National Park, Myeik Archipelago, Ayeyawady River Corridor and Taninthayi Forest Corridor.

Ramsar

The Convention on Wetlands of International Importance especially as Waterfowl Habitat (commonly known as the Ramsar Convention) was adopted in Ramsar, Iran, in 1971. There are currently 168 State Parties to the Convention who commit to "work towards the wise use of all their wetlands". Myanmar joined the Ramsar Convention in 2005 and has so far designated just one Ramsar site, Moeyungyi Wetland Sanctuary. Indawgyi Lake Wildlife Sanctuary has been nominated as a Ramsar site, and there are on-going initiatives to nominate parts of the Gulf of Mottama.

Man and the Biosphere Programme

Launched in 1971, the U.N. Educational, Scientific and Cultural Organization's (UNESCO) Man and the Biosphere Programme (MAB) is an intergovernmental programme that "aims to establish a scientific basis for the improvement of relationships between people and their environments". MAB's network of 651 Biosphere Reserves in 120 countries include terrestrial, marine, and coastal areas where solutions are promoted to reconcile biodiversity conservation with its sustainable use. In 2015, Inlay Lake was listed as a Biosphere Reserve in recognition of the integration of natural ecosystems and traditional livelihoods at this site.

ASEAN Heritage Parks

First established in 1984, and strengthened in 2003 with the signing of the ASEAN Declaration on Heritage Parks, the ASEAN Heritage Parks Programme (AHP) is a network of 35 protected areas in the 10 ASEAN member states, recognized for their exceptional biodiversity value or uniqueness. It was established to improve cooperation on the conservation and management of these sites, seven of which are in Myanmar.

While all these international designations have a focus on biodiversity conservation, the degree of protection they offer varies greatly. World Heritage Sites (WHS) are subject to the highest degree of international scrutiny and enjoy the highest level of protection. Ramsar sites and Biosphere Reserves focus on "wise use" and "sustainable development" rather than strict protection. All these labels can support biodiversity conservation by building national pride in the sites and by attracting international attention. Such recognition can in turn bring in new funding, offer training and capacity development opportunities, and encourage tourism with economic benefits for local communities and service providers (although tourism often brings its own set of problems). Agencies responsible for biodiversity conservation can leverage these labels to strengthen their own authority in the face of competing interests.

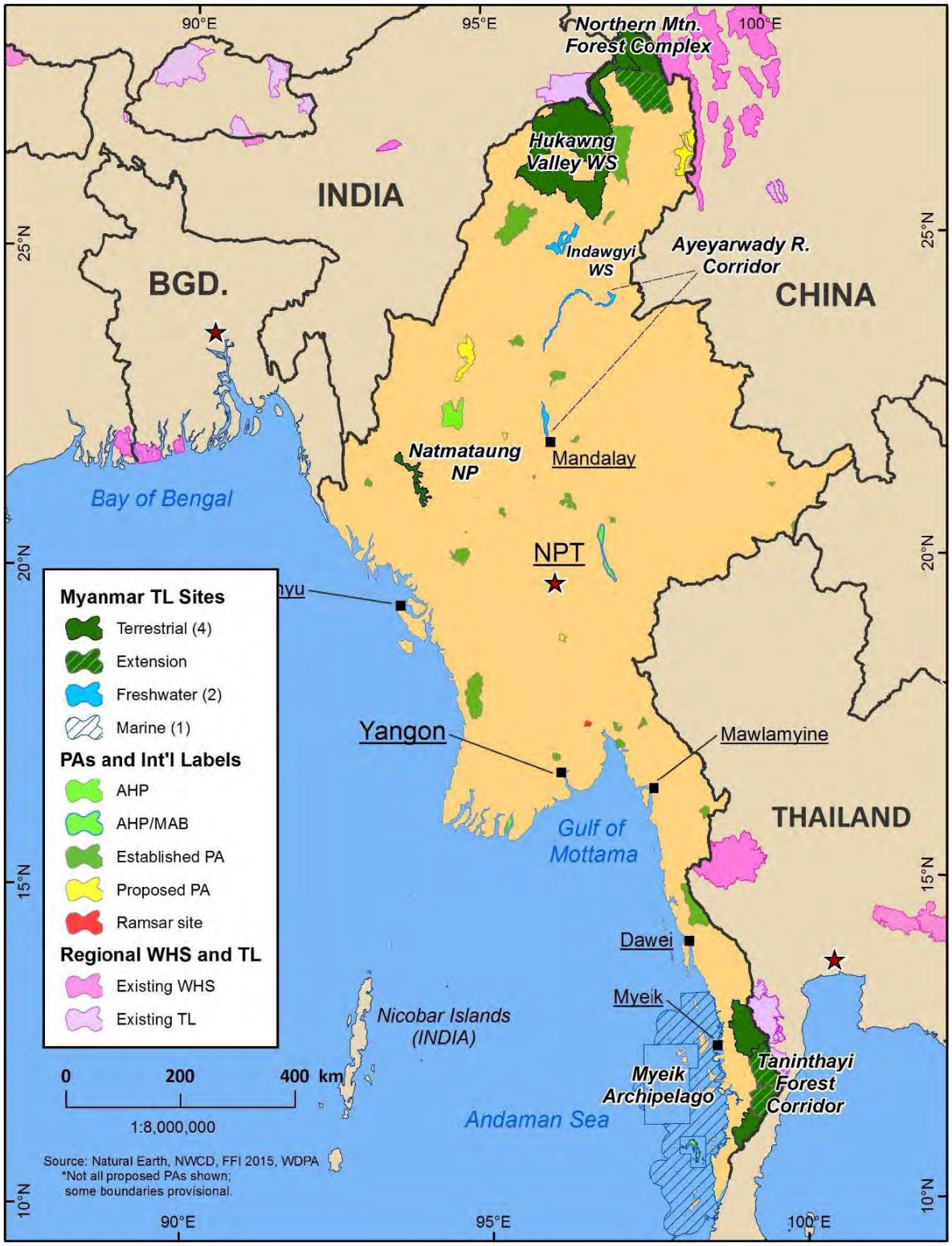

Figure 14: Myanmar TL sites, international labels, and surrounding TL and WHS.

Table 25: National targets and priority actions for Aichi Target 11.

Target and Action		Lead
Target 11.1:	**By 2020, 8% of Myanmar's land area is conserved within PAs, including ICCAs**	
Action 11.1.1	Approve proposed Lenya National Park, Lenya National Park Extension, Mahamyaing Wildlife Sanctuary and Inkhine Bum National Park	FD
Action 11.1.2	Establish Taninthayi National Park, Pan The Taung National Park	FD
Action 11.1.3	Establish Hkakaborazi National Park SE, Imawbum National Park and Za Loon Taung Protected Area	FD
Target 11.2:	**IUCN governance categories and management categories are recognized in policy and practice**	
Action 11.2.1	Conduct a review of opportunities for recognizing governance and management diversity, including ICCAs, within the current legal and governance framework, including forests, fisheries, protected area categories, and other area-based conservation approaches	FD
Action 11.2.2	Recognize additional governance types and management categories using appropriate legal tools, including amendments of laws and revisions of implementing rules and regulations	FD
Action 11.2.3	Pilot governance types and management categories by establishing co-management PA systems, recognizing ICCAs, and developing PA zonation	FD
Target 11.3:	**By 2020, the management effectiveness of Myanmar's PA system has significantly improved, with 15 PAs implementing SMART, at least five PAs implementing management plans, and local communities are involved in management activities in at least five PAs.**	
Action 11.3.1	Complete METT survey in at least 20 PAs	FD
Action 11.3.2	Implement SMART in at least 15 PAs	FD
Action 11.3.3	Implement management plans addressing conservation priorities and investment in at least five PAs	FD
Action 11.3.4	Implement pilot projects in at least five PAs involving local communities in designating buffer zones and co-management providing incentives for conservation and compensation for restricted access	FD, I/NGOs
Action 11.3.5	Expand community-based participatory biodiversity monitoring in and around PAs	FD, I/NGOs

Target 11.4:	**By 2020, Myanmar's sites of premier conservation value are recognized by relevant international designations, through the designation of one natural WHS, three additional Ramsar sites, and one Biosphere Reserve**	
Action 11.4.1	Nominate at least one natural site for inclusion on the UNESCO World Heritage list	FD
Action 11.4.2	Nominate at least two additional Ramsar sites	FD
Action 11.4.3	Nominate at least one additional Biosphere Reserve	FD
Target 11.5:	**By 2020, a Marine Spatial Plan with nested MPAs is prepared for the Myeik Archipelago**	
Action 11.5.1	Pilot marine spatial planning by developing a spatial plan for the Myeik Archipelago through a multi-stakeholder process	DOF
Action 11.5.2	Establish at least one additional MPA that can together with Lampi Marine National Park serve as a model and pilot for future MPA management	DOF, FD

4.6.12 Aichi Target 12: By 2020, the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained

As a result of its size, 2,100-km latitudinal range, and diversity of topography and habitats from the eastern extremity of the Himalayas in the far north to the Sundaic forests in the far south, Myanmar is home to a rich diversity of species, including many endemics. Due in part to the historically slow pace of economic development, Myanmar has experienced significantly lower rates of deforestation and habitat loss than in neighbouring countries. However, many species have been virtually extirpated (e.g. tiger) or pushed to the brink of extinction (e.g. several species of freshwater turtle) by hunting for subsistence and, increasingly, illegal trade. Rapid economic growth triggered by political and economic reforms since 2010 will put further pressure on Myanmar's habitats and species, but also provide resources and opportunities to save them.

If efforts to protect nationally and globally threatened species are not significantly improved in the near future, then it is very likely that Myanmar will experience the same pattern of species extirpations and extinctions that has been seen elsewhere in the region. The Red List has assessed 3,849 species in Myanmar, 715 of which are globally threatened or Data Deficient (DD) (see Table 26). The high percentage of DD species reflects the fact that a crucial limiting factor is a lack of up-to-date information on distribution and population status, as some parts of the country have not been the surveyed for decades (see Target 19).

Table 26: Species in Myanmar assessed on the IUCN Red List of Threatened Species.

Global Status		Animals		Plants		Total	
Globally Threatened	Critically Endangered (CR)	22	3%	14	18%	36	5%
	Endangered (EN)	59	9%	15	20%	74	10%
	Vulnerable (VU)	157	25%	18	24%	175	24%
Data Deficient (DD)		401	63%	29	38%	430	60%
	Total	**639**		**76**		**715**	

Functionally important species are species which play key roles in the functioning of an ecosystem, such as soil engineering, seed dispersal, pollination or, in the case of top predators, regulation of herbivore numbers. Loss of these species can result in fundamental phase shifts in ecosystems, often resulting in cascade effects of local extinctions, or irreversible environmental damage. Although not necessarily currently threatened, such species may warrant additional conservation priority, as their conservation can avoid subsequent species loss resulting from ecosystem change.

To determine conservation priorities, species can be grouped under three categories:

1. Important species for in situ conservation action **(Type A)** (see Table 27):
   - Endemic and near-endemic species
   - Globally threatened species for which Myanmar is or may become an important country (as populations decline elsewhere in the region)
   - Additional priority species identified by the Asian Species Action Partnership (ASAP), an interagency coalition formed to address extinction risk among the most threatened non-marine vertebrates in Southeast Asia
2. Tortoises and freshwater turtles that are either the focus of or in urgent need of ex situ conservation action and re-introduction efforts **(Type B)** (see Table 28)
3. Wide-ranging species of national priority and species with very fragmented populations **(Type C)** (see Table 29)

Table 27: Selected endemic/near endemic vertebrate species in need of in situ conservation action (sub-type A1).

Common name	Scientific name	Global Status
Myanmar snub-nosed monkey	*Rhinopithecus strykeri*	CR
Irrawaddy dolphin (Ayeyawady River sub-population)	*Orcaella brevirostris*	CR
Joffre's pipistrelle	*Pipistrellus joffrei*	DD
Anthony's pipistrelle	*Hypsugo anthonyi*	DD
Spoon-billed sandpiper	*Calidris pygmeus*	CR
White-bellied heron	*Ardea insignis*	CR
White-browed nuthatch	*Sitta victoriaeis*	EN
Gurney's pitta	*Pitta gurneyi*	EN
Burmese eyed turtle	*Morenia ocellata*	VU
Burmese peacock softshell	*Nilssonia formosa*	EN
Burmese narrow-headed softshell turtle	*Chitra vandijki*	NE*
Burmese flapshell turtle	*Lissemys scutata*	DD

*NE = Not Evaluated. Sub-type A1: endemics/near-endemics, n=12.

Of the Sub-type A1 species, few are currently the focus of dedicated in situ conservation efforts. FFI supports protection of the Myanmar snub-nosed monkey in Kachin State. WCS supports protection of the isolated sub-population of the Irrawaddy dolphin between Mingun and Bhamo. The Biodiversity and Nature Conservation Association (BANCA) support protection of the spoon-billed sandpiper in its wintering grounds in the Gulf of Mottama. In December 2014, ASAP and Synchronicity Earth held a conservation-planning workshop for the white-bellied heron and developed an action-oriented species conservation strategy, which is currently under development.

Table 28: Species for which Myanmar is or may become an important range country (sub-type A2).

Common name	Scientific name	Global Status	Common name	Scientific name	Global Status
Shortridge's langur	*Trachypithecus shortridgei*	EN	Greater adjutant	*Leptoptilos dubius*	EN
Western Hoolock gibbon	*Hoolock hoolock*	EN	Lesser adjutant	*Leptoptilos javanicus*	VU
Sunda pangolin	*Manis javanica*	CR	Sarus crane	*Grus antigone*	VU
Chinese pangolin	*Manis pentadactyla*	CR	Indian skimmer	*Rynchops albicollis*	VU
Black musk deer	*Moschus fuscus*	EN	Black-bellied tern	*Sterna acuticaudaonce*	EN

Common name	Scientific name	Global Status	Common name	Scientific name	Global Status
Asian small-clawed otter	*Aonyx cinerea*	VU	Jerdon's babbler	*Chrysomma altirostre*	VU
Smooth-coated otter	*Lutrogale perspicillata*	VU	Northern river terrapin	*Batagur baska*	CR
Hairy-nosed otter	*Lutra sumatranais*	EN	Big-headed turtle	*Platysternon megacephalum*	EN
Dugong	*Dugong dugon*	VU	Toli shad	*Tenualosa toli*	CR
White-rumped vulture	*Gyps bengalensis*	CR	Green sawfish	*Pristis zijsron*	CR
Slender-billed vulture	*Gyps tenuirostris*	CR	Large-tooth sawfish	*Pristis pristis*	CR
Red-headed vulture	*Sarcogyps calvus*	CR	Dwarf sawfish	*Pristis clavata*	EN
White-winged duck	*Cairina scutulata*	EN	Narrow sawfish	*Anoxypristis cuspidata*	EN
Masked finfoot	*Heliopais personatus*	EN	Chinese coffin tree	*Taiwania crypteromerioides*	VU
Green peafowl	*Pavo muticus*	EN			
Sub-type		A2,			n=29

Of the Sub-type A2 species, very few are the focus of dedicated in situ conservation. Although there are on-going programmes in parts of the home ranges of Shortridge's langur and western Hoolock gibbon, there is a need for more directed conservation action. The Turtle Survival Alliance (TSA) has been working at various sites on conservation of the Northern river terrapin and other tortoises and freshwater turtles. Friends of Wildlife (FOW) is conducting a small-scale initiative in Kachin and Shan States on conservation of vultures.

Table 29: Additional priority species identified by IUCN SSC/ASAP (sub-type A3).

Common name	Scientific name	Global Status
Irrawaddy River shark	*Glyphis siamensis*	CR
Baer's pochard	*Aythya baeri*	CR
Pink-headed duck	*Rhodonessa caryophyllacea*	CR
Largetooth sawfish	*Pristis microdon*	CR
No common name	*Puntius compressiformis*	CR

Sub-type A3, n=5.

The Irrawaddy river shark is only known from a single museum specimen described in 1896. The pink-headed duck has not been observed since 1949 despite several surveys led by Birdlife International in the early 2000s.

Table 30: Tortoises and freshwater turtles which the focus of/in need of ex situ conservation and re-introduction efforts (Type B).

Common name	Scientific name	Global Status
Burmese star tortoise	*Geochelone platynota*	CR
Burmese roofed turtle	*Batagur trivittata*	EN
Northern river terrapin	*Batagur baska*	CR
Arakan forest turtle	*Heosemys depressa*	CR

Myanmar supports globally significant diversity of tortoises and freshwater turtles, with almost 10% of the total global diversity. Twenty-eight species of tortoises and freshwater turtle have been recorded, of which seven are endemic. Key threats to their survival include overharvesting for subsistence and trade (primarily to China), and habitat destruction (particularly the conversion of nesting beaches to agricultural land, and inundation following hydropower development). Four species are recognized as CR or EN.

Table 31: Landscape species of national importance and species with very fragmented distributions (Type C).

Common name	Scientific name	Global Status
Asian elephant	*Elephas maximus*	EN
Tiger	*Panthera tigris*	EN
Hog deer	*Axis porcinus*	EN
Fishing cat	*Prionailurus viverrinus*	EN
Banteng	*Bos javanicus*	EN
Eld's deer	*Rucervus eldii*	EN
Gaur	*Bos gaurus*	VU

The population of wild **Asian elephants** has long been estimated to be 4,000–5,000, with about 6,000 additional captive elephants used for logging. However, recent studies suggest that there may be fewer than 2,000 remaining in the wild and improving data on population status, trends, and distribution is necessary (Leimgruber et al. 2011). The Rakhine Yoma Elephant Range and the North Zamari Wildlife Sanctuary have been established specifically to protect the species. Myanmar has a long history of capturing wild elephants for use in teak logging. Driven in part by low reproductive rates and high mortality among the captive population, capture is now the leading threat to the wild population. As the timber industry reduces its demand for elephants due to mechanization and changes in policy, elephants are increasingly

at risk of being trafficked into Thailand for use in the tourism industry. Elephants in Myanmar are also killed for their ivory, which is trafficked into China. As agriculture expands into forests, human-elephant conflict, which may result in retaliatory illegal killing of elephants, will become increasingly common, particularly in the Bago Yoma and Rakhine Yoma. NWCD reports data on elephant killings to CITES Monitoring the Illegal Killing of Elephants (MIKE) and on ivory seizures to CITES Elephant Trade Information System (ETIS).

Historically wide-spread in Myanmar, **tigers** are now restricted to small populations in Htmanthi and Hukaung Valley Wildlife Sanctuaries (both close to the border with India), and Taninthayi (bordering Thailand's Western Forest Complex, which is home to about 200 tigers). Its survival in Myanmar is inextricably linked to effective protection in Htmanthi and Hukaung, the creation of three PAs in the Taninthayi Forest Corridor (see Target 11), and greater transboundary cooperation, particularly with Thailand.

Several other globally threatened species are found in Myanmar with **very fragmented populations**, often falling outside the PA network. For these wide-ranging species, landscape level planning that maintains connectivity between forest fragments is essential.

In addition to the species described above, Myanmar is home to globally significant but poorly known populations of herpetofauna, invertebrates, plants, marine species and other taxa, many of which are likely to warrant urgent conservation investment. For several of these groups, identification of conservation priorities is impeded by the lack of baseline data currently available.

The trade in **endangered wildlife** is one of the greatest threats to biodiversity in Myanmar. As commercially valuable wildlife species have been wiped out in neighbouring countries, Myanmar has increasingly become a source of wildlife products. Particularly vulnerable are the country's endemic species, especially freshwater turtles and tortoises. By monitoring wildlife products in Mong La in Shan State since 2006, TRAFFIC has documented the significant trade in elephants, Asiatic bears, sun bears, tigers, leopards, snow leopards, cloud leopards, turtles, tortoises, and pangolins from Myanmar to its neighbours. In Mong La, Tachilek, and other border markets, there is essentially no enforcement of Myanmar's wildlife protection laws.

Ultimately, demand reduction is needed to reduce the impact of hunting and trading. But in the meantime, **intensive protection** of key populations and greater international cooperation, especially the disruption of transboundary wildlife trade networks, are urgently needed. NGO-supported patrols in a few PAs and participation in the ASEAN Wildlife Enforcement Network (WEN) are steps in the right direction but are insufficient to address the threat. Effective action requires an all of government approach that combines intelligence gathering, public engagement, targeted law enforcement, and other measures to detect, penalize, and prevent wildlife crimes. Livelihood programmes are important to ensure that individuals and communities that rely on the illegal wildlife trade are provided with alternative sources of income.

Table 32: National targets and priority actions for Aichi Target 12.

Target and Action		Lead
Target 12.1:	**By 2020, the conservation status of priority, globally threatened species in Myanmar has improved**	
Action 12.1.1	Pilot and scale up conservation and research initiatives for priority species	FD, DOF
Action 12.1.2	Expand programmes to establish assurance colonies, captive breeding and wild release programmes of threatened tortoises and freshwater turtles	FD
Action 12.1.3	Integrate conservation of wide-ranging species and species with very fragmented distributions into local, regional and national landscape planning	FD
Target 12.2:	**By 2020, the illegal wildlife trade in Myanmar has been substantially reduced**	
Action 12.2.1	Fully implement and enforce the requirements of the CITES Convention through national legislation.	FD
Action 12.2.2	Build the capacity of law enforcement authorities to enforce wildlife trafficking regulations, including through involvement in ASEAN-WEN	FD
Action 12.2.3	Implement alternative livelihood programmes to reduce the dependence of key communities on illegal wildlife trade	FD, I/NGOs, TRAFFIC
Target 12.3:	**By 2020, a National Red List of selected taxa has been produced**	
Action 12.3.1	Conduct Red List assessments for key taxa, with a particular focus on endemic species	FD, I/NGOs, Universities
Action 12.3.2	Hold training workshops to build capacity on application of the Red List categories and criteria	FD, I/NGOs
Target 12.4:	**By 2020, conservation status of migratory species has been improved**	
Action 12.4.1	Increased documentation of transboundary species in Myanmar and increased collaboration with appropriate international agencies through exchange of information on migratory species between relevant in-country and international organizations	FD, I/NGOs
Action 12.4.2	Prepare a species conservation action plans to protect endangered migratory species, including marine turtles and mammals, migratory birds and sharks, and to sustain the ecological health of their corridor	FD, DOF, I/NGOs
Action 12.4.3	Provide field sites for research (wetland ecosystems), monitoring (migratory birds), education and training	FD, I/NGOs

4.6.13 Aichi Target 13: By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity

Preserving the genetic diversity of cultivated plants, landraces, and crop wild relatives is essential for food security, climate change adaptation, and the maintenance of cultural traditions linked with the cultivation and consumption of traditional crops, foods, and medicines.

Myanmar's wealth of traditional landraces and crop varieties has been maintained in some areas, while in other regions it is under threat. Areas of traditional diversity include the wild rice and traditional landraces in Ngawchang Hka Valley in Kachin State. Elsewhere, hybrid crops from one seed source have replaced traditional varieties as farmers become more heavily involved in the cash crop economy. Increased commercialization of agriculture and seeds and the increase in cash cropping on both smallholder farms and plantations will reduce the genetic diversity of cultivated crops.

Myanmar's draft national seed policy recognizes the rights of farmers to "use, exchange, share or sell their farm-saved seed," a critically important provision to protect the rights of farmers to cultivate diverse landraces and participate in seed saver networks and exchanges. Any future seed laws and intellectual property rights legislation should reaffirm this policy. However, while most of the seeds used in Myanmar are produced by farmers, the extension services promote the use of commercial seeds. This is a barrier to preserving on-farm genetic diversity.

Establishing domestic and international markets for Myanmar crop varieties, including mangoes and rice, creates stronger demand for some important local varieties and can create business opportunities for farmers. The Ministry of Science and Technology is developing a law that would allow Myanmar to confer Geographical Indication status on specialty agricultural products, potentially including teas, thanaka (cosmetic paste made from ground bark), lotus root cloth, and high quality teak. The Department of Agricultural Research (DAR) plans to develop 10 to 15 varieties of certified rice seed and to promote a market for Myanmar-specific rice varieties, and has proposed a high-quality rice variety for export. While these strategies could promote specific varieties unique to Myanmar, they also create disincentives to maintain crop diversity as one variety becomes more valuable on the export market.

Loss of habitat for crop wild relatives, caused by expansion of monoculture crops and other land use changes, is a threat to agrobiodiversity. Hotspots of crop wild relatives should be identified throughout the country in collaboration with civil society, including farmer's networks, in order to document their diversity and direct efforts for collaborative research and preservation.

There is no substitute for on-farm maintenance of genetic diversity and crop diversity. Much of the agricultural diversity in Myanmar is maintained by traditional farming practices, including rotational and fallow taungya, which maintains diverse crop varieties and non-timber forest products. The recognition of communal tenure is essential for the continued cultivation of these species in diverse fields, forests, and fallows.

Collaborative research between the DAR and university researchers, farmer groups, and NGOs is needed to document and research local landraces, identify hotspots for crop wild relatives, identify priority areas for seed bank collections, and develop a national strategy and action plan. The establishment of seed saver networks is essential for the maintenance of crop diversity. Exchanges of seeds and crop knowledge on a larger scale, modelled after the ongoing Food Seed and Culture Fairs held at the state and regional level by Metta Foundation, can play an important role in facilitating seed exchanges at a broader scale. At these fairs, farmers who have lost their traditional landraces after converting to cash crops, have found these varieties anew and brought them back to their communities, thereby improving food security and preserving on-farm crop genetic diversity.

The DAR maintains the National Seed Bank in Yezin and has over 20,000 accessions in short and medium term storage. The seed bank works to inventory and conserve crop landraces through participatory field surveys, facilitating group discussions, and increasing the number and diversity of their accessions. Rice germplasm has been the focus of this collection. The seed bank has exchanged seeds with the International Rice Research Institute (IRRI) and has stored accessions of over 12,000 germplasms of 18 crops with the seed banks of Korea, Japan, and Thailand. Conservation of medicinal plants has also been identified as a priority and plants are being conserved by the seed bank and through the establishment of medicinal gardens for conservation and public awareness.

Increasing the number and diversity of seeds, both in crop type and region, that are preserved is a priority for the Myanmar Seed Bank. Partnerships between DAR and other government departments (including the Department of Medicinal Plants and botany departments at universities), NGOs, farmer groups, and seed saver networks would improve documentation of agrobiodiversity and scope for ex situ conservation.

Conservation of traditional livestock breeds and their genetic diversity can follow a similar framework. Collaborative research with livestock owners, the private sector, national and international research institutions, and NGOs working on rural livelihood improvement can strengthen the scale and impact of ex situ livestock research and conservation.

Myanmar is a signatory to the Cartagena Protocol on Biosafety to the Convention on Biodiversity, and has committed to ensure that a precautionary approach is applied to protect biological diversity from the potential risks posed by living modified organisms, such as herbicide resistant rice, resulting from modern biotechnology. Developing the capacity to identify and manage living modified organisms, whether imported accidentally or intentionally, is required to comply with the Cartagena Protocol and protect the genetic diversity of local landraces and wild crop relatives. The process for establishing a policy on biosafety in Myanmar has been stalled after a policy was drafted, and should be renewed.

Table 33: National targets and priority actions for Aichi Target 13.

Target and Action		Lead
Target 13.1:	**By 2020, priorities for the conservation of plant genetic resources have been identified and are addressed by programmes to promote in situ conservation**	
Action 13.1.1	Conduct collaborative research to identify national priorities for conservation of genetic diversity of cultivated crops including underutilized crops, medicinal plants, and forest products	MOAI, FD, Universities
	Expand programmes to establish assurance colonies, captive breeding and wild release programmes of threatened tortoises and freshwater turtles	FD
Action 13.1.2	Establish seed saver networks and village seed banks in regions where traditional crop varieties are under greatest threat	MOAI
Action 13.1.3	Conduct collaborative research between MOAI and farmer organisations, extension agents, and farmer field schools for documentation and breeding of traditional crop varieties	MOAI
Action 13.1.4	Ensure that the intellectual property rights for traditional crop varieties are recognized and protected through implementation of the Nagoya Protocol and in the national legislative framework for seeds and intellectual property	MOAI, MST, MOECAF
Action 13.1.5	Encourage incentives and programmes to promote on-farm conservation of plant genetic diversity	MOAI,Farmer organisations, I/NGOs
Target 13.2:	**By 2020, ex situ conservation gaps have been addressed through collaborative research and collection programmes**	
Action 13.2.1	Establish a programme of collaborative research and collection of biological material with seed networks, farmer organisations, village seed banks, and farmer field schools	MOAI, Universities, CSOs,Farmer organisations
Action 13.2.2	Collect accessions from crops and regions for the National Seed Bank that have been identified as priorities in national gap analysis	MOAI
Action 13.2.3	Continue to expand collaboration with international research institutions and to further develop research programmes with national universities	MOAI, universities

Action 13.2.4	Upgrade National Seed Bank leading to establishment of national gene bank, using cryopreservation and DNA conservation techniques.	MOAI
Target 13.3:	**By 2020, a crop wild relative action plan has been initiated**	
Action 13.3.1	Conduct collaborative research with universities, farmers groups, and civil society to identify centres of crop wild relative diversity throughout the country	MOAI
Action 13.3.2	Develop an action plan for conservation of crop wild relatives	MOAI, MOECAF
Target 13.4:	**By 2020, incentives and programmes to conserve the genetic diversity of livestock are established to address current gaps**	
Action 13.4.1	Conduct collaborative research to identify priorities and opportunities for conservation of genetic diversity of livestock including semi-domesticated animals like Mithun, including preservation of tissue samples, both in situ and ex situ	MLFRD

4.6.14 Aichi Target 14: By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable

The population of Myanmar is highly dependent on natural resources and ecosystem services, with 66% of the population working in agriculture, and much of the remainder of the rural work force involved in other resource-dependent activities such as fishing, mining, and forestry. Poor and vulnerable members of society, including marginalized ethnic nationalities and women, are especially dependent on the services provided by these ecosystems due to limited economic opportunities, concentration in more rural areas, and discrimination. The unsustainable exploitation of such resources will disproportionately and negatively impact vulnerable members of society as well as the biodiversity that is key to providing these services. Target 14 is a broad, cross-sectoral target and depends on the effective implementation of other targets (e.g. 3, 5, 7, 10, 11, 15, and 18). This target focuses on four key ecosystem services and their associated values: fresh water, forest products, pollination, and coastal flood protection and fisheries.

This target can be divided into two complementary aspects and associated actions: (1) restoration and maintenance of ecosystem services; and (2) equitable access to benefits deriving from such services. Many of the bio-geophysical services provided by ecosystems are also covered under Targets 5 and 15. Equity issues are complex, and in many cases strongly correlated with gender, ethnicity, poverty, and access to resources. Examples of ecosystem services benefiting such vulnerable groups are given below (see Table 34).

Table 34: Examples of ecosystem services and associated values.

Service	Associated Ecosystem	Value
Water	Forested watersheds	Potable water, irrigation water
Fisheries	Inland/coastal water bodies, mangroves	Food security, protein, income security
Agriculture	Agro-ecological	Food security, income, preservation of traditional values and culture
Timber/fuelwood	Forest land	Timber for construction, fuelwood
NTFP and wild products	Terrestrial ecosystems	Plant and animals for food, income, medicine, materials
Medicine	Forests	Provision of traditional medicines
Ecotourism	Intact landscapes (aesthetic)	Income security
Cultural link	Numerous	Community health, identity, mental and spiritual health; other non-tangible values such as happiness
Soil fertility	Soil	Food, income
Disaster Risk Reduction	Coastal	Mitigation of flood/drought from storm events
Pollination	Agro-ecological and supporting ecosystems	Food security

Source: Modified from Leadley et al. 2014.

Ecosystem services can be classified in four categories. **Provisioning services** include production of resources such as crops, fish and livestock, and raw materials for construction and other needs, all of which directly depend on natural ecosystems. **Regulating services** include functions such as climate regulation through the storage of carbon and control of local rainfall, and protection from disasters such as landslides and coastal storms, and are not measured in conventional markets. **Cultural services** are more difficult to measure and include benefits such as cultural identity (which can maintain societal stability, mental health, and other essential benefits) and ecotourism (through preservation of aesthetic values). **Supporting** services are not of direct benefit to people but are essential to the functioning of ecosystems and therefore indirectly responsible for all other services. Examples of supporting services are the formation of soils and the processes of plant growth.

Because they are not necessarily bought or sold, the value of non-market ecosystem services is difficult to quantify. As a result, the focus is often on key provisioning services for which a market value can be estimated. Consequently, many studies underestimate the value of these services.

One of the most valuable ecosystem services in Myanmar is the provision of **freshwater resources**. On average, Myanmar is a low water stress country, with the fifth highest per capita

water availability in Asia and only 2.8% of the annual total available water consumed (Simmance 2013). However, this masks large regional and seasonal differences, as water access is a significant challenge in the drier central region of the country and areas that receive high levels of rainfall struggle with water quality and seasonal access.

Farmers and hydropower plants depend on forested and intact watersheds to filter and moderate flow and retain sediment. Studies in other areas in the world make a clear case for the overwhelming economic value of safeguarding and restoring watersheds, and this should be a goal for Myanmar as well, as the devastating floods of July–August 2015 demonstrated. Potential tools include reforestation of degraded areas, enhanced agricultural cultivation techniques, and protection of upland and riparian areas. These activities could be funded through the expansion of a watershed protection fund, integration into agricultural extension activities, and in the long term, possibly by PES.

Fresh water resource

Rivers and freshwater wetlands are important sources of ecological services. In addition to the agricultural and hydropower benefits provided by rivers, ecosystem services associated with rivers and wetlands include freshwater fisheries, harvested wild goods, transport, recreation

and carbon storage. A study of Moeyungyi wetland in Bago Region estimated the site to provide a net annual benefit of US$22 million (US$2,200/hectare/year) in ecosystem services.

Forests support a wide range of ecosystem values including water provision, supply of timber, meat, and non-timber forest products (NTFP) such as medicinal plants. A systematic assessment of the values of services provided by forest ecosystems in Myanmar estimated that they generate more than US$7 billion in goods and services every year (Emerton et al. 2013). Only 15% of this value is from timber and NTFPs, with the difference made up by contributions to other sectors and regulation services, such as global climate mitigation.

The **pollination** of crops by insects and other animals supports food security and survival of plant species. Pollinators include birds, beetles, rodents, and most importantly, bees (Apis spp.), which studies show can double the yield of some crops. There are no estimates of the value of pollination in Myanmar, but if the global average of 9.5% of total crop value is used, it is likely to be a significant figure. In addition, the Red List Index (RLI) for other pollinators in Myanmar is declining, indicating faster relative population decreases and potential impacts to pollinated crop value. Considering that 58% of Myanmar's GDP is derived from agriculture, this is a worrying trend.

Coastal and marine ecosystems such as mangroves, intertidal mudflats, coral reefs, and seagrass can help mitigate **coastal flooding** and provide key **fisheries habitat** for many juvenile and adult fish species (see Target 10). The value of coastal protection services provided by mangroves was made clear during storm events such as Cyclone Nargis in 2008, when more than 140,000 people perished. Mangroves also provide a range of associated values and services, such as habitat for juvenile fish, carbon sequestration, and fuel wood. Research conducted by IUCN calculated that intertidal mudflats in Northeast Asia provide ecosystem services up to US$38,000/hectare/year, and mangroves in Southeast Asia have been assessed as having an ecosystem service value of US$4,000/hectare/year.

To incorporate ecosystem services into development planning, **a systematic valuation approach,** like that applied to forest ecosystems, should be applied to other ecosystems, particularly marine and freshwater, which have high indirect economic values. This will ensure that the true costs of a project are factored into cost-benefit analyses, and provide a basis for establishing PES schemes that support communities and create incentives to protect ecosystems.

Table 35: National targets and priority actions for Aichi Target 14.

Target and Action		Lead
Target 14.1:	**By 2020, a rapid national ecosystem assessment has been carried out, identifying the status, values and trends of key ecosystems and the services they provide**	
Action 14.1.1	Quantify trends and pressures in the status of ecosystems and species populations that provide key ecosystem services, including distinct ecological and hydrological units such as the Ayeyawady River Basin	MOECAF
Action 14.1.2	Identify and map (using GIS) key ecosystem services through desktop analyses and participatory consultations involving multiple stakeholder groups, including , marginalized, poor, and vulnerable groups	MOECAF

4.6.15 Aichi Target 15: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification

Many of Myanmar's diverse range of ecosystems have, over more than 50 years of economic and political hardship, become degraded and require restoration. Forests are in particularly urgent need of action and have been selected as the focus of this target.

While average annual deforestation is relatively low, this is largely a function of the large areas of remote forest in southern and northern Myanmar. Virtually all of Myanmar's more accessible forests are **shrinking rapidly in both extent and quality**. The FRA shows forest cover declining from 58% in 1990 to 45% in 2015 (see Target 5, Box 2). The reduction in forest quality is even more serious from a biodiversity and livelihoods perspective.

An indicator of forest quality is the **annual allowable cut** (AAC), which the FD has prepared every 10 years based on detailed forest inventory for over a century. Under the national harvesting guidelines, only mature trees over the girth limit are to be selected and harvested, which in turn defines the AAC. The AAC for teak and other hardwoods fell from 39 million m3 in 1918 to 2 million m3 in 2010. The most important reason for this >90% reduction in AAC is overharvesting over many decades. Logging accelerated in the 1980s as harvesting levels were determined by export revenue targets rather than the silviculture-based AAC.

The State Timber Board (STB), precursor to MTE was formed for harvest and process non-teak hardwoods. In 1963, hardwood marketing was nationalized, and followed for sawmilling in 1965. STB reorganized and renamed as Timber Corporation (TC) in 1974. TC was restructured and renamed as Myanma Timber Enterprise (MTE). In border areas, starting in 1989, contracts were awarded to Thai logging companies. In Kachin State, Chinese companies gained informal logging rights. FD has had little effective authority over these operations and has rarely been in a position to ensure that logging was sustainable.

FD classifies Myanmar's forests into two categories that together form the PFE, the forest that FD has gazetted through due legal process: Reserved Forest, which is the best quality and higher commercial value forest, in more remote areas, and where villagers have no harvesting rights; Protected Public Forest, which is of lower commercial valuable, more accessible, and where villagers have some harvesting rights. Technically, there should be no settlements inside the PFE and PAs, which in 2010, covered 29.80% of the land area.

FD also maps forest cover (48.50%), which for 2010 shows that 23.45% and 25.05% of forested land is inside and outside of the PFE and PAs, respectively (see Table 36). FD therefore only manages 48% of the total forest area; 52% is defined by FD as Unclassified Forest (UF), and by the Ministry of Agriculture and Irrigation as "virgin, fallow, and vacant land" and thus eligible for conversion to other uses (see Figure 15).

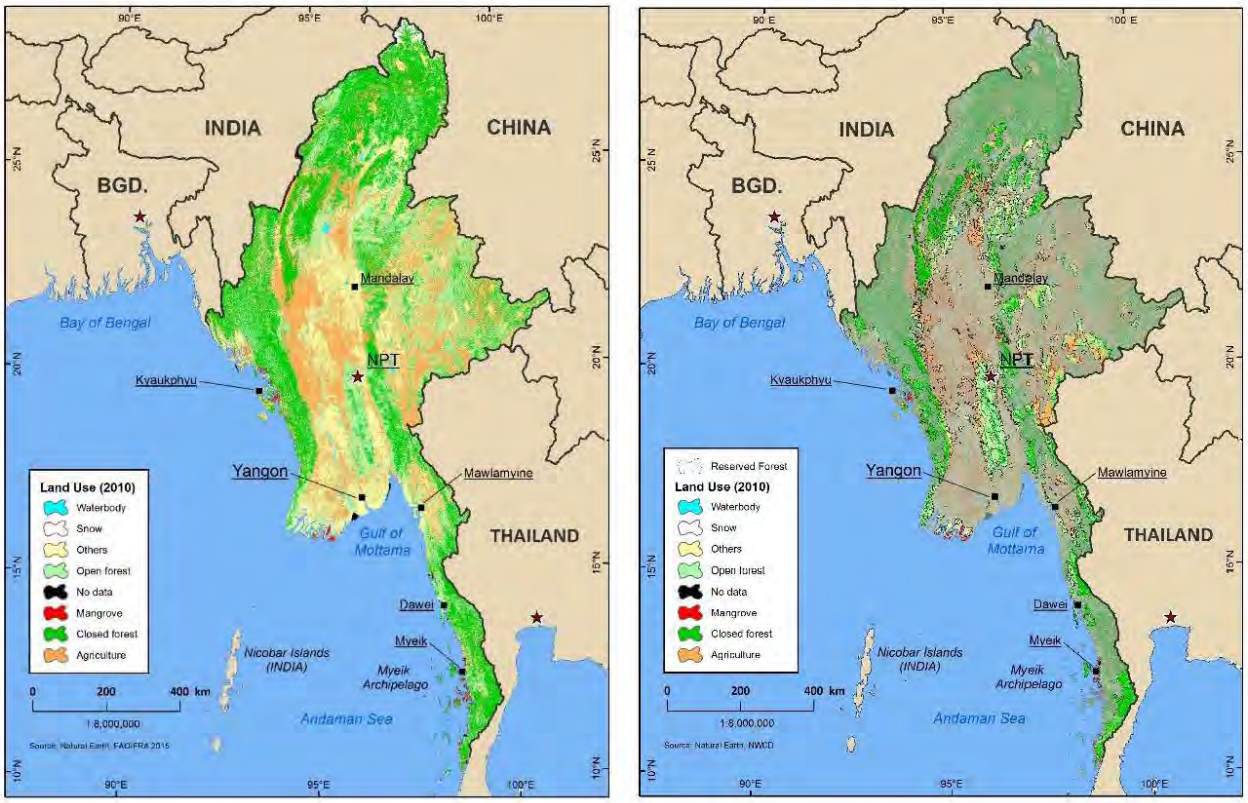

Figure 15: Forest cover in Myanmar (L) and overlaid with Reserved Forest boundaries (R) (2010).

Table 36: PFE, PAs and forest cover.

FD administrative category	% of area	Land cover category	% of area
Reserved Forest	18.01	Forest within PFE and PAs	23.45
Protected Public Forest	6.05	Non forest within PFE and PAs	6.35
Protected Area	5.75	Other forest	25.05
Permanent Forest Estate and PAs	**29.80**	Other land (Unclassified Forest)	24.80
		Cultivable wasteland (secondary forest)	9.50
		Fallow (shifting cultivation)	0.60
		Net area sown (sedentary cultivation)	15.50
		Total	**98.90**

Starting in 2010, logging accelerated in anticipation of a log export ban that was finally introduced in 2014. From a commercial perspective, Myanmar's forests are now **'logged out'**, as shown by the number of wood processing plants that are struggling to secure adequate high quality timber supplies and the gradual switch to processing lower quality plantation woods. Meanwhile, road building has opened up new areas of forest to logging and conversion.

One of the greatest threats to the remaining forest is forest clearing and conversion: for concessions to convert land to rubber, oil palm, betel nut and other agro-forestry plantations and also to a lesser extent the expansion of smallholder agriculture. Large areas of forest have now passed through a **degradation continuum** where they have been logged over so many times that conversion to plantation or agriculture, combined with substantial insecurity of tenure and in some cases conflict, is the likely next step.

Myanmar's forests are now at a **cross-roads**: will they continue to suffer continued degradation and loss or recover through a process of regeneration at a scale that can make a difference and in a way that is supported by local communities? The first outcome would resemble the situation in Cambodia and Lao PDR where rapid deforestation and the granting of economic land concessions have been accompanied by frequent human rights abuses.

FD is committed to a path of forest recovery through greater community participation. But CF, its only administrative means of engaging local communities in forest management, has progressed so slowly since the CFI was issued in 1995 that a **new policy model** is required that can rapidly expand public participation in forest restoration and protection over large areas.

In 2014, upon the approval of the Union Government, MOECAF wrote off the villages, paddy fields and religious/communal lands located inside the PFE and protected areas for the villages settled lengthy there. Total of 1184 villages with 9,193 ha, paddy fields with 166,783 ha and, religious/communal lands with 10,582 ha Ac for the villages which have 50 households and more, and 2807 villages with 17,160 ha, paddy fields with 169,914 ha and, religious/communal lands with 18,515 ha for the villages which have less than 50 households. Other corresponded cultivation lands will be allowed for CF. But there has been limited implementation of CF handover so far due to constraints of FD capacity and human resources. Community forestry has not

generally been a good model for restoration due to the 30-year lease period, the reluctance to hand over any more that small areas of forest near villages, and the promotion of commercial species. Community forests are typically small, low biodiversity tree farms.

In Nepal, where over half the forest estate is under community management, it took decades of international support to build the necessary state and non-state capacity. But Myanmar cannot wait for decades. A **large scale forest restoration initiative** is needed, under FD leadership, which builds on and adapts successful models to the Myanmar context. The initiative would work with local communities for win-win outcomes that include improved land, tree and forest tenure security, guaranteed economic benefits in the short, medium, and long terms, and prioritization of wider ecosystem service benefits (e.g. biodiversity, hydrology, and carbon sequestration).

Under the CFI, about 80,000 hectares have been brought under community management, and most community forests are smaller than 100 hectares. The National Forestry Master Plan sets a target of 980,000 hectares of community forest established by 2030. To address the imminent threats to Myanmar's forests, a total of at least **1,000,000 hectares** need to be brought under some form of community management, which implies the allocation of much larger areas of forest. Some of this could be sustainably harvested and processed to meet local timber demand; most needs to be protected and allowed to regenerate naturally.

A large-scale forest restoration initiative would face **multiple challenges**. As the lead agency, the FD may need presidential-level authority to overcome resistance from vested interests. It needs to expand its role in forest restoration toward the provision of technical support for community participation, and take advantage of initiatives such as the draft national land use policy, district-level land use planning, and REDD+, all of which MOECAF is leading. The PFE must receive stronger protection against conversion to large-scale commercial plantations and concessions. The CFI rules need to be streamlined and granted for larger areas of higher-quality forest, instead of only small degraded patches, to provide incentives for community management. Where reforestation is carried out it should use native Myanmar species, whenever possible, in order to assist in re-establishing natural forests and support native biodiversity. Substantial donor funding would be needed to build capacity and to cover the transitional costs over the first 10–20 years.

Given these challenges, **a pilot** to test this initiative should be carried out in an area that is well forested and relatively accessible such as southern Rakhine State or Bago Yoma.

The social, political, and technical requirements of large-scale forest restoration are complex and the **Global Partnership on Forest and Landscape Restoration** (GPFLR), which **works to restore degraded forests** in ways that deliver benefits to local communities and to nature, can assist. GPFLR is designed to help countries meet their international commitments on forests, including Aichi Target 15, REDD+ goals, and the Rio+20 land degradation neutral goal. It has reached 59 million hectares of the Bonn Challenge target of restoring 150 million hectares of degraded forest by 2020.

Table 37: National targets and priority actions for Aichi Target 15.

Target and Action		Lead
Target 15.1:	**By 2020, over 130,000 hectares of forest have been are under community forestry**	
Action 15.1.1	Amend the Forest Law to strengthen the legal framework of CF and increase incentives for community management	FD
Action 15.1.2	Launch a major new initiative to significantly upscale community forestry, building on the lessons and experiences to date	FD
Target 15.2:	**By 2018, guidelines for a national forest restoration programme that incorporates best international practice formally adopted by government and pilot project initiated**	
Action 15.2.1	Draft and adopt a national forest restoration strategy	FD
Action 15.2.2	Implement pilot forest restoration project	FD
Action 15.2.3	Explore opportunities for sustainable funding of restoration through REDD+ and establishment of other payments for ecological services schemes	FD
Action 15.2.4	Prepare guidelines for national forest restoration programme taking into consideration economic, including the value of ecosystem services, and ecological aspects	FD
Target 15.3:	**By 2020, REDD+ Readiness Road Map is actively being implemented**	
Action 15.3.1	Continue to implement the REDD+ Readiness Road Map, especially development of safeguards, and pilot project	FD, REDD+ Task Force,

Little Cormorant (*Phalacrocorax niger*)
Brown-headed Gull (*Larus brunnicephalus*)

4.6.16 Aichi Target 16: By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation

The Nagoya protocol was adopted in Nagoya, Japan in 2010 and entered into force in 2014. The Nagoya Protocol requires the implementation of a transparent legal framework to advance the fair and equitable sharing of benefits arising from the use of genetic resources. Fair and equitable benefits sharing is one of the three objectives of the CBD and is envisioned to create incentives to conserve and sustainably use biodiversity and to enhance the contribution of biodiversity to sustainable development. Each country must establish a legal framework for access and benefits sharing (ABS) for providers and users of genetic resources. The ABS framework protects owners of traditional knowledge associated with genetic resources, who must give consent for its use in research and share equitably in the resulting benefits.

Myanmar ratified the Nagoya Protocol in 2014. MOECAF is the focal point for the protocol, and a roadmap for implementation is being developed with support from the ASEAN Centre for Biodiversity and in collaboration with relevant ministries, including the Ministry of Health for research on medicinal plants and DAR. The roadmap includes an assessment of the legal framework and needs for establishment of ABS. An assessment of capacity and training needs for ABS implementation is also required. GEF funding is available to support these and other activities necessary to comply with the Nagoya Protocol.

Increased knowledge on genetic resources is necessary for implementation of ABS. Research on agricultural biodiversity is currently conducted on livestock, fisheries, crops, and traditional medicinal plants through various departments, but funding and capacity constraints limit the extent of these efforts. Partnerships with farmer associations and civil society groups to document and maintain traditional knowledge can supplement government and university research programmes.

A framework for the recognition and protection of indigenous knowledge is essential for communities to benefit from their traditional knowledge and resources for research purposes. Communities must be able to give Free, Prior, and Informed Consent (FPIC) to users of genetic resources and to negotiate Mutually Agreed Terms (MAT) for use of these resources. MAT are terms agreed upon by providers and users of genetic resources to minimise the misappropriation of genetic materials. As Myanmar's national investment framework is refined, ABS should be incorporated into investment rules and regulations. ABS should be reflected in intellectual property rights legislation. This should include a legal framework for bio-prospectors to establish MAT with providers of genetic resources. The Global Plan of Action (GPA) is a framework for the sustainable use and conservation of plant genetic resources and has been endorsed by the CBD. To monitor plant genetic resources, the National Information Sharing Mechanism (NISM), which helps coordinate activities and assess Myanmar's progress towards the GPA, should be strengthened.

Table 38: National targets and priority actions for Aichi Target 16.

Target and Action		Lead
Target 16.1:	**By 2020, the Nagoya Protocol is actively implemented in Myanmar**	
Action 16.1.1	Develop a National ABS Roadmap and Action Plan, which identifies the most relevant genetic resources, assesses the likely demand for these, and identifies the priorities for legislative development, awareness raising, and capacity development.	ECD
Action 16.1.2	Establish the Nagoya Protocol in the national legal framework	ECD
Action 16.1.3	Raise awareness amongst selected stakeholder groups within government, the private sector, international and national NGOs, and communities about the implications of the Nagoya Protocol, e.g. in relation to FPIC and MAT	ECD MOAI
Action 16.1.4	Strengthen and continue the NISM-GPA	MOAI
Action 16.1.5	Conduct collaborative research on medicinal plants and crops and traditional knowledge of these resources under the framework of Nagoya Protocol	ECD, Universities
Action 16.1.6	Build capacity among key stakeholders to implement the provisions of the Nagoya Protocol, through the provision of targeted training, and the development of model ABS agreements and templates.	ECD, Universities
Action 16.1.7	Translate The Guide to the Nagoya Protocol and other key references into Myanmar language.	ECD

4.6.17 Aichi Target 17: By 2015, each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan

NBSAPs are the principal instruments for implementing the CBD at the national level. The CBD requires countries to prepare a NBSAP and to ensure that it is mainstreamed into the planning and activities of all those sectors whose activities can have an impact (positive and negative) on biodiversity. To date, a total of 184 (95%) Parties have developed NBSAPs. This revision builds on the previous NBSAP, which was approved in 2012, by structuring it around the 20 Aichi Biodiversity Targets that were adopted at COP-10 in Nagoya in November 2010.

In addition to addressing international commitments under the CBD, the revised NBSAP will assist Myanmar in meeting its own commitments to a development path that respects nature for its multiple environmental and cultural values. At this time of rapid transition, the country needs a reference document that provides ambitious but realistic targets to be achieved by 2020. Some of these targets lie outside the traditional biodiversity conservation sector.

Successful implementation of the NBSAP will require the involvement of different government ministries and departments, and the engagement of civil society and the private sector. There will be a need to build awareness and support for the NBSAP amongst multiple stakeholders, and to create effective coordination, monitoring and evaluation mechanisms at multiple levels. State-level BSAPs that reflect regional and local priorities should also be considered, as mechanisms for promoting implementation at the sub-national level.

As the lead agency for biodiversity conservation in Myanmar, FD has the leading role to play in the implementation of the NBSAP. However, it faces a number of institutional and financial challenges that limit its ability to fulfil its mandate. Targets and indicators related to increased FD financing are given in Target 20. However, financial sustainability can only be achieved if there are effective institutions for management and a solid framework for planning and implementing biodiversity conservation within which financial measures are embedded. In other words, and as regional experience clearly shows, conservation performance will only improve if adequate core funding is available, the broader political and economic environment is supportive, and the responsible agency is designed to make effective use of the funding it receives.

Box 5: Civil Society and Non-governmental organizations

Civil society organisations (CSOs) have made significant contributions to conservation in Myanmar, from establishing community forestry and fisheries groups to mobilising widespread public support for the conservation of the Ayeyawady River. The growth of a formalized NGO sector accelerated after Cyclone Nargis in 2008, when civil society organised to assist relief and recovery efforts. Many of the NGOs that work on environmental issues have a focus on improving rural livelihoods through food security, disaster risk reduction, land tenure, and rural enterprise, while a smaller subset specializes in biodiversity conservation. Religious groups, youth groups, and women's groups raise awareness about environmental issues and encourage environmental stewardship among their communities. Networks like MERN, POINT, and Myanmar Green Network, community forestry associations, and religious organisations bring groups together from around the country to share knowledge and experiences.

NGOs and other civil society organisations can play a key role in mobilising communities around community-based natural resource management, especially for forestry, fisheries, and around PAs. This community work is highlighted in a number of NBSAP targets. In the Gulf of Mottama, BANCA has dramatically reduced hunting pressure on the Spoon-billed Sandpiper (Calidris pygmaea, CR) and is working with hunters to develop alternative sources of income. Recent surveys indicate that the population, which had been rapidly declining, may be stabilising.

FD will need to adopt a broad strategy that seeks to influence policies that lie outside its direct remit but nonetheless have important implications for biodiversity conservation. Within the context of this strategic redirection, FD will need to establish alliances with non-traditional partners such as development NGOs, businesses, and parliamentarians; actively coordinate international support to maximize synergies and avoid duplication of effort; negotiate with state/region governments to ensure that conservation priorities are integrated into land use planning; encourage states/regions to issue laws that give them the authority to establish PAs including ICCAs; and make enhanced use of the media and other channels to make the case for increased state and non-state investment in biodiversity conservation.

This role of FD will become increasingly important as authority over natural resources and land use becomes decentralized to the states/regions. Regional experience shows that without strong central oversight, the local incentives for economic growth will dominate conservation concerns and that this can trigger a wave of deforestation and industrial pollution. In sum, FD will aim to operate less as a manager of its partners and more as the conductor of an orchestra, organising and leading partners to achieve what they cannot do alone.

The actions recommended to achieve the national biodiversity targets will require the **revision of annual work plans** to reflect new projects and priorities, including EIA review, community forestry (CF), forest restoration, and increased time spent working with civil society and communities. Staff time must be allocated for consultation processes in order for consultations to be meaningful and effective. The national CF target provides a good example, as township and district forestry officials currently do not have time in their annual work plans to develop management plans with communities or process applications for CF certification. Once annual targets are developed for CF coverage, the work necessary to achieve these targets can be included in annual work plans. Targets and actions should also be incorporated into job descriptions and TORs to ensure a shared understanding of changing roles and responsibilities.

Table 39: National Targets and priority actions for Aichi Target 17.

Target and Action		Lead
Target 17.1:	**By 2016, the NBSAP is adopted by Cabinet as the nation's over-arching policy framework for the conservation and sustainable use of biodiversity**	
Action 17.1.1	Prepare the necessary briefing papers and formally submit the NBSAP to Cabinet for approval	MOECAF
Target 17.2:	**By 2016, the institutional mechanisms to ensure effective implementation and monitoring of the NBSAP are in place and functioning effectively**	
Action 17.2.1	Establish a National Steering Committee, to oversee and guide the implementation of the NBSAP	MOECAF/FD
Action 17.2.2	Create an NBSAP Implementation Coordination Unit within MOECAF and develop a mainstreaming and coordination strategy that recommends clear roles and responsibilities across national policy framework	MOECAF/FD
Target 17.3:	**By 2020, BSAPs are under preparation in at least three states/regions**	
Action 17.3.1	Develop guidelines and principles for BSAP preparation, to ensure consistency of approach as well as integration with the NBSAP	MOECAF/FD
Action 17.3.2	Develop BSAPs in at least three states/regions, through a participatory process involving government, civil society, local communities, academia and the private sector	MOECAF/FD

Target 17.4:	By 2020, conservation status of migratory species has been improved	
Action 17.4.1	Develop a series of high-level briefing packages on the NBSAP for senior policy and decision makers within government	FD
Action 17.4.2	Develop and implement an NBSAP communications strategy and action plan, which identifies the key target audiences who need to be reached in order to ensure effective NBSAP implementation, the messages to be conveyed, and the communications tools and approaches to be used	FD

4.6.18 Aichi Target 18: By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

Traditional knowledge and practices that contribute to conservation include the protection of sacred forests, lakes, rivers, and caves, taboos on hunting certain species, and the maintenance of watershed protection forests. Practices that contribute to sustainable use include hunting and fishing reduction during breeding seasons, no-take fishing zones and gear restrictions in spawning areas, rotational and fallows *taungya,* and indigenous silviculture and agroforestry techniques. Conservation tools to recognize and strengthen these traditional practices include recognition of customary tenure, co-management of PAs, ICCAs, and community forestry. Conservation projects should work with and be responsive to cultural traditions and beliefs about the environment. As a cross-cutting theme, traditional knowledge and customary practices can contribute to each of the other NBSAP targets.

The CBD recognizes the unique value of the knowledge and practices of traditional people and local communities for conservation, and directs parties to incorporate these values across the CBD's programme of work. The CBD provides guidelines and tools for Target 18 through the Working Group on Article 8(j), the Akwe:Kon guidelines for the conduct of impact assessments on traditional sacred sites, and the Tkariwaié:ri Code of Ethical Conduct on respecting cultural and intellectual heritage. The UN Declaration on the Rights of Indigenous People (UNDRIP) provides an international legal framework for the implementation of Articles 8(j) and 10(c) through the recognition of indigenous rights, customary practices, and heritage. National policy should use the standards that give the highest level of protection to the rights of indigenous and ethnic minority groups.

The **recognition of customary tenure and traditional systems of governance** is fundamental to the promotion of traditional practices that benefit conservation and encourage sustainable use of resources. Sustainable shifting taungya, also called swidden or rotational agriculture, is a complex rotational agroforestry system that maintains the bulk of crop genetic diversity worldwide, includes secondary forest that can improve connectivity between forest fragments, pro-

duces a mosaic landscape with high species diversity, and is linked to the cultural and spiritual heritage and social relationships of indigenous people. Tenure security for the fallow stage of rotational agriculture is essential for the sustainability of the system and the tenure and livelihood security of uplands groups that practice it.

ICCAs are diverse types of conservation areas managed by communities. ICCAs are recognized by IUCN as one of four governance types for PAs, along with government management, co-management, and private management. Community conserved areas are increasingly recognized for their importance to conservation and their key role in the protection and sustainable use of terrestrial and marine resources. Establishment and formal recognition of these areas should take care to reinforce, and not to undermine, existing governance structures and customary management that promote sustainable use.

According to UNDRIP, conservation and development projects must consult affected communities and those communities have the right to give or withhold **FPIC**. This principle can be used to strengthen existing consultation processes, and is particularly relevant for the establishment of PAs and the review of EIAs. MOECAF has already affirmed its support of FPIC and has begun to develop guidelines and build capacity for FPIC through implementation of the REDD+ Readiness Roadmap. The REDD+ Engagement and Safeguards Technical Working group has been tasked with developing FPIC guidelines for REDD+ projects. These guidelines can be used to incorporate FPIC into other conservation activities, particularly PA establishment and governance. They can also be applied to review of EIA and SIAs by ECD. Training of ECD staff on environmental and social standards should include FPIC as international best practice for consultation processes. Other ministries whose work could significantly impact indigenous groups should also affirm and take steps to institutionalize FPIC in planning and implementation of projects.

Consultation occurs as part of the **PA gazettement** process, in which communities have 90 days to submit land claims to be considered in the designation of PA boundaries and buffer zones. These consultations can be strengthened by training township-level FD, GAD, and DALMS staff that are responsible for reviewing proposed PA boundaries on methods for facilitating community consultations and understanding of customary tenure practices, and by development of outreach and educational material in local languages. The consultations for protected area gazettement, including the work of the Preliminary Scrutiny Body, should be implemented in close collaboration with NWCD staff with experience in international standards and tools for PA management. Co-management and community management should be used as tools to recognize and promote the sustainability of customary practices in accordance with Article 10(c).

Conservation activities, including establishment of PAs, must be conflict-sensitive, especially as many current and proposed PAs are in areas that are subject to overlapping and contested land claims. Upholding FPIC principles, pursuing rights-based approaches to conservation, and recognizing, protecting, and promoting traditional knowledge and customary practices in conservation projects are key components of conflict sensitivity.

Traditional knowledge of species, natural history, vegetation dynamics, and natural resource management can make a substantial contribution to the mapping and understanding of bio-

diversity. This is reflected in the growing international appreciation for the role of traditional knowledge to inform both technical management and cultural and ethical relationships to species and landscapes. Traditional knowledge should be reflected in PA management plans, co-management systems, mapping, and the designation of ICCAs. PMM can be used to incorporate traditional knowledge into PA management. Traditional knowledge and customs should be included in PA educational material. School curricula on the environment can incorporate traditional knowledge, and youth organisations and customary institutions can facilitate inter-generational learning to maintain traditional knowledge.

Table 40: National targets and priority actions for Aichi Target 18.

Target and Action		Lead
Target 18.1:	**By 2020, customary land use tenure systems has been recognized in Myanmar's legal framework and a mechanism for recognizing communal tenure is operational**	
Action 18.1.1	Pass a National Land Use Policy and Land Law that recognizes customary land use systems	MOECAF, Parliament
Action 18.1.2	Develop implementing rules and regulations to allow registration of customary communal tenure	MOECAF, DALMS
Action 18.1.3	Harmonize recognition of customary and communal tenure into relevant laws, dispute resolution mechanisms, and land use planning processes	MOECAF
Action 18.1.4	Begin to register communal land	MOECAF, DALAMS
Target 18.2:	**By 2020, FPIC principles are institutionalized in government, private sector, and donor programmes**	
Action 18.2.1	Prepare guidelines on FPIC for government use, including guidelines on consultation processes	MOECAF
Action 18.2.2	Ministries overseeing sectors, particularly extractive industries, with significant potential impact on indigenous peoples and local communities affirm FPIC principles	MOECAF
Action 18.2.3	Produce and disseminate guidelines for FPIC and grievance mechanisms to government and private sector	MOECAF
Action 18.2.4	Train relevant government staff on FPIC principles and consultation methods to increase awareness and capacity	MOECAF

Target 18.3:	**By 2020, traditional knowledge documented, recognized, promoted, and protected through incorporation into education and conservation outreach education**	
Action 18.3.1	Incorporate traditional knowledge, practices, and beliefs in PA education materials	FD, I/NGOs
Action 18.3.2	Develop educational materials on traditional knowledge, practices, and beliefs for university coursework on forestry and conservation	FD, I/NGOs, Universities
Target 18.4:	**By 2020, traditional knowledge, practices, and beliefs are documented, recognized, protected, and promoted in formal and informal education**	
Action 18.4.1	Integrate traditional environmental knowledge into school curricula	MOEd, FD,I/NGOs
Action 18.4.2	Promote environmental awareness and engagement for youth and women's groups	FD, I/NGOs

4.6.19 Aichi Target 19: By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied

Relative to other countries in Southeast Asia, the biodiversity science base is weak due to Myanmar's long period of international isolation. Nevertheless, Myanmar has benefited from over 20 years of survey work by WCS, SI, CAS, and other foreign organisations. These surveys provide the basis for the current state of biodiversity knowledge, which includes major geographic and thematic gaps. While large mammals, birds, and reptiles have been relatively well surveyed, much less attention has been paid to plants, freshwater fish, amphibians, invertebrates and other taxa. Large areas of the country have been off-limits to field work because of security concerns.

The Red List can be used to infer how relatively poorly described are Myanmar's fauna and flora. The **total number of species** assessed in Myanmar (3,849) is significantly lower than in either Thailand (5,072) or Vietnam (4,407), despite that fact that Myanmar is one-third larger than Thailand and twice the size of Vietnam. As Myanmar has opened up, many foreign organisations have started surveys that are expected to make a major contribution to the state of knowledge of biodiversity, particularly for less well studied taxa. To ensure that biodiversity data are available for use by the government and other stakeholders, some form of centralized repository for biodiversity assessments and ecological studies should be established.

There is a critical need to improve data related to the conservation of **freshwater fish**. The last comprehensive assessment of Myanmar freshwater fauna dates back to the late 19th century with some additional surveys in Inlay and Indawgyi Lakes from 1910 to 1940. Since 2000, studies conducted by foreign scientists have generally focused on specific target species. In 2013, a FFI-led survey of Indawgyi Lake and surrounding mountain streams increased the number of known fish species from this, the best-studied fish site in Myanmar, from 45 to about 96,

which includes six undescribed species. An understanding of freshwater fish distribution and ecology would permit Myanmar to develop **hydropower** projects that minimise the impacts on fish diversity and food security, and avoid the significant but unnecessary costs resulting from loss of fisheries and agricultural production experienced by other countries in the region due to hydropower development.

Data on **forest cover change** are needed for a range of purposes. Having a well-documented, spatially explicit forest cover change database is critically important for conservation and development planning. By helping to make it widely accessible, for example, through a Clearing-House Mechanism web portal, MOECAF could use this database to encourage a broader debate about forest cover management in Myanmar and as a resource for conservation and development planning.

Myanmar's isolation from the international community has had a serious impact on the quality of its higher education system, with many institutions requiring significant improvement to meet international academic standards. Reform of the **higher education** system is a national priority and in 2013 the education budget increased from US$340 million to US$740 million. However, the needs are extensive, covering physical infrastructure and IT, academic curriculum, improving the quality of instruction, university administration and governance reform, language training, skills development in research proposals and scientific writing, and international engagement.

Despite the many challenges, small-scale interactions with universities will help not only to address a number of immediate needs, but also to create partnerships that can lay the groundwork for larger engagements. International NGOs can play a vital role in fostering these partnerships, including with advanced regional universities such as Chiang Mai University and Prince of Songkla University in Thailand. The establishment of an international MS programme on biodiversity conservation in one or more universities, as FFI has done with the Royal University of Phnom Penh, would substantially increase the quantity and quality of young conservation biologists.

Table 41: National targets and priority actions for Aichi Target 19.

Target and Action		Lead
Target 19.1:	**By 2016, a CHM web portal is established**	
Action 19.1.1	Establish CHM and populate with relevant information	FD
Target 19.2:	**By 2020, a national forest cover change 2015–2020 database developed using international standard methods, and made publicly available online**	
Action 19.2.1	Finalize national forest cover database and make publicly available online	FD, I/NGOs
Action 19.2.2	Hold regular GIS training courses for relevant staff	FD

Target 19.3:	By 2020, leading Myanmar universities have established post-graduate course in conservation biology	
Action 19.3.1	Establish conservation-related diploma course and advanced degree course at universities	MOEd, Universities
Action 19.3.2	Identify and initiate opportunities for collaboration in curriculum development, student exchange, internships, and field research programs with foreign universities and international NGOs	Universities, I/NGOs
Action 19.3.3	Invite contributions to and publish a Myanmar biodiversity research journal	Universities
Action 19.3.4	Establish training programs in areas that universities have identified as priority gaps, including scientific writing, teacher training, and development of field-based courses	Universities

4.6.20 Aichi Target 20: By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011–2020 from all sources (in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization) should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.

Myanmar's PAs are vital to sustaining the biodiversity and ecosystem services that underpin sustainable development, poverty reduction, climate stability, and natural disaster reduction. Despite their importance, there are still many challenges to managing these areas. In particular, the PA network has insufficient funding to ensure its effective management. This is starting to change. Over the past few years, both government and international funding for PAs has increased significantly. However, adequate funding remains a key constraint.

Myanmar's PAs depend wholly on central government funds for their core budget. Even though the law permits a variety of revenues to be generated from the use of PA lands and resources, there are currently no systems in place that would allow this income to be retained and reinvested in PA management. All earnings must be remitted to central government. Although 'other accounts', which can handle own-source revenues are held by other ministries and departments, no such arrangement exists for MOECAF.

Over the last five years, an average of US$1.9 million a year (US$43/km2) has been spent on PAs. NWCD contributes 41% of this figure (an average of US$0.79 million/year) and externally-funded projects account for 59% (US$1.1 million). When calculated on an area base, levels of NWCD and external funding are similar (~US$25/km2/year). Self-generated revenues are negligible (less than US$17,000 in 2013–2014)

While government funding to PAs has risen by around 50% in real terms over the last five years and externally-funded grants and projects have increased even more steeply (almost US$20 million was committed in 2014), there remains a critical shortage of funds. Only half of PAs

have a dedicated budget or staff. Even those that receive regular funding are for the most part unable to cover the costs of basic infrastructure, equipment, maintenance and operations, and cannot afford to implement essential on-the-ground conservation activities.

It is possible to make a rough approximation of funding gaps using comparative data from other ASEAN countries and from global studies. Based on these figures, an annual budget of US$130/km2 is assumed for basic management, rising to US$215 for improved managemen-three and five times as much, respectively, as current levels. Three staffing, management and funding scenarios are calculated for three different PA networks: PAs that are currently actively managed by NWCD; the entire existing PA network; and an expanded system which incorporates all currently proposed PAs. The results indicate a funding gap ranging from just under US$0.5 million a year to extend current staffing and expenditure levels across the existing PA network, up to a US$9 million a year to achieve a fully-staffed, improved management and expanded PA network scenario.

Increased use of economic valuation of biodiversity and ecosystem services can strengthen the argument for greater government investment in biodiversity conservation. The economic case for greater state spending on forest conservation was made by Emerton et al. (2013), who estimated that only 15% of the value of goods and services provided by direct use of forests came from timber harvesting. Yet in 2011, 80% of government spending on forestry went to MTE, the state logging enterprise, and only 20% to the rest of MOECAF, which is responsible for forest conservation. The conclusion is clear: Myanmar could get a greater return on investment if it invested more in MOECAF and less in MTE.

One method to quantify the costs of biodiversity conservation and to leverage funding is through the Biodiversity Finance Initiative (BIOFIN). BIOFIN is programme supported by UNDP that helps countries to quantify conservation funding gaps and prioritize and mobilize international funding. BIOFIN can advise Myanmar on how to assess financial needs and how to mobilize financial resources required to fully implement the NBSAP.

Non-traditional funding mechanisms that should be explored to diversify PA financing include PES for watershed protection, carbon storage (i.e. REDD+), and ecotourism.

Table 42: National targets and priority actions for Aichi Target 20.

Target and Action		Lead
Target 20.1:	**By 2020, the funding available for biodiversity from all sources is increased by 50%**	
Action 20.1.1	Develop a national resource mobilization strategy for biodiversity, in line with the CBD's Global Strategy for Resource Mobilization	MOECAF
Action 20.1.2	Establish and capitalize a biodiversity conservation trust fund	MOECAF, Ministry of Finance, Donors
Action 20.1.3	Submit a formal request to UNDP for Myanmar to join BIOFIN	MOECAF

Target 20.2:	**By 2018, donor and partner funding for biodiversity is better coordinated and implemented**	
Action 20.2.1	Form "GEF Coordination Team" and implement "National Portfolio Formulation Exercise" to optimize GEF funding.	MOECAF
Action 20.2.2	Establish donor roundtable on biodiversity led by MOECAF	MOECAF

Brow-antlered Deer / Eld' Deer (*Rucervus eldi thamin*)

Chapter 5. NBSAP Implementation Plan

5.1 National Coordination Structure

Efficient institutional mechanisms are needed for the effective implementation of biodiversity conservation as outlined in this NBSAP. Within the given socio-political situation of the country, a national level committee should be immediately formed to oversee the progress made in implementation of NBSAP activities.

The key gaps identified in the implementation of the past BAPs are the lack of ownership at the national, local, and sectoral levels, coupled with poor coordination mechanism for fund mobilization and subsequent implementation.

The National Biodiversity Conservation Committee (NBCC), comprising high-level representation from key sectors, will guide the implementation of the NBSAP, in line with the obligations of CBD and other biodiversity-related regional and international conventions and treaties. As appropriate, thematic sub-committees or a working committee will be formed under NBCC to implement the NBSAP (2015–2020) (see Figure 16).

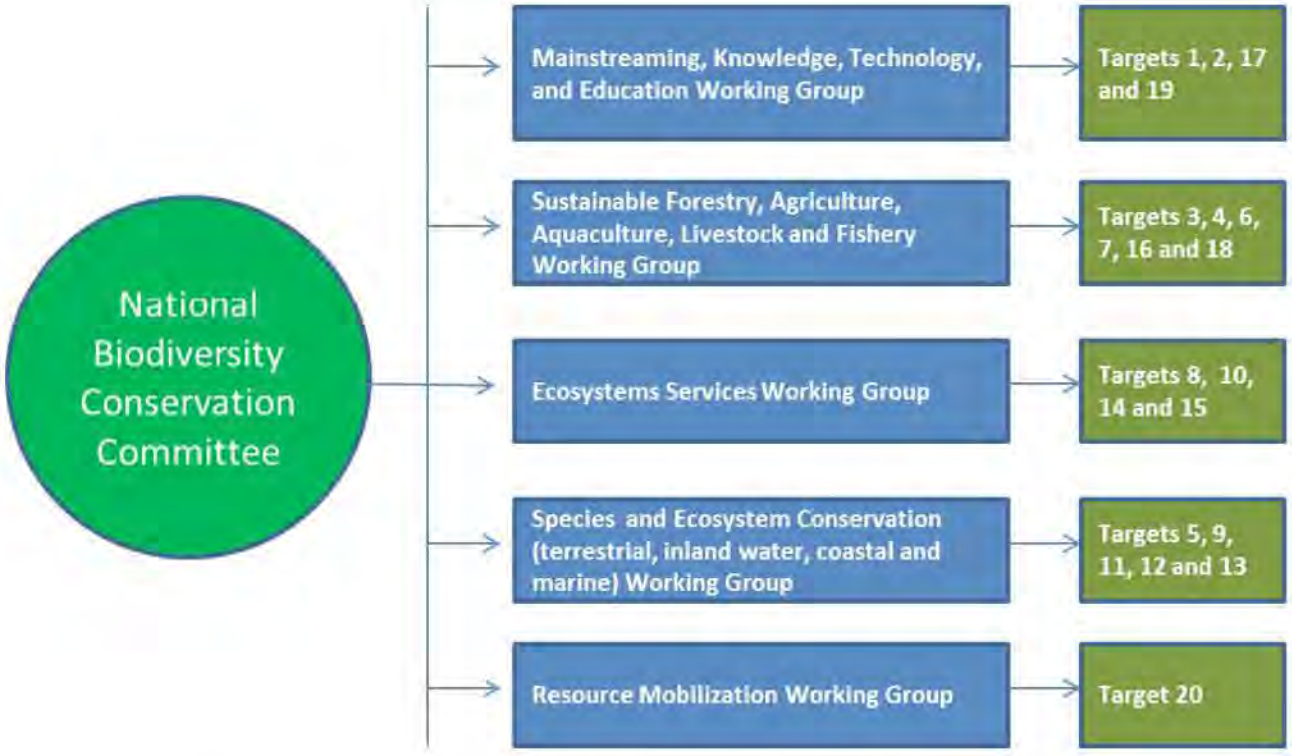

Figure 16: Institutional arrangement for implementing NBSAP (2015 –2020).

A communications strategy will be developed so that the NBSAP (2015–2020) can be fully implemented through multi-stakeholder engagement. In addition, a resource mobilization plan will be prepared to ensure that adequate resources are available to implement the NBSAP.

5.2 Capacity Development for NBSAP Implementation

One of the challenges for effective implementation of the NBSAP is limited capacity. In this NBSAP (2015–2020), the capacity needs of different thematic areas are identified under individual national targets. A technology needs assessment will be conducted, and a capacity development plan will be prepared for implementing the NBSAP. The capacity development plan will cover all stakeholders, such as central government, NGOs, CBOs, local government, and communities.

5.3 Monitoring, Evaluation and Reporting

Monitoring and evaluation of the implementation status of NBSAP activities will be conducted by assessing progress of the national targets on an annual basis, using currently identified indicators (see Annex 1). Additional indicators will be used, if required. The results will be reported to the National Biodiversity Committee for necessary interventions for the successful achievement of the targets. It will also form the basis for national and international reporting obligations as well as national planning processes. The monitoring and evaluation protocol will be prepared within the first year after the adoption of the NBSAP.

5.4 Synergies between the NBSAP and MEAs

In addition to the CBD, implementation of the NBSAP will contribute to the implementation of several other multilateral environmental agreements, including: UNFCCC; UNCCD; the Convention on the Conservation of Migratory Species of Wild Animals (CMS); CITES; Ramsar Convention; WHC; and the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR).

National targets build on or refer to many of these agreements. For example Target 16 calls for the expansion of the National Seed Bank, which is adopting a Standard Material Transfer Agreement (SMTA), a multilateral system of access and benefit sharing for the sustainable and equitable use of PGR.

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Annex 1: Summary of Select Targets and Associated Indicators

Indicators provide a way to assess progress towards national targets. Ideal indicators are SMART: specific, measurable, achievable, relevant, and time-bound. For the revised NBSAP indicators have been selected, when possible, to meet these characteristics. Not all targets or actions have an associated indicator, recognizing that this would not be feasible without large increases in budget allocation. Only those targets with and actions with indicators are listed below, and were chosen based on the availability of existing information and feasibility of monitoring over the next five years.

Aichi Target 1:	**By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.**			
Indicator	Baseline	Target Value	Source	
Target 1.1:	**By 2018, awareness of biodiversity values in key decision makers and line agencies has been improved**			
Indicator 1.1.1	Number of briefing documents presented to parliamentarians	0	4	MOECAF
Target 1.2:	By 2018, the private sector has an enhanced understanding of the value of biodiversity and relation to business practices			
Indicator 1.1.2	Number of Business Ecosystem Trainings (BETs)	0	10	Myanmar Centre for Responsible Business
Aichi Target 2:	By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.			
Indicator		Baseline	Target Value	Source
Target 2.1:	By 2018, Myanmar has made a formal commitment to natural capital accounting and has taken significant steps to integrate the value of biodiversity and ecosystem services into its national accounts			
Indicator 2.1.1	EITI Compliant Country status	0	1	Ministry of mines
Target 2.2:	By 2018, significant steps have been taken to incorporate biodiversity and ecosystem services into state/region planning			
Indicator 2.2.1	Number of states/regions that explicitly include habitat connectivity and new and proposed PAs in their long-term development planning	0	4	States/regions
Target 2.3:	By 2018, the government has significantly enhanced its capacity to review and assess EIAs and monitor and enforce EMPs			
Indicator 2.3.1	Status of EIA Procedures	0	1	ECD
Aichi Target 3:	By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.			
Indicator		Baseline	Target Value	Source
Target 3.1:	By 2020, the national legal framework on tenure encourages conservation and sustainable management			
Indicator 3.1.1	National Land Use Policy and Land Law that recognizes customary tenure rights are available	0	1	MOECAF

Aichi Target 4:	**By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.**			
Indicator		Baseline	Target Value	Source
Target 4.1:	**By 2020, SEA conducted and guidelines prepared for mining and energy sectors**			
Indicator 4.1.1	Availability of SEA for mining and energy sectors	0	1	Ministry of Energy, Ministry of Mines, ECD
Aichi Target 5:	**Aichi Target 5. By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced**			
Indicator		Baseline	Target Value	Source
Target 5.3:	**By 2020, all wetland areas surveyed and prioritized for conservation value**			
Indicator 5.3.1	Revised national wetlands inventory	0	1	FD
Indicator 5.3.2	Number of new of Ramsar sites designated	0	2	FD, Ramsar Secretariat
Aichi Target 6:	**Aichi Target 6. By 2020, all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.**			
Indicator		Baseline	Target Value	Source
Target 6.1:	**By 2020, states/regions have approved laws allowing for community and/or co-managed fisheries**			
Indicator 6.1.1	Number of laws approved allowing CFiUGs	0	1	DOF, states/regions
Target 6.2:	**By 2020, total commercial marine catch reduced to more sustainable levels**			
Indicator 6.2.2	Status of 100% seasonal closure between May and June	0	1	Myanmar Fisheries Federation, DOF, navy

Aichi Target 7.	**By 2020 areas under agriculture, aquaculture, and forestry are managed sustainably, ensuring conservation of biodiversity.**			
Indicator		Baseline	Target Value	Source
Target 7.1:	**By 2020, sustainable production has been implemented in 10% of rice paddy area**			
Indicator 7.1.1	Number of extension training and outreach activities focused on sustainable rice production	0	5	Ministry of Agriculture and Irrigation
Target 7.2:	By 2020, 5% of fish and shrimp aquaculture by volume follows international best practices for sustainable management			
Indicator 7.1.2	Percentage of fish and shrimp aquaculture (by volume) following internationally-recognized standards	0	5	DOF
Aichi Target 8:	By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.			
Indicator		Baseline	Target Value	Source
Target 8.3:	**By 2020, a water pollution monitoring network involving both government and local communities is operational at three critical freshwater sites and at existing or proposed SEZs**			
Indicator 8.3.1	Number of water pollution monitoring stations operating at Inlay Lake, Indawgyi Lake, and the Irrawaddy Dolphin Sanctuary	*Unknown*	>9	ECD, Universities, Research Institutes, I/NGOs
Target 8.5:	**By 2020, the sale and use of fuel additives, agrochemicals and veterinary drugs that are known to have significant negative impacts on biodiversity and ecosystem services are effectively controlled and, where appropriate, banned**			
Indicator 8.5.1	Number of fuel additives, agrochemicals and veterinary drugs known to have significant negative impacts on biodiversity and ecosystem services that are without effective controls on their sale and use.	>5	0	Ministry of Livestock, Fisheries and Rural Development, Myanma Petrochemical Enterprise
Aichi Target 9:	**By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.**			
Indicator		Baseline	Target Value	Source
Target 9.1:	**By 2019, a National IAS Action Plan has been developed and approved, and is under active implementation with the support of civil society, local communities, the private sector and the international community**			
Indicator 9.1.1	Percentage of actions within the National IAS Action Plan completed/under implementation	0%	30%	Forest Research Institute (MOECAF); FAO, MOAI DOF

Aichi Target 10:	**By 2015 the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.**			
Indicator		Baseline	Target Value	Source
Target 10.1:	**By 2020, 15 per cent of Myanmar's coral reefs conserved within MPAs, including LMMAs and other area-based conservation measures**			
Indicator 10.1.1	Per cent of coral reef extent conserved within MPAs, including LMMAs and other area-based conservation measures	<1	>15	FD, DOF, I/NGOs
Aichi Target 11:	**By 2020, at least 17 per cent of terrestrial and inland water areas, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.**			
Indicator		Baseline	Target Value	Source
Target 11.1:	**By 2020, 8% of Myanmar's land area is conserved within PAs, including ICCAs**			
Indicator 11.1.1	Percentage of Myanmar's land area within the PA system	5.75%	8%	FD
Target 11.3:	**By 2020, the management effectiveness of Myanmar's PA system has significantly improved, with 15 PAs implementing SMART, 5 to 10 PAs implementing management plans, and local communities are involved in management activities in at least 5 to 10 PAs**			
Indicator 11.3.1	Number of PAs with active community participation in management and co-management mechanisms, joint patrolling, monitoring, biodiversity surveys, conservation agreements, etc.	0	>5	FD
Aichi Target 12:	**By 2020, the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained**			
Indicator		Baseline	Target Value	Source
Target 12.1:	**By 2020, the conservation status of priority, globally threatened species in Myanmar has improved**			
Indicator 12.1.3	Indicator 12.1.3 Number of additional programmes to establish assurance colonies, captive breeding and wild release programmes of threatened tortoises and freshwater turtles	0	>3	FD
Target 12.3:	**By 2020, a National Red List of selected taxa has been produced**			
Indicator 12.3.1	Number of species with a Red List assessment	3,849	>4,000	FD, I/NGOs, universities

Aichi Target 13:	**By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity**			
Indicator		Baseline	Target Value	Source
Target 13.1:	**Target 13.1: By 2020, priorities for the conservation of plant genetic resources have been identified and are addressed by programmes to promote in situ conservation**			
Indicator 13.1.1	Number of crops recognised as priority PGR and with programmes for their conservation.	Unknown	>1,000	MOAI
Indicator 13.1.2	Number of seed saver networks and village seed banks in regions where traditional crop varieties are under greatest threat	Unknown	>3	DAR
Aichi Target 14:	**By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.**			
Indicator		Baseline	Target Value	Source
Target 14.1:	**By 2020, a rapid national ecosystem assessment has been carried out, identifying the status, values and trends of key ecosystems and the services they provide**			
Indicator 14.1.1	Availability of an online GIS database, showing the location of Myanmar's key ecosystems and status of management	0	1	FD
Aichi Target 15:	**By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.**			
Indicator		Baseline	Target Value	Source
Target 15.1:	**By 2020, over 130,000 hectares of forest are under community management-FD management**			
Indicator 15.1.1	Hectares of forest under community forestry	80,000	130,000	FD
Target 15.3:	**By 2020, REDD+ Readiness Road Map is actively implemented**			
Indicator 15.3.2	Number of forest restoration pilot projects under implementation	0	1	FD
Aichi Target 16:	**By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.**			
Indicator		Baseline	Target Value	Source
Target 16.1:	**By 2020, the Nagoya Protocol is under active implementation in Myanmar**			
Indicator 16.1.1	Availability of a national legal and regulatory framework for implementing the Nagoya Protocol in Myanmar	0	1	ECD

Aichi Target 17:	By 2015, each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan:			
Indicator		Baseline	Target Value	Source
Target 17.4:	**By 2017, the NBSAP enjoys broad support and understanding across government and other key stakeholder groups**			
Indicator 14.4.1	Availability of NBSAP communications plan	0	1	FD
Aichi Target 18:	**By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.**			
Indicator		Baseline	Target Value	Source
Target 18.2:	**By 2020, Free, Prior, and Informed Consent (FPIC) principles are institutionalized in government, private sector, and donor programmes**			
Indicator 18.2.1	Availability of government FPIC guidelines	0	1	MOECAF
Target 18.4:	**By 2020, Traditional knowledge, practices, and beliefs are recognized, protected, and promoted in formal and informal education**			
Indicator 18.4.1	Number of environmental awareness and engagement education events held for youth groups	0	5/yr	FD, I/NGOs
Aichi Target 19:	**By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.**			
Indicator		Baseline	Target Value	Source
Target 19.1:	**By 2016, a CHM web portal is established**			
Indicator 19.1.1.	Existence of NBSAP Clearing House Mechanism	0	1	FD
Target 19.3:	**By 2020, By 2020, leading Myanmar universities have established post-graduate course in conservation biology**			
Indicator 19.3.1	Number of universities offering advanced degree in conservation and environmental sciences	0	3	Universities
Aichi Target 20:	**By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources (in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization) should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.**			
Indicator		Baseline	Target Value	Source
Target 20.1:	**By 2020, the funding available for biodiversity from all sources is increased by 50%**			
Indicator 20.1.1	Availability of a national resource mobilization strategy for biodiversity	0	1	MOECAF

Annex 2: Species List

Table 43: Plant species found in Myanmar assessed on the IUCN Red List of Threatened Species.

No	Scientific Name	Common Name	Category
1	*Anisoptera scaphula*		CR
2	*Dipterocarpus baudii*		CR
3	*Dipterocarpus dyeri*		CR
4	*Dipterocarpus gracilis*		CR
5	*Dipterocarpus grandifloras*		CR
6	*Dipterocarpus kerrii*		CR
7	*Dipterocarpus turbinatus*		CR
8	*Hopea apiculata*		CR
9	*Hopea helferi*		CR
10	*Hopea sangal*		CR
11	*Magnolia gustavii*		CR
12	*Nardostachys jatamansi*	Spikenard/muskroot	CR
13	*Parashorea stellata*	White Seraya	CR
14	*Shorea farinose*		CR
15	*Sonneratia griffithii*		CR
16	*Vatica lanceaefolia*		CR
17	*Afzelia xylocarpa*		EN
18	*Anisoptera costata*		EN
19	*Cleidiocarpon laurinum*		EN
20	*Cypripedium lichiangense*	The Lijiang Cypripedium	EN
21	*Dalbergia oliveri*		EN
22	*Dipterocarpus alatus*		EN
23	*Dipterocarpus costatus*		EN
24	*Heritiera fomes*		EN
25	*Hopea ferrea*		EN
26	*Illicium griffithii*		EN
27	*Magnolia rostrata*		EN
28	*Paphiopedilum areeanum*		EN
29	*Paphiopedilum bellatulum*	Enchanting Paphiopedilum	EN
30	*Paphiopedilum charlesworthii*	Charlesworth Paphiopedilum	EN
31	*Paphiopedilum concolor*	One Colored Paphiopedilum	EN
32	*Paphiopedilum insigne*	Splendid Paphiopedilum	EN

No	Scientific Name	Common Name	Category
33	*Paphiopedilum parishii*	Parish's Paphiopedilum	EN
34	*Paphiopedilum spicerianum*	Spicer's Paphiopedilum	EN
35	*Paphiopedilum wardii*	Ward's Paphiopedilum	EN
36	*Shorea gratissima*		EN
37	*Shorea henryana*	White Meranti	EN
38	*Shorea roxburghii*	White Meranti	EN
39	*Taxus wallichiana*	East Himalayan Yew, Himalayan Yew	EN
40	*Vatica cinerea*		EN
41	*Aquilaria malaccensis*	Agarwood, Aloewood, Eaglewood, Lign-aloes	VU
42	*Burretiodendron esquirolii*		VU
43	*Cayratia pedata*		VU
44	*Cephalotaxus mannii*	Mann's Yew Plum	VU
45	*Cleidiocarpon cavaleriei*		VU
46	*Curcuma candida*		VU
47	*Cycas pectinate*		VU
48	*Cycas siamensis*		VU
49	*Dipterocarpus retusus*		VU
50	*Eleiotis rottleri*		VU
51	*Halophila beccarii*	Ocean Turf Grass, Species code: Hb	VU
52	*Hopea griffithii*		VU
53	*Hopea odorata*		VU
54	*Intsia bijuga*	Borneo Teak, Moluccan Ironwood	VU
55	*Magnolia nitida*		VU
56	*Paphiopedilum hirsutissimum*	Shaggy Paphiopedilum	VU
57	*Paphiopedilum villosum*	Villose Paphiopedilum	VU
58	*Picea brachytyla*	Sargent's Spruce	VU
59	*Picea farreri*	Farrer's Spruce	VU
60	*Pterocarpus indicus*	Amboyna Wood, Burmese Rosewood, Red Sandalwood	VU
61	*Taiwania cryptomerioides*	Coffin Tree, Taiwan Cedar, Taiwania	VU

Source: IUCN 2015.

Table 44: Mammal species found in Myanmar assessed on the IUCN Red List of Threatened Species.

No	Scientific Name	Common Name	Category
1	*Dicerorhinus sumatrensis*	Sumatran rhinoceros	CR
2	*Manis javanica*	Sunda pangolin, Malayan pangolin	CR
3	*Manis pentadactyla*	Chinese pangolin	CR
4	*Rhinoceros sondaicus*	Javan rhinoceros	CR
5	*Rhinopithecus strykeri*	Myanmar snub-nosed monkey	CR
6	*Balaenoptera musculus*	Blue whale, Sibbold's rorqual, sulphur-bottom whale, pygmy blue whale	EN
7	*Bos javanicus*	Banteng, tembadau	EN
8	*Bubalus arnee*	Asian buffalo, water buffalo	EN
9	*Cuon alpinus*	Dhole, Asiatic wild dog	EN
10	*Elephas maximus*	Asian elephant, Indian elephant	EN
11	*Hapalomys longicaudatus*	Greater marmoset rat, marmoset rat	EN
12	*Hoolock hoolock*	Western Hoolock gibbon, Hoolock gibbon	EN
13	*Hylobates lar*	Lar gibbon, white-handed gibbon, common gibbon	EN
14	*Lutra sumatrana*	Hairy-nosed otter	EN
15	*Moschus fuscus*	Black musk deer, dusky musk deer	EN
16	*Panthera tigris*	Tiger	EN
17	*Prionailurus viverrinus*	Fishing cat	EN
18	*Rucervus eldii*	Eld's deer, thamin, brow-antlered deer	EN
19	*Tapirus indicus*	Asian tapir, Malayan tapir	EN
20	*Trachypithecus germaini*	Indochinese lutung, Germain's langur, Germain's silver langur, Indochinese silvered langur	EN
21	*Trachypithecus phayrei*	Phayre's leaf monkey, Phayre's langur	EN
22	*Trachypithecus shortridgei*	Shortridge's langur, Shortridge's capped langur	EN
23	*Ailurus fulgens*	Red Panda, lesser panda, red cat-bear	VU
24	*Aonyx cinereus*	Asian small-clawed otter	VU
25	*Arctictis binturong*	Binturong, bearcat	VU
26	*Bos gaurus*	Gaur, Indian bison	VU
27	*Budorcas taxicolor*	Takin	VU
28	*Craseonycteris thonglongyai*	Hog-nosed bat, bumblebee bat, Kitti's hog-nosed bat	VU

No	Scientific Name	Common Name	Category
29	*Helarctos malayanus*	Sun bear, Malayan sun bear	VU
30	*Hemigalus derbyanus*	Banded civet, banded palm civet	VU
31	*Hoolock leuconedys*	Eastern Hoolock gibbon, eastern Hoolock	VU
32	*Lutrogale perspicillata*	Smooth-coated otter, Indian smooth-coated otter	VU
33	*Macaca arctoides*	Stump-tailed macaque, bear macaque	VU
34	*Macaca leonina*	Northern pig-tailed macaque	VU
35	*Naemorhedus baileyi*	Red Goral	VU
36	*Naemorhedus griseus*	Chinese goral, grey long-tailed goral	VU
37	*Neofelis nebulosa*	Clouded leopard	VU
38	*Neophocaena phocaenoides*	Indo-Pacific finless porpoise	VU
39	*Nycticebus bengalensis*	Bengal slow loris, Bengal loris, northern slow loris	VU
40	*Orcaella brevirostris*	Irrawaddy dolphin, snubfin dolphin	VU
41	*Pardofelis marmorata*	Marbled cat	VU
42	*Petinomys setosus*	Temminck's flying squirrel	VU
43	*Petinomys vordermanni*	Vordermann's flying squirrel	VU
44	*Rusa unicolor*	Sambar, sambar deer	VU
45	*Trachypithecus pileatus*	Capped langur, capped leaf monkey, capped monkey, bonneted langur	VU
46	*Ursus thibetanus*	Asiatic black bear, Himalayan black bear	VU
47	*Viverra megaspila*	Large-spotted civet	VU

Source: IUCN 2015.

Table 45: Bird species found in Myanmar assessed on the IUCN Red List of Threatened Species.

No	Scientific Name	Common Name	Category
1	*Ardea insignis*	White-bellied heron, imperial heron	CR
2	*Aythya baeri*	Baer's pochard	CR
3	*Calidris pygmaea*	Spoon-billed sandpiper,	CR
4	*Gyps bengalensis*	White-rumped vulture, Asian white-backed vulture, White-backed vulture, Oriental white-backed vulture	CR
5	*Gyps tenuirostris*	Slender-billed vulture	CR
6	*Pseudibis davisoni*	White-shouldered ibis, black ibis	CR
7	*Rhodonessa caryophyllacea*	Pink-headed duck	CR

No	Scientific Name	Common Name	Category
8	*Sarcogyps calvus*	Red-headed vulture, Indian black vulture, Pondicherry vulture	CR
9	*Asarcornis scutulata*	White-winged duck, white-winged wood duck	EN
10	*Ciconia stormi*	Storm's stork	EN
11	*Emberiza aureola*	Yellow-breasted bunting	EN
12	*Heliopais personatus*	Masked finfoot, Asian finfoot	EN
13	*Leptoptilos dubius*	Greater adjutant	EN
14	*Mergus squamatus*	Scaly-sided merganser, Chinese merganser	EN
15	*Pavo muticus*	Green peafowl, green-necked peafowl	EN
16	*Pitta gurneyi*	Gurney's pitta	EN
17	*Sitta magna*	Giant nuthatch	EN
18	*Sitta victoriae*	White-browed nuthatch	EN
19	*Sterna acuticauda*	Black-bellied tern	EN
20	*Tringa guttifer*	Spotted greenshank, Nordmann's green-shank	EN
21	*Aceros nipalensis*	Rufous-necked hornbill, Rufous-cheeked hornbill	VU
22	*Antigone antigone*	Sarus crane	VU
23	*Aquila heliaca*	Eastern imperial eagle, imperial eagle, Asian imperial eagle	VU
24	*Arborophila charltonii*	Chestnut-necklaced partridge, scaly-breasted partridge, chestnut-breasted tree-partridge	VU
25	*Calidris tenuirostris*	Great knot	VU
26	*Chrysomma altirostre*	Jerdon's babbler	VU
27	*Ciconia episcopus*	Asian woollyneck, woolly-necked stork	VU
28	*Clanga clanga*	Greater spotted eagle, spotted eagle	VU
29	*Clanga hastata*	Indian spotted eagle	VU
30	*Columba punicea*	Pale-capped pigeon, purple wood-pigeon	VU
31	*Haliaeetus leucoryphus*	Pallas's fish-eagle, Pallas's fish eagle, band-tailed fish-eagle, Pallas's sea-eagle	VU
32	*Leptoptilos javanicus*	Lesser adjutant	VU
33	*Lophophorus sclateri*	Sclater's monal, crestless monal	VU
34	*Megapodius nicobariensis*	Nicobar scrubfowl, nicobar scrubfowl	VU
35	*Mulleripicus pulverulentus*	Great slaty woodpecker	VU
36	*Nisaetus nanus*	Wallace's hawk-eagle	VU

No	Scientific Name	Common Name	Category
37	*Otus sagittatus*	White-fronted scops-owl	VU
38	*Pycnonotus zeylanicus*	Straw-headed bulbul, straw-crowned bulbul	VU
39	*Rhyticeros subruficollis*	Plain-pouched hornbill	VU
40	*Rynchops albicollis*	Indian skimmer	VU
41	*Sitta Formosa*	Beautiful nuthatch	VU
42	*Stachyris oglei*	Snowy-throated babbler, Austen's babbler	VU
43	*Tragopan blythii*	Blyth's tragopan, grey-bellied tragopan	VU
44	*Treron capellei*	Large green pigeon	VU
45	*Turdus feae*	Grey-sided thrush	VU

Source: IUCN 2015.

Table 46: Known IAS in Myanmar.

Species Name	Common Name	Type	Introduction	Habitat	Impact	Source
Acacia auriculiformis	Acacia, Aurisha	Tree	Intentional for Fuel & Pulp(forestry)	Road side, forest plantations,	Causes irritation and asthma from pollen, easily damaged by wind	NBSAP
Acacia mangium	Black wattle	Tree	Intentional for Fuel & Pulp(forestry)	Road side, plantation	Uncertain Easily damaged by wind	GISD
Achatina fulica	Giant African snail	Snail	-	Uncertain	Nuisance, impacts crops, transmits parasites	NBSAP
Aedes aegypti	Yellow fever mosquito	Insect	Unintentional	Uncertain	Uncertain	GISD
Ageratum conyzoides	Goat weed	Herb	Unintentional	Rice fields	Aggressive and competitive, rapid growth	NBSAP
Brontispa longissima	Hispid palm leaf beetle	Insect	Ornamental palm tree from Indonesia	Uncertain	Palm mortality and stunting	GISD
Chromolaena odorata	Bitter bush	Shrub	Ornamental	Fallow lands, road sides, pasture, forest plantations	Skin irritation, asthma, and toxic to animals; displaces native vegetation species	NBSAP GISD
Clarias gariepinus	African catfish	Fish	Intentional for food production	Water reservoirs, lakes	Ecosystem engineer, reduces water clarity and destroys other aquatic organisms	NBSAP, GISD
Ctenopharyngodon idella	Grass carp	Fish	Intentional for food production	Water reservoirs, lakes	Ecosystem engineer, eliminating vegetation from water systems, parasite vector	NBSAP, GISD

Species Name	Common Name	Type	Introduction	Habitat	Impact	Source
Cyprinus carpio	Carp	Fish	Intentional for food production	Water reservoirs, lakes, mangroves	Ecosystem engineer, reduces water clarity, destroys and uproots aquatic vegetation	NBSAP, GISD
Echinochloa crus- galli	Barnyard grass	Grass	Unintentional	Rice fields	Yield reduction, and toxic to animals	NBSAP
Eichhornia crassipes	Water hyacinth	Aquatic weed	Aesthetic/ Ornamental	Lakes, ponds, creek - water bodies	Clogs and dries up waterways	NBSAP, GISD
Eucalyptus sp.	Eucalypt	Tree	Forestry	Plantations and roadsides, open space	Aggressive and competitive, allelopathic suppresses native species and plantation species	
Hyptis suaveolens	Bush tea	Shrub	-	Plantation, road sides, pastures, dry lands	Causes asthma, and damage to arable lands	NBSAP
Imperata cylindrical	Blady grass, Congo grass	Grass	Multiple methods	Plantation, pasture, dry lands	Inhibits natural regeneration of forests and highly flammable	NBSAP GISD
Lantana camara	Lantana	Shrub	Intentional for ornamental	Plantation, pasture, urban	Poisonous to cattle, understory competitor, and displaces native species	NBSAP
Leucaena leucocephala	Leucaena	Tree	Intentional for fuel wood	Plantations, gardens, open spaces	Displacing native species	NBSAP, GISD
Limnocharis flava	Limnocharis	Aquatic weed	Ornamental	All water bodies	Choking and desiccation of water bodies	GISD
Loranthus pulverulentus	Mistletoe	parasite (tree), kat parr pin	Dispersed seed by birds	Teak plantations	Damage to teak plantations	FRI
Metanastria grisea	Gypsy Moth	insect	From introduced exotic pine species	Pine plantations in Southern Shan State	Damage the pine plantations	FRI
Mikania micrantha	Mile-a-minute weed, Chinese creeper, American rope	Climber	Ornamental Accidental from India	Forest and plantations	Smothers other plants, and competes for water and nutrients	NBSAP
Mimosa diplotricha	Giant sensitive plant	Small shrub	Ornamental Accidental	Forest plantations, agricultural fields, undisturbed areas	Thorny, spreads rapidly, smothers vegetation	NBSAP, Forest Research Institute
Mimosa pigra	Giant sensitive tree	Tree/ shrub	Accidental	All water bodies, waterlogged agricultural fields	Rapid spread and suppression of other vegetation	Forest Research Institute

Species Name	Common Name	Type	Introduction	Habitat	Impact	Source
Oreochromis spp.	Tilapia	Fish	Intentional for food production	Water reservoirs, lakes	Declining culturally valued native fish species, and the alteration of natural benthic communities	NBSAP, GISD
Paspalum conjugatum	Buffalo grass	Grass	Forage	Rice fields and disturbed areas	Aggressive and competitive	NBSAP
Pennisetum spp.	Mission grass	Grass	Intentional for pasture	Forest and rubber plantations	Aggressive and competitive, and inhibits growth of plantation trees	NBSAP
Pomacea canaliculata	Golden apple snail	Snail	Unintentional	Paddy field, Floating farm	Poses major threat to rice production	NBSAP
Prosopis juliflora	Mesquite	Shrub / Tree	Intentional for shade, fodder and dry zone greening	Dry land, pasture	Very aggressive in displacing native vegetation. Its poisonous thorns can injure livestock and people	NBSAP, GISD
Rattus exulans	Pacific rat	Mammal	Unintentional	Many habitats	Consumes native fauna, flora and agricultural products.	GISD
Solenopsis geminate	Fire ant	Insect	Unintentional Trade and transport	Lives on large trees	Displacement of native invertebrates and crop damage	GISD
Sorgum halepense	Johnson grass	Grass	-	Disturbed areas, including agricultural land	Aggressive and competitive, and inhibits growth of native species	NBSAP
Teredo spp.	Ship worm, Marine borer	Marine worm	Moving	Sea, Mangrove area	Decays wood, timber and destoys bridges	NBSAP V1 Table 8
Trogoderma granarium	Khapra bettle	Insect	Unintentional	Stored foods	Degradation of stored grains	GISD
Varroa jacobsoii	Parasitic bee mite	Mite	Parasitic	Bees	Impacts native and economically significant species	NBSAP V1 text

Source: IUCN 2015.

Annex 3: NBSAP Formulation Process

This NBSAP update was formulated over a year of consultation with departments, NGOs (both national and international), and CSOs. Initial inputs were solicited from a broad array of government ministries and civil society organisations. An inception workshop was held in Nay Pyi Taw, followed by three multi-stakeholder regional consultations over the following months. Workshops were also held on developing indicators for NBSAP targets and establishing a Clearing-House Mechanism. Consultations were held in Dawei for stakeholders from both Taninthayi Region and Mon State, in Myitkyina for stakeholders in Kachin State, and in Mandalay. Individual interviews were held with NGOs based in Yangon. Suggestions were also collected from other ongoing consultation processes, notably the development of the National Land Use Policy and discussions of marine conservation through BOBLME. The information collected from these initial consultations, was formulated into an initial draft of the updated NBSAP, which was disseminated to ministries and through civil society networks for review. The draft was discussed and edited at workshops in June 2015, by relevant ministries in Nay Pyi Taw and by civil society and NGOs in Yangon. During the review period of June–September 2015, NGOs and line departments provided further feedback and recommendations. Selected targets were also discussed at CSO network meetings of the Land Core Group (LCG) and POINT. A workshop to validate the draft targets and suggest final edits was held in Nay Pyi Taw in September 2015 with ministries. A timeline of major activities is given below.

Timeline of major activities:

31 July 2014: An inception workshop was held in Nay Pyi Taw in July of 2014 to introduce the Aichi Targets to 33 government departments and NGOs.

6 October 2014: A multi-stakeholder consultation was held in Dawei for civil society, universities, and ministries from Tanintharyi Region and Mon State.

24 October 2014: A multi-stakeholder consultation was held in Myitkyina with civil society, universities, and ministries from Kachin State.

15–16 March 2015: A Biodiversity Partners Meeting was held in Yangon, where organisations that work with NWCD shared their current and planned projects and discussed coordination and regional and thematic gaps.

6 April 2015: A multi-stakeholder consultation held with civil society, universities, and ministries in Mandalay.

9–10 June 2015: Consultations to review draft NBSAP were held in Nay Pyi Taw and Yangon with ministries and NGOs.

June–September 2015: A rolling NBSAP consultation process was held, including discussions with LCG and POINT networks and individual NGOs.

15–16 July 2015: A workshop on developing a Clearing-House Mechanism for Myanmar was held in Nay Pyi Taw with ministries.

9 September 2015: A final consultation was held with ministries to revise and validate NBSAP draft.