

MYANMAR



COUNTRY ENVIRONMENTAL ANALYSIS

A Road towards Sustainability, Peace, and Prosperity

SYNTHESIS REPORT



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FOREWORD

The Union Minister Ministry of Natural Resources and Environmental Conservation



Myanmar has been blessed with rich natural resources, stretching from the mountains to the plains and to the coast. This vast natural wealth has been pivotal to growing the economy and in providing livelihoods and ecosystem services, especially for people living in rural areas.

Myanmar's forestry sector has been central to the country's economy and society, particularly over the last century. Myanmar's forests contain some of the most valued timber species in the world such as teak, rosewoods, and ironwood. They are home to rich biodiversity and a number of endemic and globally threatened species. However, these forests are currently under significant threat due to deforestation and degradation.

Concerns are also arising due to the impacts on the environment from rapid development in the industrial, mining, and energy sectors, as well as from climate change. Both air pollution and solid waste management are becoming burning issues, especially in the cities of Yangon and Mandalay. This underlines the importance of establishing a transparent and robust Environmental Impact Assessment (EIA) system, improving solid waste management and pollution control, and enhancing environmental monitoring and enforcement.

The Government has been advancing the development of a legal framework in the environment and natural resources management area, to ensure that economic growth is balanced with sustainable development, as expressed in the Myanmar Sustainable Development Plan. The adoption of the National Environmental Policy (2019) and Myanmar Climate Change Policy, Strategy and Master Plan (2019) is a remarkable achievement which sets out strategic guidance for mainstreaming environmental protection and climate change into planning and decision-making at all levels of government and across all sectors.

In 2016, in response to the challenges in the forestry sector, the Government also launched the Myanmar Reforestation and Rehabilitation Program (MRRP). This sets out our goals and actions to prevent deforestation and degradation of Myanmar's forests while enhancing our efforts for forest restoration and for enabling more employment and economic opportunities for local communities through the establishment of plantations and community forestry initiatives. In addition, revisions to the legal framework, including the new Forest Law (2018) and the Conservation of Biodiversity and Protected Areas Law (2018), reflect the changing country context and acknowledge the customary natural resource uses and management by local communities.

We would like to thank the partnership of the World Bank in undertaking this Country Environmental Analysis that further advances our understanding of Myanmar's environmental and natural resource trends. This report provides a comprehensive overview of the status of the forestry sector. It also outlines the importance of strengthening EIA systems (including monitoring and compliance) and managing and monitoring solid waste and air pollution.

This Country Environmental Analysis Report sets out a road map with specific recommendations and actions to improve our management of forests and environment. We look forward to taking up these recommendations with support of World Bank and other development partners to achieve sustainable development, for the benefit of all people in Myanmar.

A handwritten signature in black ink, appearing to read 'Ohn Winn', followed by a horizontal line.

H.E. U Ohn Winn
The Union Minister
Ministry of Natural Resources and Environmental Conservation
The Republic of the Union of Myanmar

FOREWORD

**The Union Minister
Ministry of Agriculture,
Livestock and Irrigation**



Myanmar's rivers and coastline areas provide home for an abundance of natural freshwater and marine fish stocks and for aquaculture resources. Fisheries has long been an important economic sector that contributes significantly to employment, livelihoods, and food security. The sector employs over three million people and fish accounts for nearly half of the animal-source foods consumed in Myanmar.

However, overfishing has contributed to a severe decline in Myanmar's marine fisheries and in high value freshwater fish species in the Ayeyarwady River Basin. Enhanced focus on monitoring, control, and surveillance, including the use of innovative technology like Vessel Monitoring Systems (VMS), is urgently needed to ensure that the fisheries sector is sustainable and performs well both commercially and as a source of livelihoods for small-scale fishing communities.

The potential economic opportunities from improving fisheries management and aquaculture production are well known. Acknowledging this, the Ministry of Agriculture, Livestock and Irrigation has established targets and objectives to improve fisheries and aquaculture in the Agriculture Development Strategy. Further, the Draft National Aquaculture Development Plan will set objectives and targets for the sustainable development of the sector.

The Country Environmental Analysis (CEA) undertaken in collaboration between the World Bank and the Department of Fisheries consolidates our understanding of the trends in marine and freshwater fisheries and aquaculture and provides a clear set of recommendations to achieve sustainable development in the sector.

Importantly, the CEA highlights the potential of community-based fisheries management and the recent success of devolving responsibilities to States and Regions for managing our inland and inshore fisheries. The analysis of aquaculture in Thailand, Vietnam, and Bangladesh also delivers unique insights of how we can further enhance aquaculture production in Myanmar.

We are committed to implementing recommendations made in this joint report for sustainable development of Myanmar's fisheries and coastal resources.

A handwritten signature in blue ink, likely of H.E. Dr Aung Thu, the Union Minister. The signature is stylized and fluid, with a long horizontal stroke extending to the right.

H.E. Dr Aung Thu
The Union Minister
Ministry of Agriculture, Livestock and Irrigation
The Republic of the Union of Myanmar



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The CEA was produced under the overall guidance of Ellen Goldstein (Country Director, Myanmar), Gevorg Sargsyan (Head of Office, Myanmar), Mark Austin (Program Leader, Sustainable Development), and Christophe Crepin (Practice Manager, Environment and Natural Resources Global Practice).

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ABBREVIATIONS AND ACRONYMS

AAC	Annual Allowable Cut	EMF	Environmental Management Fund
ADB	Asian Development Bank	EMIS	Environmental Management Information System
ADS	Agricultural Development Strategy	EMP	Environmental Management Plan
ASA	Advisory Services and Analytics	ENR	Environment and Natural Resource
ASEAN	Association of Southeast Asian Nations	EPR	Extended Producer Responsibility
AQI	Air Quality Index	ESF	Environmental and Social Framework
AQMP	Air Quality Management Plan	E&S	Environment and Social
BOD	Biochemical Oxygen Demand	EU	European Union
CD	Cleansing Department	FAO	Food and Agriculture Organization of the United Nations
CDZ	Central Dry Zone	FD	Forest Department
CEA	Country Environmental Analysis	FDI	Foreign Direct Investment
CF	Community Forest(ry)	FFI	Flora and Fauna International
CFE	Community Forestry Enterprises	FLEGT	Forest Law Enforcement, Governance, and Trade
CFI	Community Forestry Instruction	GAD	General Administration Department
CFMP	Community Forestry Management Plan	GBD	Global Burden of Disease
CFUG	Community Forestry User Groups	GDP	Gross Domestic Product
COD	Chemical Oxygen Demand	GIS	Geographic Information System
CSO	Civil Society Organization	GMS	Greater Mekong Subregion
DALMS	Department of Agricultural Land Management Statistics	GoM	Government of Myanmar
DALY	Disability-Adjusted Life Year	GPS	Global Positioning System
DANIDA	Danish International Development Agency	HAP	Household Air Pollution
DICA	Directorate of Investment and Company Administration	ICCA	Indigenous and Community Conserved Areas
DOF	Department of Fisheries	ICD	Information and Communication Technology
DOM	Department of Mines	IEE	Initial Environmental Examination
DZGD	Dry Zone Greening Department	IFC	International Finance Corporation
EAO	Ethnic Armed Organization	JICA	Japanese International Cooperation Agency
ECC	Environmental Compliance Certificate	KIA	Kachin Independence Army
ECD	Environmental Conservation Department	KNLA	Karen National Liberation Army
ECL	Environmental Conservation Law	KNU	Karen National Union
ECR	Environmental Conservation Rules	KOICA	Korean International Cooperation Agency
EEZ	Exclusive Economic Zone	LSMS	Living Standards Measurement Survey
EIA	Environmental Impact Assessment		

MCCSAP	Myanmar Climate Change Strategy and Action Plan	NGO	Nongovernmental organization
MCDC	Mandalay City Development Committee	NLD	National League for Democracy
MCRB	Myanmar Centre for Responsible Business	NTFP	Non-Timber Forest Product
MCS	Monitoring, Control, and Surveillance	NWCD	Nature and Wildlife Conservation Division
MDI	Multidimensional Disadvantage Index	PA	Protected Area
MIC	Myanmar Investment Commission	PAP	Project-Affected Person
MMSIS	Myanmar Statistical Information Service	PCCD	Pollution Control and Cleansing Department
MOALI	Ministry of Agriculture, Livestock, and Irrigation	PCD	Pollution Control Division
MOECAP	Ministry of Mines and the Ministry of Environmental Conservation and Forestry	PES	Payment for Environmental Services
MOEA	Ministry of Ethnic Affairs	PFE	Permanent Forest Estate
MOEE	Ministry of Electricity and Energy	PL	Post Larvae
MOHA	Ministry of Home Affairs	PM	Particulate Matter
MOHT	Ministry of Hotels and Tourism	PPF	Projected Public Forest
MOI	Ministry of Industry	PPR	Project Proposal Report
MONREC	Ministry of Natural Resources and Environmental Conversation	PROFOR	Program for Forests
MOPF	Ministry of Planning and Finance	RF	Reserved Forest
MPA	Marine Protected Area	REDD	Reducing Emissions from Deforestation and Forest Degradation
MRRP	Myanmar Reforestation and Rehabilitation Program	SCF	Sustainable Coastal Fisheries
MSDP	Myanmar Sustainable Development Plan	SEA	Strategic Environmental Assessment
MSS	Myanmar Selection System	SEE	State-owned Economic Enterprise
MTE	Myanmar Timber Enterprise	SEZ	Special Economic Zone
MTMA	Myanmar Timber Merchant Association	SIA	Social Impact Assessment
MYSAP	Myanmar Sustainable Aquaculture Program	SLC	Safeguard Learning Center
NBSAP	National Strategic Action Plan	SME	Small and Medium Enterprise
NCRMC	National Coastal Resources Management Committee	RF	Reserved Forest
NDC	Nationally Determined Contributions	TA	Technical Assistance
NEA	Norwegian Environmental Agency	TLAS	Timber Legality Assurance System
NECCCCC	National Environmental Conservation and Climate Change Central Committee	TSP	Total Suspended Particulate
NEP	National Environmental Policy	UNDP	United Nations Development Programme
NEQ	National Environmental Quality	UNEP	United Nations Environment Programme
NFI	National Forest Inventory	VFV	Vacant Fallow and Virgin
NFMP	National Forest Master Plan	VMS	Vessel Monitoring System
		VOC	Volatile Organic Compound
		VPA	Voluntary Partnership Agreement
		WCS	Wildlife Conservation Society
		WHO	World Health Organization
		WWF	World Wildlife Fund
		YCDC	Yangon City Development Committee

EXECUTIVE SUMMARY

Myanmar is rich in natural resources and is a global biodiversity hotspot. It is also a country in the midst of a huge political and social change. For three decades, Myanmar was ruled by a military junta. In 2015, free elections were held, and since then the government has been grappling with the challenge of tackling poverty and developing the country. However, the government is aware of the importance of managing its natural wealth in a sustainable way as expressed in the Myanmar Sustainable Development Plan (MSDP). This vision is supported by a recent World Bank *The Changing Wealth of Nations* report that argues that the management of natural resources is critical to long-term sustainable development (Lange, Wodon, and Carey 2018).

Myanmar's forests and fishing industry are two significant contributors to the economy, and yet these sectors are also potentially under threat from overexploitation and mismanagement. The management of solid waste, air pollution, and the use of plastics provides another growing challenge. In addition, the role of government and other stakeholders in the management of these sectors and issues is central to whether the government will succeed in reversing the current trends and be able to find a long-term sustainable solution to the problem.

This report explores the issues and challenges faced and the legal and institutional context. Through a lens of poverty reduction, social inclusion and participation, and economic growth, the report tells a story of an urgent need for institutional support and reform, improvements in the enforcement against illegal extraction of resources, behavior change in all relevant stakeholders, institutional capacity building, increased funding, and improvements in data collection and analysis. If these recommendations are acted on, then Myanmar can reverse the negative trends and lead its environment on a path toward a more sustainable future.

Despite diminishing stocks, renewable natural resources continue to play an important role in Myanmar's economy

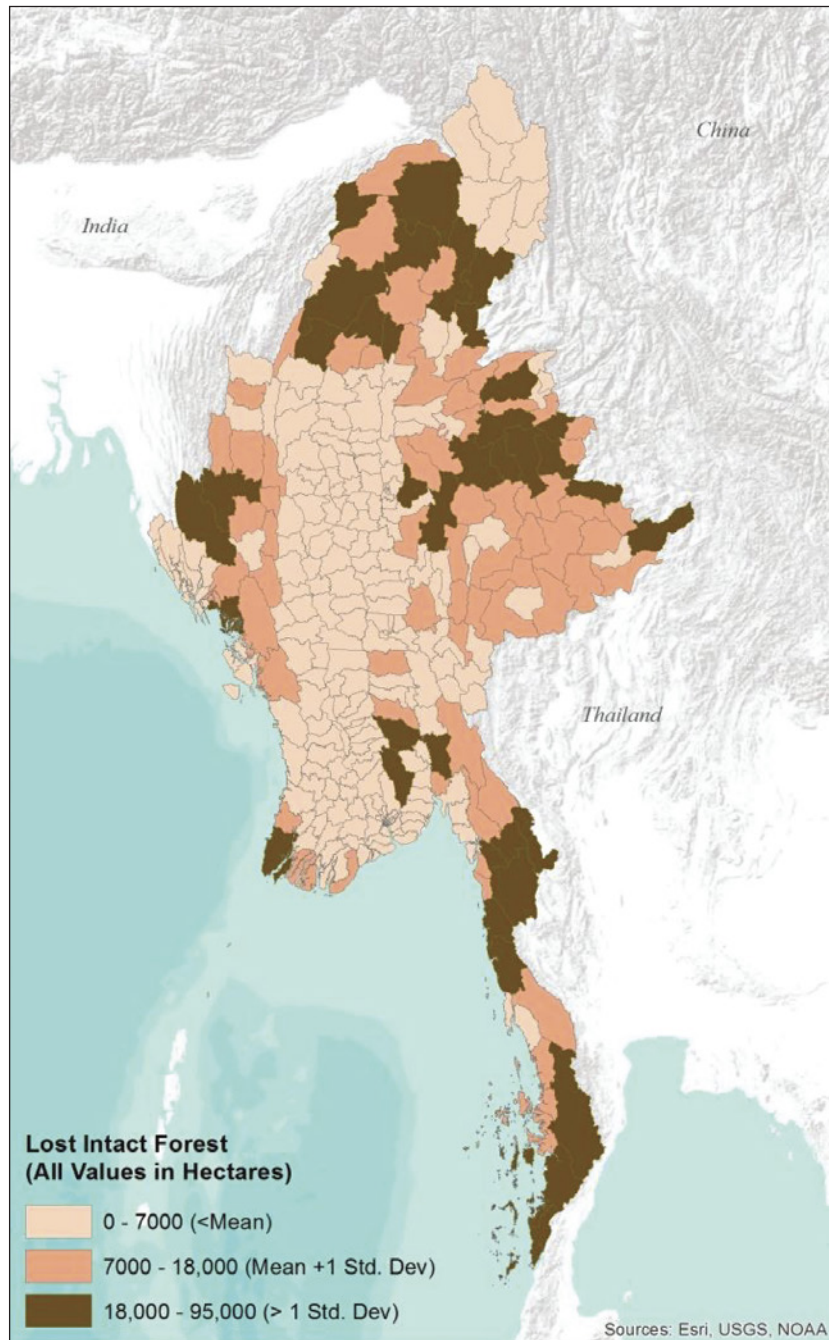
Natural resources, particularly commercial teak exports, have traditionally played a major economic role in Myanmar. The economy of colonial Burma was oriented around the extraction and export of natural resources, particularly teak, oil, and rubies. During the colonial era, Burmese teak accounted for up to 85 percent of global teak production and by the end of the 19th century provided approximately 45 percent of net government revenues for the whole of British India (Bryant 1997). Myanmar's forests also form some of the world's most critically important biodiversity 'hotspots'.

In more recent decades, there have been dramatic declines in forest and fisheries resources. Between 1990 and 2015, forest cover declined at an average rate of 1.2 percent a year, a total of 10 million hectares (ha) (FAO 2015). In addition, during 2010–2015, Myanmar experienced the third largest absolute forest loss globally (FAO 2015). Figure

1 shows the extent of intact forest loss across different areas in the country from 2002 to 2014. Since 1980, marine fish stocks are estimated to have fallen by as much as 90 percent for pelagics and 50 percent for demersals (Krakstadt et al. 2015). Large declines in many high-value species of freshwater fish are reported throughout the Ayeyarwady River Basin, which covers around 60 percent of Myanmar's land area (Baran et al. 2018).

Figure 1

Intact forests (ha) lost between 2002 and 2014



Source: Bhagwat et al. 2017

Against a backdrop of strong industry- and services-led gross domestic product (GDP) growth, official statistics suggest that renewable resources now make only a modest contribution to the formal economy. Myanmar's GDP grew at a high rate of 7.2 percent in the 2013–2018 period.¹ The recorded share of forestry in GDP in Fiscal Year (FY) 2015/16 was just 0.2 percent or US\$130 million at constant 2018 prices,² and forest exports earned some US\$270 million or 2.5 percent of total export earnings (Central Statistics Organization 2016; MMSIS 2018). The fisheries sector is not recorded as a separate line in GDP statistics but combined with livestock contributed 8 percent of GDP in 2015/16 (of which fisheries probably contribute the minor share). The Department of Fisheries (DOF 2017) records the total value of fish exports at over US\$600 million for 2016/17.

However, formal GDP statistics vastly underestimate the economic and social importance of natural resources. Direct contributions to economic production are undervalued due to illicit and informal use of natural resources. Estimates put the value of unlicensed or illegal timber exports at four times the documented value (Raitzer, Samson, and Nam 2015; UNODC 2013), and timber is estimated to account for a small proportion of the total volume of forest products. Over 80 percent of woody biomass extracted in 2017 was for wood fuels (based on FAO 2018a). Substantial quantities of marine fish are thought to be illegally exported to Thailand. In addition, while about half of the animal-source foods consumed in Myanmar is fish (Belton et al. 2015), a substantial proportion of that consumption comes from subsistence fishing, which is not reflected in the formal economy.

Including both their direct contribution to production and other ecosystem services, the total annual value attained from Myanmar's ecosystems has been estimated to be up to 10 times higher than reflected in formal GDP figures for forestry and fisheries:

- **Forest ecosystem services were valued at around US\$5.5 billion** not including mangroves (Emerton and Aung 2013). In the hills and coastal areas in particular, forests help maintain stream flow in the dry season and retain sediments and thus purify water, particularly in the northern mountainous part of the country. They also help mitigate the impact of climate change.
- **The value of marine and coastal ecosystem services was estimated at US\$8.5 billion a year**, almost 60 percent of which is contributed by mangrove and coral reef ecosystems (BOBLME 2014).

One important dimension of ecosystem services is to reduce Myanmar's vulnerability to climate change and natural disasters. Myanmar is highly vulnerable to natural disasters—floods, drought, cyclones, landslides, and earthquakes. In 2016, the country ranked second in the Global Climate Risk Index³ (Kreft, Eckstein, and Melchior 2017), with natural disasters causing an average loss of US\$2 billion per year (3 percent of the GDP). For example, the estimated cost of the damage from floods and landslides in July–August 2015 was US\$1.51 billion (World Bank 2015a). Forests reduce flood and landslide risk, and recent modeling has estimated that mangroves reduce the impact of natural disasters on the coast by an average of US\$165 million per year (Losada et al. 2018).

1 <https://data.worldbank.org/country/myanmar>.

2 All U.S. dollar values referred to in this section are expressed at constant 2018 U.S. dollar, deflated using the Consumer Price Index for that year and then converted at the 2018 exchange rate.

3 Based on weather-related loss events from 1996 to 2015.

Forestry and fisheries also generate high employment. Over 3.2 million people are currently engaged directly in the fisheries sector, including 800,000 full-time and 2.4 million part-time workers. In some coastal areas, fisheries employment rates are as high as 34 percent (Tezzo et al. 2018). The forestry sector provided as many as 886,000 jobs in 2015/16—the equivalent of just over 4 percent of national employment. It also generated up to US\$95.5 million in wage earnings (MEITI 2019).

Natural resources are particularly important to the poor . . .

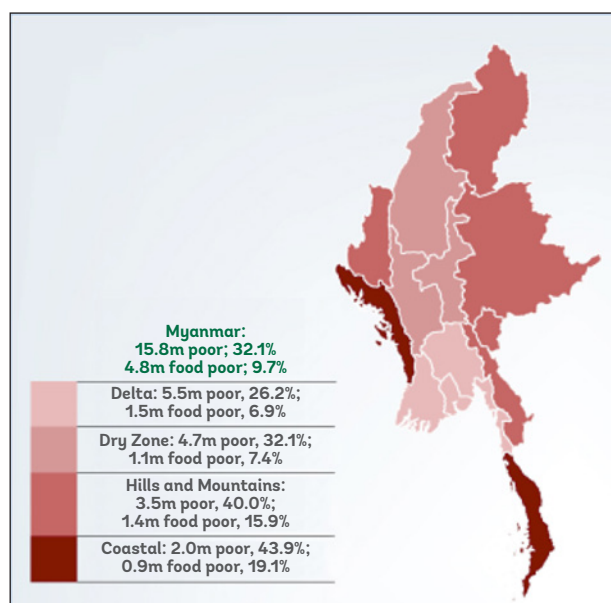
Poverty is more concentrated in rural, natural-resource dependent areas of Myanmar.

An updated poverty assessment in 2017 concluded that the headcount poverty level is 32.1 percent in 2015, declining from 48.2 percent in 2004/05 (World Bank 2017a). This means that about one-third (or 16.98 million people) of the current estimated population of 52.89 million are poor. Around 10 percent are food poor. Poverty is significantly higher in rural areas (38.8 percent of population), compared to urban areas, where it is now around 14.5 percent and is declining more rapidly. About 35 percent of Myanmar's population is rural. This means that 87 percent of all poor are in rural areas, compared to 13 percent in urban areas.

Poverty is more prevalent and severe in the hilly, mountainous, and coastal agro-ecological zones of Myanmar, compared with the Delta and Dry Zone (Figure 2). There is also a strong correlation at the township level between forest cover and deprivation as measured by the World Bank Group's Multidimensional Index (MDI)⁴ (see Figures 3 and 4). About 520,000 rural households were estimated to be living adjacent to forests in 2012 (Emerton and Aung 2013).

Figure 2

Poverty headcount by agro-ecological zone

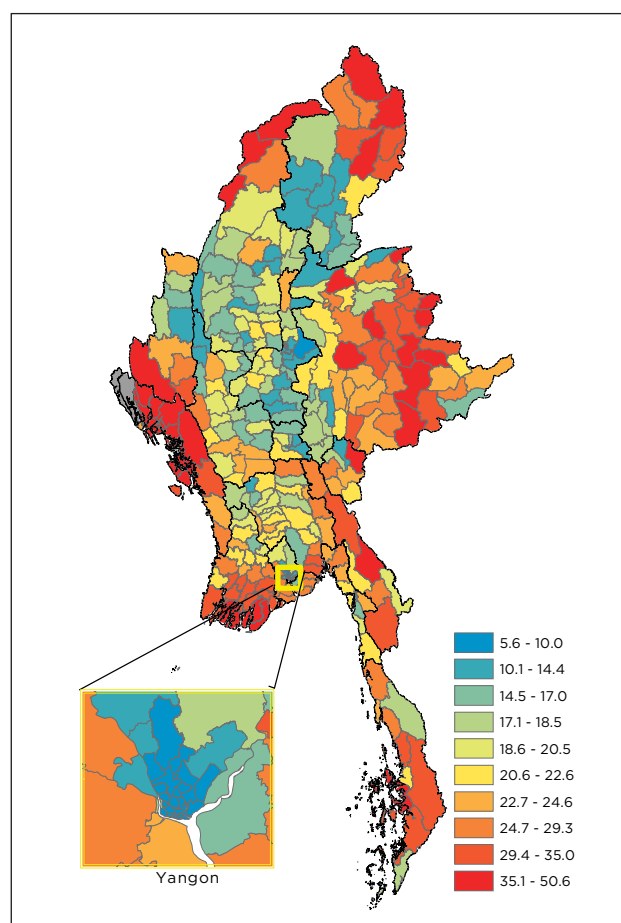


Source: MOPF and World Bank 2017.

⁴ See <http://hdr.undp.org/en/content/what-multidimensional-poverty-index>.

Figure 3

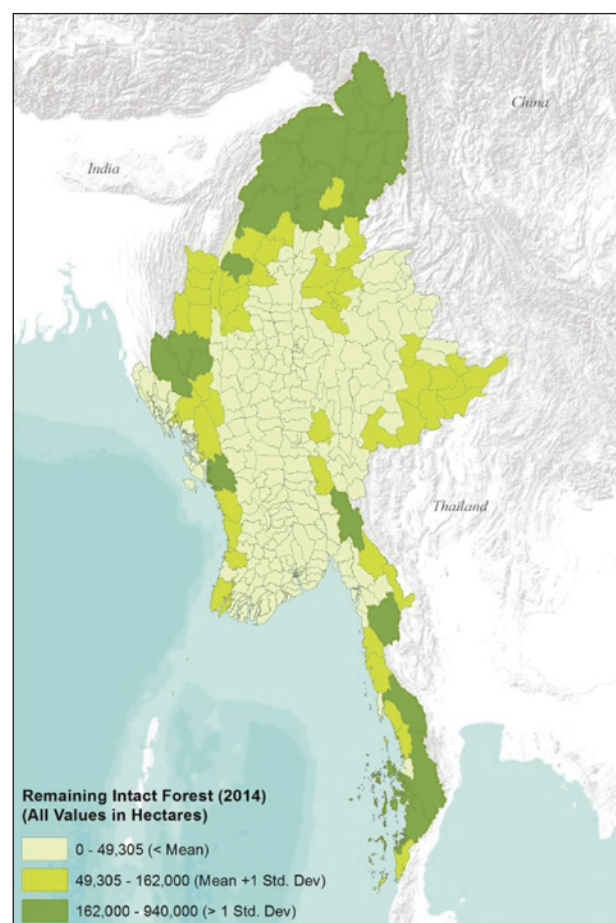
MDI by township



Source: World Bank 2018b

Figure 4

Remaining intact forests by township (2014)



Source: Bhagwat et al. 2017.

The poor are also highly reliant on forests and natural ecosystems. Wood fuel remains the most important energy source in rural areas, and non-timber forest products (NTFPs) are a major source of income and housing materials for the poor. Similarly, 1.9 million households live in divisions and townships located in the coastal zone, mostly dependent on marine and coastal resources (BOBLME 2014). Given their high reliance on natural resources, the poor suffer the most when these resources are degraded or depleted. A recent natural capital assessment also suggests that the biophysical supply of key services—such as sediment retention, waterflow regulation, and flood control—is concentrated in the relatively poorer areas in the north and northwest of the country (Mandle et al. 2017; WWF 2016a).

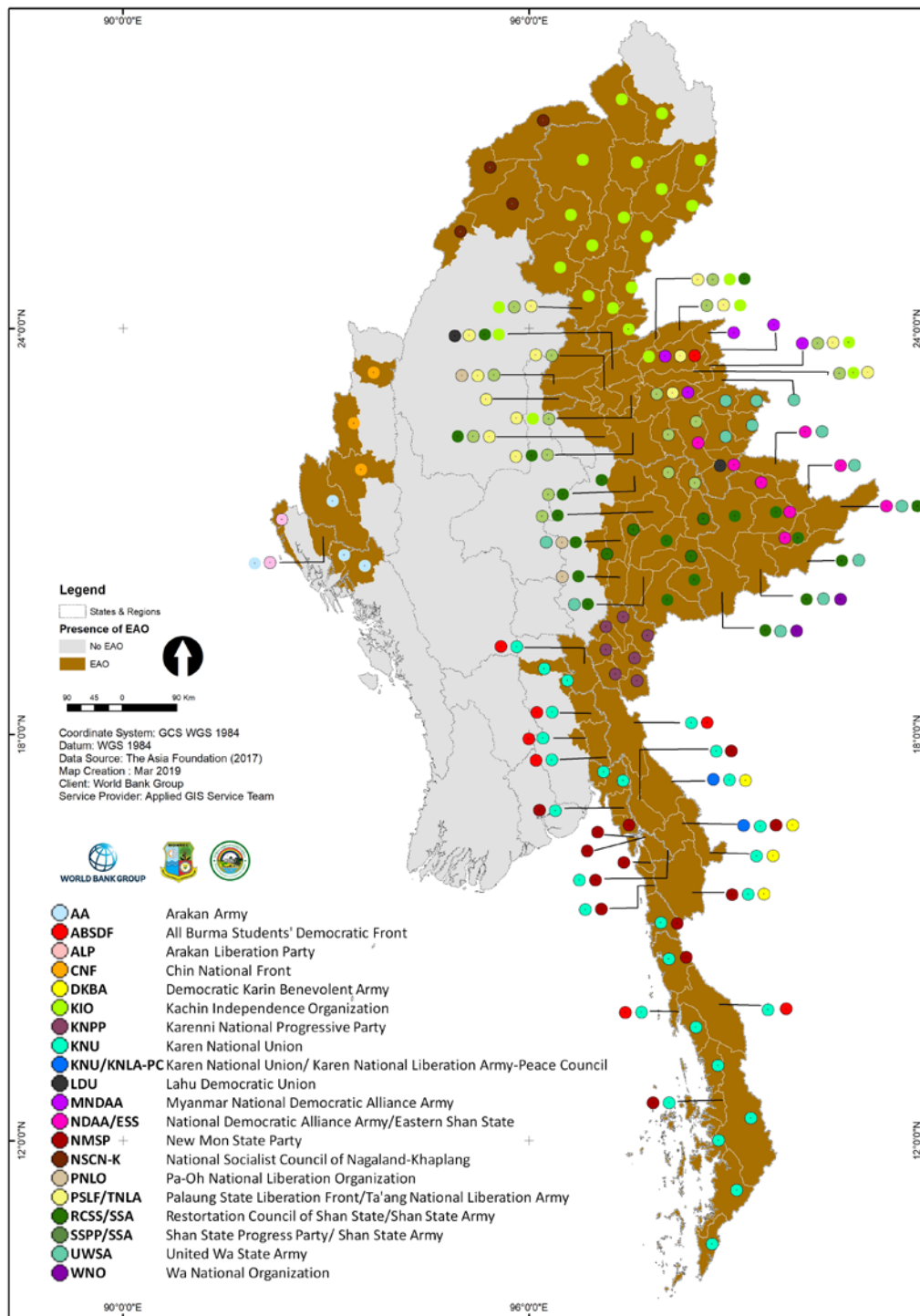
.. and have a role in peace-building and inclusion

Myanmar has been more deeply affected by subnational conflict than any other country in Asia, fueled in part by abundant natural resources. Across the country, there are at least 20 major ethnic armed organizations (EAOs) as well as hundreds of smaller splinter groups and government-affiliated militia.

While Myanmar's subnational conflicts are not driven solely by economic interests, the great natural resource wealth found in many contested parts of the country is a significant factor. Natural resources and control over trade routes can generate wealth to sustain EAOs or support the Tatmadaw (the Myanmar Armed Forces). In 2016, it was estimated that 118 out of 330 townships in Myanmar were affected by active or latent conflict (TAF 2017) (Figure 5).

Figure 5

Presence of EAOs in Myanmar



Source: The Asia Foundation 2017.

Participatory natural resources management can support Myanmar's ongoing peace process. Around two-thirds of Myanmar's remaining forests are in areas managed by non-Bamar ethnic groups, in many cases through customary tenure systems, with much of this forest located in conflict areas. The demands for greater subnational control over natural resources are strong, especially among EAOs. In addition, the ruling National League for Democracy (NLD) has committed to establishing a federal state that allocates certain responsibilities for natural resources to subnational governments. Both forestry and fisheries can make an important contribution to devolving power at the subnational level and creating income and employment opportunities in rural areas.

Rapid economic development is bringing new environmental challenges

There are growing concerns around the impacts of the large-scale development, particularly from the mining sector. While the national economic transition has facilitated the entrance of more efficient machinery in the mining industry, the increased level of activity has also intensified pressure on water resources and competition for land. Mining and other land concessions, including for agriculture, have led to deforestation, land degradation, deterioration of water quality, flooding and landslides, biodiversity loss, and depletion of inland and coastal fisheries.

Acute environmental health issues are on the rise, caused by rapid urbanization and industrialization. In 2017, over 45,000 deaths in Myanmar were attributed to air pollution. Air pollution is a higher mortality risk factor in Myanmar than in other countries in the region, at almost twice the average for Southeast Asia (GBD 2017). Yangon and Mandalay have the highest particulate matter (PM) concentration, PM₁₀, among the cities in Southeast Asia (Raitzer, Samson, and Nam 2015).

Urban waste also increases the risk of environmental health issues. In 2016–2017, Yangon city dumpsites received 855,000 tons of solid waste, a 20 percent increase from the previous year.⁵ However, it is assessed, on the basis of estimated waste generation and landfill records, that the waste collection coverage in Yangon is only 49 percent, in Mandalay 80 percent, and in Taunggyi 64 percent, with waste ending up instead around the city and in water streams. Plastic littering is also increasing. In both Yangon and Mandalay, most waste is collected and handled manually, with negative consequences for health (IGES and CCET 2016).

Treatment and proper sanitary waste disposal remain limited, even in formal landfills which are operated as open dumpsites without any environmental controls. This is far from the targets established in the National Waste Management Strategy and Master Plan for Myanmar to: (i) achieve solid waste collection for all citizens (70 percent collection by 2020, 85 percent collection by 2025, and 100 percent collection by 2030) and (ii) eliminate the uncontrolled dumping and burning in the cities and mandate the operation of environmentally sound waste disposal facilities (ECD and MONREC 2018).

⁵ Yangon City Development Committee presentation on current situation of solid waste management, 2018.

Income from solid waste management services is insufficient to cover the costs of solid waste collection and disposal and represents 25–50 percent of the operational expenditures. Amortization costs that can allow for the cost recovery of the solid waste investments are not covered at all. There is a need to optimize costs and increase the revenues of solid waste management and increase the waste collection coverage specifically in the larger cities to increase the financial sustainability of the waste operations and improve the environmental sustainability of both waste collection and proper disposal in environmentally compliant landfills.

The Government of Myanmar has begun modernizing its environment and natural resources management systems.

Environment and natural resources management systems need to catch up with the new challenges and opportunities presented by rapid economic development, and the related increase in environmental pressures, and the peace process. This includes the following:

- Adopting a more holistic approach to forest management that embraces a range of forest functions. These include community livelihoods and inclusion, environmental services that support and protect the productivity of other sectors (such as agriculture and tourism), and traditional timber industries.
- Moving from a focus on collection of fishing license fees to the recognition of fisheries as finite and exhaustible resources that require active management to maximize social benefits.
- Developing effective systems for environmental assessment, monitoring, and compliance.

In each of these areas, there are opportunities to learn lessons from other countries, avoid pitfalls, and develop robust systems while retaining substantial natural assets.

The Government of Myanmar (GoM) has made impressive progress recently in developing a set of national strategies and action plans to manage natural resources. Planning frameworks and instructions include the following:

General planning frameworks

- **MSDP 2018**

It recognizes the importance of environment and natural resources (ENRs) for economic growth. Goal 3 identifies the need to build infrastructure to facilitate economic growth and also establishes effective social and environmental safeguards against negative impacts of infrastructure development.

- **National Environmental Policy (NEP) 2019**

It covers three strategic areas: (a) clean environment and healthy and functioning ecosystems, (b) sustainable economic and social development, and (c) the mainstreaming of environmental protection and management.

- **Myanmar Climate Change Strategy and Action Plan (MCCSAP) 2018–2030**

It aims to support the public and private sectors and vulnerable communities to respond to climate change.

Forestry

- **National Forest Master Plan (NFMP) (2002–2031)**

It commits to increasing reserved forest (RF) and protected public forest (PPF) to 30 percent of total land area by 2030 (up from 24.5 percent) and protected areas (PAs) to 10 percent (up from 5.75 percent) and to establish around 920,000 ha under community forestry (CF).

- **Myanmar Reforestation and Rehabilitation Program (MRRP) 2017–2026**

It includes ambitious targets to restore close to 1 million ha of degraded and deforested land within RF and PPF, including establishing over 311,746 ha under CF.

Fisheries

- **Agricultural Development Strategy (ADS) 2018–19 to 2022–23**

It establishes objectives for fisheries and aquaculture.

- **Draft National Aquaculture Development Plan**

It sets out long-term national objectives for the sustainable development of the sector.

Environmental and pollution management

- **Environmental Conservation Law (2012)**

It is supported by the Environmental Conservation Rules (ECR) 2014 and the Environmental Impact Assessment (EIA) Procedure (2015) and establishes the legal framework for environmental assessment and regulation.

- **National Waste Management Strategy and Master Plan (2018–2030)**

It aims to implement waste collection for all citizens and eliminate uncontrolled disposal and open burning of waste.

The rapidly expanding policy framework establishes many ambitious objectives but translating these into achievable action steps and budgeted and financed investments remains a major challenge.

However, significant work remains in the management of forestry . . .

In the years before the democratic transition, forest areas were largely over-logged. This resulted in widespread degradation of the Permanent Forest Estate (PFE). Illegal logging and corrupt practices still occur. However, in 2014 a temporary log export ban was imposed to stop the plunder, after which a series of reforms were enacted to better control and manage the resources.

The new forest reforms emphasize restoration and include CF. The MRRP and the revised 2016 Community Forestry Instruction (CFI) provide the framework for a long-needed program that has the potential to address many of the social and inclusion legacy issues in the sector. [The recently amended CFI (2019) was released in May 2019 as the report was being finalized; its analysis is not included in the report]. The MRRP sets clear targets for forest restoration and scaling-up of community forestry, which, if implemented as planned, will be a significant step forward. Global experience shows that CF and smallholder plantations are financially and socially viable and can meaningfully contribute to generation of rural income, trust, and business opportunities, if secure tenure and incentives are in place (World Bank 2019d).

Despite progress, there are substantial opportunities for improvement and higher ambition. Although there is high political ownership by the government and society, the sector still lacks the financial and human resources to accelerate reforms and implementation of programs, attract the needed private capital and technology, and develop an inclusive enabling environment for forest communities and private forest enterprise. Key opportunities to add value to the sector include the following:

- **More diverse ways of recognizing and enabling existing forms of community-based forest management and enabling new community engagement are needed.** CF should be mainstreamed within the PFE. Outside the PFE, existing forms of customary forest management should receive legal recognition and where necessary technical support. Agricultural expansion and concessions, conversion for infrastructure, and overharvesting are the main causes of forest cover loss and degradation. A pragmatic approach is needed to manage forested land across different land classifications and ecosystems, including Vacant, Fallow, and Virgin (VFFV) land and mangroves, which are mostly under de facto control of communities.
- **Wood fuel is used as the main energy source by 60–80 percent of the rural population, but it is not widely recognized as a priority area for action.** A concerted cross-sectoral response is needed, involving incentives for the establishment of wood fuel plantations, introduction of more efficient technologies, and fuel substitution (by extension of the national grid and off-grid electricity provision).
- **The targets for expanding private plantations in the MRRP (within the PFE) could be significantly increased if the right enabling environment is created to attract reputable international companies.** These companies could facilitate and support technology transfer, sustainable practices, and outgrower schemes for a modern, sustainable, and competitive wood-based industry.
- **Myanmar's limited and low-quality processing of some of the world's most valuable timber represents a huge opportunity cost in terms of export and rural jobs.** For example, Vietnam invested heavily in high value-added processing and forest small and medium enterprises (SMEs) over the last 10 years. Today, it is the fifth largest wood products exporter globally, with related revenue exceeding that of Myanmar more than twenty-fold.

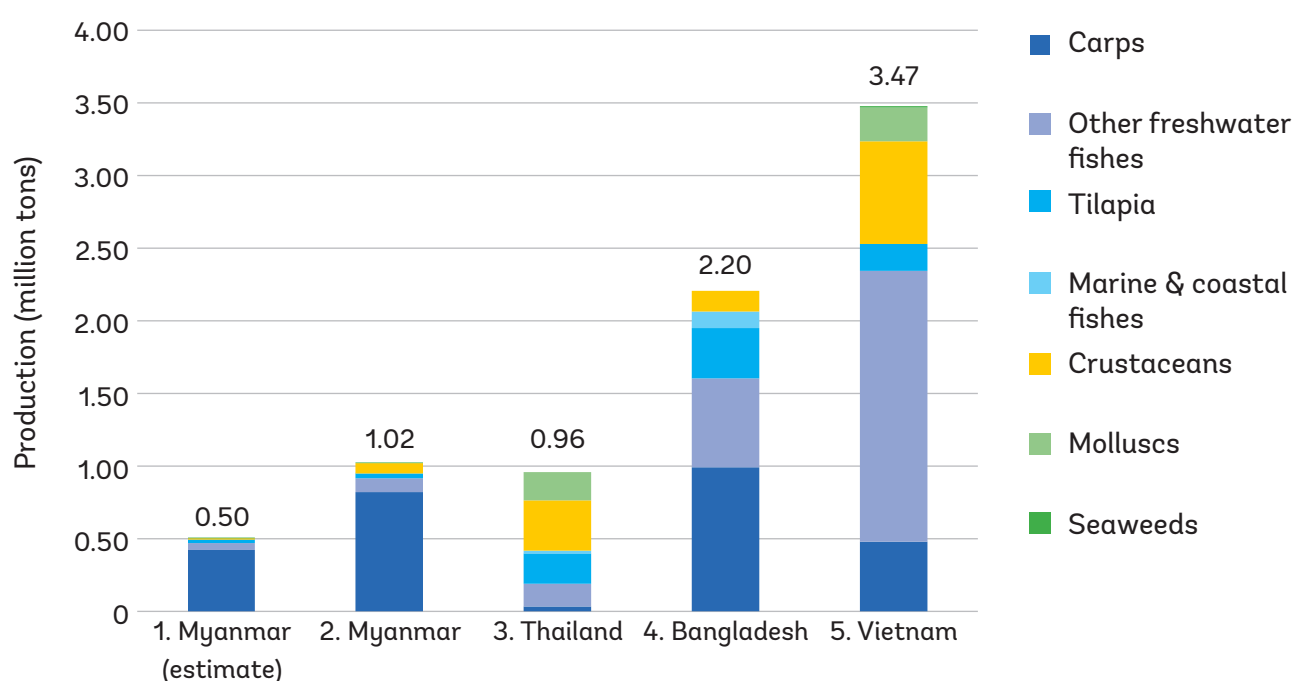
There is a scarcity of scientific data on which to base the management of Myanmar's fisheries. Official catch estimates show an inexorable rise in marine fisheries' production (DOF 2017; FAO 2018b). Yet, these estimates are contradicted by a variety of other economic and research data, and there are discrepancies between what is officially reported and other sources. Periodic visits of the *Fritjof Nansen* research vessel have provided vital information on Myanmar's marine stocks, but more routine and lower-cost stock assessment methods are needed.

The potential economic opportunities from improving fisheries management are substantial. Ballpark estimates suggest that current production from marine fisheries alone falls short of their biological potential by potentially US\$1 billion per annum. Bioeconomic modelling of marine fish stocks in Rakhine and Tanintharyi is expected to also show large potentials for yield increases.

The value of aquaculture production could be increased. This could be done by raising productivity, diversifying production to include more valuable species, and allowing expansion of the area under production. It is estimated that Myanmar's actual aquaculture production is about half of Thailand's, one-quarter of Bangladesh's, and one-seventh of Vietnam. Figure 6 compares the volume and composition of aquaculture production in Myanmar, Bangladesh, Thailand, and Vietnam.

Figure 6

Aquaculture production for Myanmar, Thailand, Bangladesh, and Vietnam, 2016



Source: FAO 2018; author's own calculations⁶.

⁶ Column 1 is an alternative estimate of likely levels of production for Myanmar, based on yields of fish and shrimp derived from farm surveys. This alternative estimate suggests that Myanmar's actual aquaculture production is about half of reported production.

It is clear that fisheries and aquaculture value chains are underperforming (Belton et al. 2015; FAO 2018). This is apparent in areas including limited value-added processing, limited diversity of available fish seed, low levels of adoption of pelleted feeds in aquaculture, and extremely limited veterinary and diagnostic services. This situation is made worse by a lack of access to formal credit and insufficient provision of basic infrastructure to support market access.

Community-based fisheries management provides opportunities to resolve some of the issues faced by the fisheries sector. It would promote more equitable distribution of benefits from inland and inshore fisheries and help balance the competing demands between improving fisheries governance and safeguarding the livelihoods of the poor. However, legal reforms and community capacity-building would be needed to expand existing pilots. Increasing access to affordable credit could also help address equity and poverty among fishers. Myanmar ranks 178 of 190 countries for access to credit by SMEs, and most fishers are locked into debt dependency relationships with traders.

Improved fisheries governance and management offers significant opportunities to reduce local conflicts in coastal and floodplain areas. Major sources of conflict in the fisheries sector are (a) competition in marine fisheries between commercial offshore vessels and small-scale inshore fishers, (b) conflict between farmers and fishers over the management of water levels on floodplains, and (c) conflict between large fish farms and former rice growers and fishers over confiscated land. The planned establishment of a vessel monitoring system (VMS) for the offshore fleet will be instrumental in addressing these local conflicts.

...the environmental impact assessment (EIA) system

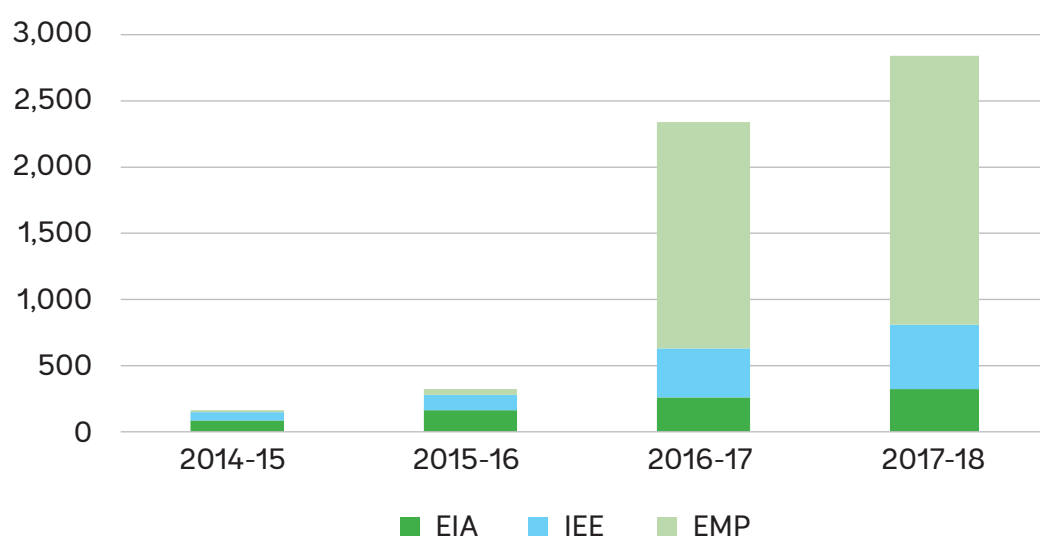
Myanmar's EIA system is struggling to cope with the demands it faces from an environment sector that is increasingly under stress. EIAs are critical to identifying and managing the potential impacts of large-scale development and striking the balance between economic development, environmental conservation, and social inclusion (IFC 2017; Raitzer, Samson, and Nam 2015). Significant recent progress has been achieved in establishing the legal and regulatory framework. The government has set up an EIA Division in the Environmental Conservation Department (ECD) to oversee the review and approval of EIAs, initial environmental examinations (IEEs), and environmental management plans (EMPs).

However, EIA systems need to ensure that the government has a transparent information system for managing the EIA process. The ECD also needs to be equipped with the technical capacity, tools, budget, and resources to become a more effective environmental regulator. This includes improving the tracking and transparency of EIAs, IEEs, and EMPs; strengthening ECD's capacity; operationalizing financial mechanisms for the review and approval of reports; and shifting focus toward inspection, monitoring, and audit.

A huge number of EIA, IEE, and EMP reports have been submitted. This is a major achievement, but the limited capacity of ECD and poor-quality of reports has led to major backlogs in approval. By February 2019, a total of 2,783 reports had been submitted (Figure 7). A breakdown of these submissions by sector shows that a high proportion are for the mining sector. While nearly all reports have been replied to (90 percent in total), only 6.9 percent (192) have been approved. A further 250 EIAs, 482 IEEs, and 1,859 EMPs await approval.

Figure 7

EIA/IEE/EMP received from FY2014/15 to FY2017/18



Source: World Bank Group 2019

Currently, compliance visits are only carried out in response to complaints from local community, and there is not an effective regime for regular inspection and monitoring. In Myanmar, less resources are committed to compliance and monitoring as the ECD is dealing with the review and approval of a significant volume of reports. This is a common issue in the other Mekong Region countries (ERI 2016). Myanmar would benefit from developing a compliance strategy to help focus the post EIA environmental inspection and compliance efforts on achieving measurable environmental outcomes.

...and solid waste, plastic, and air pollution

In order to reach the targets of the National Waste Management Strategy and Master Plan of 100 percent waste collection coverage, a road map for the development and implementation of a plastic action plan is required. This needs to include an analysis of the negative economic impacts of plastics mismanagement and define the policy actions and investments that will reduce plastic use and leakage into waterways. Part of this analysis exercise needs to identify the top 10 priority plastic items found in the environment and the effectiveness and efficiency of potential plastic policies, based on international experience and the Myanmar context. In addition, information on plastic leakage into the waterways from priority cities is needed, as is an analysis of municipal investments and policies that could significantly reduce such leakage and the use of plastic.

Establishing an ambient air quality monitoring network and enforcement of emission guidelines would support the monitoring and control/enforcement of air pollution as a first step in air quality management. Myanmar needs a systematic long-term assessment of pollutant levels through provision of equipment and expertise to measure the quantity and types of pollutants as well as the key sources of air pollution. This could include the provision of low-cost air monitoring sensors and of training in case of calibration with fixed reference air monitoring stations. The development of an air pollution emission inventory for key cities will also be required. With the assistance of air quality modelling on the basis of actually monitored air quality, source apportionment, and emission inventories, the cost-effective policies and investments to reach air quality targets can be established and form the basis for an air quality management plan.

Forestry

1. Create delivery mechanisms to scale up CF within PFE.

The Forest Department (FD) needs to simplify and accelerate the handover processes for CF establishment. Developing an efficient delivery mechanism to scale up the establishment and implementation of CF, including providing CF services to ethnic communities, will help facilitate this process.

2. Undertake an inventory of forest stocks, strengthen control mechanisms, lead on cross-agency enforcement, and reform the Myanmar Timber Enterprise (MTE).

While sustainable production forestry is still viable in some natural forest areas, the FD should (a) undertake an inventory of forest stocks to decide on how to proceed on the restoration of forests and how best to manage private, community, and public efforts; (b) improve the timber legality assurance system (TLAS) to support high-value production and export; (c) strengthen planning and control mechanisms and lead a cross-agency dialogue on law enforcement; and (d) reform the MTE considering the entire value chain.

3. Promote an enabling environment for private plantations to attract reputable and chain of custody-certified private companies and investment.

Myanmar would benefit from the preparation of an Industrial and Commercial Plantation Strategy, in close cooperation with wood-based industry. This would address constraints related to transparent licensing, safeguards, competitive partnership agreements (public-private partnerships), financing, fiscal incentives; and create an enabling environment for forest SMEs.

4. Increase protected areas to 10 percent of total land area.

Planning, gazettelement, and management of PAs should continue taking into account communities' preexisting rights. The FD should consider (a) creating a more effective management framework to promote ecotourism, (b) protecting and restoring mangroves as a priority, and (c) assessing the possibility of introducing Payment for Environmental Services (PES), including carbon payments, to support PAs and watershed restoration.

5. Build the capacity of the FD to implement a challenging reform process.

The support needed includes skills development, an increased budget, technological support, and better civil society engagement. Specific skills needed in the FD include bottom-up planning, community engagement, facilitation, livelihoods expertise, business development, and private sector partnerships.

Fisheries

6. Strengthen enforcement of existing fisheries laws and regulations and move toward quota-based systems.

Existing fisheries laws and regulations need to be more strongly enforced. This includes enforcing closed seasons and gear restrictions in marine and freshwater capture fisheries, clearly defining inshore and offshore zones with global positioning system (GPS) markers, and applying VMS to the entire offshore fleet. In addition, the capacity of partnerships as well as procedures to bring cases to court need to be developed. Quota-based systems also need to be implemented. Over time, the development of stock assessment and monitoring should provide a foundation for establishment of quotas and auctioning of quota-based licenses, at least in marine fisheries.

7. Expand protection of aquatic habitats.

This includes protection of freshwater wetlands, mangroves, and coral reefs, including the establishment of additional Marine Protected Areas (MPAs). Legal and institutional frameworks for coastal resources management and incorporation of protections for freshwater fisheries into agriculture and water resources policies are also important.

8. Strengthen co-management to mobilize fishing communities to support improved governance.

Expanding current co-management pilots within inshore and to freshwater fisheries will require the expansion of legal frameworks for secure tenure and establishing local institutions such as fishers' associations and cooperatives. Analysis of credit constraints and options for community-based fisheries enterprises is also important.

9. Create the space for a more productive aquaculture sector.

The first step should be to assess the biophysical and market potentials for different types of aquaculture. Legal frameworks need to be reformed to remove the constraints on aquaculture development within farmland and reservoirs and to develop regulations for coastal cage fisheries. In addition, investment strategies need to be prepared to address basic market access infrastructure, extension, biosafety and quality control services, the provision of commercial hatcheries and feed production, and the introduction of selective breeding programs.

10. Data collection and management.

It should cover fish consumption (potentially through including modules in standard household surveys), monitoring of fish stocks and landings, a registry of vessels and VMS, a geographic information system (GIS) registry of inns and tenders, and a GIS registry of fish farms.

11. Build the capacity of the DOF to implement this broad management agenda.

The support needed includes skills development, an increased budget, more staff, and technological support. This will enhance the DOF's ability to deliver on monitoring, control, and surveillance (MCS); stock assessment and management; community engagement and business development; aquaculture and biosafety; and fisheries monitoring and spatial statistics.

The EIA system

12. Establish a transparent Environmental Management Information System (EMIS).

A transparent EMIS is needed to track the status of EIA, IEE, and EMP preparation and review and to facilitate the monitoring of their implementation and compliance by regulators and stakeholders. Public participation and attention to environmental assessment can greatly help mitigate the existing institutional capacity constraints.

13. Adopt risk-based and outcome-focused approach to EIA review, approval, and monitoring.

This includes extending the current focus on EIA documents review to a systematic follow-up on their implementation and compliance. Focus should be on prioritizing high environmental risk projects and delegation, and accelerating EIA approvals based on risk. A clear compliance strategy is also needed for engaging regulated industries and simplifying the Environmental Compliance Certificates (ECCs) for practical compliance monitoring.

14. Operationalize dedicated financial mechanisms to cover the costs of environmental assessment and compliance.

This includes operationalization of the Environmental Management Fund (EMF) to provide funding to improve the implementation of the EIA procedure and environmental inspection and monitoring (Schulte and Baird 2018). Generating environmental funding can also be facilitated through the establishment of systems for Payment for Environmental Services (PES).

15. Strengthen environmental management institutions and mobilize resources to boost capacity at national and subnational levels.

The staffing and resourcing of the ECD and other institutions responsible for environmental and pollution management at national and subnational levels needs to align with the expanding regulatory requirements and growth of the regulated economic sectors. Other institutional strengthening actions include establishment of a third-party review mechanism to support the ECD with the review of EIAs and IEEs; a functional review of the EIA Division and Pollution Control Division (PCD) regarding compliance, inspection, and monitoring; and strengthening of the Safeguards Learning Center (SLC) for staff and stakeholder capacity.

Solid waste and air pollution

16. Prepare a road map for a plastic action plan.

It is important to systematically plan to address the plastic menace. This plan could include the following: analyze the impact plastic has on the environment, identify top priority plastics to act upon, and decide a time frame and budget for implementation.

17. Improving financial sustainability and waste collection services.

Options to optimize costs and increase revenue for solid waste management will be analyzed in the subnational expenditure review. Measures to increase solid waste collection and options to rehabilitate dumpsites to sanitary landfills or new landfills will be defined as part of the ongoing World Bank analytical work on solid waste and pollution management.

18. Invest in monitoring air quality and waste streams.

It is important to understand the impacts of solid waste and air pollution and the available management options. This can be done by establishing a national air quality monitoring network, focusing initially on large population centers, and investing in solid waste analysis and management, taking advantage of simple cost-effective technologies.



INTRODUCTION

The Myanmar Country Environmental Analysis (CEA) aims to enhance shared understanding of environment and natural resource (ENR) trends in Myanmar between the Government of Myanmar (GoM), the World Bank, and other stakeholders. It is expected to serve as a basis for dialogue between the GoM and the World Bank on why and how the World Bank's support to the country should promote environmental sustainability and effective management of natural assets and also serve a wider audience interested in these topics.

In consultation with the GoM and other stakeholders, a decision was made to focus this analysis on four priority environmental issues. These are forestry, fisheries, solid waste and air pollution, and the Environmental Impact Assessment (EIA) system diagnostic. It was agreed that changes made in these four sectors are most likely to contribute to reversing the environmental trends Myanmar currently faces.

The CEA is the first major piece of analytical work in the ENR sector since the World Bank's reengagement in Myanmar in 2012. The ENR space is important, complex, and rapidly evolving. This CEA builds on the sector studies and analysis undertaken to date by the government and other development partners and consolidates shared knowledge. It is hoped that the insights the CEA provides will serve to inform further analytical and sector work and guide the investments and policy reforms of the GoM.

The CEA also sets out to inform a number of activities in the World Bank's Myanmar Program.⁷ In particular, forest sector studies, undertaken as a part of the CEA, feed into the preparation of proposed forest sector project. There are also community forestry (CF) components planned as a part of the proposed Peaceful and Prosperous Communities Project focused initially in the Kayin, Kayah, and Mon States; mangrove and forest restoration and CF activities planned as a part of the proposed Rakhine Recovery and Development Support Project; subnational Environmental Conservation Department (ECD) capacity-building activities planned as a part of the proposed Enhancement of the State and Regional Government Capacity Project; and the nature-based tourism component of the proposed Myanmar Sustainable Tourism Project.

In addition, the CEA contributes toward the development of the Strategic Country Diagnostic. This diagnostic underpins the upcoming Myanmar Country Partnership Framework, particularly its environmental sustainability pillar—mirroring the pillar of the Myanmar Sustainable Development Program (MSDP) on People and Planet. The CEA is further complemented by other pieces of ongoing analytical work, including the Myanmar Country Forest Note, Myanmar Coastal and Delta Resilience Program, Myanmar Sustainable Solid Waste and Pollution Management Study, Wealth Accounting and the Valuation of Environmental Services Program, and the proposed Blue Economy Study.

The CEA focuses on four areas of particular significance to ENRs from the perspective of poverty reduction, social inclusion and participation, and economic growth. In particular, the CEA focuses on forests and fisheries as two key renewable natural resources which Myanmar has relied upon to provide livelihoods, fuel, and nutrition to a large part of its population, and whose ecosystems provide a variety of additional protective and productive services to multiple parts of the economy. It also reviews the impacts solid waste and air pollution have on the environment, including the issue of plastics, a topic of increasing global interest and awareness. It assesses Myanmar's progress in establishing effective EIA and monitoring systems as the cornerstones of a national environmental management framework. And it does this while acknowledging the growing pressure on these critical natural assets (that many of the threats come from development activities in other sectors) and the exceptional opportunities and challenges presented by Myanmar's transitions to peace, democracy, and economic openness.

⁷ The focus of the World Bank Myanmar Program is on promoting social inclusion in conflict-affected areas through analytical work, advisory, and investments in education, health, nutrition, energy, agriculture, rural development, water resource management, macroeconomics, and other sectors.

This CEA Synthesis Report is the main deliverable of the CEA. It is a consolidation of the key findings and recommendations of three separate reports on **Forest Resources, Fisheries,** and an **EIA Systems Diagnostic.** A separate study on **Potential for Scaling Up Community Forestry** was undertaken as well. In addition, the Synthesis Report integrates some initial findings of the ongoing World Bank study on 'Sustainable Solid Waste and Pollution Management' to draw attention to this agenda of increasing importance.

The CEA has been carried out by the World Bank in partnership and close collaboration with a number of GoM departments. These include the Forest Department (FD) and ECD under the Ministry of Natural Resources and Environmental Conservation (MONREC) and the Department of Fisheries (DOF) under the Ministry of Agriculture, Livestock, and Irrigation (MOALI). The CEA adopted a highly participatory approach during preparation, involving the GoM development partners, civil society, nongovernmental organizations (NGOs), communities, and the private sector in a series of consultations and technical and validation workshops.

The CEA applied the methods outlined in the World Bank CEA Toolkit. These covered (a) review of environment development priorities, status, and trends by consolidating existing information, data, studies, and reports; (b) assessment of environmental policies and institutions drawing on the experience from the World Bank and other development actors' interactions with these institutions; and (c) an in-depth analysis of environmental priorities in forestry, fisheries, solid waste management and pollution, and EIA systems. These analyses included a detailed examination of trends, sector policies and strategies, and investment priorities. The CEA primarily drew on analysis of existing data sources and a variety of expert opinions, supplemented by systematic review of institutional data and field visits and consultations.



photo: ©David Gritten

1

FORESTRY

1. FORESTRY

Myanmar's forests are recognized globally for their biodiversity values. Forests are considered to be integral to the stability of the environment. Myanmar's huge altitudinal range (from the sea to the Eastern Himalayas) and position between major biomes make it highly important for biodiversity and wildlife. Myanmar is one of the world's biodiversity 'hotspots' with, for example, over 300 mammal species, including at least five endemic mammal species and 144 globally threatened species,⁸ as well as the greatest diversity of bird species in Southeast Asia.

However, these forests are under threat and urgent action is needed to reverse this trend. This chapter describes the extent of Myanmar's forests, the challenges they face, and the role they play in Myanmar's economy and livelihoods. It also makes recommendations on actions that can be taken to reverse the decline.

1.1 Overview of forest resources

1.1.1 Forest cover

In 2015, approximately 44 percent (29 million ha) of the land area was forested (FAO 2015) (Figure 8).⁹ Of this, about 42 percent was closed forest and 58 percent open forest. Of the total forest area in 2015, 3.19 million ha (or 11 percent of the forests) was considered 'primary forest' (that is, forest with no visible indication of human activity). The rest was 'other naturally regenerated' where there is clear indication of human disturbance.

Myanmar's forest area is composed of a range of main types. These include hill and temperate evergreen forest (27 percent), mixed deciduous forest (38 percent), Indaing (4 percent), dry forests (10 percent), scrub (2 percent), tropical evergreen forest (17 percent), and mangroves (1.5 percent) (MOECA 2011). Figure 9 shows forest cover by State / Region in 2015.

In 2014, an independent study found that only 38 percent of the country's forests could be considered 'intact' (over 80 percent canopy cover). The large extent of the 'other wooded land' category is partly explained by the prevalence of long fallows forest cultivation (shifting cultivation) in ethnic areas.

In 2014, an independent study found that only 38 percent of the country's forests could be considered 'intact' (over 80 percent canopy cover). The large extent of the 'other wooded land' category is partly explained by the prevalence of long fallows forest cultivation (shifting cultivation) in ethnic areas (Bhagwat et al. 2017).

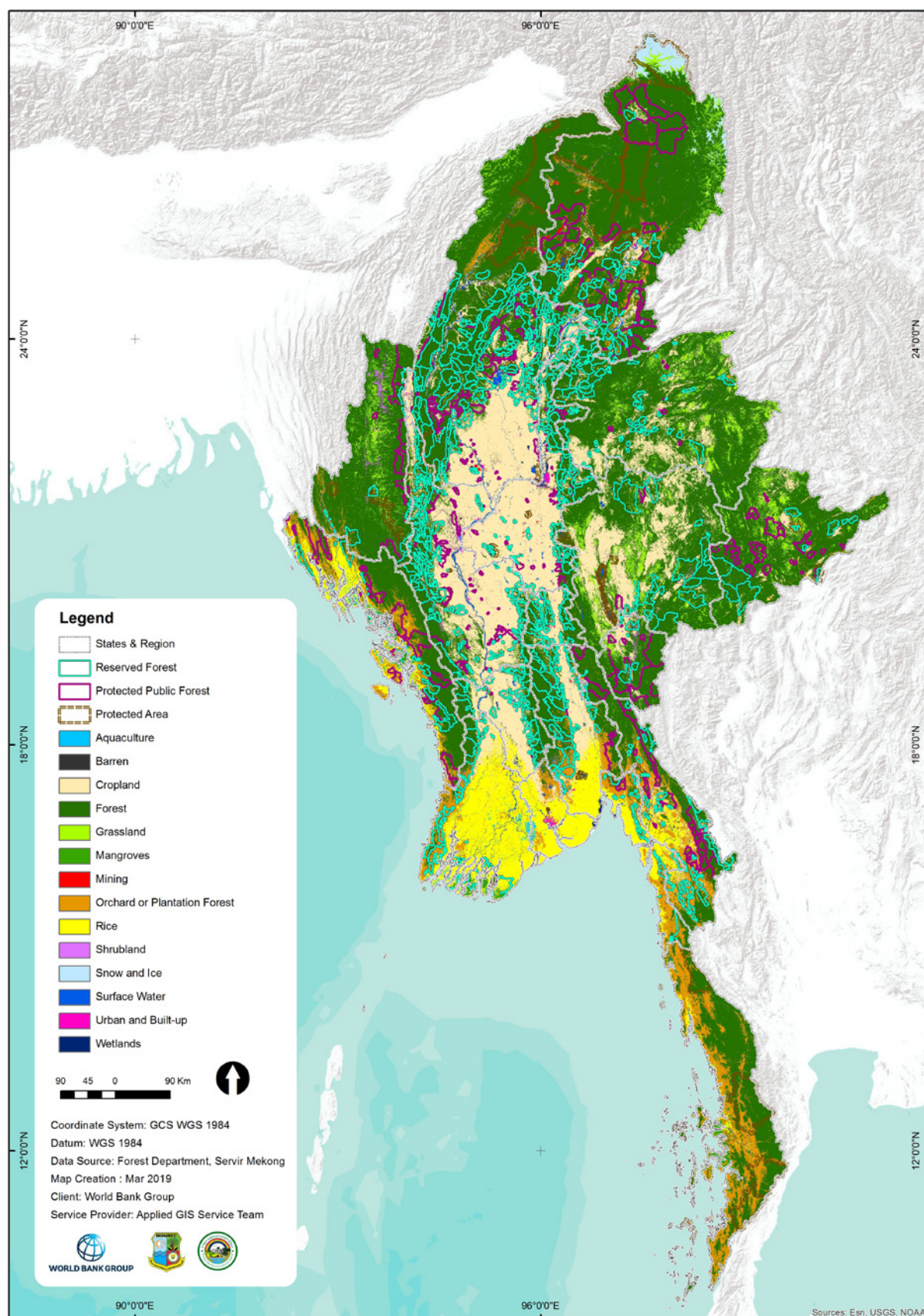
Myanmar's forests are estimated to contain 1,342,118 m³ in growing stock (FAO 2015). This is concentrated in just the four largest States and Regions (Shan, Kachin, Sagaing, and Tanintharyi) and represents around 78 percent of the entire growing stock. Based on the growing stock data, Myanmar's forests are estimated to contain 3,300.57 million metric tons of forest biomass over dry weight—including above ground, below ground, and leaf litter (FAO 2015). This is estimated to represent 1,292.8 million metric tons of forest carbon.

⁸ Myanmar Convention on Biological Diversity Country Profile: <https://www.cbd.int/countries/default.shtml?country=mm>.

⁹ The GoM follows the FAO's conventional definition of 'forest': "Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use." (FAO 2014). Forests are subcategorized into 'closed' (>40 percent canopy cover) and 'open' (normally degraded) (10–40 percent).

Figure 8

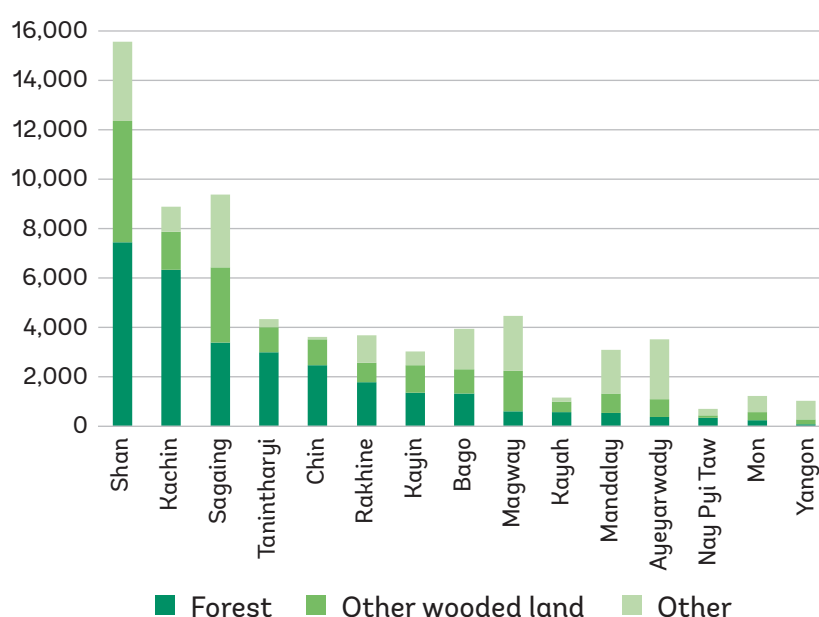
Forest and land use, 2017



Source: SERVIR-Mekong 2017.

Figure 9

Forest extent by State/Region in 2015, in ha



Source: FAO 2016a.

1.1.2 Forest classification

Under the National Forest Policy (1995), extensive areas of forested land have been gazetted to form the **Permanent Forest Estate (PFE)**, encompassing about 25 percent of Myanmar's land areas (FD data). Forest lands within the PFE are distinguished into (a) Reserved Forest (RF) - priority areas for timber production and (b) Protected Public Forest (PPF) - lower timber priority, mainly for local use. In addition, Protected Areas (PA) have been established for biodiversity conservation. Table 1 provides the current status of PFE and PAs and progress toward achievement of targets set in the National Forest Master Plan (NFMP) (2002–2031) for increasing forest areas.

Table 1

Status of the PFE

Category	Current Area, ha	Current area, % of land area	NFMP target, % of land area
Reserved forest	12,041,601 ^a	17.80	30
PPF	5,041,364 ^a	7.45	
PA system ^b	3,510,685 ¹⁰	5.85	10

Note: a. Semiannual progress report for MRRP, April–October 2018.

Of the total forest area of Myanmar (29 million ha), only 41 percent or 11.8 million ha are within the PFE (Enters 2017). Most of the forest outside the PFE lies on land designated as Vacant, Fallow, and Virgin (VFV) land. Only 60.4 percent of the PFE has forest cover (closed plus open forest). Unclassified forests outside of the PFE have ambiguous tenure and are vulnerable to informal extraction and land use change. Those under customary community management lack adequate statutory recognition and are vulnerable to conversion, including through appropriation for agricultural plantations through the VFV Land Management Law (2012),

¹⁰ Source: Planning and Statistics Division, Forest Department, 2010, as cited in UN-REDD Programme (2013) UN REDD Myanmar REDD+ Readiness Road Map.

particularly through the VFV Law Amendment 2018. There is an acute need for clear processes that can lead to statutory recognition of customary tenures, especially in ethnic areas.

There has been a strong emphasis on expanding timber plantations over the last few years, including mobilizing the private sector. With forested area progressively degrading, the urgency has increased, and the MRRP sets specific targets for different types of plantations.

From 1981–2013, around 12,100 ha of forest were planted per year. Plantation effort declined after 2005, presumably due to underresourcing, and focus began to shift to commercial plantation. For the overall period, village supply and watershed plantation made up 37 percent of plantation. FD data indicate that plantation effort dropped to around 3,075 ha in 2015 (World Bank 2019b). For instance, large areas of teak plantation are in Sagaing Region.

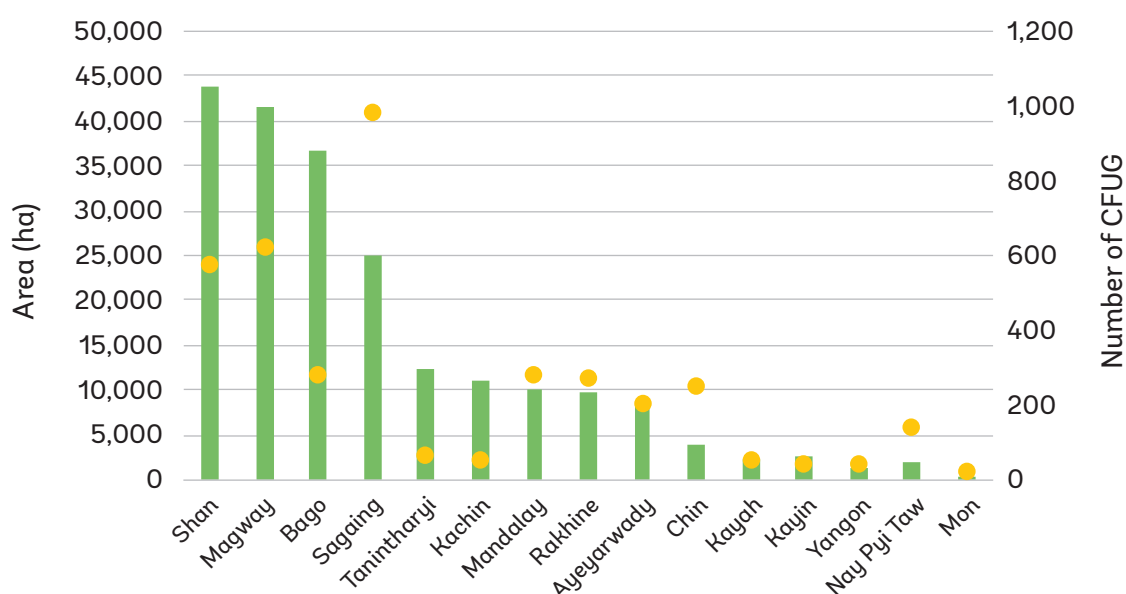
There are an estimated 567,000 ha of private forest plantations in Myanmar, consisting of teak, hardwood, rubber, palm, and industrial crop plantations, established by 2017. Private plantations were allowed in natural forest lands, which have been significantly degraded and were no longer able to regenerate as natural forests for developing private businesses in the sector, supporting the environment, and conserving forest resources. However, more than 270,000 ha, or close to half of these plantation concessions, are assessed to be dormant and have been confiscated by the state (Myat Moe Aung 2018, citing FD).

1.1.3 Community forestry

As of February 2019, there were 248,967 ha of CFs in Myanmar. These are represented by 4,711 community forestry user groups (CFUGs) and around 119,985 households. Each CF has a mean size of 52.8 ha, CFUGs have a mean number of 25.4 members, and each member has a mean of 2.1 ha of land. A notable shift in progress has been made over the last few years since the introduction of Community Forestry Instruction (CFI) (2016), and, since 2016, the area of CFs has more than doubled. Figure 10 shows the area under CF and number of groups by State and Region. The recently amended CFI (2019) was released in May 2019 as the report was being finalized; its analysis is not included in the report.

Figure 10

Area under CF and number of CFUGs by state



Source: World Bank 2019b

While this recent increase is impressive, the overall progress continues to be significantly below the NFMP's target of 919,000 ha by 2030–2031. There also remains uncertainty about the quality of the CFUG formations processes, the level of subsequent activity, and the dynamism of CFUGs that have been established. There is no centralized data available on whether all CFUGs have remained active after they were established. It is also not clear whether they are able to operate in an equitable manner and in adherence with rules and guidelines, including with agreed Community Forestry Management Plans (CFMPs). Earlier studies have indicated that perhaps as many as a quarter or more have stopped operating. The reason for this may be weak formation processes and limited post-formation support, as local FD field offices rarely have the capacity to support and facilitate CFUGs (Tint, Springate-Baginski, and Gyi 2011). Independent assessment of the current status of the CFUGs would be very helpful to clarify this issue.

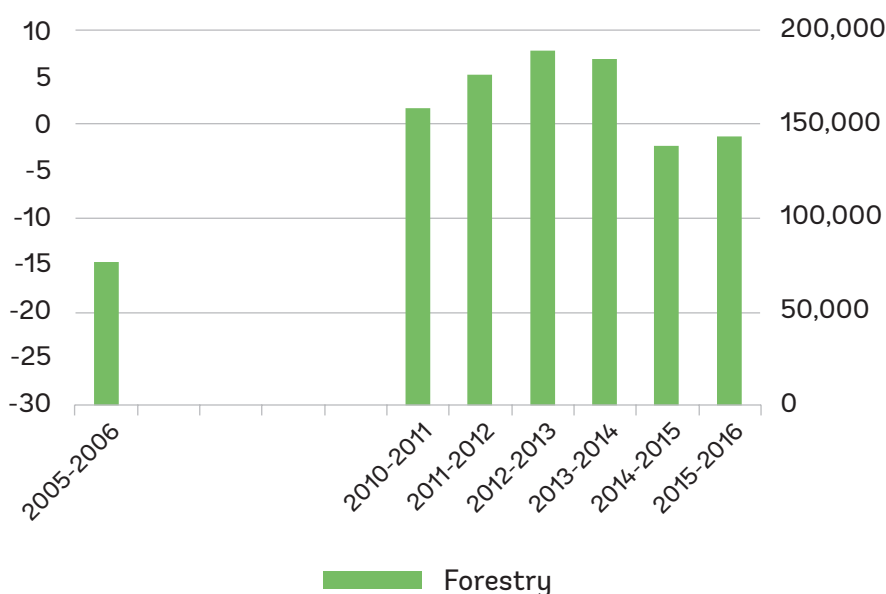
1.2 Socioeconomic significance of the forestry sector

1.2.1 Economic

The forestry sector has traditionally played a major economic role, dominated by commercial teak exports. Commercial timber was extracted in huge volumes over the last century. Today, the forestry sector is less prominent in formal gross domestic product (GDP) estimates. In 2015/16, it accounted for just 0.2 percent of GDP, and forest exports earned US\$270 million or 2.5 percent of total export earnings.¹¹ However, the value of unlicensed or illegal timber exports is said to be significantly higher than this amount.

Figure 11

Contribution of Forestry to GDP (million MMK)



Source: MOPF 2016

¹¹ Data for 2016 reported by Myanmar's Central Statistical Organization.

While forestry continues to make a contribution to GDP, this contribution has fluctuated widely over recent years. The Ministry of Planning and Finance (MOPF) data indicate a significant fluctuation and declining trend over the recent five-year period (Figure 11). This can be explained by four interlinked factors: (a) the reduced Annual Allowable Cut (AAC) and forest exhaustion due to overharvesting; (b) the one-year logging ban introduced in 2015; (c) the 10-year logging ban in Bago Yoma, the important teak producing region since 2016; and (d) the introduction of the log export ban in 2014 requiring processing of wood products before export.

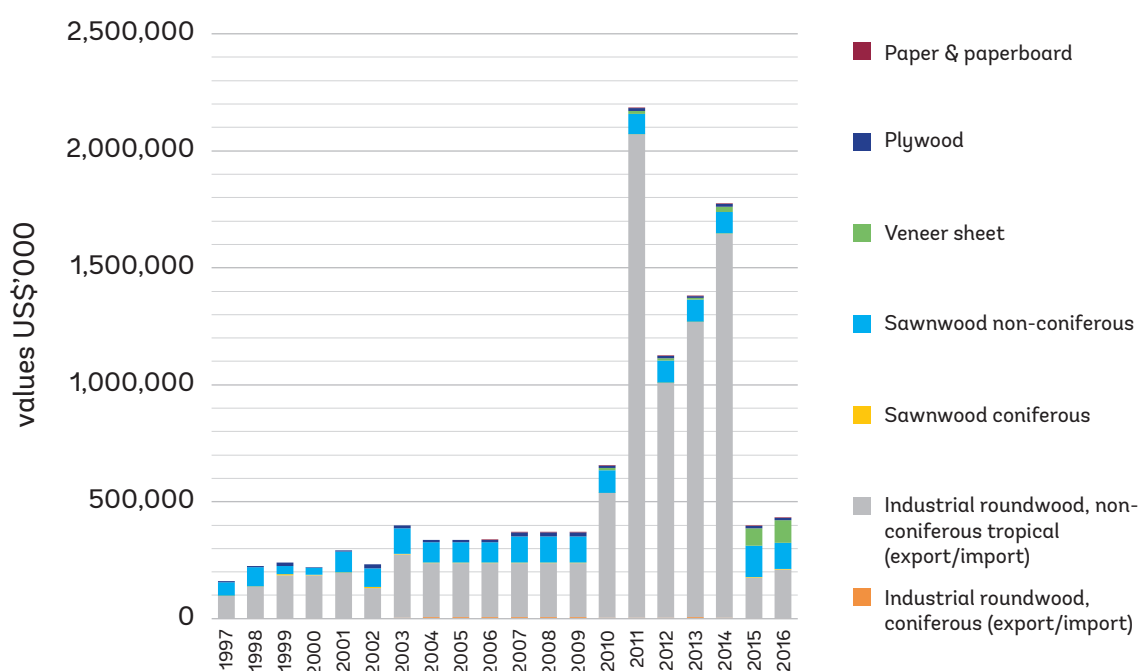
Total government revenues received from the forestry sector are significant. In FY2015/16, they represented 8.3 percent (US\$583 million) of overall government revenues (MEITI 2019). This revenue mainly comes from timber, either from direct timber sales by the Myanmar Timber Enterprise (MTE) (62 percent), taxation on timber sales (36 percent), and sales of confiscated timber by FD. The MTE sells the timber at local and national open tender auctions, although until recently the MTE would also engage in direct export. Logs sold at these auctions may also be exported, but they must be processed before export. The revenue collection from NTFPs is less than 1 percent.

In 2015/16, the FAO estimated the total value of wood exports at US\$443 million (FAO 2018a). They estimated that almost half of official wood exports for 2015/16 from Myanmar were 'round wood'. This was despite the introduction of the log export ban in 2014 that should have resulted in round wood exports falling to zero. Presumably, this result originates from a delay in introduction and perhaps (illegal) export to China overland. The recent Myanmar Extractive Industries Transparency Initiative (MEITI) 2019 report stated an export value of US\$207 million for the same period, less than half of the FAO figure. The discrepancy in reporting shows the need for more accurate data collection.

From 2010 to 2014, there was a huge increase in the volume of wood and timber products, with an extreme peak in 2011 of close to US\$2.2 billion. Figure 12 displays the trend of timber and wood product exports over the last 20 years. It shows a steady level until 2009, with exports composed of mainly round wood with some sawn wood and other products. Since 2014, there has been a fall in export values caused by a decline in availability, the log export ban, and reduced AAC. Timber can now only legally be exported through Yangon (with a minor concession from Myeik port in southern Tanintharyi).

Figure 12

Myanmar timber and wood product exports, 1997–2016



Source: FAO 2018

India and China are two of the largest importers of timber products from Myanmar. India has recently become a major (official) importer country. However, if unofficial trade is considered, then China is also a major importer of timber products, including charcoal. In 2013, 94 percent of Myanmar's timber product exports to China were registered in Kunming, the capital of Yunnan, a landlocked Chinese province bordering Kachin State in Myanmar. It is likely that all Myanmar timber imports registered in Kunming were transported overland through trade posts along the Yunnan border (MEITI 2019).

Estimates put the value of unlicensed or illegal timber exports at four times the documented value (Raitzer, Samson, and Nam 2015; UNODC 2015). In 2018, large volumes of timber were still reported to be exported illegally to China through the Ruili route, which partially explains the discrepancy of export data. In addition, large volumes of timber were not accounted for in formal logging activities of subcontractors (EIA 2019). China maintains customs statistics, and these appear to indicate a virtual end of overland illegal import of logs in the last two years (although the import of charcoal continues).

However, GDP figures only measure the formal economy, and NTFPs and wood fuel largely operate in the informal sector. Overall economic value of NTFPs is underestimated, as most of the collection and marketing is informal. Wood fuel remains the country's major energy source, and it is reported to be used for cooking and heating by up to 80 percent of households (although there is evidence that this is declining with the spread of electrification). It is also an important source of energy for small-scale industries. These significant sectoral contributions are not included in the GDP calculations, mainly due to lack of data.

1.2.2 Livelihoods

The forestry sector contribution to formal employment represents 4.1 percent of the total country's 2015 labor force (about 886,000 persons), employed by FD, MTE, and selected companies.

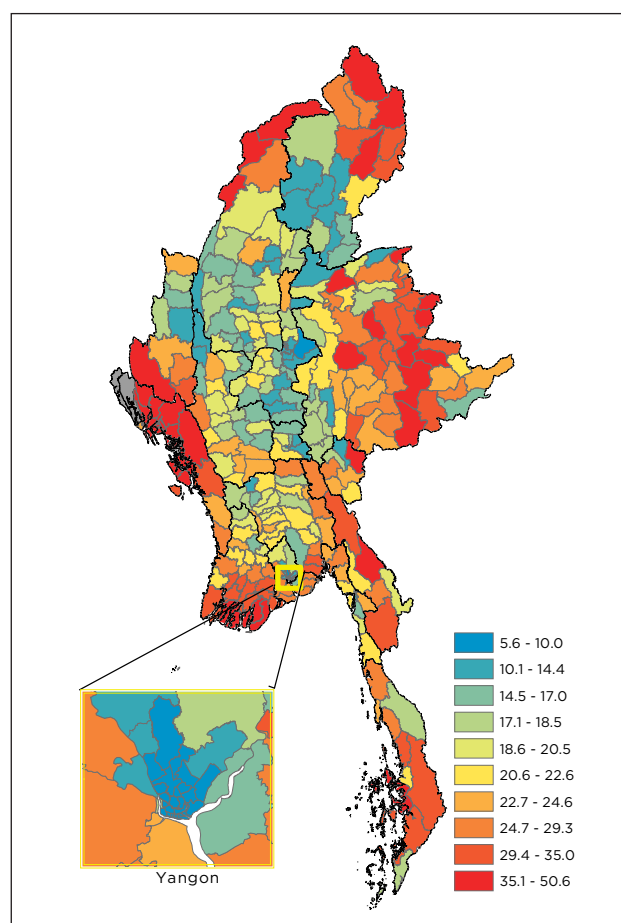
As yet, there are no comprehensive studies of forest dependent livelihoods in Myanmar.¹² However, in 2012, it was estimated that around 520,000 households in Myanmar are located in and around forests (Emerton and Aung 2013). Rural households depend on forests for a range of material benefits, ecosystem services, and cultural values (Tint, Springate-Baginski, and Gyi 2011). These include wood fuel, land for shifting cultivation, construction and timber poles, bamboo and rattans, fodder and forage for animals, wild foods, bush meat, medicines and other NTFPs, wood extraction processing and sales, and cultural values.

There does appear to be a strong correlation between the World Bank Group Multidimensional Disadvantage Index (MDI) and forest cover (World Bank 2018b). Especially, in upland ethnic areas where a large majority of rural households rely on fuelwood as a primary energy source and 63 percent of rural land is either forest or woodland. The MDI is an index of disadvantages by township, constructed using 2014 census data. This allows for the mapping of townships with greater than average, average, and lower than average disadvantage levels (World Bank 2018b). Figure 13 shows the MDI by township (greater than average disadvantages in red) and Figure 14 shows remaining intact forests by township.

¹² This gap could be filled by using the Living Standards Measurement Survey (LSMS) forestry modules and the LSMS-ISA trees on farm module which is especially useful for the agriculture-related perennial agroforestry activities.

Figure 13

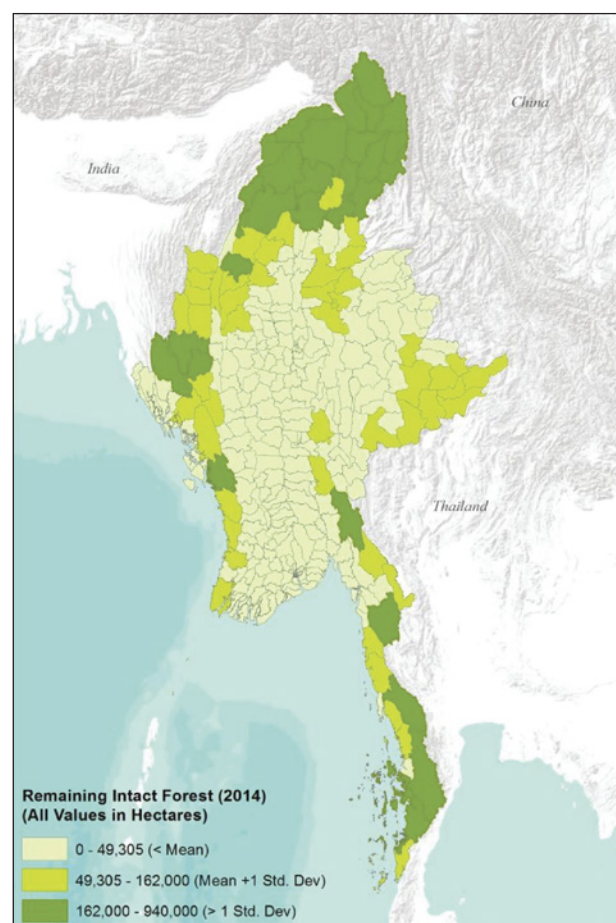
MDI by township



Source: World Bank 2018b, ; author calculations.

Figure 14

Remaining intact forests by township (2014)



Source: Bhagwat et al. 2017.

The annual value of NTFPs per household was estimated to be around MMK166,000 per person (Emerton and Aung 2013). This would accrue to households in and around forests giving an overall NTFP value to rural communities of US\$487 million for NTFP harvesting from terrestrial forests. Transferring evidence from other countries in the region for mangrove benefits, the study estimates an annual value of around MMK44,000 per ha, giving a total of around US\$20 million for benefits from mangrove forests.

Generally, women tend to be more engaged in subsistence forest product collection for domestic use, especially fuelwood and fodder collection. Men are often more focused on cash generation and employment and may migrate away in pursuit of income opportunities, leaving women-headed households with the 'double burden' of domestic tasks and farm management. Men tend to be more involved in dealing with outsiders, including FD staff (for example, village 'headman'). In addition, anecdotal evidence suggests planning and species choices in CF may not always adequately reflect women's aspirations.

There are several regional studies that also illustrate the importance of forests as major components of livelihoods across the various agro-ecological zones:

- In uplands, there is a range of forest uses, including shifting cultivation, agroforestry, hunting, and gathering (Vicol 2018).

- **In the Central Dry Zone (CDZ)**, pastoralism is more frequent, so forage and fodder are important. The wood fuel deficit had led to illicit trade from the edges of the CDZ, putting extra pressure on resources there. With perceived increasing aridity, forests play important local ecosystem service functions for the local microclimate (Forsyth 2018; Zin et al. 2019).
- **In coastal areas**, mangrove forests play a range of roles including maintaining juvenile fish habitats, coastal zone protection, and provision of particular forest products including roofing (nypa palm leaves) and smokeless charcoal. A recent study on livelihood use of mangroves in CFs found significant overall dependency on forests, particularly by the poorest, especially for wood fuel, timber, and NTFPs (Feurer, Gritten, and Than 2018).

1.2.3 Peace and conflict

Forest governance and governance of other natural resources is one among numerous issues in the peace process. The key issues relate to ethnic groups' aspiration for federal decentralization of forest governance and more equitable benefit sharing between the Union, State, Region, and locality, already recognized in the Pyingdasu Accord (2017).

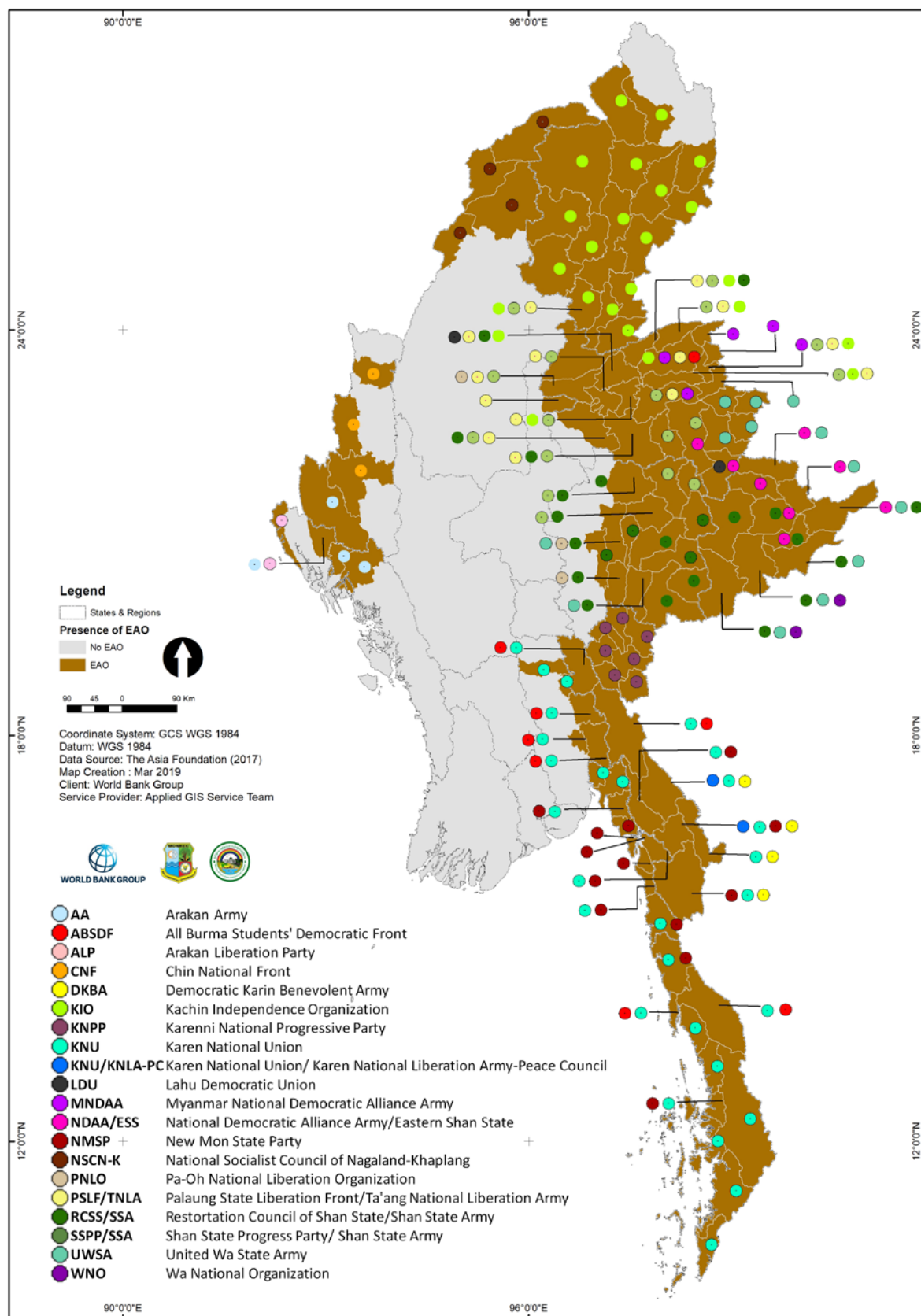
Forest resources can act as a 'resource curse' by encouraging conflict over the control of benefit flows, eroding peacetime institutions, and undermining the rule of law. Past militarization of forestry in contested areas, especially logging operations, has exacerbated conflict in some areas, and the military and ethnic armed organizations (EAOs) have used logging as means of generating funds.

In addition, around two-thirds of remaining forests are in ethnic areas, and in most of these areas there are strong grievances over past and even ongoing abuses (BMI 2018). These areas mostly remain militarized, either by the Tatmadaw, militias, or EAOs. Ongoing armed conflict is concentrated in the Rakhine, Kachin, and Shan states (Figure 15). Kachin State and Shan State are areas with extensive intact forest. In 2016, it was estimated that 118 out of 330 townships in Myanmar had been affected by active or latent conflict (The Asia Foundation 2017¹³).

¹³ <https://asiafoundation.org/2017/10/18/contested-areas-myanmar-key-findings-new-asia-foundation-study/>.

Figure 15

Presence of EAOs in Myanmar in 2016



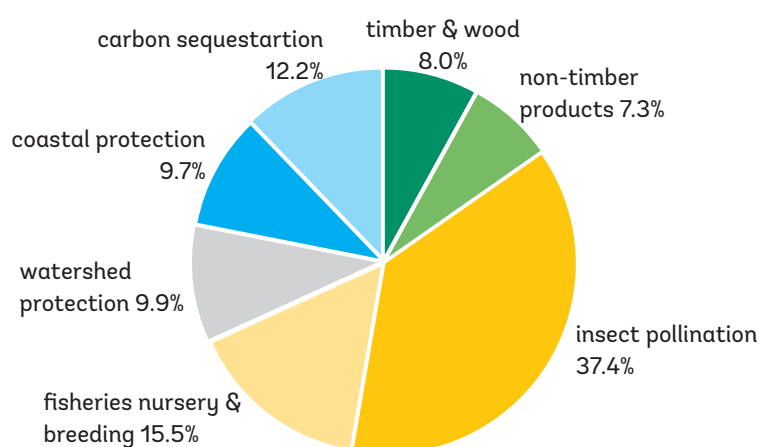
Source: The Asia Foundation 2017.

1.2.4 Forest ecosystem services

The annual value of forest ecosystem services is extremely high and estimated to be US\$7.3 billion (Emerton and Aung 2013). The largest contributions come from insect pollination supporting agriculture (37.4 percent) and mangrove fishery nurseries (15.5 percent) (Figure 16 and Table 2). Other forest ecosystem services include (a) carbon sequestration, (b) watershed protection, and (c) coastal protection. The authors make the point that the benefits of ecosystem services recur throughout the year on a continual basis, and while forest conservation may limit the short-term benefits, forests provide long-term benefits, whereas overharvesting increases short-term benefit flows but, at the same time, undermines the long-term flows.

Figure 16

Ecosystem services of forests



Source: Emerton and Aung 2013.

Table 2

Baseline values of forest ecosystem services

Ecosystem service	MMK billion	US\$ million
Timber & wood products	565.2	582.1
Non-timber forest products	492.0	506.6
Forest elephants	20.0	20.6
Terrestrial forest watershed protection	700.1	721.0
Mangrove coastal protection	686.6	707.1
Forest carbon sequestration	863.9	889.7
Mangrove fisheries nursery & breeding habitat	1,097.6	1,130.4
Insect pollination	2,649.2	2,728.3
Nature-based recreation & tourism	8.6	8.8
Total forest sector	7,083.0	7,294.6
Of which:		
Direct forest income	1,057	1,088.7
Value-added to production in other sectors	3,755	3,867.5
Domestic costs and damages avoided	1,407	1,448.6
Global costs and damages avoided	864	889.7

Source: Emerton and Aung 2013.

1.2.5 Disaster risk management

Watershed protection services are another important ecosystem service, and in Myanmar, their annual value is estimated to be US\$721 million (Emerton and Aung 2013). They also have a key role in managing seasonal river flow fluctuations and in maintaining water quality. Watershed forests reduce disaster risk by absorbing precipitation and releasing it more slowly. This lowers the risk of flooding during the rainy season and ensures that water continues to flow during the dry season.

Mangroves also play an important role in managing the risk of disaster. They are a crucial component of coastal protection, and yet these mangroves are disappearing. From 2000 to 2014, an estimated 14,619 ha of mangroves were lost every year in Myanmar, with an economic loss of US\$2.4 million per year in mangrove ecosystem services values (Estoque et al. 2018). Mangroves are found in the coastal regions of Rakhine State and Ayeyarwady and Tanintharyi regions. They provide a range of production and protection services, including timber, fuelwood, NTFPs, nursery and breeding grounds for fish, and protection from cyclones and storm surges.

This loss of coastal protection puts Myanmar at a greater risk to disaster. Myanmar is considered to be one of the countries most vulnerable to cyclones, flooding, earthquakes, and related tsunamis. Myanmar was ranked second out of 187 countries in the 2017 Global Climate Risk Index¹⁴ and has the fourth highest level of natural risk out of 191 countries in the INFORM Index for Risk Management.¹⁵ It is estimated that every year natural disasters cost Myanmar an average of US\$2 billion (3 percent of the GDP). For example, the estimated cost of the damage from floods and landslides in July–August 2015 alone was US\$1.51 billion (World Bank 2015a).

1.3 Legal and institutional framework

The key policy and legal framework in the forest sector comprises primarily the 2008 Constitution of the Republic of Myanmar, the National Forest Policy (1995), CFI (2016), the Forest Law (2018), Forest Rules (1995) and associated guideline, and the Conservation of Biodiversity and Protected Areas Law (2018). The recently amended CFI (2019) was released in May 2019 as the report was being finalized; its analysis is not included in the report.

In recent years, significant changes have been made to the legal and policy framework supporting CF in particular, resulting in a progressive enabling environment for the establishment of CF, CFUGs, and community forestry enterprises (CFE) across the country. It can be argued that the legal environment for CF in Myanmar is more advanced than the legal frameworks found in other countries in Southeast Asia (World Bank 2019d).

1.3.1 Policy, law, and regulations

The key policy, legal, and regulatory frameworks in the forest sector include the following:

- **2008 Constitution.** ‘Forests’ are included under Schedule 1 under Section 96, as a matter for Union legislation, rather than the State and Region level.
- **Forest Policy (1995).** It provides the framework within which forests are governed by the Union administration.
- **CFI 2016 revised (from 1995).** This is a detailed framework for the establishment and functioning of CF. The 2016 revision particularly emphasizes enterprise development and provides for commercialization of timber and non-timber CF products and services. The recently amended CFI (2019) was released in May 2019 as the report was being finalized; its analysis is not included in the report.

¹⁴ <https://germanwatch.org/en/download/16411.pdf>. Accessed February 14, 2018.

¹⁵ Inter-Agency Standing Committee and European Commission 2019. [http://www.inform-index.org/Portals/0/InfoRM/2019/Inform percent202019 percent20WEB percent20spreads percent20\(3\).pdf?ver=2019-02-07-113610-123](http://www.inform-index.org/Portals/0/InfoRM/2019/Inform%20percent202019%20WEB%20spreadsheet%20(3).pdf?ver=2019-02-07-113610-123). Accessed February 25, 2019.

- **Forest Law (2018), Forest Rules (1995 - under revision), and associated guidelines.** These set out legal basis of forest land administration and production of forest products. The Rules of the new Forest Law have been drafted and are under public consultations.
- **Conservation of Biodiversity and Protected Areas Law (2018).** The objective is to implement the government policy for conservation of PAs. The rules to guide implementation of the law have been developed and are under public consultations.

1.3.2 National programs

The MRRP (2017–2026) sets out a plan to prevent deforestation and degradation of forests while enhancing efforts for reforestation, including the establishment of plantations, for the recovery of Myanmar’s forest cover. The MRRP includes ambitious targets to restore close to 1 million ha of degraded and deforested land within the PFE by 2026. This plan is to be achieved through a combination of plantations, CF, agroforestry, natural forest regeneration, and enrichment planting activities.

Other national programs have been developed for the forestry sector and are currently being implemented. These include the following:

- **The NFMP (2002–2031).** It was developed to cover all forest-related activities, including wildlife and nature conservation, for the whole country.
- **Integrated Plan for the Greening of CDZ (2002–2031).** It covers current land use status, soil management, development of water resources, reforestation, natural forest management, training, research and extension, development of wood fuel substitutes, infrastructure development, and institutional strengthening
- **Nationally Determined Contributions (NDC).** The Myanmar Climate Change Strategy and Action Plan (MCCSAP) (2016–2030) and its NDC set in 2017 spell out a broad vision of how to address climate change. Forestry is a key pillar of Myanmar’s NDC, for both protection against extreme events and preservation of biodiversity.
- **MSDP.** Forestry development plays an important role in achievement of goals under the MSDP Pillar 3, People and Planet, in particular its Goal 5, Natural Resources and Environment for National Posterity.

Myanmar is also a signatory to the UN Convention on Biological Diversity (1992). It is through this that the five-year National Biodiversity Strategy and Action Plans (NBSAPs) are developed. The current NBSAP (2015–2020) prioritizes launching an initiative to restore millions of hectares of forest that are commercially exhausted and subject to conversion to plantations or agriculture.

Myanmar has an ambitious goal for expansion of its protected forest area, as set out in the Forest Policy (1995) and the NFMP. The NFMP includes a target to increase the PA network to cover 10 percent of the land area by 2030. The NBSAP defines a strategy for establishing seven additional PAs, taking total coverage from the current 5.75 percent to 7.82 percent by 2021.

The National REDD+¹⁶ Strategy is currently being consulted and is expected to be finalized in mid-2019. This will lay out the management framework, drivers of deforestation, and mitigation strategy for the implementation of REDD+.

The National Strategy and Action Plan for mangrove conservation and coastal management and Inle Lake Watershed Conservation Action Plan also have relevance to forestry.

¹⁶ Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks.

1.3.3 Land policy

Forest governance is also closely linked to land and agricultural policies.

- **Master Plan for the Agriculture Sector (2001–2031).** It aims to convert about 4 million ha of ‘wasteland’ for private industrial crop production, with rubber, oil palm, paddy, pulses, and sugarcane, primarily for export.
- **Farmland Law (2012).** It provides legal basis for issue of tradeable private titles.
- **VFV Land Management Law (2012, amended 2018).** It defines ‘VFV’ land, what was previously ‘Land at Government Disposal’—including the unclassified forest areas. It is a residual administrative category of lands not under private or state ownership. However, this law does not yet provide for recognition of prior customary rights, which is the prevalent de facto tenure system across ethnic areas.
- **National Land Use Policy (2016).** It was developed through a consultative process to try to unify the policies and laws across the sector. ‘Customary land rights’ have been recognized under Chapter 8 of the policy. The National Land Law is currently under preparation.

1.3.4 Peace and conflict

As large parts of remaining forests are in ethnic areas, resolving conflicts is crucial for achieving effective enabling conditions for sustainable forest management. EAOs such as the Kachin Independence Army (KIA), Karen National Union (KNU), and Karen National Liberation Army (KNLA) have a strong presence on the ground. Due to the ongoing conflict, EAOs have developed administrative mechanisms. These have recently been formulated into policies as follows: (a) KNU - Land Policy 2015 and Forest Policy 2015, (b) KNLA - Karenni Land Policy 2016, and (c) KIA - Kachinland Forest Policy (Draft). The KNU has also established CFs.

1.3.5 Institutional arrangements

MONREC Union Minister’s Office coordinates and facilitates the tasks of the FD, the MTE, Dry Zone Greening Department (DZGD), ECD, and Survey Department as well as other line ministries / institutions. It mainly deals with policy matters related to forestry. The roles and responsibilities of key departments, under the MONREC, that directly relate to forestry are summarized below:

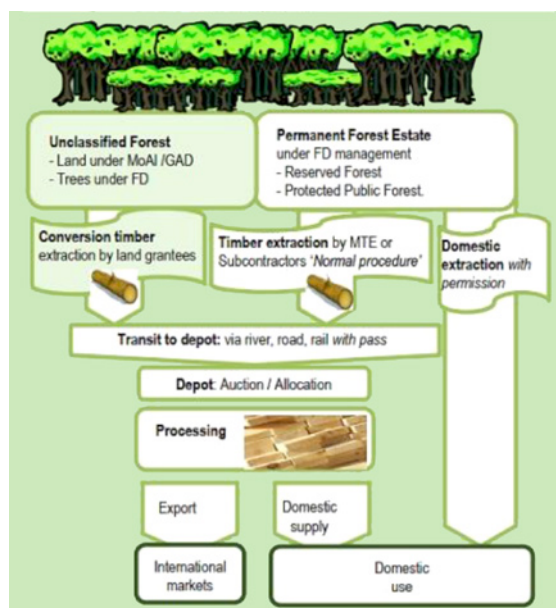
- **The FD is the primary agency responsible for forest management.** The FD, under the MONREC, is responsible for sustainable forest management, biodiversity conservation, restoration of degraded forests, watershed protection, CF, mangrove conservation, and research and development. It has 10 divisions and the Forest Research Institute under the FD headquarters and territorial offices across the country. The FD State / Regional offices consist of a Regional Director and rangers who are responsible for coordinating and implementing the field activities within the respective State / Region.
- **MTE.** The MTE is the only state-owned economic enterprise (SEE) in the forest sector. Historically, it has been at the center of the official administration of timber harvesting and marketing. The responsibilities of the MTE include timber harvesting, milling and processing, and marketing. The MTE has also recently initiated the elephant conservation based tourism activities..
- **DZGD** is responsible for greening the densely populated central dry zone of Myanmar, through rehabilitation of degraded forest lands, protection and conservation of remaining natural forest, and restoration of the environment.

1.3.6 Timber management system

The principal silvicultural system practiced in natural forests is the **Myanmar Selection System (MSS)**, which dates back to colonial times (Figure 17 shows a simplified flow). For harvesting and export purposes, forest products are classified into two categories: (a) 'teak' and (b) 'other hardwoods', a distinction significant in trade regulation.

Figure 17

Simplified timber flow system



Source: Springate-Baginski, Treue, and Htun 2016

Timber production in Myanmar is regulated by the following rules and regulations:

- Logging Rules (1936)
- Extraction Manual (1948)
- State Timber Board Act (1950)
- Standing Orders for Extraction Staff of MTE (1970)
- National Code of Forest Harvesting Practices (2000).

The FD holds the mandate to manage land in the PFE and also to manage forest on land at the disposal of the Government. Non-PFE land is administered by different relevant agencies, including the MOALI, and the General Administration Department (GAD) under the Ministry of office of the Union Government (formerly Ministry of Home Affairs (MOHA)).

Timber is produced and extracted according to AAC prescribed in the 10-year district forest management plans. AACs are based on systematic inventories of the forest stands.

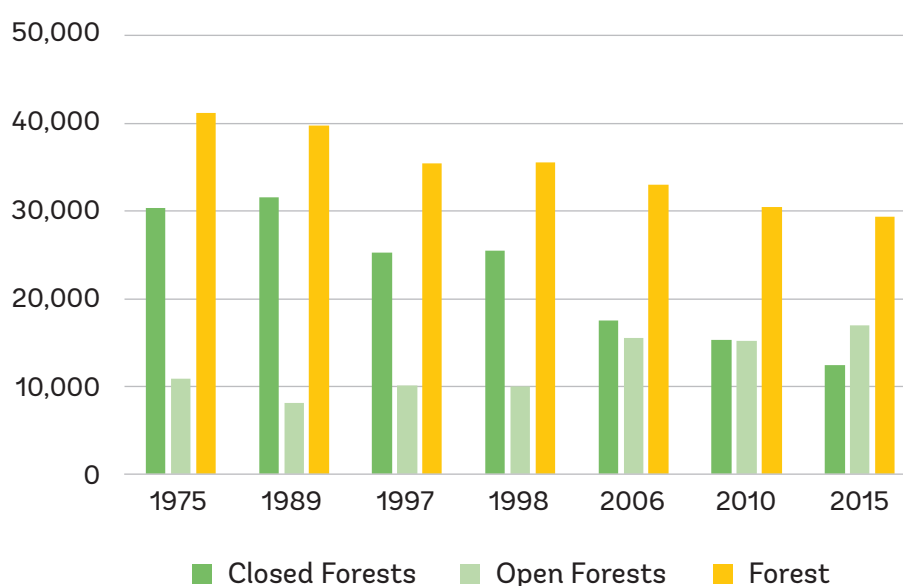
1.4 Issues and challenges

1.4.1 Forest loss

Since 1975, Myanmar has lost a significant amount of its forest cover. Between 1975 and 2015, forest cover went down from more than 61 percent of land area to 43 percent of the total country area, 41,196 million ha to 29,388 million ha, a loss of 11,808 million ha (Figure 18). 'Closed forests' fell from almost 45 percent of land area in 1975 to around 18.3 percent in 2015, reflecting severe forest degradation.

Figure 18

Forest cover change, 1975–2015



Source: FAO 2015, 2016.

Between 2010 and 2015, Myanmar had the third largest absolute forest loss in the world, which confirms a deteriorating situation. During this period, the rate of forest loss increased to 1.8 percent annually (approximately 407,000 ha). From 1990 to 2015, the forest cover declined at an average rate of 1.2 percent per year, around 10 million ha in total.¹⁷

From 2002 to 2014, the rate of decline in 'intact forests' (over 80 percent density) was 0.94 percent per year, amounting to over 2 million ha of intact forest loss (Bhagwat et al. 2017). This study indicated that forest loss was widespread, but with concentrated cases in Northern Shan, Kachin, Tanintharyi, Southern Chin, Southern Bago, and Southern Rakhine.

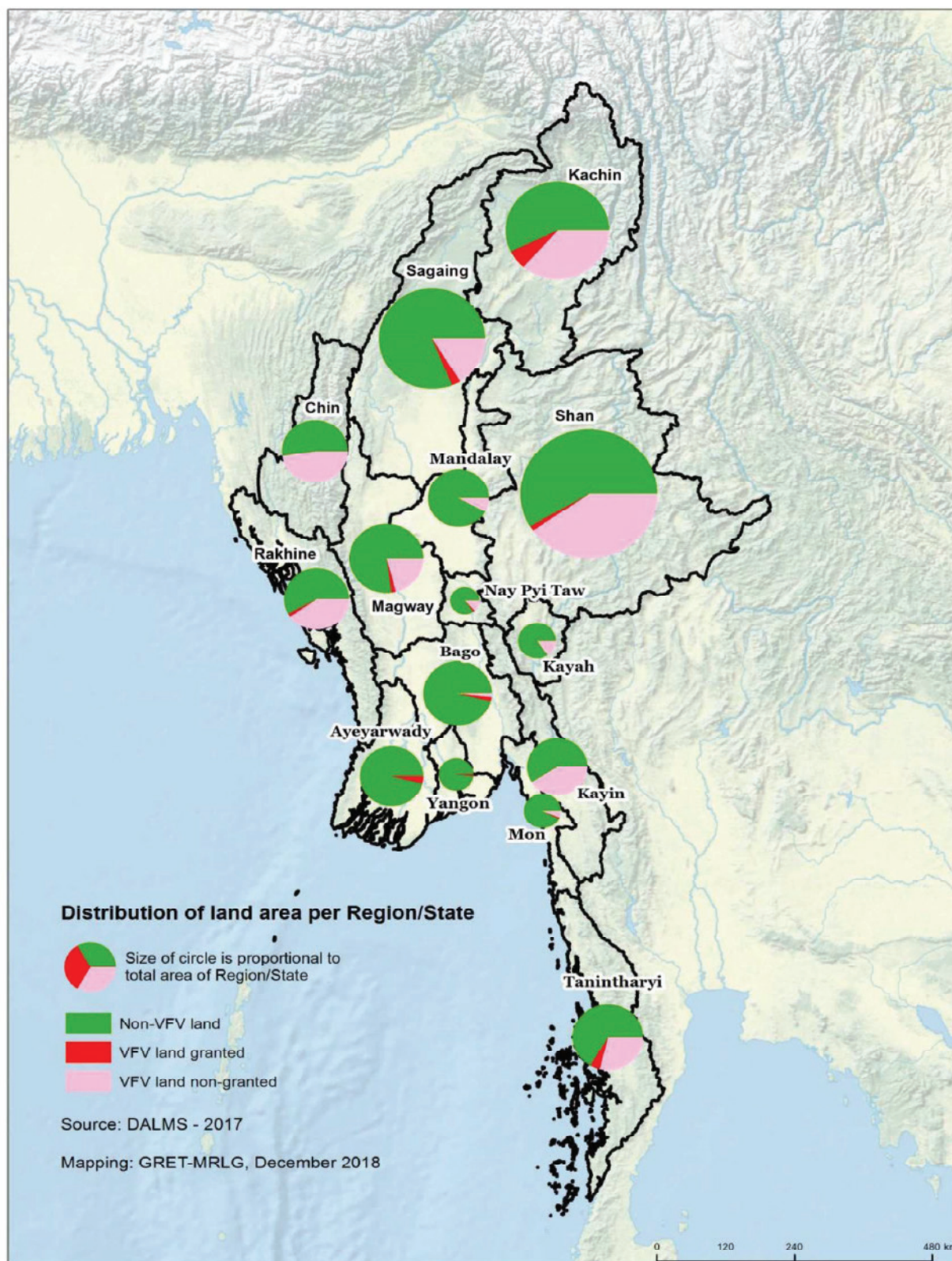
Changes appear to be most extreme in not only conflict areas such as Kachin and Shan but also in Sagaing where there has been extremely heavy logging pressure (Bhagwat et al. 2017). Between 2000 and 2014, 11.73 percent of forests outside reserves degraded compared to 10.31 percent inside reserves (Treue, Springate-Baginski, and Htun 2016).

It is estimated that over-extraction accounts for 23 percent of loss of 'intact forests', whereas 50 percent of loss is accounted for by land use change to mining, agriculture, and infrastructure (Bhagwat et al. 2017).

¹⁷ Inter-Agency Standing Committee and European Commission 2019. [http://www.inform-index.org/Portals/0/InfoRM/2019/Inform percent202019 percent20WEB percent20spreads percent20\(3\).pdf?ver=2019-02-07-113610-123](http://www.inform-index.org/Portals/0/InfoRM/2019/Inform%20percent202019%20WEB%20spreadsheet%20(3).pdf?ver=2019-02-07-113610-123). Accessed February 25, 2019.

Figure 19

Distribution of land classified as VFV and remaining forest



Source: Groupe de Recherches et d'Echanges Technologiques (GRET) / Mekong Region Land Governance (MRLG) 2018

A considerable extent of forest is still located outside the PFE on VFV lands, of which parts are under customary management. There is currently no 'customary land' category that provides for recognition of customary tenure rights. Recognizing customary tenure or providing other acceptable types of tenure security will be essential for the protection of the remaining forests outside the PFE. Figure 19 shows the status of (a) non VFV land, (b) VFV land granted, and (c) VFV land not granted in States / Regions.

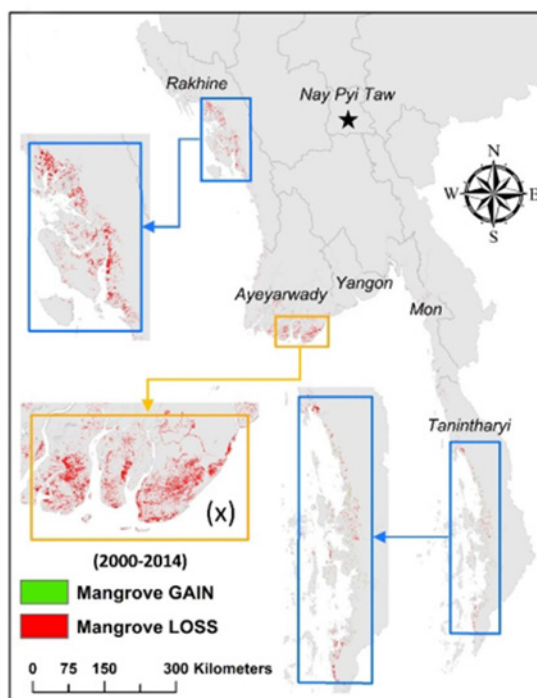
Inconsistencies remain between policies and laws across different sectoral ministries in relationship to VFV land. There are competing policy targets for VFV land between the Department of Agricultural and Land Management Statistics (DALMS) that promotes agricultural land use and the FD seeking expansion of PFE. This is a particular challenge in ethnic areas, including Kachin, Shan, Tanintharyi, Chin, and several other states. The lands being categorized as 'VFV' lands are often forested landscapes under customary or community management, mainly in ethnic states. The implementation of the VFV Law (2018) may, therefore, override established customary community forest management, and potentially lead to conflict.

1.4.2 Mangrove loss

From 2000 to 2014, Myanmar had a net mangrove loss of 191,122 ha (Estoque et al. 2018). Since 2000, Myanmar has been losing mangrove forest cover at an alarming rate of 2.2 percent per year (14,619 ha). The loss was predominantly in Rakhine State and the Ayeyarwady Region (Figure 20). The observed mangrove forest cover loss has resulted in decreased evapotranspiration and loss of carbon stock and tree cover. The main cause of this loss is the expansion of rice cultivation. This is estimated to account for nearly 88 percent of mangrove loss between 2000 and 2012 (Richards and Friess 2016), and only 1.6 percent of mangrove deforestation could be attributed to aquaculture.

Figure 20

Mangrove change 2000–2014



Source: Estoque et al. 2018.

1.4.3 Drivers of deforestation

The primary drivers of deforestation are as follows:

- **Land use conversion (primarily for agriculture and mining).** An estimated 1 million ha, both in and out of the PFE is estimated to have been converted for commercial plantations and mining between 2002 and 2014 (Lim et al. 2017). It is estimated that 27 percent of forest loss was attributed to large-scale plantation crops (oil palm, rubber, and sugar) (Bhagwat et al. 2017). Mining accounts for at least an estimated 46,000 ha of forest loss, almost all in Kachin, Sagaing, and Mandalay (Connette 2016). Poor governance of the mining sector, particularly jade, has led not only to deforestation but also to pollution and, in some cases, to social conflict. For example, most of the deforestation along the Uyu and Chindwin rivers in Homalin township was caused by illegal [and legal] surface mining (Bhagwat et al. 2017).
- **Development of roads and other infrastructure** in closed forest and high-priority conservation areas. The increase in dams and reservoirs has also had a negative effect on forests. Bhagwat et al. (2017) estimates that hydropower and irrigation reservoirs account for about 70,000 ha of the 2 million ha of intact forest loss over the period 2002–2014 (Treue, Springate-Baginski, and Htun 2016). The International Finance Corporation (IFC) Strategic Environmental Assessment (SEA) of the hydropower sector estimated 139,400 ha could potentially be inundated by dams currently under construction and a further 253,300 ha from proposed projects (IFC 2018).

1.4.4 Drivers of forest degradation

Conversion of forests to other uses is the main cause of deforestation, but it largely takes place in already degraded forests. For degraded forests, **overlogging** is often the first stage, leading to degraded forests rendered accessible through opening up of logging roads. **Informal extraction of timber and fuelwood** can follow, continuing the degradation process (Treue, Springate-Baginski, and Htun 2016). Forest degradation is driven mainly by the following:

- **Unsustainable extraction of timber.** Since the 1970s and until recent years, formal commercial timber extraction volumes, especially of teak, had exceeded the estimated AAC.
- **Illegal logging.** A review of the export of unauthorized harvests indicated a 47.7 percent illegal logging rate between 2001 and 2013 (Enters 2017).
- **Wood fuel production.** The Food and Agriculture Organization (FAO) estimates for annual total annual wood fuel consumption is 38.2 million m³ (FAO 2018a). Natural forests are considered to be the primary source for fuelwood, which is estimated to be around 80 percent of all wood extractions from forests based on aggregate FAO data of 2017.¹⁸

Commercial timber has been extracted in huge volumes over the last century, both teak and other timber species. In recent decades, timber extraction has consistently exceeded the AAC. For 2015/16, official extraction levels are stated as 60,052 tons for teak (just over 11 percent of the 2009/10 levels), and 619,742 tons for other tree species (around 23 percent of 2009/10 levels). Most of the recent extraction comes from (Upper) Sagaing (66 percent of hardwoods and 46 percent of teak).

¹⁸ Figure based on FAOStat data for aggregate national wood production for different products by ton or approximated at 0.75 ton / m³ for data comparison.

1.4.5 Wood fuel production

Some reports estimate wood fuel extraction as by far the biggest single extraction demand on forest biomass, significantly greater than timber. The scale of wood extraction, to meet domestic as well as transborder demand for fuelwood and charcoal, is extremely concerning due to the severe pressure it puts on forests. The situation is made worse by poor regulation. However, total national demand for domestic wood fuel has not yet been assessed systematically.¹⁹

Wood fuel is the primary fuel for as much as 95 percent of rural domestic energy needs (cooking and heating needs), and estimations range between 60 percent and 80 percent of total energy consumption. Wood is the largest source of biomass energy, most of which is sourced from natural forests (ADB 2014).

1.4.6 Forest products and value chain issues

Before the introduction of the log export ban, round wood exports, especially teak, were the dominant commercial forest product in Myanmar. Since 2014, teak and other species have been required to be processed before export. The Forest Product Strategy 2015–19, developed by the Ministry of Commerce, lays out an action plan to improve processing capacity in support of export-oriented companies. The lack of reliability, pricing and quality of upstream supplies, poor skills and capacity of the industry, lack of transparency, and changing taxes were identified as challenges.

Teak is the most recognizable and relatively fast-growing species with significant, albeit long-term, investment opportunities. Overextraction and a global supply gap are driving high global demand and high prices internationally and nationally. However, there is concern over low product quality and poor silvicultural practices. In addition, buyers consider the quality of plantation teak to be significantly lower than teak from natural forests.

At present, most of wood processing is undertaken by small and medium enterprises (SMEs). Those smaller processing industries suffer from lack of a cohesive business environment, lack of credit financing, and regulatory complexity. Access to timber is challenging, market information is scarce, and productive infrastructure (labor, skills, logistics, and electrification) is still poor. Accessing timber through timber auctions (from plantations, conversion forests, and RF) does not provide the possibility for long-term planning, as prices, quantities, and species are often unpredictable.

Myanmar has around 1,783,800 ha of natural bamboo forest areas (either pure stands or mixed with forests). These are found particularly in Bago Yoma (estimated 819,500 ha), Rakhine (777,000 ha), and Tanintharyi (187,300 ha). Bamboo is also cultivated in many areas by farmers and grows widely in disturbed forest areas across the country. It is estimated that bamboo grows across a total of over 14,300,000 ha of the country. There are 18 species of bamboo of commercial importance in Myanmar. Internationally, demand for bamboo is increasing for application in diversified products such as flooring, chopsticks, charcoal, and construction material.

¹⁹ The team understands that there is currently a detailed wood flow study ongoing in Myanmar under European Forest Institute which should provide more accurate figures and perhaps insights into how best to manage the issue.

1.4.7 Scaling up CF initiatives

The scale-up of CF has been hampered by limited capacity and financial resources. A recent assessment of 104 CFs established during 2015–2018 found that the CF establishment process—such as consultations, establishing CFUGs, identifying CF areas, submitting CF application, developing CFMP, and the issuing CF certificate by the FD—took an average of 255 days to complete. Each process involved 65 working days from the FD and NGO staff and cost approximately US\$3,600, not including FD and NGO staff costs. To address the capacity gaps, new competencies that emphasize social inclusion, community engagement, livelihood development, and enterprise development are needed. The formation of network of CFUGs may also help address capacity gaps, through peer-to-peer learning (World Bank 2019d).

The CF is currently implemented through a handover agreement, based on a 30-year lease to communities. In practice, this has often led to the development of CFMPs with a 30-year plantation, getting in the way of more diversified approaches to CF management. Rural households also need rapid returns that non-wood crops may offer to encourage them to invest in more long-term revenues from reforestation or timber plantations.

A challenge to sustaining commitment to CF often arises due to the quality of forest resources that are provided to communities. Communities are often given tenure to degraded forests, providing limited tangible short-term benefits. In addition, extension services tend to focus on forest rehabilitation, and CFMPs focus too much on timber management. Meanwhile, little attention is paid to developing local livelihoods through agroforestry and NTFPs.

In self-administered or contested areas, issues still remain related to land tenure and authority for management of natural resources. In these areas, households and communities often need registration certificates from both GoM authorities and EAOs. For example, the KNU has developed their own forest and land policies, making FD-led establishment of CF in these areas more challenging. These lands are also typically under customary tenure systems, yet effectively categorized as VFV land. This can result in conflict over recognition of prior customary land claims. As a result, there is a risk that expanding CF on ethnic customary lands can be seen as extending the union government's jurisdiction over ethnic areas (ECDF 2016).

1.4.8 Community forest enterprises (CFE)

Forest products with high potential for enterprise development include bamboo, timber, rattan, charcoal, and firewood. Other products for commercialization include a range of agroforestry products (for example, coffee, Sterculia gum, and elephant foot yam starch) and services such as nature-based tourism. Across Myanmar, opportunities for CFE development vary according to location, reflecting, for example, the different agro-ecological conditions, tenure rights, security, livelihood needs, and market access. While there is significant potential for diversifying CFEs into a range of products, currently there is high interest in bamboo and timber plantations (Elson 2016).

However, this kind of enterprise development faces many challenges. It is sometimes difficult to access finance (especially loans). Access to market information is also limited, as are resources such as technology. At the same time, alternative informal lending sources tend to have crippling interest rates. Limited access to finance is compounded by the fact that only 25 percent of rural dwelling adults have a bank account and only 19 percent of CFUG members reported having savings. This too constrains their overall ability to invest (Lin et al. 2019).

Another limiting factor for market opportunities is related to inadequate physical assets. For example, many communities lack sealed road access to markets or access to the electricity grid. This limits the market opportunities for value-added CF products. However, these obstacles are expected to be addressed through a number of ongoing and planned state and non-state driven investments in road and energy infrastructure.

Competitive small-scale financing as well as wider business development support is urgently needed. The establishment of associations or cooperatives between CFUGs could greatly facilitate the access to resources to increase efficiency in livelihood activities, while also strengthening the negotiating position of the members as they sell their CF products and services. Coordination with agricultural extension services can improve agroforestry and tree-based productive systems.

1.4.9 FD capacity - Staffing levels

The FD staffing levels are significantly lower than needed to implement a sustainable forestry agenda. Currently, permanent staffing of the FD is approximately 8,000, and the department has 7,400 vacant positions (see Table 3). However, it is supposed to have more than 15,000 employees. FD staffing is also much lower than planned due to budgetary limitations.

Table 3

FD staffing, planned and current (2018)

Position	Number planned in organizational structure	Currently recruited	Vacant
Officer	538	482	56
Staff	14,911	7,554	7,357
Total	15,449	8,036	7,413

Source: World Bank 2019b

The staffing levels, skill, and competencies of the FD need to be assessed to inform future composition, capacity building, and training plans. After decades of a highly centralized governance system and technical implementation of forest management by the FD, current programs will need to orient themselves more on partnership building with private sector, civil society organizations (CSOs), communities, ethnic groups minorities, and other stakeholders. This will demand a new set of skills, especially at State, Region, and local levels.

At the same time, MTE's overcapacity represents a challenge for the MONREC. Staffing of the MTE is estimated to currently be around 15,000. There are also thousands of forest laborers. With declining availability of viable forest management areas and reduced AACs, the demand for forest extracting and processing had declined. The role of the MTE in the future may need to be reformed.

1.4.10 FD capacity - Enforcement

In the past, the FD has not had the capacity to effectively control illegal logging and over-extraction. Organized crime and illegal networks were, and to some extent still are, influential actors. As a result, many accessible forests have been stripped of their most valuable timber (both legally and illegally), and in some areas of almost all their trees (for example, western areas of Bago Yoma). There are several regional well-known but difficult to tackle hot spots of illegal timber trade, for example, cross-border traffic from timber harvested in Sagaing and Kachin exported illegally to China. Wildlife and charcoal trade are other illegal activities affecting sustainable forest management.

According to the FD, more than 250,000 tons of teak and other hardwoods were seized over the past seven years (Irrawaddy 2018). Despite such data on illegal timber confiscation, it is impossible to estimate what proportion of the illegal timber trade is actually being seized and if progress is made overall or not with combatting the illegal timber trade. As a reference, FD data indicate a fluctuating level between 25,000 tons and 55,000 tons seized per year over the period 2001–2013. More recent reports indicate increased volumes, with 160,000 tons of timber seized in 2015.

Staffing levels and resources capacity are still too low in relation to effective law enforcement. FD field staff lack capacity for enforcement and for self-defense. They also lack vehicles and fuel budget and supporting technology to allow staff to detect, track, and ultimately transport confiscated timber.

Effective control mechanisms will need additional field staff, logistical support, and training. They will also need improvement along the entire value chain, better information systems (including financial tracking), citizen engagement tools, strengthened collaboration with other national agencies (judiciary, customs, police, and communities), and support from international collaborators.

1.4.11 Limited funding for PAs

PA network funding does not adequately cover all management needs. In the last decade, both government and international funding for PAs has increased significantly. Government funding has risen by about 50 percent in real terms between 2010 and 2015, and externally funded grants and projects committed almost US\$20 million in 2014. However, funding gaps remain. Only half of PAs have a dedicated budget or staff. Even PAs that do receive regular funding are, for the most part, unable to cover the costs of basic infrastructure, equipment, maintenance, and operation. Comparative studies from other Association of Southeast Asian Nations (ASEAN) countries suggest an annual budget of US\$130 per 100 ha is needed—three times the level of funding available to the PA system in Myanmar in 2015 (MOECAP 2015).

In addition, the current FD staff has limited capacity to manage the expanding PA network. The Nature and Wildlife Conservation Division (NWCD) has about 500 staff, of which 450 are on the ground in only 23 of the existing 43 PAs.

Private funding of biodiversity conservation has been largely absent too, with the prominent exception of the Tanintharyi Nature Reserve established in 2005. The reserve is funded by the gas companies that run three pipelines across the area. Their main aim is to compensate for some impacts on biodiversity caused by the pipelines and support facilities.²⁰

However, PAs also provide great economic opportunities in the form of ecotourism and cultural tourism. Many areas in Myanmar are highly attractive for further developing this kind of tourism. The Greater Mekong Subregion (GMS) has received increasing volumes of ecotourists, and it is important to put Myanmar's PAs on the tourism operators' map. At the same time, the appropriate management framework needs to be in place to take advantage of this potential income stream: (a) provide basic infrastructure, including water, access, and others; (b) build a revenue management stream, including benefit sharing; (c) support overall PA governance; and (d) build capacity of rangers and local population.

²⁰ <http://www.tnrpmoecaf.gov.mm/about>.

1.5 Current context for action

The forest sector in Myanmar is currently undergoing dynamic political and economic reform. As a result, there is hope that the wealth Myanmar receives from its forest resources can be leveraged for greater economic opportunity as well as for the benefit of rural communities. There is also hope that these reforms will help facilitate the national process of peace and national cohesion. About two-thirds of remaining forests are located in a conflict area. A shift to a more inclusive and people-centric approach to forest management could result in critical contributions to the road to peace.

The government has also identified forestry as a key pillar of Myanmar's NDC. It recognizes the important role of forests in increasing resilience against extreme events, including the impact of floods and droughts, and for preserving biodiversity.

However, at present, Myanmar's forest resources are still declining. In the recent period, Myanmar had the third biggest annual loss of forest in absolute terms (estimated at 536,000 ha in 2010–2015) after Indonesia and Brazil. The situation has improved after adopting the log export ban and other governance reforms. However, due to lack of available data, it is difficult to measure the impact over the last few years.

In 2016, the government initiated the ambitious US\$500 million MRRP (2017–2026). This program aims to reverse deforestation and forest degradation trends. It also aims to restore forests across several regions and ecosystems, including through the establishment of state-owned and private plantations.

The most progressive target of the MRRP is the establishment of CF. CF will build the capacity of communities to plan and manage their forest resources according to an agreed management plan. However, despite its relatively ambitious targets, the MRRP will only be able to offset about 15 percent of projected forest loss over the period of the program (assuming linear progression of current deforestation rates). This highlights why scaling-up efforts are so important.

In addition to the MRRP, a series of important policy measures and commitments were approved to address forest loss and degradation:

- **2014 - A raw log export ban** was announced, requiring all log exports to be processed.
- **2016/17 - A temporary logging ban** was introduced as part of the National League for Democracy (NLD) 100-day plan.
- **2016/17 - A 10-year logging ban in the Bago Yoma Region** was introduced.
- **2016 - The CFI (2016)**, initially issued in 1995, was significantly revised. The recently amended CFI (2019) was released in May 2019 as the report was being finalized; its analysis is not included in the report.
- **2018 - The Forest Law (2018)**, which was newly enacted, allows ownership of teak and other previously restricted high-value species, laying out more flexible zoning within the different land classifications (RF and PPF) of the PFE, confirming formal legal authority to MONREC for CF rollout, and allowing commercialization of timber-based CF.
- **2018 Conservation of Biodiversity and Protected Areas Law (2018)** potentially enables a greater role for communities to form community conserved PAs and to benefit from potential income through PES systems.

The World Bank's Program on Forest (PROFOR)²¹ sees an increasing timber supply gap over the coming years based on increasing demand for wood products. At the same time, loopholes for illegal timber import will be closing as most producer countries will commit themselves to timber legality assurance system (TLAS). Major

²¹ [https://www.profor.info/sites/profor.info/files/Productive percent20forests percent20booklet percent20-updated.pdf](https://www.profor.info/sites/profor.info/files/Productive%20forests%20booklet%20updated.pdf).

consumer markets, including China's timber industry, are pushing into the same direction. Although this is good news for Myanmar, it also means that key policy reforms need to be advanced.

Myanmar has huge potential to become a more important player in regional and global timber markets and respond to the demand of a 21st century wood-based economy. There is vast opportunity to transform and improve the performance of the sector, including uplifting wood-based timber industries with technology transfer and modernization.

Myanmar holds the largest expanse of natural forest in the region, providing a strong basis for sustainable forest management of its unique high-value timber stock. This rich natural resource has the potential to benefit the economy, boost job creation, contribute to livelihood sustenance, and provide critical environmental services. Moreover, Myanmar's forest-related public sector agencies and sector-relevant research institutions further boost significant human resources with good technical forest management and planning capacity.

To leverage Myanmar's potential for reviving its legendary forest sector, business as usual is no longer viable and significant transformation and modernization of the sector is needed. The impetus for such transformation is already present, and there is a recognition for the need of reform. In the case of the MTE, which is the only state-owned enterprise with legal right to timber extraction, reform process is about to start.

CF, as well as new community-based conservation models proposed through recent policy reform, provides opportunities for large-scale forest restoration through a multi-purpose landscape approach that better reflects the diverse range of social, institutional, land, and resource conditions. Such landscape approach offers a more people-centric approach to forest restoration, taking into account mixed forestry and agriculture livelihood models that create increased social benefits, while also restoring ecosystem functions. Strengthened legal and institutional foundations, in particular provisions for productive use and value addition enterprise development from timber and non-timber CF products and services, have resulted in significant uptake of CF over the last few years, with the total area under CF doubling since 2016 after decades of slow progress in rollout.

Despite the recent dynamics in support of CF, Myanmar's national target of 3 percent of total forest area is still comparatively low when compared to international best practice. Globally, almost one-third of the world's forest area is now estimated to be under some form of community-based management, and regional data show that 34 percent of total forests is under community-based management regimes in East Asia and the Pacific (FAO 2016c).

Expanding and accelerating CF and other community-based conservation models must be a priority. These models have huge potential to engage local communities into the efforts toward meeting national policy targets for forest rehabilitation, reforestation, and forest conservation. At the same time, they contribute to increased land and resource tenure security of communities over their customary lands and protection of local livelihood assets. This is particularly urgent for mangrove ecosystems, which have declined dramatically over the past decades and have higher average annual loss rates (2.2 percent) than other forest types. With in-country evidence showing improved community-led governance of mangroves as a result of CF, there is opportunity to curb current mangrove deforestation trends through community-based management and protection.

At present, only 41 percent of Myanmar's forests is located inside the PFE, while most of the forest area is located on land designated as VFV under the administration by DALMS. These unclassified forests outside the PFE on VFV land are typically under customary community management. However, without statutory recognition of customary tenure, they are at risk from land use change through expansion of agricultural concessions and appropriation through VFV laws, as well as from informal extraction. CF provides a means to provide tenure security for these unclassified forests for a 30-year renewable term, although approval of CF on VFV land has thus far proven to be challenging in the context of overlapping authority between DALMS and the FD. Similar ambiguity remains regarding competing policy targets for expansion of agriculture on VFV land versus expansion of the PFE, including for protection purpose.

Building stronger relationships between government, civil society, and other actors, including the private sector, will be essential to promote peaceful and sustainable governance on forests across the landscape. Multi-stakeholder processes that are inclusive, participatory, and cognizant of local conflict dynamics are needed to prevent tensions that can arise from forest conservation and restoration initiatives. In this context, a considerable shift in skills development will be needed to develop and implement a more people-centric public sector culture emphasizing outreach and engagement and develop models for improved sharing of benefits derived from forests with local communities in a more equitable way.

Ethnic communities' aspirations for peace, self-determination, cultural preservation, and environmental sustainability are reflected in local initiatives supported by ethnic organizations. Many conservation and forest management initiatives exist under the administration of ethnic groups, some of which demonstrate a strong track record and readiness for implementation. The scope by which such self-governed ethnic initiatives could be recognized is worth exploring in the context of the country's vision for creating a peaceful, prosperous, and democratic Myanmar.

1.6 Recommendations

Actions needed in the forestry sector are:

1. Create delivery mechanisms to scale up CF within PFE.

The Forest Department (FD) needs to simplify and accelerate the handover processes for CF establishment. Developing an efficient delivery mechanism to scale up the establishment and implementation of CF, including providing CF services to ethnic communities, will help facilitate this process.

2. Undertake an inventory of forest stocks, strengthen control mechanisms, lead on cross-agency enforcement, and reform the Myanmar Timber Enterprise (MTE).

While sustainable production forestry is still viable in some natural forest areas, the FD should (a) undertake an inventory of forest stocks to decide on how to proceed on the restoration of forests and how best to manage private, community, and public efforts; (b) improve the timber legality assurance system (TLAS) to support high-value production and export; (c) strengthen planning and control mechanisms and lead a cross-agency dialogue on law enforcement; and (d) reform the MTE considering the entire value chain.

3. Promote an enabling environment for private plantations to attract reputable and chain of custody-certified private companies and investment.

Myanmar would benefit from the preparation of an Industrial and Commercial Plantation Strategy, in close cooperation with wood-based industry. This would address constraints related to transparent licensing, safeguards, competitive partnership agreements (public-private partnerships), financing, fiscal incentives; and create an enabling environment for forest SMEs.

4. Increase protected areas to 10 percent of total land area.

Planning, gazettment, and management of PAs should continue taking into account communities' preexisting rights. The FD should consider (a) creating a more effective management framework to promote ecotourism, (b) protecting and restoring mangroves as a priority, and (c) assessing the possibility of introducing Payment for Environmental Services (PES), including carbon payments to support PAs and watershed restoration.

5. Build the capacity of the FD to implement a challenging reform process.

The support needed includes skills development, an increased budget, technological support, and better civil society engagement. Specific skills needed in the FD include bottom-up planning, community engagement, facilitation, livelihoods expertise, business development, and private sector partnerships.

Annex 1 provides the full details of the recommendations in the forestry sector, including the key messages, the actions, the time frame (short, medium, and long), the context, and the responsibilities for implementation.



photo: ©RECOFTC

2 FISHERIES

2. FISHERIES

Myanmar's fish stocks are an important renewable natural resource. However, this ENR sector faces overexploitation from a range of drivers, including illegal fishing and a rising population. In addition, those employed in the industry often experience exploitative labor conditions and even conflict.

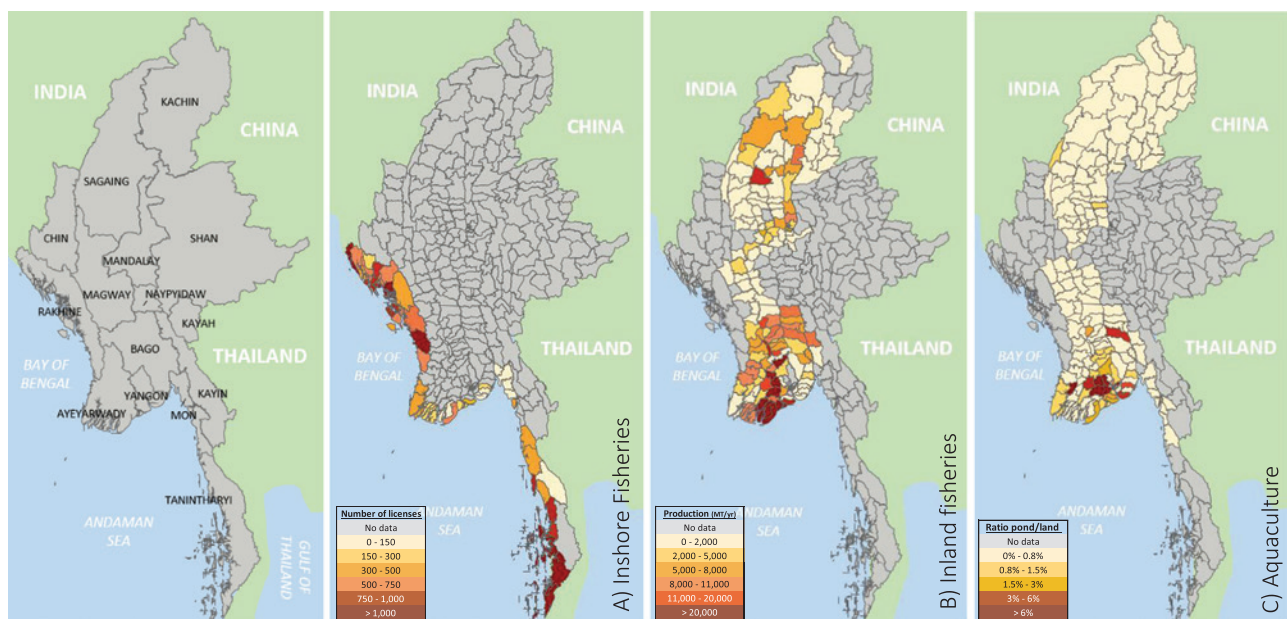
This section presents the facts about the fishing sectors and the challenges and issues they face. It also explores the opportunities available for reform and change and makes recommendations on the best way forward.

2.1 Fishing in Myanmar

There are three main fishing subsectors that are socially and economically significant in Myanmar. Each subsector has its own distinct pattern of distribution. The subsectors include (a) marine fisheries, (b) freshwater capture fisheries, and (c) aquaculture. Figure 21 shows the geographical importance of these sectors across Myanmar.

Figure 21

Heat maps illustrating the geographical importance of the different fisheries subsectors



Source: Teggo et al. 2018.

2.1.1 Marine fisheries

Marine fishing covers both the inshore fishing (0 to 10 nautical miles from the coast) and offshore fishing (10 nautical miles from the coast to edge of the exclusive economic zone [EEZ]).

2.1.2 Inshore (0–10 nautical miles from coast)

Inshore fishing is reserved for boats under 30 ft and 25 HP. It is licensed by Township officers of the DOF. There are no limits on either harvest levels, the number of vessels, or fishing gear licenses. The fishery is essentially open access except for some inshore-tendered areas.

2.1.3 Offshore (10 nautical miles from coast to EEZ)

Offshore fishing grounds are open to boats over 30 ft and over 25 HP, mostly trawlers and purse seiners. Licensing is done by the DOF. Currently, no new offshore licenses are being issued, but the offshore fishery is already overcapitalized (that is, too many boats). There are no effective limits on harvest levels, and area restrictions, including encroachment into inshore fishing areas, are not effectively enforced.

2.1.4 Freshwater capture fisheries

Myanmar's freshwater resources are exceptional. The 10 principal rivers have a combined catchment area of 737,800 km² and surface water volume is estimated to be 1,082 km³ (WEPA 2019). The Freshwater Fisheries Law (1991) defines freshwater as “waters, pond, course, river, stream and lake which are of a permanent or temporary nature and in which fish live and thrive and which are situated within the inland boundary along the sea coast of the Region.” Freshwater fisheries in Myanmar are classified as open areas or leasable areas.

2.1.5 Open areas

These are open areas where licenses are issued for specific fishing gears. There are no restrictions on the number of licenses available. However, open waters also include tender areas where exclusive rights to operate large fixed gears are licensed on an annual basis through auction.

2.1.6 Leasable areas (Inn)

These are restricted water bodies. The exclusive exploitation rights of these water bodies are sold at auction annually by the DOF. Leases were granted for 3,299 inns in 2017 (DOF 2017).

2.1.7 Aquaculture

There are three main subsectors of aquaculture in Myanmar. In order of importance, they are (a) inland (freshwater), (b) coastal (brackish water), and (c) marine. The structure of each subsector is outlined below, in terms of spatial distribution, ownership and scale, technologies deployed, and growth rates.

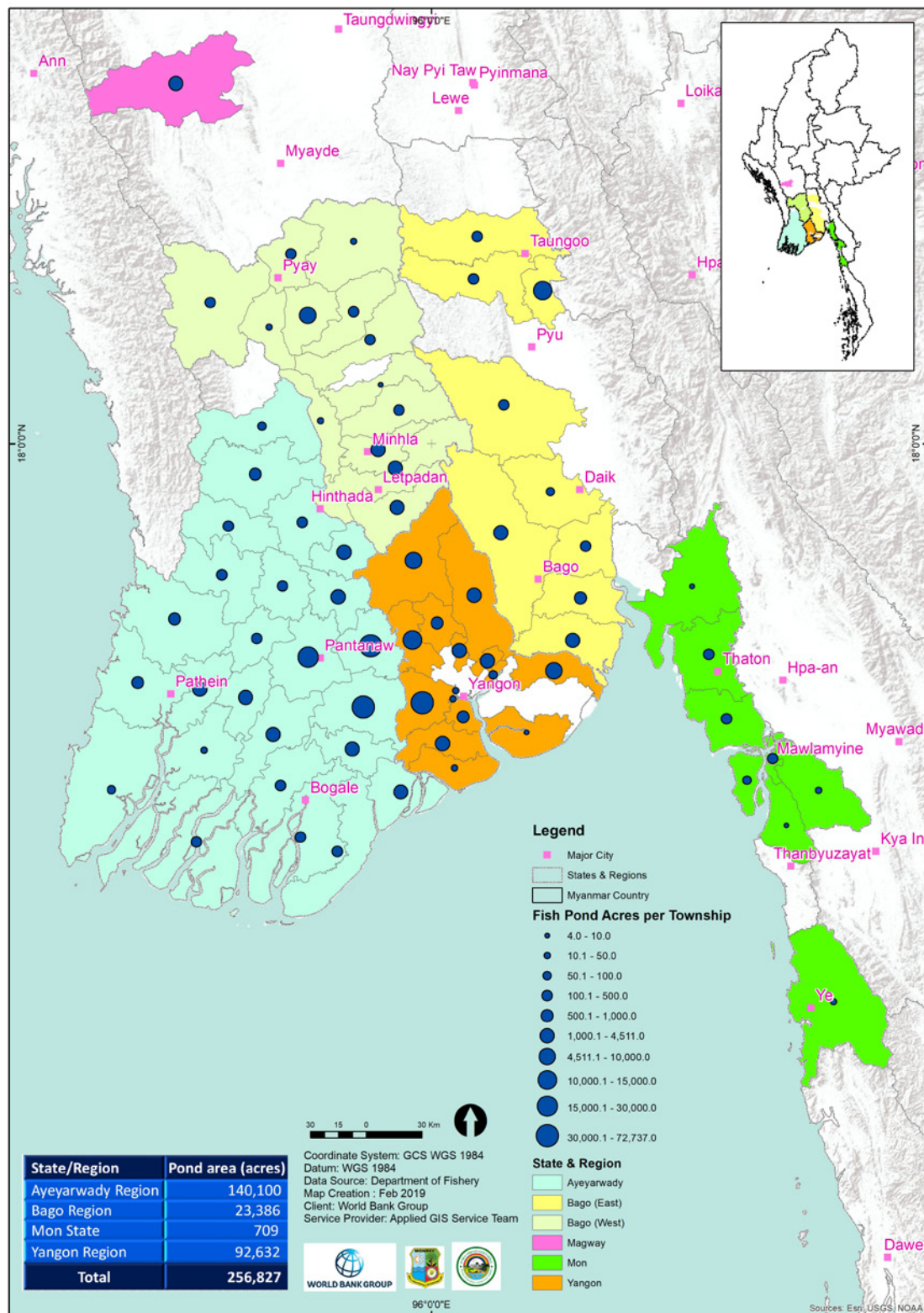
2.1.8 Inland (freshwater)

Inland (freshwater) fish accounts for 95 percent of Myanmar's aquaculture production. Freshwater fish production is highly geographically concentrated. Around 90 percent of Myanmar's inland fish farms are located in the Delta area across the Ayeyarwady, Yangon, and Bago Regions (DOF 2017). Most of these farms are found within a 25–50 km radius of Yangon. Three townships (sub-districts) to the west of Yangon (Maubin, Twantay, and Nyaungdon) account for nearly two-thirds of the Delta's pond area (Figure 22). Based on analysis of satellite

images, it was estimated that area of fishponds in the Delta was 105,450 ha in 2014 (Belton et al. 2015). This is 30 percent higher than the 80,843 ha officially reported by the DOF in 2014.

Figure 22

Location of fishponds in Lower Myanmar



Source: Belton et al. 2015.

The structure of farm ownership is highly concentrated. Based on the results of a survey in the main fish farming areas of the Ayeyarwady Delta, a study found that farms of around 40 ha and above accounted for 8 percent of farms but 60 percent of pond area (Belton et al. 2015). A subset of these were ‘mega-farms’ of over 203 ha. This amounts to just 1 percent of operations but almost one-third of total pond area. The largest farm in this size category was reported to be 2,833 ha. In addition, these large farms are owned mainly by private domestic capital and established on land concessions granted by the previous government (Belton et al. 2015).

2.1.9 Coastal aquaculture

More than two-thirds of Myanmar’s shrimp ponds are in central Rakhine State, with the remainder found primarily in the Ayeyarwady Region. The vast majority of these farms are extensive ‘trap and hold’ systems in which naturally recruited shrimp post larvae (PL) are trapped in shallow coastal ponds at high tide and then grown without feed inputs, relying only on the natural productivity of the pond. Some farms also stock purchased PL—either harvested locally from the wild, illegally imported from hatcheries in Bangladesh, or ordered from local hatcheries operated by the DOF.

2.1.10 Marine aquaculture

Marine aquaculture development in Myanmar is limited. United KMK is a large company involved in farming barramundi in cages in Tanintharyi, where it operates farms in three sites, along with its own hatchery. Domestic demand for barramundi is reported to be substantial (Svennevig and Lwin 2016). There are also around 50–60 small cage farms in the Myeik area, producing barramundi using seed from the KMK hatchery. KMK is seeking to implement changes that will triple production capacity in its hatchery, opening up the possibility for further growth in numbers of smaller producers who can use its seed.

2.2 Economic and social significance of fisheries

For the people of Myanmar, the fisheries sector provides important employment, livelihoods, and nutrition. Myanmar’s fisheries sector is officially reported to provide employment to 3.2 million people, 800,000 full time and 2.4 million part time, or 6 percent of Myanmar’s population (Tezgo et al. 2018). Marine fisheries are of special livelihood importance given that nearly half of the population lives in coastal states and regions. For instance, in Mon State, direct participation in small-scale inshore fisheries by fishing households accounts for around 10 percent of rural employment and 11 percent of rural income, with 34 percent of households in areas engaged in commercial small-scale fishing (Tezgo et al. 2018). In Ayeyarwady, fishing is the primary source of income for approximately 13 percent of households (EMR and World Bank 2013).

Fish also accounts for about 50 percent of the quantity of animal source food (such as meat, eggs, dairy and fish combined) consumed in Myanmar. This makes fish the single most important animal protein (Belton et al. 2015). The official per capita consumption rate is calculated by simply dividing the inflated total production numbers for Myanmar (minus exports) by the total population resulting in an annual per capita consumption of fish of roughly 60 kg per person. An FAO study carried out in 2006 suggested a figure of 21 kg per person per year with large variations in state and regions (Needham and Funge-Smith 2014). For example, the per capita fish consumption rate was 6.4 kg in Northern Shan State and 25.4 kg in the Ayeyarwady Region (Needham and Funge-Smith 2014).

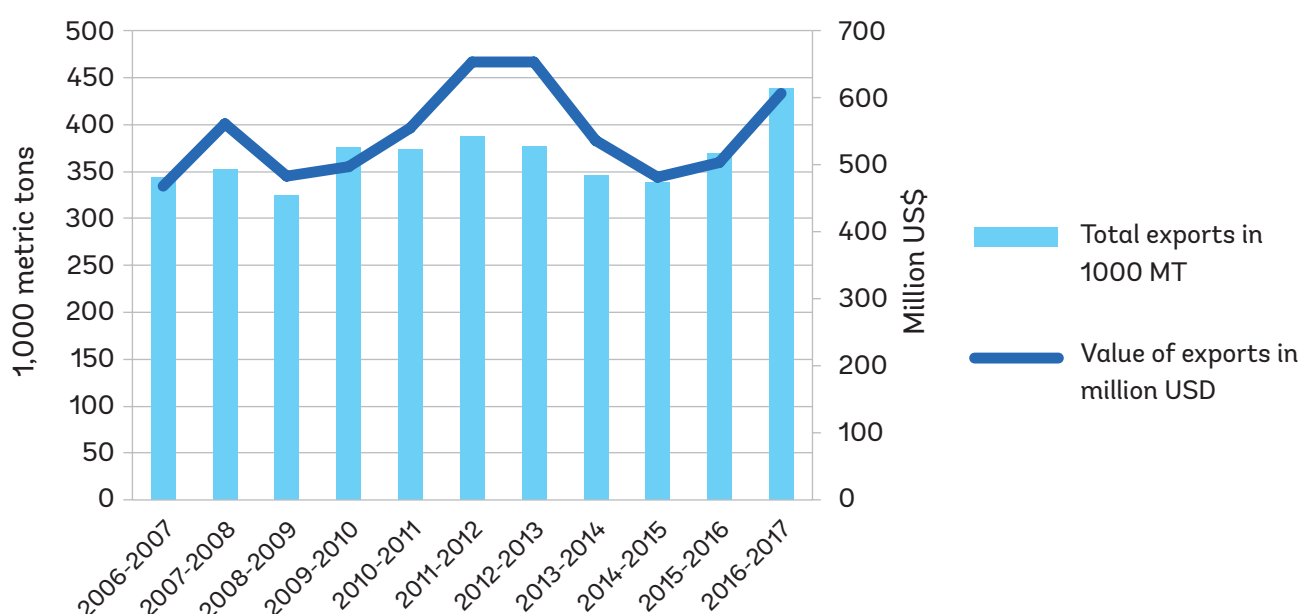
2.2.1 Economic contribution

The contribution of aquaculture and fisheries to Myanmar's GDP is estimated at 2 percent. National statistics show the share of fisheries as between 8 percent and 10 percent of GDP (DOF 2017). However, this estimate is not considered reliable as total agricultural GDP (including fisheries and livestock) accounts for only 23 percent of national GDP (World Bank 2018a). It is also estimated that aquaculture's contribution to GDP is in the range of 0.6 percent, and it is likely that aquaculture and fisheries together account for something in the order of 2 percent of GDP²² (Belton 2018). This is well below the contributions of aquaculture alone in Bangladesh (3.6 percent of GDP) and Vietnam (5–6 percent) (Belton 2018).

Export markets also play a significant economic role. Fish and fishery product exports in 2016–2017 were 438,710 metric tons, generating over US\$600 million in export value (DOF 2017). Export markets for higher-value fish and fish products are driving significant production, processing, and harvesting investments and are an important contribution to both export earnings and local livelihoods in Myanmar. Figure 23 shows export production and value trends over 2006–2017, which demonstrate that the value per ton of export products is relatively stable. Most rohu are exported to the Middle East. It is widely believed that there are substantial informal and undeclared exports to Thailand by trans-shipping.

Figure 23

Myanmar fishery exports 2006–2017



Source: DOF 2017.

The value of marine and coastal ecosystem services was estimated at US\$8.5 billion a year, almost 60 percent of which is contributed by mangrove and coral reef ecosystems (BOBLME 2014). Emerton and Aung (2013) estimated that forest ecosystem services were worth more than US\$7.3 billion in 2013 comprising 15 percent (or US\$1.1 billion a year) for mangrove fisheries nursery and habitat and 10 percent (or US\$707.1 million a year) for mangrove coastal protection.

²² Based on the rough estimate that aquaculture contributes around a third of production, and also on export statistics.

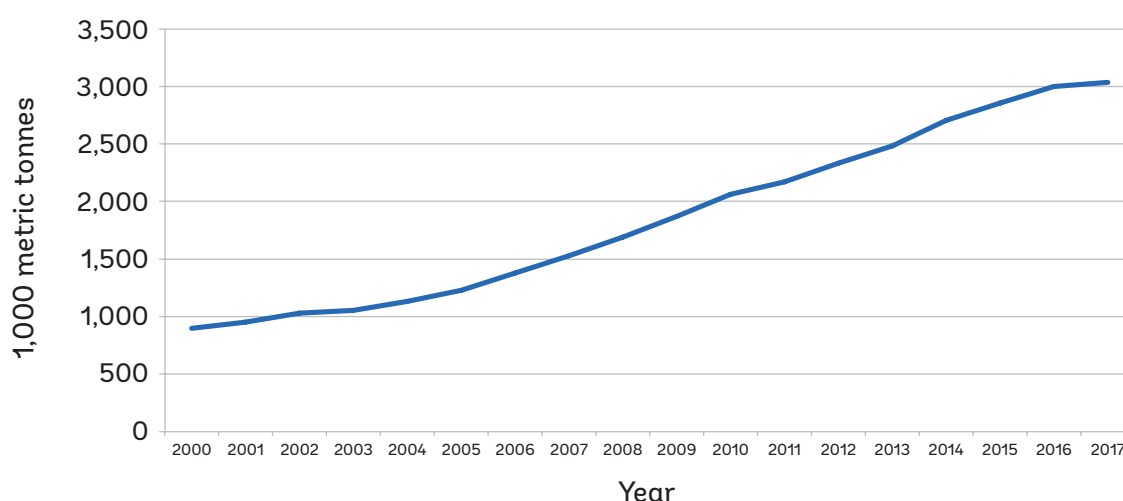
2.2.2 Fish production

Estimates of total fisheries production in Myanmar vary depending on the source, ranging from 3 million to 5.5 million metric tons per year. Official Myanmar statistics cite 5.5 million metric tons per year, but 3 million metric tons is a more reasonable estimate as the official statistics are “based on target levels rather than collection” (FAO 2016b).

Estimates of Myanmar’s marine capture fisheries production also vary tremendously, from 1 million (FAO) to 3 million metric tons per year (official Myanmar statistics). Despite strong scientific evidence that marine fisheries are in decline (Krakstad et al. 2015), and export and tax data that suggest no growth or point to a decline, official statistics still show linear growth in fisheries production (Figure 24).

Figure 24

Marine fisheries production



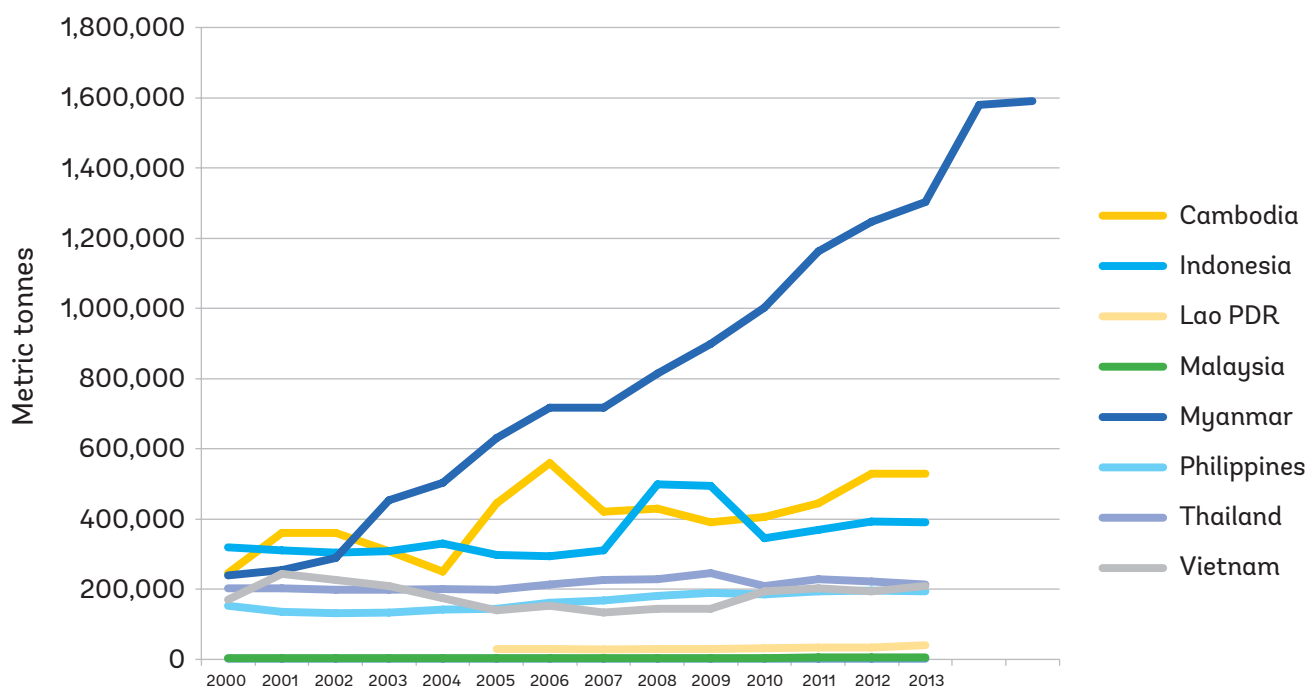
Source: DOF 2017.

The government estimates that freshwater capture fisheries production is 1.6 million metric tons per year, accounting for close to a third of total fish production. Myanmar’s coastline is dominated by major river deltas and these, along with numerous lakes and smaller river systems, support a wide array of species and productive environments. Much of the inland fisheries productivity stems from the large floodplain areas created during the monsoon and the high biodiversity of fish species. Fishbase lists 511 freshwater fish species present in Myanmar (Froese and Pauly 2019). About 311 fish species are present in the Myanmar portion of the watershed of the Ayeyarwady River, of which approximately 62 percent (193) are endemic and 32 percent (100) are found only in Myanmar (Baran et al. 2017).

However, the linear growth trend shown in official freshwater catch statistics is unlikely when compared to other Southeast Asian countries (Figure 25). The FAO revised its estimates for Myanmar’s inland fisheries to a total production of 863,450 metric tons in 2015 (Funge-Smith 2018). However, even if a figure of 0.5 million metric tons is used, Myanmar would still rank fourth in the world for inland fisheries production.

Figure 25

National freshwater fisheries production in Southeast Asia



Source: Coates 2002; DOF 2013; FAO 2013.

Myanmar is the world's eighth largest aquaculture producer (excluding aquatic plants and non-food products), producing an estimated 1 million metric tons annually (FAO 2015). Two species dominate aquaculture production: Rohu (*Labeo rohita*) and tiger shrimp (*Penaeus monodon*). The importance of farmed fish in the domestic market is growing, and it is estimated that 21 percent of the fish consumed nationally now comes from aquaculture (Belton et al. 2015).

2.3 Legal and institutional framework

2.3.1 Marine, freshwater fisheries, and aquaculture

Under the 2008 Constitution, Myanmar's natural resources such as fisheries, land, and forestry are owned by the State. The rights to ownership and access to these assets are assigned by the respective government departments. The fisheries sectors are regulated under the following laws:

- Myanmar Marine Fisheries Law (1990)
- Freshwater Fisheries Law (1991)
- Aquaculture Law (1989).

The Marine Fisheries Law (1990) and the Freshwater Fisheries Law (1991) are similar as they both focus on establishing an effective mechanism for taxation and revenue collection. The states and regions do not have any constitutional rights for management of the Myanmar's offshore marine fisheries. The Myanmar Marine Fisheries Law (1990) is currently being revised and is in an advanced draft form but this is yet to be released due to reported procedural issues.

Inshore marine fisheries and inland fisheries are both regulated under the Freshwater Fisheries Law (1991). Inshore marine fisheries have been covered under this legislation since the 2015 Constitutional Reform. The 2008 Constitution allows each state and regional government to draft its own freshwater fisheries legislation.

The Aquaculture Law (1989) legalized ponds that had been constructed previously and promoted the expansion of large-scale aquaculture by providing a mechanism for allowing pond construction on ‘wastelands’. Following the law’s implementation, large areas of ‘wasteland’ (much of it already cultivated by farmers without land use certificates) were allocated to companies and individuals with close links to the military. The Aquaculture Law (1989) is similar to the marine and freshwater fisheries laws as it is mainly an instrument for revenue collection. Currently, States and Regions cannot draft their own aquaculture legislation.

2.3.2 States and Regions

The Ayeyarwady Region Freshwater Fisheries Law (2018) recognizes the rights of communities to form community fisheries associations. The accompanying regional fisheries policy now offers all inn and tenders below a value of MMK4 million and fishing grounds with a history of conflict to communities for co-management. In addition, the Rakhine State Freshwater Fisheries Law (2014) provides a legal basis for community fisheries co-management. In 2016, Mon State also enacted a State Fishery Law that covered freshwater and inshore areas, although the legality of that law has not yet been tested.

However, under the 2008 Constitution the governance of both aquaculture and land remains Union-level responsibility. This severely limits the scope for initiatives to promote aquaculture at the State or Region level. Decisions regarding land use are ultimately made at the Union level and cannot be legally circumvented at the subnational level.

2.3.3 Aquaculture and land use policy

Aquaculture development is constrained by the Farmland Law (2012) and the VFV Land Management Law (2012). The Farmland Law (2012) restricts the conversion of land registered for rice cultivation for any other permanent purposes without appropriate permission. The VFV Law (2012) has contributed to weakening land tenure for small landholders.

The current land use policies also restrict the emergence of small-scale aquaculture. Potential fish farmers are discouraged from converting even small parcels of lands to ponds, for fear of losing their land use rights. Many of the fishponds dug in areas of concentrated aquaculture development, such as the Ayeyarwady and Sagaing regions, do not have the correct land titling and are, therefore, illegal.

It has been suggested that these illegal ponds may soon be given an option for legitimacy. At a meeting with the DOF in May 2019, it was understood that there will be a new ministerial order issued shortly that will provide amnesty for owners of aquaculture ponds, dug illegally in paddy land, who are willing to pay a penalty of around MMK12,150 per hectare.

In Ayeyarwady, it is estimated that this would legitimize 121,405 ha of fishponds in addition to the 40,046 ha that have already been legally registered. The implications of this policy are that (a) some of the ponds dug in the 1990s were on land grabbed from local communities and (b) given the power of the Department of Agriculture, enforcement of the Farmland Law (2012) may be more rigorous following the amnesty period. This means that owners of any new ponds dug illegally may be punished more quickly.

2.3.4 Institutional framework

The DOF is the primary agency responsible for fisheries management and collection of fish production-related statistics. It is one of the 11 departments within the MOALI, and the MOALI is a new ministry created in 2016.

The DOF has a total of 2,469 staff, including 365 officers, working at central, regional, district, and township levels. The DOF is organized into four divisions dealing with (a) capture fisheries, (b) aquaculture, (c) research and development, and (d) administration.

It is estimated that only 0.8 percent of the annual budget of the MOALI is allocated to the DOF (Tezgo et al. 2018). This is despite the size of its contribution to the revenues of some regional governments reaching up to 56 percent in the Ayeyarwady Region (Tezgo et al. 2018). It could be a result of the perception that fisheries still remain a sector that can stay productive and generate large amounts of revenue without good governance and management.

Human resources and capacity are inadequate to support effective resource management, training, and extension activities. Currently, where technical ability exists in the DOF, it tends to be in aquaculture (for example, conventional hatchery management). Although the Fishery Management Division exists, the DOF hardly employs any capture fisheries specialists, either freshwater or marine. Many of the staff in township or district offices have only been educated and trained for administrative roles. In addition, the routine rotation of State and Region DOF officers every few years by the MOALI may be an attempt to increase broad-based knowledge of fisheries. However, these rotations also disrupt many long-term development projects.

The DOF does have a research and development division, but it is not well supported with funding and resources. However, DOF staff were involved in the stock assessment surveys carried out by the *Fritjof Nansen* vessel in 2013, 2015, and 2018. This work is enormously important to Myanmar's marine fishery sector. However, these surveys were expensive, sending out a message that fisheries research has to be expensive and high tech. In reality, there are many other more modest field-level research studies that could be done effectively.

2.4 Issues and challenges

2.4.1 Decline in marine and freshwater fish resources

The overexploitation of fish stocks has contributed to a severe decline in Myanmar's marine fish resources, reportedly by as much as 90 percent since FY1979/80 (Krakstadt et al. 2015). As a result, Myanmar's fisheries are underperforming both commercially and as a source of livelihoods for small-scale fishing communities. Sustainable harvest levels and fishing methods must be effectively managed to increase production from marine fisheries, create more revenue for commercial operations, and strengthen livelihoods among small-scale fishers. Profitable, sustainable marine fisheries depend on enforcing existing rules and boundaries; developing new rules based on conservation, science, economics, and social awareness; and collecting and analyzing fisheries-related data.

Open access and the 'race to fish' is the primary driver of depletion and overfishing. Open access also plays a significant role in the decline of freshwater fisheries. Although a tender system exists in many freshwater areas, tender rights are allocated on an annual basis, creating incentives that favor maximizing extraction over management. Poor enforcement of laws and regulations has also compounded the problem.

Large declines in numerous species of freshwater fish are reported throughout the Ayeyarwady River Basin, which covers around 60 percent of Myanmar's land area. Through surveys, fishers reported that from 2007 onward inland stocks were declining and the decline accelerated significantly from 2012 (Baran et al. 2018). Affected stocks include commercially valuable species such as eel, hilsa, freshwater shrimp, and Wallago catfish; brackish water species such as barramundi and Indian threadfin; and a variety of cyprinid and catfish species and smaller endemic fishes. The main causes of decline reported by fisheries were (a) pollution from industry and agriculture, (b) overfishing of dry season refuge areas and harmful fishing practices, and (b) habitat degradation, such as the clearing of flooded forests and mangrove areas.

2.4.2 Limited enforcement of illegal fishing in marine offshore and inshore areas

Illegal fishing in the inshore and offshore segments of Myanmar's marine fisheries is common and enforcement remains limited. Licenses for inshore vessels are gradually acquired throughout the fishing year by fisheries officers visiting villages and fishing grounds and selling the licenses in the field. This coverage is incomplete, meaning that the true size of the inshore fleet is unknown.

It is reported that an illegal fleet of inshore fishing vessels operates along Myanmar's coast.²³ These are made up of fishing vessels that are rigged with wholly illegal gears, such as baby trawls, pair trawls, and push nets. Operation of gears that do not conform to regulatory specifications (such as mesh sizes being too small, nets exceeding regulatory lengths, and light fishing) is also common. In the offshore fishery, 'copy-cat vessels' are thought to operate in significant numbers. These are vessels that exist in duplicate versions, share the same looks and name, and operate using a single fishing license.

Many fishing vessels over 30 ft in length are licensed as inshore fishing vessels, even though their size characteristics establish them as offshore vessels. This way of registering and licensing vessels allows larger-scale vessels to fish in inshore areas from which they would otherwise be excluded. Some offshore vessels are known to transship illegally at sea for direct exportation to other countries in the region. More significant, especially in the south in Myanmar, is the unreported landing of fish directly in Thailand by Myanmar vessels. Efforts in monitoring, control and surveillance, and active law enforcement by the DOF remain largely ineffective (Hosch 2015).

For marine fisheries, the primary conflict is over the dividing line between inshore and offshore. By law, inshore fisheries lie within 10 nautical miles of the coastline and are reserved for small-scale fisheries. Incursion of offshore vessels into inshore fishing grounds is said to occur particularly in areas where deep water is found within 10 nautical miles of the shore, such as the Mawtin Coast region of Rakhine (WCS Myanmar 2018). Islands and other geographical features also allow for broad interpretation of where the inshore-offshore line lies, and both offshore and inshore vessels routinely follow the fish wherever that takes them.

Encroachment by offshore fishing vessels is commonly believed to be the major cause of rapid resource depletion of inshore fisheries. Despite illegal practices among inshore fishers (such as fishing in closed areas and using illegal gear), illegal trawling of inshore waters by large vessels licensed to fish in the open waters (or not licensed at all) also appears to be the most common source of resentment among inshore fishers. At the very least, offshore vessels seem to be responsible for localized depletion.

²³ Anecdotal reports.

2.4.3 Conflict between farmers and fishers over water and land use

Farmers and fishers face conflict in how they manage the flow of flood water. Many farmers drain their rice fields at the end of the wet season so they can plant the summer crop, while fishers try to retain water on the floodplain for as long as possible to increase production. Such conflict can be serious and has resulted in violence in some cases in the Delta. An example includes guards being hired to lease or tender fisheries to target local residents whom they suspect of poaching fish.

Conflict between shrimp farmers and rice farmers can also be serious. In some townships in Rakhine, once the wet season had ended, shrimp farmers allowed saline water to enter neighboring paddy land. This may have been a deliberate strategy used by unscrupulous shrimp farmers to allow for the expansion of their shrimp farms.

Large-scale and small-scale fishers contesting the same fishing grounds is another source of conflict. For example, most tenders awarded to stow net fishers are in the open fishery, but small-scale fishers are not allowed to fish in nearby areas. Inn-tagyi (fishery leaseholders) will often employ (local) guards to prevent poaching of stocks by small-scale fishers, increasing tension in the community.

Loss of mangroves and habitation conversion

The rates of mangrove loss in Myanmar are the highest in the region with 2.2 percent annually over 2000–2014 or a net loss of 191,120 ha (Estoque et al. 2018). The area of mangroves in Myanmar is the second largest in Southeast Asia after Indonesia, totaling around 500,000 ha. While the rate of loss is high, rates of clearance appear to have slowed compared to the decade 1990–2000 when the annual rate of mangrove deforestation in Myanmar stood at 2.9 percent (Giri et al. 2008). Myanmar has three major mangrove areas: Rakhine State, the Ayeyarwady Delta, and Tanintharyi. From 1980 to 2007, total mangrove coverage in Rakhine State decreased from 413,850 ha to 240,968 ha. Mangroves in Tanintharyi, the second largest mangrove area in Myanmar, are relatively well-preserved (Veettil et al. 2018). However, major deforestation hot spots have been identified (Giri et al. 2008).

Aquaculture is not the main driver of mangrove loss. The main drivers of mangrove loss from 1975 to 2005 were the overharvesting of mangrove forests for fuelwood and charcoal production, illegal logging encroachment, and paddy cultivation (Giri et al. 2008). It is estimated that 98 percent (293,035 ha) of mangrove deforestation in Myanmar during the period 1975–2005 was due to agricultural expansion. During the same period, approximately 2 percent (6,870 ha) of mangrove forests were converted to aquaculture. In addition, rice agriculture was the major driver of mangrove loss in Myanmar, accounting for 87 percent of mangrove deforestation between 2000 and 2012, whereas aquaculture expansion contributed only 1.6 percent (Richards and Friess 2016).

However, mangrove loss does have a significant impact on the decline in coastal fisheries resources. Regardless of the drivers, mangrove habitat conversion has likely contributed to declines in coastal fisheries resources as mangroves play a crucial ecological role as nursery habitat. Shrimp farms tend to be constructed in places where the mangroves have already been cleared for charcoal production and paddy cultivation (Banner-Stevens 2018). And yet, this mangrove loss probably affects the potential for shrimp aquaculture in Myanmar, which is largely dependent on naturally occurring shrimp PL from estuarine and mangrove environments.

Conversion of wetlands to inland fishponds is another habitat conversion that has had significant environmental impacts. Large-scale aquaculture development in the Delta during the 2000s took place largely on 'wastelands' allocated to concessionaires. In a recent study, it was reported that the expansion of fish and paddy farms during this period transformed seasonally flooded pasture and permanent wetlands that had previously been used for fishing (Mark and Belton 2019). It also disrupted the annual spawning migrations of wild fish between river and floodplain, causing fish populations to decline significantly. Informants from Maubin

township estimated that fish farm development resulted in loss of their access to more than 50 percent of the area that they had previously fished (Mark and Belton 2019). They also reported that peak season fishing incomes fell by three to four times.

Another potential victim of fish farm expansion is the breeding habitat of the endangered sarus crane. This iconic species (the world's tallest flying bird) is highly endangered globally. A resident population is found in the townships of Maubin and Wakema where they nest and feed in deep-water rice fields and seasonally flooded wetland habitat. Maubin is one of the three Delta townships with the highest rates of fish farm development. Wakema is just to the west of Maubin and is a new frontier for spillover development of fish farms. The deep-water rice fields on which these birds depend are less productive than fields in areas with better drainage, making their conversion to aquaculture an attractive option for those who can afford, and obtain permission, to do so (Slover 2018).

2.4.4 Labor and working conditions

There is also mounting evidence of exploitative labor conditions in the Myanmar offshore and inshore fishery, similar to those recently exposed in the Thailand fisheries sectors. Workers on rafts in the set bag net fishery in Ayeyarwady Region and Mon State face conditions of bonded labor, extremely arduous and dangerous working conditions, and violence (BBC 2018; Nyein and Matthew 2017; Wai 2018). Workers in other sections of the offshore fleet (such as the driftnet fishery) may also face similar problems, but information is limited.

2.5 Socioeconomic benefits of a sustainable and inclusive fisheries sector

Fisheries' contributions to economic output and employment in Myanmar still lag behind other countries in the region. For instance, the aquaculture sector alone contributes more to the GDP of Bangladesh and Vietnam (more than 3 percent and 5 percent, respectively) than the entire fisheries sector's GDP contribution in Myanmar.

It is estimated that an optimally-managed marine fisheries sector in Myanmar could add over US\$1 billion in value to Myanmar's economy. The World Bank *Sunken Billions Revisited* report (World Bank, 2017c) used 2012 landings data to calculate that ecologically and economically well-managed fisheries could produce an additional US\$54.8 billion in value throughout all of Asia. In 2012, Myanmar reported 1,131,500 metric tons of marine capture fisheries production, or 2.7 percent of the total marine capture fisheries production from Asia (41,205,165 metric tons). The full biological potential of Myanmar's fisheries may not be practically achievable, but even partially closing the gap would likely reflect a huge increase in production.

New modeling also suggests large potential returns from improved fisheries management. The Environmental Defense Fund has assembled a wealth of data from fishery-independent surveys including life history data for species found in Myanmar's waters. It is one of the most comprehensive databases available for Myanmar fisheries. These data were used in a multispecies model that evaluates the effects of different management interventions (ranging from simple reductions in fishing pressure to minimum size limits and closed areas) in a highly overexploited ecosystem. The model will soon be adapted to provide economic estimates, but initial results suggest that compared to the 'status-quo', reductions in catch can produce significant recovery of biomass (EDF-WCS 2019). It also suggests that a shift to larger, higher-value species would yield disproportionately greater economic returns beyond simple yield increases.

Improved fisheries governance and management also offers significant opportunities to reduce local conflicts in coastal and floodplain areas. Major sources of conflict in the fisheries sector are (a) competition in marine fisheries between commercial offshore vessels and small-scale inshore fishers, (b) conflict between farmers and fishers over the management of water levels on floodplains, and (c) conflict between large fish farms and former rice growers and fishers over confiscated land.

Community-based approaches to management have been successfully piloted in Myanmar, supported by devolving legislative control to states and regions for inland and inshore fisheries. Community-based fisheries management provides opportunities to promote more equitable distribution of benefits from inland and inshore fisheries, and to sometimes balance competing demands between improving fisheries governance and safeguarding the livelihoods of the poor.

Increasing access to affordable credit could also help address equity and poverty concerns. Myanmar ranks 178 of 190 countries for access to credit by SMEs, and most fishers are locked into debt-dependency relationships with traders. There are a number of international models for how certification, credit access, and devolution of management powers can be used as tools to enhance the incentives for sustainable community-based fisheries.

The value of aquaculture production could be increased severalfold. This can be done by raising the productivity of existing farms to levels similar to neighboring countries, diversifying production to include more valuable species, and allowing expansion of the area under production. However, the following challenges need to be addressed:

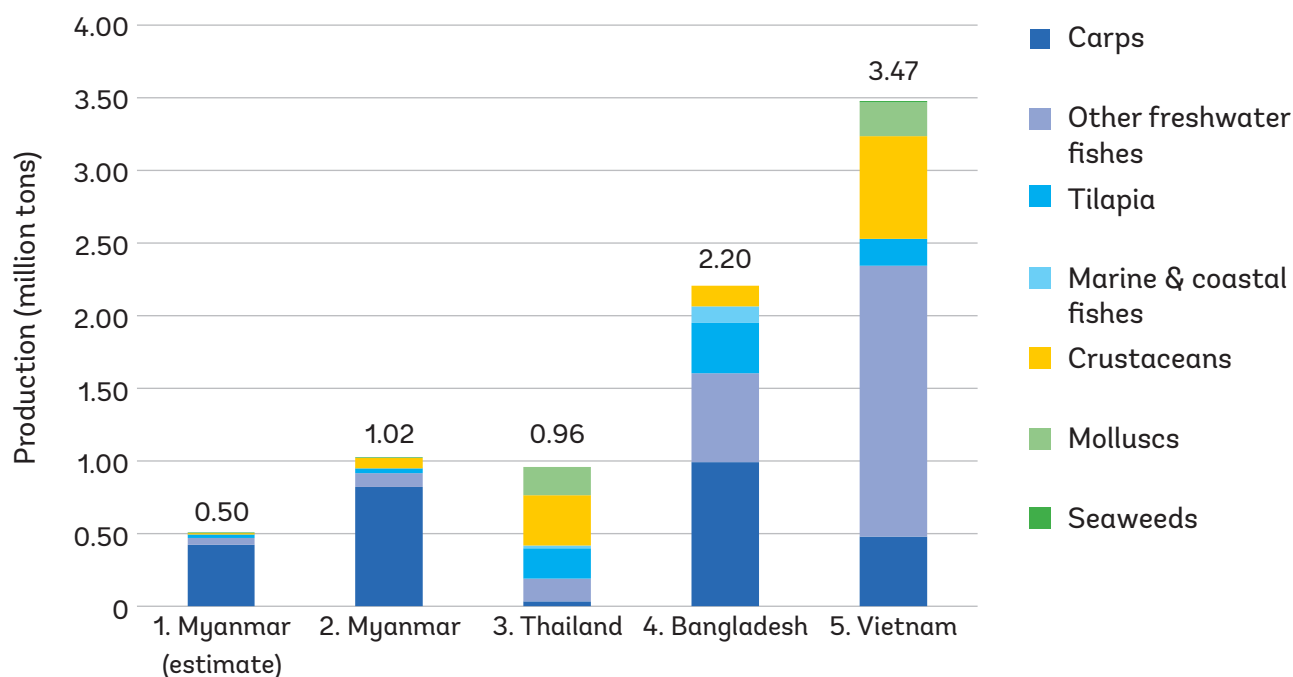
- **Inland aquaculture development has been constrained by restrictions that prevent the conversion of farmland to ponds as well as a lack of basic infrastructure and market access.** This is despite evidence that fishponds in Myanmar can provide six times more revenue and four times more employment than the same area of rice paddy.
- **Mangrove degradation has contributed to the decline of Myanmar's extensive shrimp farm sector.** This has driven a fall in natural recruitment of shrimp PL and increased losses due to disease and cyclones.
- **Cage-based aquaculture has substantial growth potential in reservoirs and in coastal areas.** However, this growth is limited by the lack of enabling regulatory frameworks and supporting infrastructure, such as marine hatcheries, to allow development to take place sustainably.

Converting 1 percent of the land currently under paddy to small fish farms could generate an additional net value added distributor of US\$193 million. This would take aquaculture's contribution to agricultural GDP to 3.7 percent and its contribution to national GDP to 0.94 percent. Inland fishponds in Myanmar cover an area of 98,922 ha, the equivalent to just 1.6 percent of total paddy area (calculated from Belton et al. 2015; FAO 2018b). This means that even doubling this area, currently under inland fish production, would have a negligible impact on rice output. Thailand and Vietnam are both major rice exporters, and Bangladesh is self-sufficient in food grain production. These countries' experiences with aquaculture development show that fears that it could jeopardize rice production are unfounded.

It is estimated that Myanmar's actual aquaculture production is about half of Thailand's, one-quarter of Bangladesh's, and one-seventh of Vietnam's. Figure 26 presents an analysis of the volume and composition of aquaculture production in Myanmar, Bangladesh, Thailand, and Vietnam. Columns 2–5 report figures published by FAO (2018b). Column 1 is an alternative estimate of likely levels of production for Myanmar, based on yields of fish and shrimp derived from farm surveys. This alternative estimate suggests that Myanmar's actual aquaculture production is about half of reported production (0.5 million metric tons versus 1.02 million tons).

Figure 26

Aquaculture production for Myanmar, Thailand, Bangladesh, and Vietnam, 2016



Source: FAO 2018; author's own calculations.²⁴

The species composition of production across the four countries is dominated by carps, 'other freshwater fishes' (mainly catfish), tilapia, and shrimp. Myanmar is the only country whose production comprise almost entirely of carps. The other three countries have much more diverse profiles, with tilapia, catfish, and shrimp accounting for substantial shares of output. Farms in Bangladesh, Thailand, and Vietnam produce a far more diverse mix of 'niche' species than those in Myanmar, including climbing perch, snakehead, gourami, mullet, barramundi, and grouper. Unless production diversifies to include new species, prospects for further growth are limited in Myanmar. Some opportunities include the following:

- In Myanmar, it is estimated that irrigation and hydropower reservoirs cover a total area of 203,770 hectares (IFC 2017b), some of which could be used for cage-based aquaculture, if restrictions on their use for this purpose are removed.
- Tanintharyi has significant potential as a site for cage-based marine aquaculture.
- Well-regulated and sustainable shrimp farm development should be fostered, for example, black tiger shrimp.

²⁴ Column 1 is an alternative estimate of likely levels of production for Myanmar, based on yields of fish and shrimp derived from farm surveys. This alternative estimate suggests that Myanmar's actual aquaculture production is about half of reported production.

2.6 Opportunities for reform

2.6.1 The Myanmar Agricultural Development Strategy (ADS) (2018–23)

The ADS provides strategic directions for the Myanmar Agriculture Sector for 2018–2023. In relation to fisheries, the ADS includes the following actions for aquaculture under the productivity ‘pillar’:

- Aquaculture seedling infrastructure (hatcheries and breeding ponds) for production and distribution of fish and shrimp seeds reorganized, including privatization where appropriate.
- Identification, inventory, and fishery resource conservation of adaptable fish species established.
- Network of Aquaculture Technology Centers (Korean International Cooperation Agency [KOICA] Research Center - Marine Biology Departments of Universities of Mawlamaine, Patheingyi, Meiktila, and Yangon), with supporting laboratory facilities established.
- Provision and availability of fishing infrastructure facilitated and aquaculture initiatives (including land development and cage and pen technology) integrated with existing ponds or reservoirs under appropriate legal frameworks.
- Preparation of a new fisheries law.

2.6.2 The DOF Annual Yearbook (2018)

The DOF Annual Yearbook (2018) incorporates an awareness of the FAO Code of Conduct for Responsible Fisheries and of current international standards of best practice for fisheries management. Although it remains production focused, this approach to fisheries management is articulated in an introductory section entitled ‘Vision, Objectives, Policy and Plans’. The yearbook also includes plans to conduct routine research on marine and freshwater habitats for fish species identification and stock assessment. In addition, it intends to enhance research activities in support of fisheries management and development, including research in conservation and protection of enlisted endangered aquatic species and their habitats.

2.6.3 Installation of Vessel Monitoring System (VMS)

Parliament has mandated the installation of a VMS to track the location of offshore fleet. The DOF is now in the process of issuing a tender notice to solicit proposals from international VMS service providers. The Danish International Development Agency (DANIDA) is supporting efforts by the DOF to install VMS on offshore vessels. They have reported that the GoM will fund and build the onshore infrastructure and the lease software necessary for the managing the VMS.²⁵ The offshore fishing industry has agreed to pay for the transponders (roughly US\$3,500 per vessel) and annual satellite subscriptions (roughly US\$1,200 per year). A significant driving factor in the adoption of the VMS has been the experience in Thailand with the yellow card restrictions of the European Union (EU) on importing fish products from Thailand.

2.6.4 Ongoing efforts to improve fisheries in Myanmar

The traditional role of the DOF focused on collection of fisheries revenues from license and tender fees. However, it now has a more modern mandate to support the sustainable development of the fisheries sector, and to do this, it needs a larger allocation of financial and human resources. DOF’s budget has grown from a couple

²⁵ Meeting with DANIDA in March 2019.

to a few million U.S. dollars per year in recent years. Yet, this is still a fraction of the total management budgets for other natural resources management agencies. According to official data, the central government's fisheries revenues from license fees and taxes capture less than 1 percent of fisheries' GDP contribution, and are around the same amount that is spent on the DOF's budget.

There are currently four bilateral donor- and two FAO-funded aquaculture development projects operating in Myanmar, with a total value of approximately US\$39 million (DOF 2016). The Myanmar Sustainable Aquaculture Program (MYSAP) is funded by the EU and has a policy component, which aims to facilitate the DOF in developing a National Aquaculture Development Plan in consultation with other stakeholders. MYSAP also has a coastal aquaculture development component, but its implementation has been hampered by an inability to obtain permission to work in Rakhine State. Three of these projects work in Myanmar's CDZ (an arid area with few ponds), with rather limited efforts targeted at the Ayeyarwady Region, where the majority of Myanmar's aquaculture occurs.

A small FAO-funded project (US\$250,000) is piloting improvements to data collection on fisheries and aquaculture production in Yangon region, with a view to possible national scale-up.

Capture fisheries have received less donor support than aquaculture. The largest project is the DANIDA-funded Sustainable Coastal Fisheries (SCF) project (approximately US\$10 million) that aims to improve management of coastal fisheries in Tanintharyi and Rakhine. Like MYSAP, the implementation of the SCF has been hampered by an inability to obtain access to project sites in Rakhine. Some smaller projects implemented by Wildlife Conservation Society (WCS) and Flora and Fauna International (FFI) seek to promote marine conservation and marine spatial planning. Inland fisheries are also relatively underrepresented. A medium-sized project (US\$1.85 million) implemented by World Fish aims to improve inland fisheries governance in the Delta, and a US\$6 million FAO-funded project seeks to strengthen adaptive capacity and resilience in fisheries and aquaculture.

Development assistance to Myanmar's fisheries has generated promising results, but the scale of investment and implementation has not been large enough to bring about significant transformation in the sector. Most projects focus primarily on producers or communities and pay less attention to supporting value chain issues, including infrastructure and credit supply. In addition, many of the governance and policy issues affecting both aquaculture and fisheries (such as land use policy and enforcement in offshore fishing activities) are outside the sphere of influence of the DOF. This means that for change to occur, a higher-level policy engagement is needed. The level of investment accorded to fisheries in general, and inland fisheries in particular, is disproportionately small, given that they continue to account for a much larger share of fish production and livelihoods than aquaculture, and face more severe challenges to long-term viability.

2.7 Recommendations

Actions need in the fisheries sector are:

1. Strengthen enforcement of existing fisheries laws and regulations and move toward quota-based systems.

Existing fisheries laws and regulations need to be more strongly enforced. This includes enforcing closed seasons and gear restrictions in marine and freshwater capture fisheries, clearly defining inshore and offshore zones with global positioning system (GPS) markers, and applying VMS to the entire offshore fleet. In addition, the capacity of partnerships as well as procedures to bring cases to court need to be developed. Quota-based systems also need to be implemented. Over time, the development of stock assessment and monitoring should provide a foundation for establishment of quotas and auctioning of quota-based licenses, at least in marine fisheries.

2. Expand protection of aquatic habitats.

This includes protection of freshwater wetlands, mangroves, and coral reefs, including the establishment of additional Marine Protected Areas (MPAs). Legal and institutional frameworks for coastal resources management and incorporation of protections for freshwater fisheries into agriculture and water resources policies are also important.

3. Strengthen co-management to mobilize fishing communities to support improved governance.

Expanding current co-management pilots within inshore and to freshwater fisheries will require the expansion of legal frameworks for secure tenure and establishing local institutions such as fishers' associations and cooperatives. Analysis of credit constraints and options for community-based fisheries enterprises is also important.

4. Create the space for a more productive aquaculture sector.

The first step should be to assess the biophysical and market potentials for different types of aquaculture. Legal frameworks need to be reformed to remove the constraints on aquaculture development within farmland and reservoirs and to develop regulations for coastal cage fisheries. In addition, investment strategies need to be prepared to address basic market access infrastructure, extension, biosafety and quality control services, the provision of commercial hatcheries and feed production, and the introduction of selective breeding programs.

5. Data collection and management.

It should cover fish consumption (potentially through including modules in standard household surveys), monitoring of fish stocks and landings, a registry of vessels and VMS, a geographic information system (GIS) registry of inns and tenders, and a GIS registry of fish farms.

6. Build the capacity of the DOF to implement this broad management agenda.

The support needed includes skills development, an increased budget, more staff, and technological support. This will enhance the DOF's ability to deliver on monitoring, control, and surveillance (MCS); stock assessment and management; community engagement and business development; aquaculture and biosafety; and fisheries monitoring and spatial statistics.

See Annex 1 for full details of the recommendations in the fisheries sector, including the key messages, the actions, the time frame (short, medium, and long), the context, and the responsibilities for implementation.



photo: ©Lesya Verheijen

3

EIA SYSTEM DIAGNOSTIC

3. EIA SYSTEM DIAGNOSTIC

3.1 Importance of a robust and transparent EIA system

Myanmar's GDP has been growing at a high rate of 7.2 percent during 2013–2018, and new investments pose environmental challenges. As is typical of the growth pattern in Asia, over the last 10–15 years growth has been driven largely by the industrial and services sectors. Foreign direct investment (FDI) plays a major role through investments in the energy, agriculture, industrial, and mining sectors. However, if not managed properly, these large-scale investment projects also carry the significant risk of adverse environmental and social (E&S) impacts.

Myanmar has relied heavily on natural resource exploitation to sustain economic growth, and serious environmental issues are emerging, underlining the importance of a transparent and robust EIA system. There are growing concerns around the impacts of the large-scale development, including deforestation, depletion of inland and coastal fisheries, land degradation, flooding and landslides, biodiversity loss, and the deterioration of water and air quality (IFC 2017; Raizer, Samson, and Nam 2015). A functioning EIA system is critical in identifying and managing the potential impacts of large-scale development and striking the balance between economic development, environmental conservation, and social inclusion.

Balancing economic growth and environmental protection remains a critical policy challenge. Myanmar was ranked 171 in the World Bank Group Doing Business 2019 report. In terms of environmental governance, Myanmar scored 138 out of 180 countries on the Environmental Performance Index in 2018. There is a need to improve business regulations while increasing efficiency and effectiveness of EIA, monitoring, and compliance systems that support E&S sustainability. This also underlines the need for effective public participation in ENR management, which an effective EIA process can facilitate.

3.2 Legal and institutional framework

3.2.1 Policies, laws, and regulations

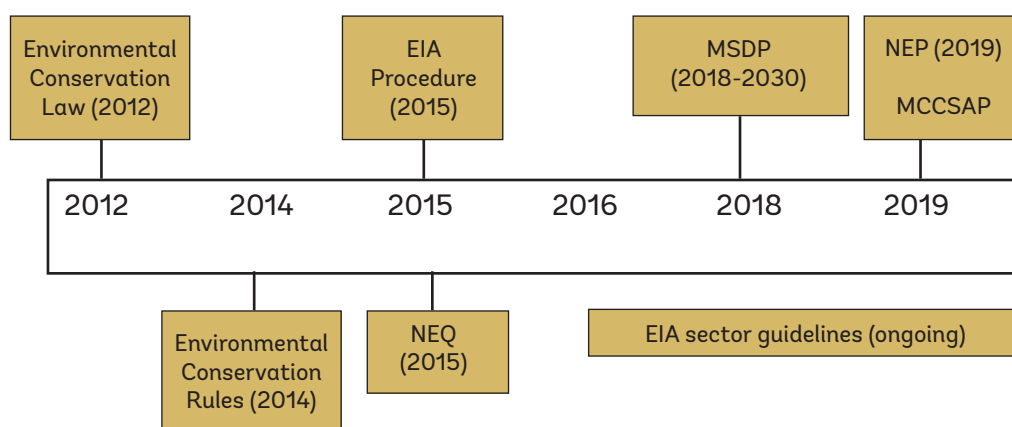
At the policy level, the MSDP (2018–2030), National Environmental Policy (NEP) (2019), and MCCSAP provide the foundation for mainstreaming ENR into development planning.

- **MSDP (2018).** It recognizes the importance of ENRs for economic growth. Goal 3 identifies the need to build infrastructure to facilitate economic growth and also establish effective social and environmental safeguards against negative impacts of infrastructure development.
- **NEP (2019).** It covers three strategic areas: (a) clean environment and healthy, and functioning ecosystems, (b) sustainable economic and social development; and (c) the mainstreaming of environmental protection and management.
- **MCCSAP (2018–2030).** It aims to support public and private sectors and vulnerable communities in decision making at both national and local levels to respond to climate change. The MCCSAP was approved by government in February 2019.

Significant progress has also been achieved in recent years by the GoM in establishing the legal and regulatory framework for environmental management. The GoM passed the Environmental Conservation Law (ECL) (2012) supported by the Environmental Conservation Rules (ECR) (2014) and the EIA Procedure (2015) (see Figure 27). The National Environment Quality (Emission) Guidelines (2015)²⁶ and sector-specific EIA guidelines have been developed for the hydropower, mining and oil and gas sectors,

Figure 27

Policy and legal framework for environmental management



The EIA Procedure (2015) sets out specific requirements for scoping EIA, initial environmental examination (IEE), and environmental management plan (EMP); defines roles and responsibilities of the ECD and project proponent; and sets penalties for violating these requirements. Annex A of the Procedure provides the project categorization screening to determine the need for development of an EIA, IEE, or EMP. The procedure is consistent with environmental legislation in the GMS and generally meets international good practice (Schulte and Baird 2018).

The National Environmental Quality (NEQ) (Emission) Guidelines came into effect in December 2015. The guidelines provide performance level and measures for regulation and effluent and emission control for various environmental aspects such as air emission, noise pollution, dust, water, and wastewater effluent and discharge from development projects. The guidelines are based on IFC's Environmental Health and Safety Guidelines (Schulte and Baird 2018). Myanmar has yet not established nationwide ambient air or water quality monitoring networks, which constrains its ability to measure and limit ambient pollutant levels.

Sector-specific EIA guidelines have been prepared for the mining sector with support from the Asian Development Bank (ADB) and World Wide Fund for Nature (WWF), for the oil and gas sector with support from the Norwegian Environmental Agency (NEA), and for the hydropower sector with support from IFC. In addition, Draft Guidelines for Public Participation in the EIA process were also developed in 2017 and are awaiting approval. ADB, Japanese International Cooperation Agency (JICA), United Nations Development Programme (UNDP), and other development partners have also provided ongoing capacity building and support to ECD officers in reviewing EIAs and also to EIA consultants in conducting them more effectively.

Myanmar has adopted other laws with potential implications for the implementation of the EIA Procedure (2015), especially the new Investment Law (2016) and Investment Rules (2017). Article 36 of the Investment Law (2016) requires project proponents to obtain approval from the Myanmar Investment Commission (MIC) if

²⁶ NEQ Standards are being drafted and when completed, these standards will incorporate and supersede the guidelines and will become a regulatory requirement.

their businesses are capital-intensive investments and have a significant impact on the environment and the local community. However, there remains a lack of clarity over the relationship between the Investment Law and Rules and the EIA Procedure (2015), particularly around the timing for preparing EIAs and IEEs.

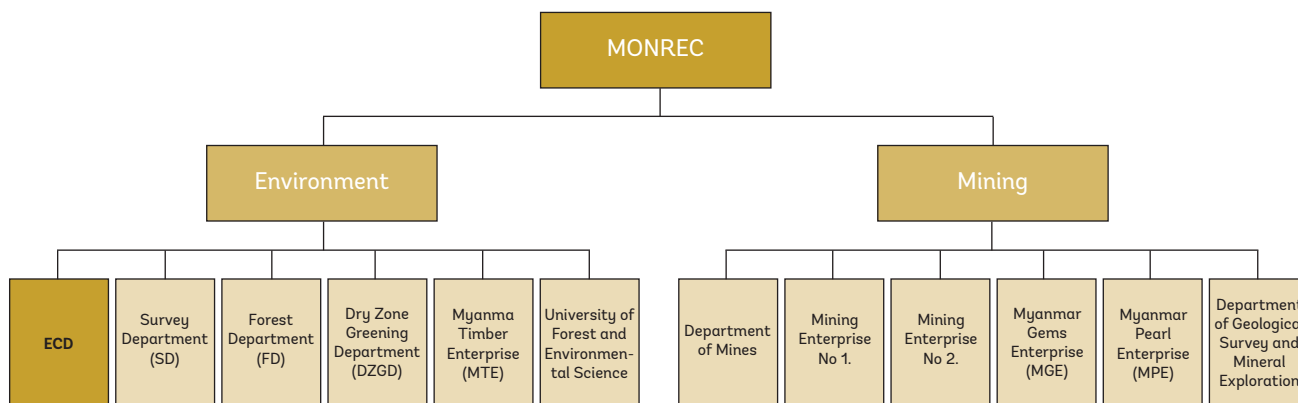
Currently, projects obtain approval from the MIC before submitting the project proposal to the ECD to determine whether an EIA, IEE, or EMP is required.²⁷ As the MIC approval form includes the project design, type, and specific location of the project, this limits the analysis of alternatives and opportunities to avoid or mitigate impacts through siting and design.

3.2.2 Institutional framework

The MONREC was established in March 2016. It followed a restructuring of ministries by the newly elected Union Government where the portfolios of the Ministry of Mines and the Ministry of Environmental Conservation and Forestry (MOECF) were merged to establish the MONREC. Under the MONREC, there are six departments, five enterprises, and one university (Figure 28).

Figure 28

Organizational structure of MONREC



Source: World Bank Group 2019

The ECD is the environmental protection and regulatory branch of the MONREC and was established in 2012 by the ECL (2012). The ECL (2012) sets out a range of duties and powers for the MONREC to implement the law, including developing and implementing a system for EIA, issuing environmental compliance certificates (ECCs), and issuing and enforcing environmental regulations. In March 2018, the ECD had a total of 487 assigned staff, 166 officers, and 321 other staff.

In 2016, the GoM established the EIA Division within the ECD to undertake the review and approval of EIAs, IEEs, and EMPs. In March 2019, the EIA Division had 42 staff and 41 vacancies. There are currently five sector teams for the review of EIAs, IEEs, and EMPs. These include (a) mining; (b) hydropower; (c) infrastructure; (d) industry (manufacturing); and (e) agriculture, livestock, fishery, and plantation. The PCD was also established in 2016 and is responsible for post-EIA inspection, monitoring, and audit.

The ECD has ambitious plans to increase staffing and capacity at Union, State, Region, district, and township levels. The ECD is planning to (a) recruit more than 19,000 staff by 2025, (b) establish 73 offices at the district level, and (c) establish 365 offices at the township level. In FY2017/18, 13 district-level ECD offices were established.

²⁷ MIC application process: www.dica.gov.mm/en/step-by-step/mic-application-process.

A review of MONREC budget allocation and expenditure found that the share of union budget allocated to environmental conservation activities had increased steadily (albeit modestly), from 0.15 percent in FY2011/12 to 0.23 percent in FY2016/17.²⁸ Estimates from a 2015 study by WCS were expanded at the end of 2017, in partnership with WWF, to consider combining MONREC conservation-oriented budgets²⁹ as well as for each of the ECD, FD, and NWCD (Emerton and Kyin 2018). The expenditure review found that, after an unusually high allocation in the postelection year of 2010, conservation-oriented MONREC budgets have registered sustained growth. Expenditures had increased in real terms by around 70 percent to the end of FY2016/17.

The amount of funding to environmental conservation provided by international development partners was approximately equal to that allocated from the public budget (Emerton and Kyin 2018). In total, between 2007 and 2015, around US\$125 million of official development assistance was marked with environment as the 'principal objective'. This amount has increased over time, although it fluctuates widely between years and across different ENR subsectors. The share of the total official development assistance in Myanmar allocated to environmental spending has remained relatively constant, at between 1 percent and 2.5 percent of the total amount.

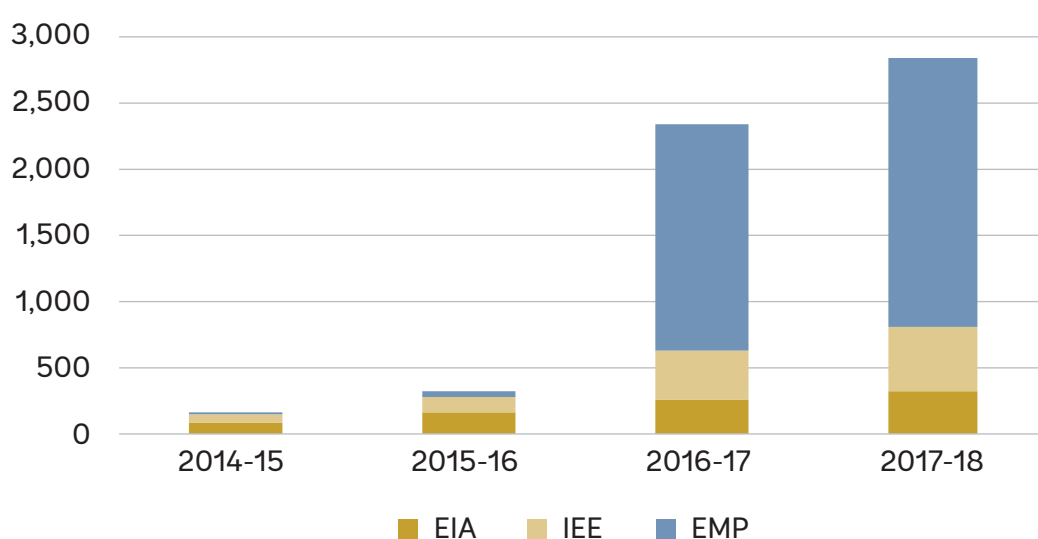
3.3 Issues and challenges

3.3.1 Delay in the review and approval of EIAs, IEEs, and EMPs

The number of EIAs, IEEs, and EMPs submitted is increasing every year, with a significant increase of EMPs in 2016–2017 and of all reports in 2017–2018 (Figure 29). A total of 2,783 reports were submitted as of February 2019 (Table 4). A high proportion of these reports is for the mining sector (which can be largely explained by the new licensing requirements for mining operations). While nearly all reports have been replied to (89.6 percent in total), only a small fraction has been approved (6.9 percent).

Figure 29

EIA/IEE/EMP received from FY2014/15 to FY2017/18



²⁸ Union budget refers to Union ministries and departments only (including transfers to States and Regions).

²⁹ The review does not cover the state economic enterprises associated with MONREC, or mining-related receipts and expenditures. It looks only at conservation-oriented MONREC departments (including their component divisions and other units) and the Union Minister's Office.

Table 4

EIAs/IEEs/EMPs received as of January 31, 2019

Type	Total received	Total replied	Replied (percent)	Total approved	Approved (percent)	Total awaiting reply	Total awaiting approval
EIA	287	195	67.9	37	12.9	92	250
IEE	525	454	86.5	43	8	71	482
EMP	1,971	1,845	93.6	112	5.7	126	1,859
Total	2,783	2,494	89.6	192	6.9	289	2,591

Source: ECD 2019

Between June 2018 and February 2019, the ECD made significant progress in replying to 1,006 EIA, IEE, and EMP reports. They succeeded in processing an increased number of reports and they significantly reduced the backlog of reports awaiting response. The total percentage of reports replied to increased from 52.2 percent (1,488) to 89.6 percent (2,494). These included EIAs increasing from 44.3 percent (143) to 67.9 percent (195), IEEs from 38.4 percent (193) to 86.5 percent (454) and EMPs from 56.8 percent (1,154) to 93.6 percent (1,845). In other words, 1,006 or 36 percent of documents were reviewed and replied to between June 2018 and January 2019: 52 EIAs, 263 IEEs, and 691 EMPs.

However, only 6.9 percent (192) of all 2,783 reports submitted were approved. This leaves 250 EIAs, 482 IEEs, and 291 EMPs awaiting approval. As of January 31, 2019, only 37 out of 287 EIAs (or 13 percent) have been approved. As of June 2018, fewer than 10 ECCs had been issued by the ECD. Although some ECCs have been made public by the project proponents or consultants themselves, the lack of capacity and experience with legal issues at the ECD has prevented it from disclosing them (Schulte and Baird 2018). Development partners are currently working to help the ECD simplify the ECC template.

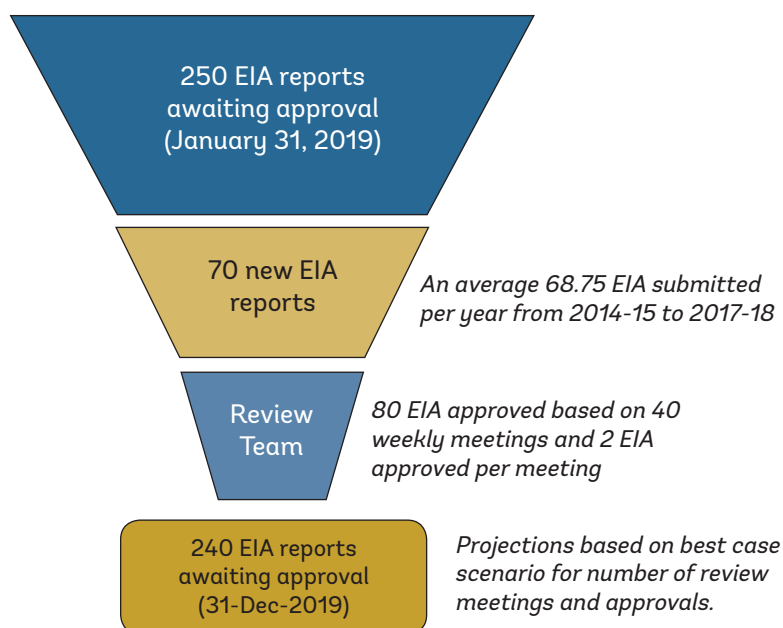
Under the current system and with current capacity, it is not possible to approve all of the outstanding EIAs. If all EIAs go to the EIA Review Team as currently required, the outstanding EIAs will not be approved, especially when taking into account the submission of new reports. Figure 30 shows that even under a best-case scenario based on current performance, it would only be possible to reduce the EIAs awaiting approval from 250 to 240 reports by December 2019. This projection assumes (a) 70 new EIAs submitted in 2019, (b) 40 weekly review teams are held in 2019, and (c) two EIA reports are approved at every meeting.

There is an urgent need to reform the EIA review process using a risk-based screening system for incoming reports based on risk, investment volume, complexity, or political sensitivity. Similarly, the authority for approvals will need to be differentiated based on risk and delegated.

Currently, the mining sector accounts for 72.2 percent (2,010) of the total reports submitted, including 84.7 percent (1,669) of all EMPs submitted, 54.1 percent (284) of IEEs, and 19.9 percent (57) of EIAs. Most of these stand-alone EMPs were submitted in 2016–2017. In 2016, when the Department of Mines (DOM) was incorporated into MONREC, the ECD issued a guidance requiring all existing mines to submit stand-alone EMPs. This decision led to a significant volume of stand-alone EMPs requiring review and approval. Most of the EMPs submitted were reported to be of poor quality.

Figure 30

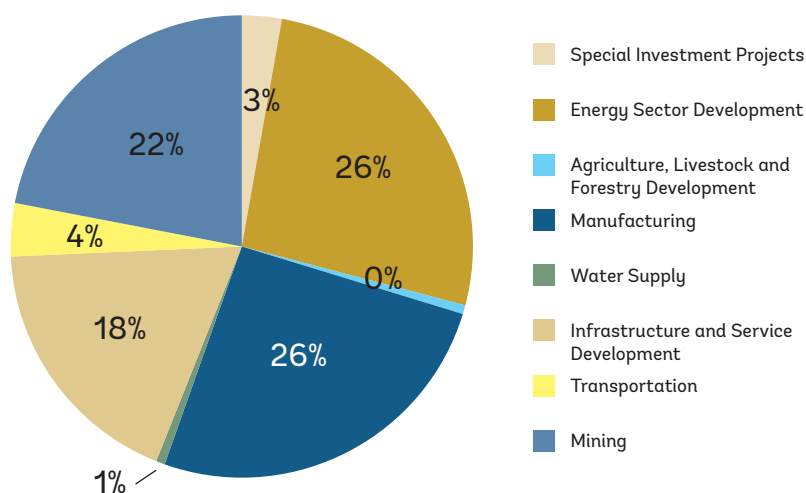
Projections for EIA approval



Source: ECD 2019

Figure 31

EIAs received by sector from 2011/12 to 2017/18



Source: ECD 2019

There is a more even distribution of EIA reports across different sectors. As shown in Figure 31, 26.3 percent (85) of EIAs received are from energy sector development, 25.7 percent (83) for manufacturing, 22 percent (71) for mining, and 18.3 percent (59) for infrastructure and service development. For IEEs, 59.3 percent received are for the mining sector, 16.6 percent (114) for manufacturing, and 13.3 percent (65) for infrastructure and service development.

The EIA systems review included surveys of the EIA Division staff at Union and State and Region levels, E&S consultants, private sector, third-party reviewers, and NGOs. These stakeholders have all provided unique insights into existing challenges and a way forward for improving the system. The results of these face-to-face meetings and online survey are summarized in the following sections.

3.3.2 Inadequate quality of EIAs, IEEs, and EMPs submitted

The limited resources and technical capacity of the ECD coupled with the poor-quality EIAs, IEEs, and EMPs submitted have led to a significant volume of reports that remain requiring review and approval. The backlog of reports can be contributed partly to the limited staffing and capacity of the ECD to review a large number of EIAs, IEEs, and EMPs in a short time. However, the staff also has had to deal with a constant stream of documents that are largely inadequate due to the poor impact and risk assessment, resulting in deficient EMPs and mitigation measures. The quality of reports contributes to the delay, especially as the division does not currently have a mechanism to quickly send back poor-quality EIAs. The EIA Division staff spend time trying to revise the EIA and going back and forth with the project proponent and consultant.

Project proponents and consultants pointed through a survey to the time it takes the ECD to complete the administrative review as the main cause of delay in the EIA system. The EIA Division staff are responsible for completing the administrative (or initial) review of the EIA report, comments are sent to the project proponent, and usually the revised version is then submitted to the EIA review team for final review. The results of the survey in relation to the quality of reports and response time are summarized below in Table 5.

Table 5

Quality of EIAs, IEEs, and EMPs and typical delay

Report	Quality of report submitted (from EIA Division Survey)	Requirement of EIA Procedures (2015)	Response time (reported by companies and consultants)
Project Proposal Report (PPR)	PPR is not always submitted or has limited information.	Decision on whether an EIA/ IEE/EMP is required within 15 working days.	Responses usually take between 2 and 3 months.
Scoping report for EIA	46% of staff reported that scoping reports were of poor quality.	Provide comments within 15 working days.	Responses usually take between 1 and 6 months.
EIA	54.6% of staff reported poor quality, 36.4% reported acceptable quality, and only 9.1% reported good quality.	ECD to provide comments within 90 working days.	Between 6 and 12 months and some EIA still awaiting comments.
IEE	No staff reported very good or good quality, 37.5% reported acceptable quality, 56.3% reported poor quality, and 6.3% reported very poor quality.	ECD is required to issue a decision within 60 days.	4 to 12 months to receive a decision, in some cases up to 2 years.
EMP	66.7% of staff reported that EMPs were acceptable, 25% poor, and 8.3% very poor.	ECD is required to issue a decision within 30 working days	Between 3 and 12 months.

If the ECD does not adhere strictly to the timelines for issuing decisions and comments, this can delay investments or lead to projects starting without an EIA, IEE, and EMP in place. If guidance on the PPR and scoping report is not provided within the time frame, the EIA investigations go ahead without any guidance and agreement from the ECD on the approach and methodology. There are projects that have proceeded without approval from the ECD and are under construction or operating without ECCs or Approval Letters.

Companies are not allocating sufficient budget or timelines for consultants to prepare EIAs and IEEs that comply with EIA Procedure or international best practice. Through consultations for the review it was revealed that E&S consultants are agreeing to prepare EIAs, IEEs, and EMPs at a very low cost and as a result are producing low-quality EIA reports. Worryingly, the Directorate of Investment and Company Administration (DICA) 'Cost of Doing Business Survey' (2018) estimated that the costs for doing research for an EIA and IEE ranged from minimum US\$20,000 or less to maximum US\$100,000 or more, depending on the level of assessment and the size of the project. This would not be sufficient for conducting an EIA for a large-scale project, as this cost should reflect the level of investment, risk, and complexity.

The ECD does not have an effective and transparent mechanism for tracking the submission of EIAs, IEEs, and EMPs. All stakeholders called for an online system to improve tracking and workflow for the ECD, communication with project proponents on review and approval, and disclosing reports and information to the public. Post EIA, there is no system that links the approval of documents with monitoring and compliance.

3.3.3 Lack of budget and resources for monitoring, inspection and compliance

Currently, compliance activities are only carried out in response to complaints from local community, and there is no effective regular monitoring and inspection regime in place. Through discussions with state and region ECD offices, it was reported that the PCD normally conducts monitoring or inspection in response to complaints. The PCD only has limited staff, equipment, and facilities to conduct effective monitoring.

Additional budget and resources are urgently needed to improve the technical capacity and to mobilize resources and equipment for the EIA Division and PCD to fulfil their role in review, approval, monitoring, and audit. There is a need to secure enough public and private finance to address these threats, to sustainably manage the natural environment, and to support Myanmar's sustainable development (UNDP and WWF 2018). Recognizing these urgent needs, MONREC is in the process of setting up the Environmental Management Fund (EMF). The National Environmental Conservation and Climate Change Central Committee (NECCCCC) authorized the ECD to lead a Fund Preparation Working Group, with WWF and UNDP providing technical assistance. Currently, there are three distinct sources of potential revenue:

- **Compensation from polluters for environmental impacts.** Under subsection (o) of Section 7 of the ECL and Section 30 of the ECR (2014).
- **Contributions from organizations which obtain benefit from natural environmental service system.** This latter category can be identified as PES.
- **Receipts from MONREC carrying out its duties relating to environmental conservation.** Article 31 of the ECR (2014).

The EIA Procedure (2015) establishes a number of fees and charges that can be collected by the ECD for review of EIAs and IEEs and compliance monitoring. These include service fees for reviews of IEE and EIA reports, compensation to the ministry for conducting inspections, and penalties for breaches of ECC. Currently, only limited funds have been used to pay for third-party review using an ad hoc approach. However, there is certainly more scope to generate increased revenue to support environmental conservation and activities related to EIAs, IEEs, EMPs, and post-EIA inspection and monitoring.

Post-EIA monitoring, inspection, and audit stage remains weak across the GMS due to the strong emphasis on the review of the EIA reports. As a result, less resources are committed to enforcement and compliance monitoring (ERI 2016). When comparing Myanmar's EIA system to other countries in the GMS, Myanmar had a smaller number of staff than Laos and Vietnam, and these countries also have established independent review panels (Sano et al. 2016).

Myanmar's EIA system is also very new. It has only been in place for three years unlike other countries in the GMS. Yet, these countries still face similar issues. An evaluation in 2011 of the Vietnam Law on Environment Protection (Revised) 2005, which had been operational for six years found the main deficiencies were (a) limited staff resources and (b) limited capacity to review and appraise a large number of EIA documents and monitor the resulting projects. In Thailand, which has had an EIA system in place for over 40 years, there are still challenges with respect to project screening, terms of reference development, preparation of EIA reports, EIA report review processes, and EIA monitoring and evaluation (Sano et al. 2016).

It was estimated that since the ECD issued the notification (which applied to 1,155 factories), by February 2019 less than 10 percent of factories had complied. Recent data provided by the ECD showed that by January 31, 2019, only 171 EMPs had been submitted for 'Industries' (which includes factories), which is only 56 more than as of May 31, 2018. While these figures are estimates only, they do point to a serious noncompliance with the ECD Notification. There is no doubt that the ECD needs to take action against the nine industrial sectors due to the risks they pose to water quality, air quality, and public health. However, a more consultative approach could have been taken to ensure achievable time frames were put in place.

3.3.4 Lack of capacity to enforce compliance of factories

In 2018, the ECD launched a compliance campaign focused on nine priority sectors. This was in response to sampling which revealed that factories lack measures to adequately minimize water pollution and treat wastewater. From 2016 to 2018, the JICA 'Project for Capacity Development in Basic Water Environment Management and EIA System' was implemented near industrial zones on the Hlaing River in Yangon and the Myitnge River in Mandalay. The analysis of 100 wastewater samples from factories in Yangon and Mandalay in 2017 revealed that 89 percent of factories were not meeting the NEQ values for Biochemical Oxygen Demand (BOD) and 64 percent were not meeting the values for Chemical Oxygen Demand (COD). Sampling in the dry season (February 2018) revealed that water quality had deteriorated as indicated by high COD detected at some points and slightly elevated levels of oil and grease detected at all points.

In January 2018, the ECD ordered factories in nine priority sectors (Notification No. 3/2018) to develop EMPs within 9–12 months.³⁰ The sectors included food and beverage, alcohol, pesticides, cement, textiles, foundries, tanning, pulp and paper mills, and sugar manufacturing. The factories raised concerns that they would not be able to comply due to the limited resources and capacity for owners to develop EMPs and install wastewater treatment plants. **It was estimated that since the ECD issued the notification (which applied to 1,155 factories), by February 2019 less than 10 percent of factories had complied.** Recent data provided by the ECD showed that by January 31, 2019, only 171 EMPs had been submitted for 'Industries' (which includes factories), which is only 56 more than as of May 31, 2018. While these figures are estimates only, they do point to a serious noncompliance with the ECD Notification. There is no doubt that the ECD needs to take action against the nine industrial sectors due to the risks they pose to water quality, air quality, and public health. However, a more consultative approach could have been taken to ensure achievable time frames were put in place.

3.3.5 Applying the EIA Procedure to Special Economic Zones (SEZs)

The Thilawa SEZ is often cited as a practical model for ensuring environmental compliance and monitoring and the process of setting up a centralized wastewater treatment system. However, this model should not be replicated for other SEZs due to type and scale of industries planned. In December 2015, to enable development of Thilawa SEZ, the ECD dispatched officers to the environmental section of the One-Stop Service Centre (ECD No.101/2015). Concerns were raised by CSOs about the EIA Procedure (2015) that had devolved the powers of the ECD to a small team in a site-level office to (a) determine whether an EIA is required, (b) review EIAs and EMPs, and (c) make critical decisions on issuance of ECCs (ICJ 2017). CSOs also documented that people living on land acquired for the Dawei and Thilawa SEZs were displaced without proper planning for resettlement before

³⁰ This requirement has now been extended by six months.

the submission and approval of the EIA report.

The approach of doing an EIA for an industrial park and then IEEs and EMPs for associated factories is being adopted for other urban development projects. However, more clarity on how these decisions are made and clearer guidance are needed. For example, an EIA for the Yangon Urban Area Expansion (approximately 400 acres) is required as well as separate IEEs and EMPs for wastewater treatment plants, water supply and distribution, roads, manufacturing, and light industry.

3.3.6 Limited use of SEA for planning

There is a lack of SEAs used to inform the planning of large developments. Chapter X of the EIA Procedures (2015) states that MONREC can request for other policies, strategies, development plans, frameworks, and programs prepared by relevant GoM organizations to undertake a SEA study in accordance with the SEA guidelines. However, the SEA guidelines or procedures have not been established. To date, MONREC has not provided any guidelines on the form or procedures for SEAs.

The SEA of the hydropower sector in Myanmar, carried out by MONREC, Ministry of Electricity and Energy (MOEE), and IFC, with support from Australia, provides a platform for future SEAs. Based on the experience of implementing this SEA, it was recommended that a SEA procedure be developed under the ECL (2012) to provide regulatory guidance on when to apply a SEA to sectors, such as mining and transportation, or to areas, such as SEZ.

The report of former UN Secretary-General Kofi Annan's commission on the Rakhine issue called government to implement a SEA on the planned Kyaukphyu SEZ. A SEA could be used to examine how the SEZ will affect local communities and the economic implications on sectors and industries in the region.

3.3.7 Inadequate public participation and disclosure and limited provisions for social impact assessment (SIA)

The EIA system in Myanmar is still a new system and is slowly being implemented. There are many opportunities for the community and civil society to actively participate in the EIA system in Myanmar, but there is limited capacity for Project-Affected Persons (PAPs) to exercise their rights under the EIA Procedure (2015). Effective public participation requires support and capacity development for PAPs and civil society's meaningful engagement in the public participation process. The methods employed for conducting public consultations seem to vary widely, and, as of yet, there is no standard practice for demonstrating how the public's views and concerns have been considered and either rejected or incorporated into the EIA report (Schulte and Baird 2018).

Challenges still remain with public participation with regard to information disclosure during the IEE and EIA report investigation stages. The EIA procedure itself does not specify what information must be disclosed to the public, other than 'project related information'. As a result, the type and amount of information that is actually shared with the public (as well as the method for dissemination) varies widely across projects (Schulte and Baird 2018). The surveys with the EIA Division, reviewers, and CSOs revealed that very few EIAs are disclosed to the public. Consultants and companies also called on more EIAs and IEEs to be disclosed to improve transparency and accountability.

The EIA Procedure (2015) states that projects should comply with the international best practices on involuntary resettlement and indigenous peoples, such as the World Bank Group and ADB safeguards. However, no article explicitly mentions which ministry is obliged to handle reviewing, approving, and monitoring follow-up processes and implementation of social issues. The existing policy and legal framework under the National Land Use Policy (2016) is currently under development, and the Land Acquisition Act 1894 is being reviewed by parliament. This means that there are no laws or procedures related to voluntary and involuntary resettlement and indigenous people's rights.

3.4 Opportunities for reform

3.4.1 ECD action plan

In June 2018, the ECD prepared an 'Action Plan on Reviewing EIA Reports' (No. EIA I 1/5/ 757/2018). The key actions to address the backlog of EIA reports included improving the EIA review process, further capacity building and sectoral guidelines, human resources and staffing; involving state and region ECD offices in review of IEEs and EMPs; and outsourcing to third-party reviewers. In addition, the ECD proposed several project proposals to strengthen EIA related capacity. Presented by the Director General of the ECD to the Environment Sector Coordination Group Meeting in August 2018, the ECD highlighted the activities that could improve the EIA process, monitoring, inspection, and audit (summarized in Table 6).

Table 6

ECD priority project proposal

Name of program/ project	Goals/objective	Duration	Estimated budget (US\$)	Potential development partners
Central Environmental Database System	To provide consolidated primary and secondary data from relevant ministries and departments	—	500,000	To be determined
ECD ICT Facility developed	Operational effectiveness strengthened within the ECD	6 months	500,000	To be determined
Establishing the ECD e-library	To support the environmental research activities	2018–19	50,000	KOICA
Spatial data management and development	To develop and manage spatial data related to environment-related activities and issues	5 years	200,000	To be determined
Establishment of Polluter Pay Principle and PES	To develop the financial resource for EMF	5 years	500,000	To be determined
Formulation of the National Environmental Quality Standards	To protect the health of human beings and ecosystems	2 years (2018–19)	Technical cooperation	ADB

Note: KOICA = Korea International Cooperation Agency.

3.4.2 Ongoing support by development partners

Development partners have been working together with the GoM since the introduction of the EIA Procedures (2015) to (a) strengthen the capacity of the ECD at the union and state/region levels, (b) enhance the EIA review and approval function of the ECD, (c) develop sector-specific EIA guidelines, (d) improve supervision and monitoring, and (e) develop an EIA tracking system. There are a number of ongoing or planned initiatives to continue supporting the EIS systems as summarized below:

- **World Bank.** Completed scoping missions and feasibility assessment for establishing functioning and sustainable E&S Safeguard Learning Center (SLC) in the ECD. The SLC would initially be supported by the World Bank, ADB, and JICA. The World Bank also provided trainings on World Bank safeguards and the ESF.
- **IFC.** From June 2019, IFC will provide two consultants from to build the capacity and confidence of the ECD staff in reviewing EIA reports through on-the-job training and in-house seminars as requested. IFC will continue to provide thematic trainings based on IFC's performance standards and coordinate with the SLC.
- **ADB.** Myanmar Country Partnership Strategy (2017–2021) includes ongoing safeguards capacity support as a priority area.
- **JICA.** JICA is finalizing the Myanmar version of the Transitional Consultation Registration and Licensing system and developed an e-manual (or technical references library).
- **UNDP.** UNDP is providing a senior management adviser to the ECD following review of EIAs and, in February 2019, commenced an organization review.
- **NEA.** NEA is finalizing the EIA guidelines for the oil and gas sector and is continuing to assist the ECD in building capacity to review EIAs and issue ECCs through the 'Oil for Development' program.

3.5 Recommendations

The recommendations for improving the EIA systems are aimed at ensuring that the government has a modernized information system for managing the EIA process, and that the ECD is equipped with the appropriate technical capacity, tools, budget, and resources to become a more effective environmental regulator. This includes improving the tracking and transparency of EIAs, IEEs, and EMPs; strengthening EIA institutions and operationalizing financial mechanisms for the review and approval of reports; and shifting focus toward inspection, monitoring, and audit.

Detailed recommendations for the EIA systems are provided in Annex 1. These are grouped under three key areas: (a) tracking and transparency, (b) strengthening EIA Institutions, and (c) operationalizing financial mechanism.

Actions needed to improve EIA systems are:

1. Establish a transparent Environmental Management Information System (EMIS).

A transparent EMIS is needed to track the status of EIA, IEE, and EMP preparation and review and to facilitate the monitoring of their implementation and compliance by regulators and stakeholders. Public participation and attention to environmental assessment can greatly help mitigate the existing institutional capacity constraints.

2. Adopt risk-based and outcome-focused approach to EIA review, approval, and monitoring.

This includes extending the current focus on EIA documents review to a systematic follow-up on their implementation and compliance. Focus should be on prioritizing high environmental risk projects and delegation, and accelerating EIA approvals based on risk. A clear compliance strategy is also needed for engaging regulated industries and simplifying the ECCs for practical compliance monitoring.

3. Operationalize dedicated financial mechanisms to cover the costs of environmental assessment and compliance.

This includes operationalization of the EMF to provide funding to improve the implementation of the EIA procedures and environmental inspection and monitoring (Schulte and Baird 2018). Generating environmental funding can also be facilitated through the establishment of systems for PES.

4. Strengthen environmental management institutions and mobilize resources to boost capacity at national and subnational levels.

The staffing and resourcing of the ECD and other institutions responsible for environmental and pollution management at national and subnational levels needs to align with the expanding regulatory requirements and growth of the regulated economic sectors. Other institutional strengthening actions include establishment of a third-party review mechanism to support the ECD with the review of EIAs and IEEs; a functional review of the EIA Division and PCD regarding compliance, inspection, and monitoring; and strengthening of the SLC for staff and stakeholder capacity.



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4 SOLID WASTE, PLASTIC, AND AIR POLLUTION

4. SOLID WASTE, PLASTIC, AND AIR POLLUTION

4.1 Solid waste and plastic

4.1.1 Municipal solid waste generation, composition, and collection

The actual amount of waste generated by households and industry is not known. There is no regular waste sampling and analysis carried out, and there is insufficient information on the exact waste collection coverage in different geographical areas. In Mandalay, information from the weighbridge at the controlled waste dumpsite that covers three townships suggests it receives 980 tons of waste per day and that the average waste generation is 0.8 kg per person per day. This waste is collected after the informal sector has taken out the recyclable materials. Based on international experience, the waste generation rate in rural areas is probably about 0.4 kg per person per day (50 percent of urban waste generation). This would result in a national average of 0.56 kg per person per day (60 percent rural areas and 40 percent urban areas) and follows internationally observed ranges for a lower-middle-income country averaging at 0.53 kg per person per day (Kaza et al. 2018).

At a national level for Myanmar, 0.53 kg per person per day results in a nationally generated waste quantity of 10.5 million tons of municipal waste per year (or 28,850 tons per day).³¹ Out of this, 4,160 tons per day is estimated for Yangon (5.2 million people) and 1,120 tons per day for Mandalay (1.4 million people) (Central Statistics Organization 2016). In addition, solid waste is rapidly increasing, and both the Yangon City Development Committee (YCDC) and Mandalay City Development Committee (MCDC) have prioritized solid waste management as a result.

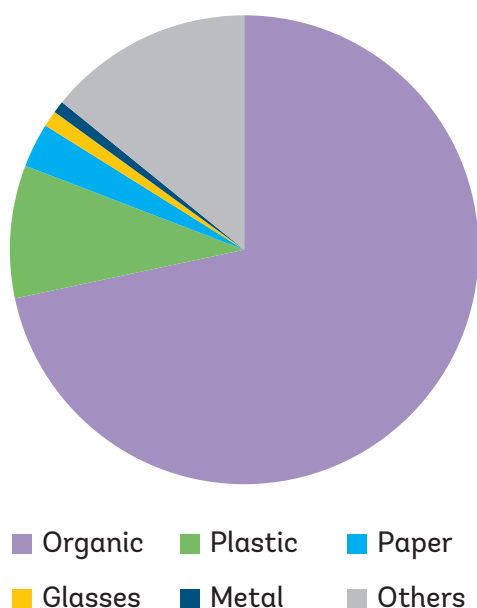
Municipal solid waste is composed mainly of organic materials (77 percent), while the remainder comprises plastic (13 percent), paper (7 percent), and others (3 percent) (Figure 32). This has been confirmed by observation and evaluation of the waste composition of Yangon and Mandalay (IGES and CTE 2016). The large organic fraction provides opportunities for reducing the wastes going to the dumpsites.

Based on the analysis of the landfill waste disposal data, it could be concluded that the waste collection coverage is about 53 percent in Yangon and 84 percent in Mandalay. Public cleanliness and insufficient waste collection are some of the main problems in municipal waste management due to the (a) limited public awareness of cleanliness; (b) lack of sufficient containers, especially for households, and as a result households put their waste in small (shopping) bags outside; (c) inadequately organized street cleaning as pushcart operators are acting both as street sweepers and waste collectors; and (d) the income from solid waste management services is insufficient to cover the costs of solid waste collection and disposal.

³¹ Based on 51.5 million people \times 0.56 \times 0.365 = 10.5 million tons of municipal waste per year or 28,850 tons per day.

Figure 32

Characterization of solid wastes in Yangon



Source: IGES and CCTE 2016

To increase the effectiveness of the waste collection, increasing the waste collection in cities to 100 percent should be a priority objective. Due to the low waste collection coverage, a substantial quantity of waste is illegally dumped, resulting in blocked drainage systems and creating extra work for the by Pollution Control and Cleansing Department (PCCD) to clean the drainage systems. In addition, to improve the efficiency of the expenditures and particularly optimizing the costs of waste collection, it is important that the planning of the routing of the collection equipment is done as efficiently as possible and that the areas of waste collection in the cities are substantially increased to achieve a 100 percent waste collection target.

4.1.2 Solid waste administration, regulations, and operations

A National Waste Management Strategy and Master Plan (2018–2030) was developed recently with donor assistance. The first goal of the strategy is to implement waste collection for all citizens and to eliminate uncontrolled disposal and open burning of waste. The MCDC developed the Waste Management Strategy and Action Plan for Mandalay City (2017–2030). However, capacity and financing for implementation and control and enforcement is lacking.

The PCD, that sits within the ECD, is responsible for developing national waste policies, strategies, and legislation. However, the PCD has limited staff (24 staff at the Union level), and they mainly deal with pollution control activities (such as air and water). No staff have specific responsibility for solid and industrial (hazardous) waste management. This lack of capacity severely hampers the development and implementation of waste management policies and guidelines in Myanmar.

Legislation for municipal waste management both at national level and local level is limited, and essential bylaws are non-existent. There exists no specific definition in the legislation on 'Municipal Solid Waste' but it is generally accepted to be non-gaseous and non-liquid waste that results from the daily activities of residential, commercial, and public operations (public markets, street sweepings, and so on) within a given administrative area. No details are given on waste fractions, and no waste catalogue identifying the different types of waste exists.

Waste collection, transport, and disposal as well as the waste fee collection is the responsibility of the local municipal government. In Yangon, the actual waste collection, disposal, and street cleaning operations are carried out by the PCCD under the YCDC that have staff in each township for supervision and for waste fee collection. In Mandalay, the pollution control is separated from cleansing activities³² and is handled by the Cleansing Department under the MCDC. In other states and regions, the municipal waste-related tasks are carried out by the respective Development Affairs Organizations.

In Myanmar, typically waste management is a full public service except for waste separation activities by the informal sector. Waste collection is divided into primary collection by means of pushcarts, tricycles, and small tippers in alleys and narrow streets taking the waste to a transfer point and sometimes directly to compactor trucks. At the transfer station, the waste is loaded into a large container or in a compactor truck for transport to the landfill. The landfills are open dumps where the waste is disposed without sufficient environmental protection, such as leachate collection and treatment, daily compaction and covering, and landfill gas capture.

4.1.3 Environmental impacts of waste disposal and littering

Due to the current practice of open dumping of waste and the insufficient collection coverage and cleanliness, there are key environmental and operational issues:

- Landfills are almost at their full capacity, and their operation as an open dumpsite is not well organized.
- Waste dumping without any compaction in combination with steep slopes is a dangerous situation for waste pickers and reduces the landfill capacity.
- There is observed surface water and groundwater contamination from toxic waste components.
- There is potential impact of contaminated water on surrounding farmland.
- Leachate infiltration into the underground is environmentally hazardous and not acceptable regarding groundwater protection.
- Windblown light plastic material litters surrounding area.
- There is methane production, release of greenhouse gas, and potential for landfill fires.
- Solid waste disposal sites are a major source of diseases for nearby population, agricultural lands and workers, and waste pickers.

4.1.4 Financing and costs of recovery

Solid waste management in Yangon and Mandalay is a substantial expenditure item for the municipal budget. The operational costs for solid waste management represent around 13–16 percent of the operational municipal budget spending in Mandalay and Yangon (excluding capital costs). These figures are in line with international experience that indicates the costs of waste management to be around 20 percent for low-income countries and an average of 11 percent for middle-income countries (Kaza et al. 2018). However, the costs in Myanmar do not include amortization costs of the solid waste infrastructure investments and would need to be higher to move toward cost recovery.

Waste landfilling is estimated to cost less than US\$1.0 per ton in Myanmar, very low compared to international costs. This is because disposal is carried out without environmental protection, such as bottom liner, leachate or gas treatment, waste compaction, and waste covering. Investments in infrastructure are almost lacking. Waste is dumped in some cities in unprotected areas without any fencing, paved roads, or surface water collection. The main costs for landfilling are wages and fuel for excavators and bulldozers.

³² Besides municipal solid waste, the PCCD's are also dealing with Industrial waste, medical waste, and hazardous waste and have responsibility for air and water pollution monitoring and control.

Income from solid waste management services is insufficient to cover the costs of solid waste collection and disposal and represents 25–50 percent of the operational expenditures.³³ Street cleaning costs are a public good and are typically not at all or only partly covered from the waste management fee, with the rest is financed by municipalities. Key options to increase waste revenues are as follows:

- Gradually increase the solid waste fee up to a maximum of 1 percent of household income in line with international affordability benchmarks for waste fees. In addition, for the commercial and institutional sectors to link the waste fee to waste generation (size of container).
- Apply cross subsidy with commercial and institutional fee to compensate for low household fee.
- Explore introduction of municipal tourist fee per person per night in hotels and guesthouses with allocated funds for environment and waste management.
- Introduce extended producer responsibility for the packaging waste (national legislation needed).
- Develop commercial activities such as hospital waste collection and treatment, collection of non-hazardous industrial waste, collection of construction and demolition waste, collection on demand, such as of bulky waste (with separate fees linked to the amount of waste generation).
- Increase penalty for noncompliance with local and national legislation on solid waste management.

Without improving financial sustainability and waste collection services it will not be possible to reach the targets of 100 percent waste collection service and environmentally sustainable waste disposal/treatment.

Further options to optimize costs, increase revenue for solid waste management, and improve cost allocation and institutional and regulatory framework are being analyzed in the Solid Waste Chapter of the Subnational Public Expenditure Review. This aims to support the region and city governments of Yangon, Mandalay, and Taunggyi to better manage their waste and their revenues and expenditures. By doing this, it should improve the financial sustainability and, therefore, the financing for environmental sustainability of the solid waste management system.

Further measures and investments to increase solid waste collection and options to rehabilitate dumpsites to sanitary landfills or new landfills are being defined as part of the ongoing World Bank analytical work on solid waste and pollution management. This work will also provide support to Myanmar to (a) further analyze planning and capacity building support to achieve environmentally and financially sustainable solid waste management services in selected cities in Myanmar, (b) prepare a road map for a plastic action plan, and (c) map and analyze key priority sources of air and water pollution. Further analysis has been undertaken to recommend: (a) institutional; (b) legal and regulatory; and (c) financial measures to clearly allocated costs of waste management, optimize costs and increase revenues as well as introduce information systems that can accurately record the amount of waste generated, collected and properly disposed. This analysis will further include an overview of the investments required in solid waste collection, transport and disposal to meet the targets in the National Waste Management Strategy for key cities, as well as measures to increase public outreach and citizen engagement in waste management.

³³ In Mandalay, the truck fleet for solid waste collection is under the Vehicle, Transport and Workshop Department and not included in the costs of the solid waste management, but the stated operational expenses have been corrected to include the costs of drivers, fuel, and maintenance/repair.

4.2 Plastic waste

Plastic waste in Myanmar is as much of an issue for Myanmar as it is for the rest of the world. According to the World Bank, the world generated 242 million tons of plastic waste in 2016, and this will increase by 70 percent by 2050 (Kaça et al. 2018).

In an attempt to tackle the scourge of plastic in Myanmar, the government is preparing a plastic action plan. This road map for this plan consists of (a) analyzing negative economic impacts of plastic mismanagement, (b) establishing the priority plastic items for public policy based on the identification of top 10 priority plastic items found in the environment, (c) analyzing efficiency and effectiveness of potential plastic policies based on international experience, (d) estimating the plastic leakage from key priority cities into the waterways and analyzing the range of accompanying annual leakage from priority cities, and (e) preparing a road map to put the plan in action.

Selected cities in Myanmar with populations larger than 100,000 and close to waterways and the coast will be used as part of the analysis to estimate plastic leakage. Figure 33 shows cities larger than 100,000 people and tourism sites. Recommendations for prioritization of policy and investment measures to reduce plastic leakage into environment and waterways will be made. In addition, the reuse and recycling of plastic items will be increased. Increased citizen engagement and public awareness raising is required to successfully introduce policies, and consideration will be given to the potential to take such actions on a regional basis in Asian countries.

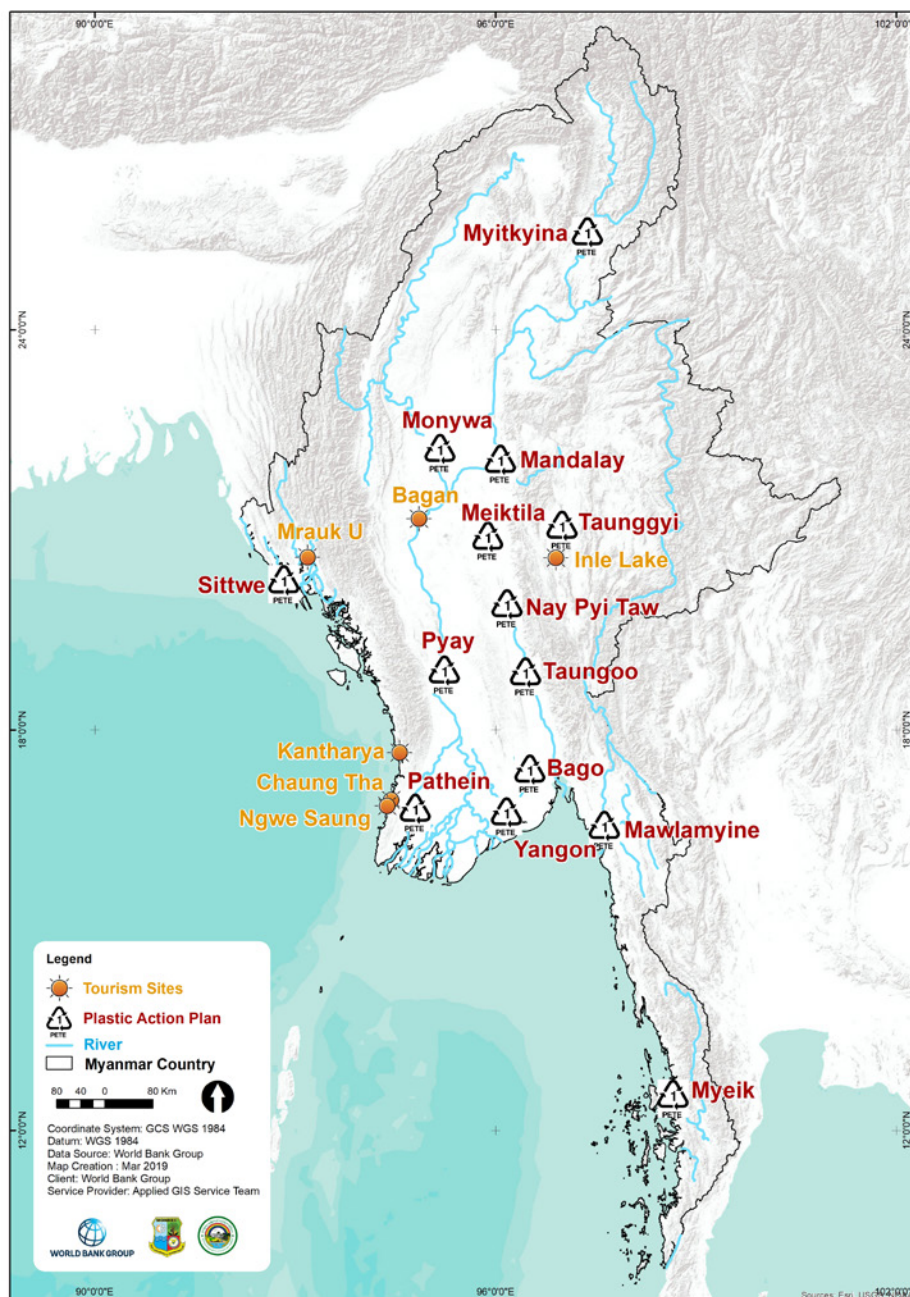
The World Bank's analytical work on solid waste and pollution management is already analyzing the negative economic impacts of plastic mismanagement and estimating the plastic leakage from key priority cities into the waterways and oceans. This analytical work is also establishing a list of top 10 priority plastic items for public policy and defining the policy actions and investments needed to reduce plastic leakage and use.

A remote satellite survey and subsequent drone surveys are being piloted in Cambodia. The aim is to identify waste dumps close to waterways, dense “plastic carpets” in large city areas that point to key sources of plastic leakage into the waterways, and to report on the quantity of plastics on beach areas and upstream and downstream of key suspected polluted cities. Following this pilot, this analysis will be scaled-up in Cambodia and be employed in Myanmar³⁴, specifically in the Yangon area where there is the interlinkage between waste “carpets” floating on the river and the flood management issues as the water cannot be sufficiently drained and some selected tourism areas.

³⁴ Provided that flying permits can be obtained, first drone survey is being piloted analysing the waste volume at the Htein Bin Landfill in Yangon as a basis for rehabilitation design into a full sanitary landfill for Yangon.

Figure 33

Priority cities and tourism sites for plastic action plan



4.3 Air quality

Since 2011, Myanmar has experienced rapid development, and air pollution in urban areas is on the rise. A number of factors contribute to this trend. Yangon and Mandalay, the two biggest cities in the country, are experiencing increased urbanization and growing density from rural-urban migration as the urban population growth has been faster than urban spatial growth (World Bank 2019a). Another factor is that more than 80 percent of the urban population continues to cook and heat with solid fuels (WHO 2015). The number of registered motor vehicles is six times higher than it was 10 years previously, and the number has doubled in the past five years (CEIC 2018). The number of industries located on the outskirts of cities is also growing, and the continued development of industrial zones is strongly promoted by the GoM. In Yangon alone, new industrial zones of 405 ha or more are planned in each of 11 townships throughout the region (Myanmar Times 2017).

4.3.1 Health impacts of air pollution

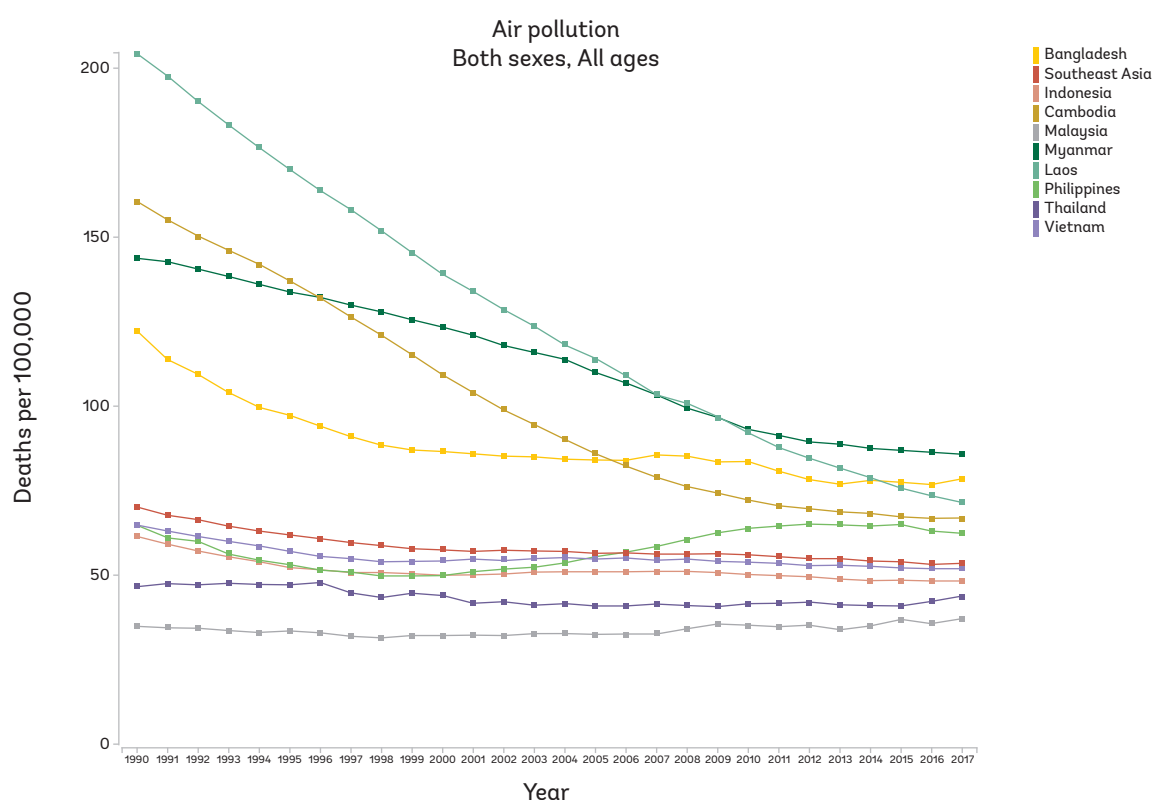
While the impacts of air pollution to human and environmental health are well known, there is very little data available on the actual level of air pollution in Myanmar. This section briefly explores the Global Burden of Disease (GBD) dataset to shed light on the risk of air pollution to death and functional health. It also summarizes the current monitoring arrangements and data available on ambient air quality and provides recommendations for better monitoring of air quality, source apportionment, and taking actions for those sources that can be addressed in a cost-effective manner.

Pollution in Myanmar's urban areas causes significant health effects that affect men, women, and children differently. The inhalation of fine particulate matter (PM_{2.5}) causes several illnesses, including cardiovascular disease, chronic obstructive pulmonary disease, and lung cancer among adults and acute lower respiratory infections among children. The GBD dataset from 1990 to 2017 gives an indication of the level of risk from air pollution for death and functional health in the Myanmar population and the development of those risk factors over time (GBD 2017). While the share of deaths attributed to household air pollution (HAP) has fallen, it remains the leading risk factor related to air pollution for premature death and disability (GBD 2017).

In 2017, air pollution is estimated to have contributed to over 45,000 deaths in Myanmar. As a risk factor for death, air pollution is higher in Myanmar than in other countries in the region and is almost twice the average for Southeast Asia (Figure 34). PM pollution remains the leading environmental and occupational risk factor causing over 10 percent of all deaths in Myanmar with 85 deaths per 100,000 persons (GBD 2017). For Myanmar youth aged 5–14 years, PM pollution is the leading risk factor of death among all risk factors, including malnutrition and other behavioral risks.

Figure 34

Deaths per 100,000 attributed to air pollution in selected countries 1990–2017



Source: GBD 2017.

HAP is a particular problem for women in Myanmar. The numbers of years lived with disability due to HAP from solid fuels is the highest rate in Southeast Asia and double the regional average. HAP is primarily caused by the high prevalence of using solid fuels for cooking and heating, and it is women cooking at home who bear the brunt of this risk. Even in the urban population 81 percent still relies on solid fuel (WHO 2015). Since 1990, risk factor for death and disability reduced by 50 percent and 66 percent, respectively, for HAP from solid fuels. However, it still remains a significant issue. In 2017, household use of solid fuels caused up to 50 deaths per 100,000 inhabitants, equal to 7.6 percent of all deaths in Myanmar. In 2017 alone, more than 900,000 disability-adjusted life years (DALYs) were lost to HAP.

The GBD from ambient ozone pollution is also particularly high in Myanmar. The risk of ambient ozone pollution is growing, and in 2017 it contributed to over 70,000 DALYs in Myanmar. This is the highest in Southeast Asia where the yearly rate average is 35 DALYs per 100,000 compared to 135 DALYs per 100,000 for Myanmar. Ambient air quality is affected by a growing influx of cars and industries, and, as more and more trees are being cleared for logging and industrial expansion, the cities lose their capacity to filter carbon dioxide out of the air.

4.3.2 Air quality monitoring and management

There is a lack of reliable actual data on air quality in Myanmar and arrangements for monitoring of air quality and pollution control are still in their infancy. Some of the building blocks for environmental regulation are now in place, yet implementation arrangements are weak. In addition, there is no air quality monitoring network in large cities, let alone across the country. Therefore, no monitoring data are available to analyze the actual level of pollution in Myanmar. A few studies have conducted ground-level monitoring of air quality in a number of cities for a limited time period, while others have modeled and estimated the situation. Together, they provide some insight into the current situation on air pollution in Myanmar.

Some urban air pollution monitoring was done in Yangon and Mandalay by the Occupational Health Division under the Ministry of Health since 2008 and in 2012 by the ASEAN Clean Air project. Concentrations of PM₁₀ exceeded the World Health Organization (WHO) guidelines by more than 100 percent. Concentrations of nitrogen oxide (1 hour) exceeded the limits slightly and concentrations of sulfur dioxide were well within limits. This indicates that the main source of pollution is traffic emissions. Since 2015, YCDC has installed permanent air quality monitoring facilities in Yangon. It also does mobile testing to measure the levels of dust, carbon dioxide, and other pollutants including sulfur dioxide and PM₁₀. However, YCDC does not have a platform to announce the details of air quality data and information to the public.

4.3.3 Institutional arrangements for air quality monitoring

Existing legislation at the national and local levels contain provisions directly related to air pollution control. These include the Public Health Law (1972), the Motor Vehicle Law (1964), Section 16 of the Factories Act (1951), Section 33 (a) of the City of Yangon Development Law (1990), and the City of Yangon Municipal Act (1922). However, clear implementation arrangements are in many cases not well defined, and the level of enforcement is low. The standards for maximum emissions from vehicles are based on the Motor Vehicle Rules (1989). The Road Transport Administration Department uses an exhaust emission test as a condition for the renewal of motor vehicle registration.

The Myanmar NEQ (2015) contains general and industry-specific emission guideline values for air quality. The guidelines apply to all new projects (under the EIA Procedure 2015). For existing projects, the ministry may apply less stringent levels or measures than provided for in the guidelines and agree to a time frame for a project to become fully compliant.

Due to the delays in the review and approval of EIAs, IEEs, and EMPs, very few ECCs have been issued. (For more information on the delays on EIAs, IEEs and EMPs, see 'EIA System Diagnostic'). As a result, the follow-up monitoring of compliance is not happening on a regular basis, which is the major responsibility of the PCD.

4.3.4 Recent research with data on air pollution

In 2014, the annual median concentration of $PM_{2.5}$ for urban areas in Myanmar was estimated to be $57 \mu\text{g}/\text{m}^3$ (WHO 2016). This figure came from a comprehensive global analysis by WHO of air quality by country looking at exposure to $PM_{2.5}$.

Two further studies measuring air quality at the ground level in Yangon indicate that outdoor air is highly contaminated with traffic-related pollutants. One of the studies used portable pocket sensors attached to smartphones to measure $PM_{2.5}$ in seven townships around Yangon city (Yi et al. 2018). They found that concentrations of $PM_{2.5}$ in the air exceeded the WHO guidelines, particularly during rush hours due to motor vehicles emissions. Similarly, the other study found that outdoor air quality is contaminated with pollutants most of which are traffic-related (Aung et al. 2018). Using four kinds of diffusive air samplers to measure volatile organic compounds—ozone and carbonyl compounds, acidic gases, and ammonia—samples from seven locations around Yangon showed that ambient nitrogen dioxide values are higher than previous studies have indicated, and that Yangon is now facing high traffic congestion. Contribution of pollutants from industries and construction sites to outdoor air quality is also of growing concern.

Differences in the urban landscape between residential, commercial, and industrial areas affect the concentrations of pollutants. As part of the first exercise to map air pollution in the cities of Yangon and Mandalay in 2007 and 2008, the United Nations Environment Programme (UNEP) undertook a three-day sampling of air quality. The monitoring results suggest that PM, as total suspended particulates (TSPs) and PM_{10} , is the main pollutant of concern in both cities. Relative to the daily PM_{10} guideline value set by WHO of $50 \mu\text{g}/\text{m}^3$, the PM_{10} levels in Yangon and Mandalay were two to four times higher at the time. Comparing the various sites, it showed that commercial areas had higher levels of TSPs and PM_{10} compared to residential and industrial sites. However, this was only observed during the summer sampling period.

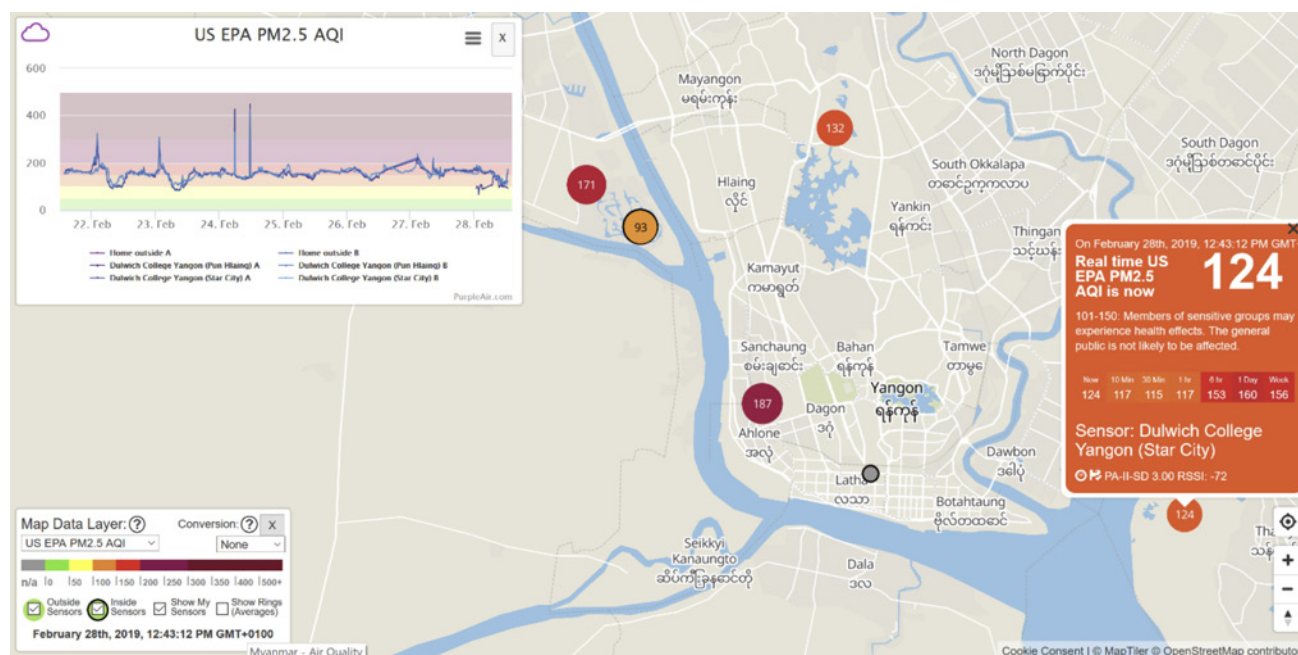
These findings are supported by observations made from real time air quality sensors with live online feed from Myanmar. Purple Air, a U.S.-based technical grassroots group, services a global monitoring network with their own purpose-built air quality sensors. Four second-generation Purple Air sensors using laser-based sensors with a fan are installed around Yangon city and measures air quality against the U.S. Environmental Protection Agency air quality index (AQI) scale. Accessed on February 28, 2019, Purple Air shows that real time $PM_{2.5}$ AQI is 124 with raw concentrations ranging from $45 \mu\text{g}/\text{m}^3$ to $125 \mu\text{g}/\text{m}^3$. The histogram indicates that air pollution in Yangon sometimes reaches hazardous levels (Figure 35).

However, caution should be applied in interpreting the results from air quality sensors. First, results from air quality sensors should be referenced against fixed monitoring stations to gauge how representative the data is. This is not possible in Myanmar where there is no established air monitoring network. Second, the sensors' received signal strength should neither be too weak nor too strong to avoid overestimation. All four Purple Air stations in Yangon record a received signal strength indicator below -70, which may indicate that the signal is weak and subject to external interference.

Another monitoring station in a residential area in Yangon shows slightly different results. The 24-hour AQI is published by The Heinrich Böll Foundation from their office in a residential area of Yangon where a monitoring station tracks air pollution. Figure 36 shows the AQI measuring 81.85 based on WHO guidelines and U.S. air quality standards with $PM_{2.5}$ at $40.11 \mu\text{g}/\text{m}^3$ in a 24-hour period (Saturday - February 23, 2019). The AQI also points to days where $PM_{2.5}$ concentrations measures in the unhealthy range above $55 \mu\text{g}/\text{m}^3$ for a 24-hour period.

Figure 35

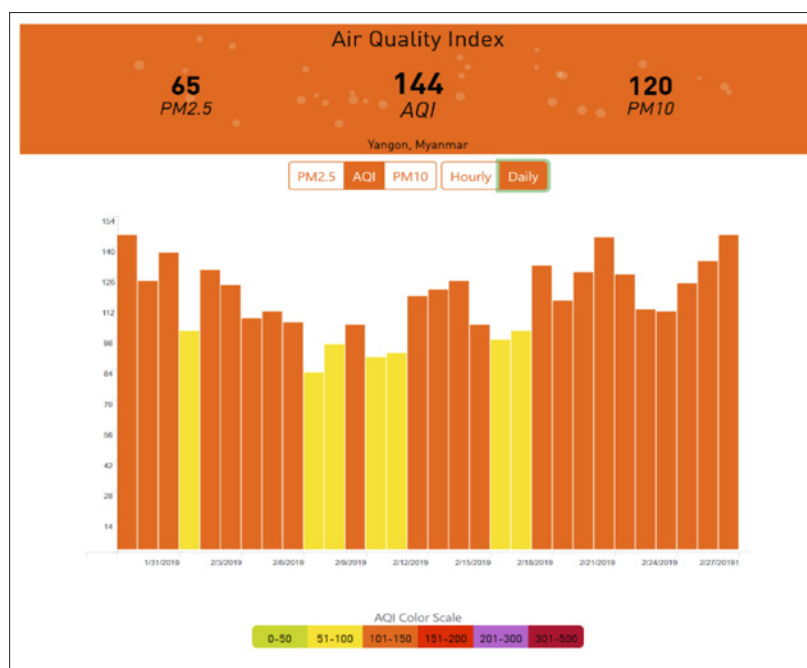
AQI in Yangon by Purple Air



Source: Purple Air 2019 (Accessed on February 28, 2019 at www.purpleair.com/map.)

Figure 36

Yangon, Myanmar, February 24, 2019



Source: Available at mm.boell.org/air-quality-index

Air Quality Index - Yangon, Myanmar, Feb. 24, 2019. Color code: Green=Good, Yellow=Moderate, Orange=Unhealthy for Sensitive Groups, Red=Unhealthy, Purple=Very

The Yale Environmental Performance Index ranked Myanmar 171 out of 180 countries in the world for air quality in 2018.³⁵ This index estimates air pollution exposure using satellite-based measurements in areas where no ground-based measurements are obtainable, as in Myanmar.

³⁵ <https://epi.envirocenter.yale.edu/epi-topline>. Accessed on May 27, 2019.

4.4 Opportunities for air quality monitoring and pollution control

Air pollution has significant social, economic, and environmental costs. However, better monitoring and taking cost-effective actions toward large sources of air pollution constitutes a good contribution to Myanmar's pollution management for green growth and improved human health.

One opportunity is to improve how air quality is monitored and controlled. An ambient air quality monitoring network needs to be established. These stations could be in Yangon and Mandalay and include strategic fixed or mobile stations close to industrial zones, key sources of traffic pollution, and other major sources.

There needs to be a systematic long-term assessment of pollutant levels using equipment and expertise to measure the quantity and types of pollutants in the surrounding outdoor air. This should include provision of some limited low-cost air monitoring sensors to test the quality of such sensors and of training and calibration with fixed reference air monitoring stations. It should also identify data gaps for proper air quality monitoring network.

Advanced laboratory equipment and expertise is required to analyze the chemical spectrum of particulate matter mass to determine the precise emission sources that make up the air pollution. This laboratory can then be used for referencing air quality to the standards.

Information is needed on how severe the situation is and where it comes from. To gain this information, a proper air pollutant emission inventory is needed. This will allow for the identification of major emission sources, the definition of priorities for emission reductions, and the uncovering of significant data gaps. Information gathered from the emission inventory will allow for an air pollution source apportionment analysis. In addition, capacity building could be undertaken to measure and understand the different sources and sectors of air pollution and their pathways and distribution to the ambient air quality.

Simulations on policy analysis, cost effectiveness, and cost-benefit could be modeled based on emissions as per different emission sources, emission control measures and costs, air quality and climate indicators, and health and ecosystems impact. The model could assess impacts, benefits, and interventions against current policies and control packages to identify least costs policy and investment measures to achieve policy targets of improved air quality and health targets.

An Air Quality Management Plan (AQMP) would direct policy makers to the most effective ways of responding to the problem. Once a better understanding of air pollution with priority for Yangon and Mandalay has been established, identification of the most cost-effective policy and investment options to achieve improvement in air quality through advance air quality management modeling will be possible.

Key measures in terms of policies and investments are needed for improving arrangements for air quality monitoring and pollution control. Measures can be oriented toward the type of policy and investment support that can be provided by the MONREC and the PCCDs of Yangon and Mandalay cities.

4.5 Recommendations

Actions need for solid waste management, plastic, and air pollution are:

1. Prepare a road map for a plastic action plan.

It is important to systematically plan to address the plastic menace. This plan could include the following: analyze the impact plastic has on the environment, identify top priority plastics to act upon, and decide a time frame and budget for implementation.

2. Improve financial sustainability and waste collection services.

Options to optimize costs and increase revenue for solid waste management will be analyzed in the subnational expenditure review. Measures to increase solid waste collection and options to rehabilitate dumpsites to sanitary landfills or new landfills will be defined as part of the ongoing World Bank analytical work on solid waste and pollution management.

3. Invest in monitoring air quality and waste streams.

It is important to understand the impacts of solid waste and air pollution and the available management options. This can be done by establishing a national air quality monitoring network focusing initially on large population centers and investing in solid waste analysis and management, taking advantage of simple, cost-effective technologies.

See Annex 1 for full detail of the recommendations relating to solid waste, plastic and air pollution, including the key messages, the actions, the time frame (short, medium, and long), the context, and the responsibilities for implementation.

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ANNEX

ANNEX 1: CONSOLIDATED SET OF CEA RECOMMENDATIONS

Forestry

Context	Key Message	Action	Time Frame (S, M, L)	Main Responsibility
Planning, management, and monitoring of production forests				
Overharvesting and weak control mechanism led to the degradation of large areas of forest reserves. This represents major loss of potential commercial values, livelihood benefits, and ecosystem services.	Review of Reserve Forest and Protected Public Forests (forest stocks, boundaries and management plans, where necessary). Based on site-specific review, define how production forests should be managed; and adapt district forest management plans.	Implement a comprehensive National Forest Inventory system and produce major forest type maps.	S	FD
		Enhance site-specific inventories in production forests.	S	FD
		Validation of existing RF and PPF boundaries and maps.	S	FD
		Create forest production information system.	S	FD
There has been weak understanding of 'regulated markets' and the impact that mandatory laws and regulations from consumer countries and the VPA will have on tightening the supply chain procedures and standards and increasing the confidence of importers and end-users in legal sources. International lucrative buyer markets are increasingly looking at TLA), including the emerging China's Green Growth Timber Platform.	Improving TLAS is critical for market positioning and creating investment climate for high-value production and export. Definition and implementation of national certification standards should align with regional and international requirements.	Align MTLAS principles, criteria, indicators with requirements from key consumer countries.	M	FD, MTE, MFCC
		Implement national certification standards aligned with regional (that is, ASEAN) and international requirements.	M	FD, MTE, MFCC
		Consider third-party domestic verification and other ways of increased transparency as part of the emerging operational procedures.	M	FD, MTE, MFCC
		Implement good governance recommendations under the FLEGT and improve law enforcement across agencies in a concerted manner.	M	FD, MTE, Myanmar Timber Merchant Association (MTMA), Private sector, CSOs
		Build capacity of wood-based industry on MTLAS and certification.	M	FD, MTE, MTMA
		Cooperate with GMS and ASEAN trading partners on legality, tracking systems, especially with Vietnam TLAS/VPA, China Green Growth Platform and Thailand.	M	MONREC, MTMA

Context	Key Message	Action	Time Frame (S, M, L)	Main Responsibility
MTE				
The MTE enjoyed for decades high-volume and high-value timber easily exported as logs, with little or no value addition, high wastage, and limited transparency. A lack of effective control and political influence resulted in overharvesting. With reduced availability of timber, over dimensioned structure and high maintenance costs, the MTE faces the need for restructuring.	Reform MTE with consideration of entire value chain. All reforms should take into account a strong regulatory, planning, and control function of the FD.	Carry out functional review.	S	MONREC/ FD MTE
		Undertake comprehensive capacity and skills assessment.	M	FD, MTE
		Pass on pension obligations, away from the books of MTE, while taking practical considerations as well as existing regulations into account.	S	Parliament, MONREC
Wood fuel				
Natural forests are estimated to be the primary source for wood fuel (fuelwood and charcoal). The scale of wood extraction, to meet household, commercial, and transborder demand for fuelwood and charcoal is highly concerning due to severe impacts on forests.	Address wood fuel as the major rural energy source and driver of forest degradation.	Complete assessment of wood fuel consumption (household and commercial), assessment of value chains to identify key interventions and cross sectoral policy concerns.	S	FD
		Incentivize private sector and community plantations, including wood fuel plantations.	M	FD, private sector
		Incentivize production and distribution of efficient cook stoves.	M	FD, Private sector
		Incentivize alternative energy sources.	M	FD, DZGD, MOEE
		Cooperate with industrial consumers to improve legality and efficiency of wood fuel use.	M	FD, Ministry of Industry (MOI), Private sector
Plantation (state owned and private)				
State-owned plantations had suffered high mortalities due to insufficient long-term maintenance and inadequate budgets.	Improve long-term management of state-owned plantations.	Consider participatory models or partnerships with communities (benefit-sharing mechanisms, initial consultations) or with public-private partnerships.	S	FD
		Provide adequate budget for maintenance.	L	FD

Context	Key Message	Action	Time Frame (S, M, L)	Main Responsibility
<p>Domestic entrepreneurs are currently operating in a challenging environment due to unpredictable timber supply from the MTE's auction system; and focus on minimally processed timber exports).</p> <p>As both global as well as domestic demand for wood products is growing, planted forests provide attractive investment opportunities at commercial scale while also contributing to national reforestation targets. Fast-growing species offer good business opportunities for smallholders and price and market development are favorable.</p> <p>Myanmar lacks high-quality timber processing and integrated plantation industry which will be needed to cope with sophisticated clients and markets.</p> <p>Foreign investors still perceive challenges to invest in Myanmar: complex processes and regulations; weak infrastructure, political economy, land conflicts, lack of secure tenure, and lack of incentives are the main issues raised.</p>	<p>Commercial plantations have a significant potential to create rural jobs, boost exports, provide secure timber to build a thriving internationally competitive wood industry.</p> <p>Develop a comprehensive reform package to improve business climate for high-end investors to stimulate national forest industry development.</p>	Offer silviculture training for smallholder plantations and strengthen extension services, possibly through third-party service providers.	S-M	FD
		Identify appropriate and uncontested land availability for public and private investors, with conflict resolutions systems.	S-M	FD, MOALI
		Identify clusters of CF and forest land areas where outgrower forest plantation schemes can be promoted.	S-M	FD, Private sector
		Assess competitive and transparent instruments to promote partnerships.	S-M	FD, Private sector
		Provide sufficiently secure and long-term tenure for private investors (including foreign) and community groups.	S-M	FD, MTMA, MIC
		Increase FD capacity to license, plan and control partnerships in an effective and credible manner.	S-M	FD
		Assess fiscal incentives for large-scale integrated industry using certified timber (domestic and foreign) to promote out-grower and community partnerships.	S-M	FD, MT
		Promote industry/public research platform to develop fast-growing clones, germplasm and technology applications.	S-M	
Processing				
<p>Most of the processing is undertaken by SMEs in the wood Industry. However, credit financing, enabling environment, and access to timber is challenging; market information is scarce and productive infrastructure is still poor (labor, skills, logistics, and electrification).</p> <p>Myanmar's wood industry lacks research and technology support.</p>	<p>Improve enabling environment for SMEs for wood processing, and handling.</p> <p>Attract industry that can promote vertical integration in cooperation with smallholders.</p>	Create cross-ministerial task team to assess and improve enabling environment for SMEs.	S/M	MONREC, MOPF, MIC, MOI
		Simplify procedures to establish, run, and set up wood-processing enterprises.	S	FD, MIC
		Promote technology and skill enhancing training for national labor force.	M	FD, MTE, Private sector
		Promote national and foreign investments in integrated industries, including fiscal incentives.	M	FD, MIC
		Assess market acceptability of lesser utilized species in close cooperation between research bodies and private companies.	M	FD, MTE, MTMA
		Disseminate state-of-the-art processing technology.	M	FD, MTE, MTMA
		Collect and disseminate market information on domestic and international markets.	M	FD, MTE, MOC

Context	Key Message	Action	Time Frame (S, M, L)	Main Responsibility
Community-Based Forest Management				
Currently, there is limited handover capacity and slow approval of CF application process, which will be exacerbated with increased numbers of CFUGs. A large share of CFUGs are inactive. Capacity gaps at subnational level (community, township, and district levels) to support CFUGs at all stages of CF implementation will need to be addressed.	Improve and simplify the approval process of CF establishment (to ensure equity and inclusiveness) and develop efficient delivery mechanism for scale-up of CF establishment and implementation.	Accelerate establishment of CF.	S	FD
		Develop efficient delivery mechanism for CF establishment and implementation, including the following: <ul style="list-style-type: none"> Clarify responsibilities and strengthen delivery functions of local FD staff. Develop capacity of local FD staff and agricultural extension services. Develop a cadre of service providers and community facilitators. Create open access CF database and information systems. Strengthen CF outreach program. 	S	FD (for example, Central Forestry Development Training Center, CF Unit, FRI, Myanmar Forest School) MOALI CFNWG CSOs
Ethic areas with customary tenure and forest management systems need a practice solution.	Recognize customary tenure systems and support their effective forest management.	<ul style="list-style-type: none"> Explore current status of different forms of community-based forest management beyond CF. Develop and define legal and technical processes that will lead to effective tenure for customary groups and sustainable forest management. 	S S-M	FD, Ministry of Ethnic Affairs
The potential impact of CF is significant, but there are critical capacity constraints among community members.	Support systematic capacity building of CFUGs, including through association and networks of CFUGs at district, regional, and national levels.	Facilitate a stepwise emergence of a national CF network, building on existing formal and informal networks at regional and district levels, promote peer-to-peer knowledge exchange.	S-M	FD, FRI, CFNWG, CSOs
		Identify best practices and develop database and practitioner handbook.	S-M	FD, CSOs
The foundations for livelihood development from CF, including CFE establishment, are becoming stronger. However, the CFUGs and their members (including potential entrepreneurs) have limited access to finance, especially loans for value added processes.	Support business development for CFE (legal, technical incubator); expand financial services (credit, finance, PES to CFUGs).	Develop an evolving menu of option by which CFUGs can access financing, including from microfinance institutions.	S-M	FD (e.g. CF Unit), CFNWG
		Provide technical support to existing non-parastatal producer cooperatives (or similar mutualistic enterprise organization) covering various CF products in the country.	S-M	FD, CFNWG
		Survey and improve services provided by cooperative-like organizations—finance, technical, organizational, and so on as well as their effectiveness to identify gaps to be target by CFE/SME incubator.	S-M	FD, MOI, SME Development Department
		Develop a CFE/SME incubator and accelerator support program providing technical assistance and training.	S-M	FD, MOI, MOPF

Context	Key Message	Action	Time Frame (S, M, L)	Main Responsibility
The revised CFI (2016) and the CF Strategic Plan (2017–2020) highlight the importance of private sector engagement in CF, specifically forming partnerships with associated CFE. There is limited experience where CFUGs and private sector are building mutually beneficial partnership models. CF-based locally controlled spinoff enterprises would be a priority as well as enterprise partnerships with CFs.	Assess and promote expansion of smallholder, outgrower, and other private sector-smallholder partnership models to encourage mutually beneficial enterprise partnerships with private sector.	Implement capacity development program for smallholder entrepreneurs (technical and extension services for improved germplasm/seedling, silviculture practices for tree-based enterprises).	M	FD (CF Unit) MOPF
		Carry out market analysis of NTFP and other wood products.	M	FD, MOPF
		Create CF platform that promotes CF products and identifies potential business opportunities to facilitate connection between CFUGs, CFEs, and private sector actors.	M	FD, MTMA, MOI, MOPF, Private sector, CSOs
		Promote timber plantation development in CF.	M	FD
In the past, CF expansion has often focused on handing over degraded forests with insufficient stock for forest-based enterprise development or conservation forests with insufficient tangible benefits to communities. There is potential for using CF in all forested areas, in particular coastal mangrove areas, which have experienced significant decline.	Mainstream CF rollout across different land classifications, including in reserved forests, in mangrove forests, on VFV lands, and explore ways to promote CF services to ethnic communities.	Proactively expand CF in reserved forests to provide viable opportunities for sustainable wood-based CFE development.	S-M	FD (CF Unit)
		Recognize on the ground existing customary lands, as recommended in the NLUP 2016 and VFV Amendment 2018. In areas beyond these explore options for community participation.	S-M	FD, DALMS, Ministry of Ethnic Affairs (MOEA), CSOs.
		Strengthen dialogue with ethnic communities to recognize and enable preexisting customary tenures and management, where appropriate and agreed by communities promote CF.	S-M	FD, DALMS

Context	Key Message	Action	Time Frame (S, M, L)	Main Responsibility
Protection				
<p>Myanmar's PAs network area has not yet reached the target of land under protection (NFMP 2001-02 to 2030-31).</p> <p>Some of the main challenges for managing the national PA system include— incomplete PA zoning, lack of PA management plans for all PAs, inadequate data management systems, and implementation capacity at local levels.</p> <p>There is further scope to expand the role of communities in meeting the national protection target of 10 percent based NFMP 2001-02 to 2030-31.</p>	Expand area under protection to meet national targets with increased focus on community-based conservation models and improved stakeholder engagement.	Promote community conservation models as defined in the 2018 Conservation of Biodiversity and Protected Areas Law and 2016 National Biodiversity Action Plan (these are CPA and Indigenous and Community Conserved Areas [ICCA]). Building on multistakeholder consultations, develop instructions to designate CPAs and ICCAs.	M	MONREC, NWCD (FD), CSOs
		Continue gazettement of planned PAs in conjunction with civil society.	M	MONREC, NWCD (FD), CSOs
		Strengthen multistakeholder engagement and dialogue including promoting CF in buffer zones.	M	FD, NWCD (FD)
		Review zoning as part of PA (and CPA) establishment process to diversify management approaches, including collaborative arrangement.	M	NWCD (FD), CSOs
		Develop PA management plans for PAs and provide adequate budget for implementation, including for law enforcement.	M	MONREC, NWCD
		Invest in ecotourism and create effective management framework to promote ecotourism (fee management, access, promotion, management plans, benefit-sharing mechanism, private sector partnerships, basic infrastructure).	M	MONREC, Ministry of Hotels and Tourism (MOHT)
PA management is challenged by insufficient funding for planning, capacity development, monitoring and operating cost, and engagement with communities. Improved resource mobilization and revenue generation is needed to financial viability of the national PA system.	Put in place multi-pronged approach to improve financial sustainability of the PAs system.	<p>Assess and put in place options to address financial sustainability of PA system, including</p> <ul style="list-style-type: none"> Assessing ecosystem service values and develop PES scheme to support sustainable financing for PAs including CPAs and ICCA; Promoting ecotourism in PAs to increase revenue collection; Operationalizing Myanmar Biodiversity Fund for PAs; and Including REDD+³⁶ payments to support PA management. 	M	MONREC, FD, NWCD (FD), MOPF, MOHT
With a target of almost 40 percent of energy production coming from hydropower, protection and rehabilitation of critical watershed forests will be important.	Develop financing mechanisms for rehabilitation of critical watershed forests and for establishment of watershed plantations.	Conduct analysis of potential PES schemes as well as other potential financing mechanism to provide sustainable financing for rehabilitation of critical watershed forests.	M	FD
		Expand watershed plantations.	M	FD

³⁶ Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks.

Context	Key Message	Action	Time Frame (S, M, L)	Main Responsibility
FD skill development				
<p>After decades of a highly centralized governance system and technical implementation of forest management by the FD, emerging modalities will rely more on decentralized partnership building with private sector, CSO, communities, ethnic groups, and other stakeholders.</p> <p>This will require new skills, more capacity, and institutional readiness to manage these new institutional challenges, especially at state/region and local levels.</p>	<p>Invest in technology and new skill development for FD with emphasis on state/region and local levels.</p> <p>Strengthen citizen engagement.</p>	<ul style="list-style-type: none">Enhance technical capacity of existing FD at state/region and township level, including for<ul style="list-style-type: none">Monitoring (for example, remote sensing);Sustainable forest management (for example, inventory, enforcement); andValue addition and enterprise development.	S-M	MONREC, MOEA, FD, state / region, governments
		<ul style="list-style-type: none">Emphasize development of new skill sets at state/region and township level that focus on citizen dialogue, social inclusion, and trust building:<ul style="list-style-type: none">Bottom-up planningCommunity engagement skillsLivelihoods developmentBenefit-sharing modalities.	S-M	MONREC, FD, state / region, governments
		Engage, communicate, and consult with private sector and civil society groups, including ethnic minority civil society groups.	S-M	FD, CSOs, Private sector, MOEA
		Establish mechanism for citizen feedback.	S-M	FD
<p>The forest sector has experienced irregularities as well as challenges related to governance and transparency, which has been leading to leakage of forest resources as well as benefits to organized crime as well as to shadow markets.</p>	<p>Introduce transparency, accountability, and citizen engagement measures and mechanisms to increase efficiency and facilitate control mechanism.</p>	<p>Collaborate with and support the President’s anticorruption initiative and offer channels for collaboration between NGOs and FD.</p>	M-L	MOPF, MONREC
		<p>Improve transparency and accountability mechanisms in the forest sector, including but not limited to improving open access satellite-based monitoring, citizen engagement tools, increasing financial surveillance, and strengthening law enforcement capacity across agencies.</p>	M-L	MOPF, MONREC
Cross-sectoral and cross-cutting issues				
<p>Many of the drivers of deforestation relate to cross-sectoral issues and require dialogue, planning, and coordination across multiple sectors including agriculture, mining, energy, and infrastructure to ensure that the objectives of the forest sector, including increasing the portion of total land areas designated as forest reserve and PAs, are met.</p>	<p>Address multisectoral causes of deforestation by breaking down sectoral silos in the public sector administration and by strengthening safeguards application for activities impacting forest lands.</p>	<p>Prioritize and proactively strengthen mechanism for intersectoral coordination, coordinated policy formulation, and collaborative implementation, in particular with MOALI and the Ministry of Industry.</p>	M-L	MONREC (FD, ECD), MOALI, MOI, NECCCCC NCRM
		<p>Strengthen E&S safeguards implementation to ensure that impact on forests from large infrastructure, energy (hydropower) and mining investments are avoided, minimized, mitigated, and offset.</p>	M-L	MONREC, other sectoral Ministries, NECCCCC

Context	Key Message	Action	Time Frame (S, M, L)	Main Responsibility
Uncontrolled forested land conversion has often resulted in loss of forests in critical watersheds.	Appropriately control land conversion logging and develop strategy to improve competitive bidding for conversion timber to avoid distortion of markets.	Improve monitoring of conversion timber.	M	FD
		Include conversion timber into TLAS.	M	FD
Overlapping and conflicting authority between the MONREC (FD) and the MOALI related to the management and administration of land according to the VFV Land Management Law has led to significant conversion of forest land outside the PFE for agricultural purposes, mainly for the purpose of large agribusiness concessions (for example, palm oil around Myeik, rubber plantations in Kachin and Shan). There has been insufficient application of safeguards and stakeholder consultation, often resulting in environmental impact, social grievances, as well as evictions. Customary tenures have not yet been properly recognized according to the NLUP 2016 and VFV Amendment 2018.	Ensure appropriate forest management of forests on VFV lands.	Recognize preexisting customary tenures across ethnic areas according to NLUP 2016 and VFV amendment 2018 and develop the legal framework for their statutory recognition.	M-L	MONREC, MOALI, MOEA, Union Attorney General (UAG)
		Review implementation of recent amendment of VFV law with regard to customary tenure	M-L	MONREC, MOALI, MOEA
		Remove ambiguity related to overlapping authority of MONREC and MOALI on VFV land to prevent conversion of forest land without due application of stakeholder consultation, safeguards application, and so on.	M-L	MONREC, MOALI, MOEA
		Any VFV lease of forested land should ensure that tree cover is not lost. Remove perverse incentives for forest destruction through VFV leases.	M-L	FD, DALMS
With no statutory recognition yet for customary tenure, land and resource tenure is insecure, in particular in ethnic forested landscapes. Providing customary tenure security is a central ethnic aspiration in the national peace process. Tenure security will help protect ethnic cultures, support livelihood, poverty reduction, and food security.	Support rural livelihood security by enabling customary tenure systems.	Continue dialogue between agencies and all stakeholders toward statutory recognition of ethnic customary land and resource tenure systems as proposed under the National Land Use Policy 2016 and Pyidaungsu Accord 2017 (National Reconciliation and Peace Center 2017)..	L	Parliament, Cabinet UAG

Fisheries

Context	Key Message	Action	Time Frame (S, M, L)	Responsibility
Regulation of capture fisheries				
Marine and freshwater fish stocks are depleted, and often existing fisheries regulations are not properly enforced.	Strengthen the DOF for improved MCS.	Enforce closed seasons and gear restrictions in marine and freshwater capture fisheries. Clearly define boundaries of inshore and offshore zones with GPS markers, and apply VMS to the entire offshore fleet.	S	DOF
		Analyge and develop specific recommendations for improving transparency and enforcement in fisheries sector, and development of capacity, partnerships and procedures to bring legal cases. Expand legislation making it an offence to be in possession of illegal fishing gear, rather than requiring offenders to be caught in the act.	M	DOF, coast-guard, police, and judiciary
With catch allocations, good scientific advice, strong co-management institutions, and effective monitoring of landing sites, it may be possible to manage catch levels, in addition to managing where, when, and how people fish.	Move to a quota-based fisheries management system, at least in marine fisheries.	Assess the potential for organizing the offshore fishing industry into a harvest quota shareholding organization. Bring experts from New Zealand, Australia, the United States, and the Pacific Northwest to offer models of shareholding that increase sustainability and profitability.	M	DOF
		Develop stock assessment and monitoring systems, as a foundation for establishment of quotas and auctioning of quota-based licenses.	L	DOF
Protection of aquatic habitats				
Conservation of aquatic habitats is critical not only to support fisheries production, but to a range of additional and valuable ecosystem services. Myanmar has a large number of freshwater sites of high ecological value, key fish species, such as Hilsa, which rely on poorly studied migration routes, and mangroves that provide hundreds of millions of U.S. dollars in annual value.	Increase protection of key aquatic habitats.	Expand protections for key freshwater wetlands, mangroves and coral reefs, including the establishment of additional marine protected areas (MPAs). Assess models for sustainable mangrove-based livelihoods reforestation, such as mud crab fattening in mangroves and floating fish cage culture in tidal creeks, and potentially sustainable forms of extensive shrimp farming.	M	MONREC/DOF
	Establish policy and legal framework for a sustainable blue economy along Myanmar's coast.	Comparative analysis of the legal and institutional framework for coastal and marine area management among Myanmar and its neighbors.	M	National Coastal Resources Management Committee (NCRMC)
		Assess coastal tourism development trends, the status of blue natural capital and mechanisms for engaging local communities in decision-making (consider targeting the Myeik Archipelago).	M	MOHT
		Develop a strategy to integrate conservation of inland fish resources into water resource management, land-use, and agricultural policy.	M	DOF/MOALI

Context	Key Message	Action	Time Frame (S, M, L)	Responsibility
Fisheries co-management				
<p>Empowering communities to set management goals and to receive some of the benefits of more sustainable fisheries will reduce conflict and incentivize stewardship of the resource.</p> <p>There are a number of efforts in other parts of Asia that could provide useful templates, including Fair Trade Fishery Associations in Indonesia and Japanese Fishery Cooperative Associations.</p>	Expand co-management pilots within coastal fisheries and to freshwater fisheries.	<p>Conduct objective assessment of success and constraints of co-management pilots.</p> <p>Review and develop legal frameworks for co-management, including securing community tenure rights.</p>	S	DOF and state and regional lawmakers
		<p>Identify options for creating strong community and industrial fishing associations/cooperatives that could coordinate efforts to improve the ecology and economics of fishing while ensure that benefits are spread widely in communities.</p> <p>Explore examples of strong community associations elsewhere in Asia and Oceania (both developed and less-developed).</p>	S	DOF
Small-scale fishers in Myanmar largely finance their fishing operations through loyalty arrangements with fish buyers. In some, but not all cases, these relationships can be exploitative and can encourage overfishing and destructive fishing practices. Linking co-management efforts to formal credit provision could provide a means of incentivizing participation and compliance.	Assess credit systems in fisheries value chains.	In-depth assessment of informal credit institutions in small-scale fisheries if and how access to credit could be extended to small-scale fisheries without destroying benefits of informal credit system (including payment flexibility and market access) and without directing investment to increased capacity.	M	DOF

Context	Key Message	Action	Time Frame (S, M, L)	Responsibility
Aquaculture				
There is a clear opportunity for inclusive growth in aquaculture.	On the basis of a detailed assessment of the potentials for freshwater, rice-fish, shrimp, and marine and reservoir aquaculture, prepare and implement an aquaculture development strategy.	Assess biophysical and market potentials for different types of aquaculture, to inform further steps.	S	DOF
		Reform legal frameworks, including: <ul style="list-style-type: none"> • Revision of the Farmland Law (2012) to promote the development of a fish farming sector with more inclusive characteristics. • Regularization of the status of illegally constructed ponds, if their operators are in possession of legal agricultural-use rights and land is not the subject of land restitution claims. • Development of regulatory and licensing framework for reservoir aquaculture based on independent scientific assessment of the environmental carrying capacity of receiving waterbodies. • Development of regulatory and licensing framework for coastal cage aquaculture based on assessment of potential conflicts with alternate use of coastal resources. 	M	DOF/ MOALI
		Assess and prepare an investment strategy for the basic market access infrastructure needs to facilitate sustainable and climate-resilient growth in aquaculture.	S	DOF
		Assess and prepare an investment plan for aquaculture extension services, quality management systems and certification, and quarantine facilities and policies to prevent import of infected shrimp and aquatic animal epidemics as the sector grows.	M	DOF
		Assess and prepare an investment strategy for provision of commercial hatcheries and feed production, and selective breeding programs (especially for rohu).	M	DOF

Context	Key Message	Action	Time Frame (S, M, L)	Responsibility
Fisheries statistics				
There is very limited scientific information on which to base management of Myanmar’s fisheries. Lessons can be drawn from Cambodia in the late 1990s when a concerted effort by the government produced new science-based estimates for freshwater fisheries production, leading to a better understanding of the actual production changes in statistical reporting.	Develop key fisheries management statistics capacity and processes.	Conduct a nationally representative survey of fish consumption (potentially through including modules in standard household surveys), exports, and employment in the fisheries and aquaculture sectors.	M	CSO
		Develop and implement fisheries management data systems, including; <ul style="list-style-type: none">• Monitoring of fish stocks and landings,• Registry of vessels and offshore VMS,• GIS registry of inns and tenders,• GIS registry of fish farms, and• Survey-based system for collection of national aquaculture statistics, starting with a national aquaculture census, potentially incorporated into the national agricultural census.	M	DOF
Capacity development in DOF				
The DOF has traditionally focused resources of collection of fisheries license fees, but intensifying pressure and external impacts on fisheries mean more active management of the resource is needed.	Conduct institutional review and strengthening.	Conduct a public expenditure and institutional review of the DOF (MOALI), in relation to its legal mandates.	S	DOF
		Develop and implement a strategy to provide responsible units, staffing, and training for MCS, stock assessment and management, community engagement and business development, aquaculture and biosafety, and fisheries monitoring and spatial statistics. An economic and financial analysis of the social benefits and government revenues from improved fisheries management may be necessary to justify the investment in institutional capacity.	M	DOF

EIA System

Context	Key Message	Action	Time Frame (S, M, L)	Responsibility
Tracking and transparency				
There is no effective mechanism for tracking the submission of EIAs, IEEs, and EMPs, for ECD to communicate with project proponents or consultants on progress, or to disclose reports to the public. Post-EIA there is no system that links the approval of documents with monitoring and compliance.	An EMIS is needed to track and monitor the status of EIAs, IEEs, and EMPs; consolidate GIS layers and biophysical and socioeconomic information; communicate with project proponents; make reports publicly available; and assign tasks for compliance monitoring.	Evaluation of information and communication technology (ICT) at union and state/region ECDs and document control procedures.	S	ECD and development partners
		Map process flow and ICT requirements for EMIS Phase 1: EIA review and approval.	S	ECD and development partners
		Prepare procurement plan for ICT and training to establish EMIS Phase 1.	M	ECD and MOPF
		Conduct evaluation to determine ICT, process procurement plan for EMIS Phase 2: Post-EIA inspection and monitoring.	L	ECD and development partners
Strengthening EIA institutions				
The EIA Division was established in 2016 and staffing levels at Union and State/Region levels are increasing significantly. All staff needs are to be supported with capacity building and training to ensure they can perform their duties. Training for consultants and project proponents may assist in improving quality of EIAs, IEEs, and EMPs submitted.	Capacity building and training needs to be upscaled to include new ECD staff and state and region officers. Further training is needed to improve E&S performance of consultants and project proponents.	Prioritize training topics to include in SLC.	S	ECD, World Bank Group, ADB, and JICA
		Prioritize training topics for E&S consultants and project proponents.	S	ECD, IFC, Myanmar Environmental Assessment Association (MEAA), and private sector
		Set up system in ECD to track training, that is, skills passport.	M	ECD, UNDP, and development partners.
Staff and consultants reported that the sector-specific EIA guidelines have improved their capacity to review and/or prepare EIAs, IEEs, and EMPs. Staff stressed the need for additional guidance on sectors and screening/scoping.	Draft sectoral guidelines need to be finalized and additional guidance is needed for industry, SEZs, agriculture, and how to deal with environmental management and compliance for artisanal and small-scale industries.	Finalize the sector guidelines for oil and gas, hydropower, mining, and public participation.	S	ECD, IFC, ADB, Vermont Law School and NEA
		Prioritize new guidelines to be developed for sector and small-scale industries, that is, SEZ, transport, and infrastructure.	S	ECD, sectoral ministries, IFC, and development partners
		Provide additional guidance on the screening and scoping phase for EIAs and IEEs.	M	ECD, UNDP, and UNEP

Context	Key Message	Action	Time Frame (S, M, L)	Responsibility
Currently all EIAs must go to the EIA review team for approval. Under this system it is not possible to approve outstanding EIAs. The review team process is largely ineffective for approving EIAs and delegating authority for approving IEEs and EMPs should also be considered. Compliance is not triggered until an ECC is issued, so monitoring is done on a complaint basis.	The EIA review and approval process needs to adopt a risk-based and outcome-focused approach and more systematic and simplified approach for approval; for example, the authority for approvals delegated to Director General, Director of EIA Division, and state and region ECD Offices. The membership and function of the EIA review team needs to be reformed and issuance of ECC improved.	Develop risk-based approach and process for categorizing projects.	S	ECD, World Bank Group, IFC, and UNDP
		Legal review to determine how delegations for approval can be approved.	S	ECD, UAG, and development partners
		Reform the membership and functions of EIA review team.	M	ECD, EIA review team, and UAG
		Design a new template for ECC.	M	ECD, UNEP, NEA, and UAG
As of January 31 2019, only 6.9 percent of all reports have been approved by the ECD. Further assistance is needed to address this situation in the short-term.	Third party and independent review have been established for the review of EIA/ IEE. A more public and transparent panel of experts needs to be established urgently to assist in addressing the backlog. This could be funded through establishing the EMF or through the EIA Procedure (2015).	Develop terms of reference for EIA review panel so that experts can be mobilized efficiently.	S	ECD, World Bank Group, IFC, and UNDP
		Prioritize high-risk EIA for review and approval.	S	ECD, World Bank Group, IFC, and UNDP
		Evaluate use of EMF or EIA Procedure (2015) to cover costs of review.	M	ECD, UNDP, WWF, and development partners
Staff reported that they do not have adequate time to review EIAs, IEEs, and EMPs and also perform administrative tasks. The internal processes are also contributing to delays in EIA review and approval.	The EIA Division needs reorganizing separate administrative tasks from the review process, adopt a team approach to review and will also require modernizing to manage the EMIS.	Organizational review to re-organize the EIA Division.	S	ECD, UNDP, and Union Civil Service Board (UCSB)
		Training needs assessment for managing current tasks and operating EMIS.	M	ECD and development partners

Context	Key Message	Action	Time Frame (S, M, L)	Responsibility
The ECD launched a campaign for factories in nine sectors to submit EMPs and install wastewater treatment plants, following surveys and sampling that revealed wastewater was exceeding the NEQ guidelines. As of January 2019, it appears that the 1,155 factories the notification applied to did not submit EMPs.	The ECD has prioritized dealing with issues in mining and industrial sectors, however the approach has led to an influx of poor quality EMPs and IEEs due to limited capacity and resources to comply. Assist the ECD in preparing a targeted campaign to improve environmental management and compliance.	Assess the compliance of factories (nine priority sectors) in submitting EMPs and design a strategy for enforcement and monitoring.	S	EIA Division, PCD, MOI, MEAA, JICA, EU, YCDC, and MCDC
		Identify other high-risk sectors or areas with environmental degradation.	S	ECD, sectoral ministries, World Bank Group, JICA, and EU
		Design a campaign to ensure environmental compliance.	M	ECD, JICA, and EU
There has been a strong emphasis on the approval of EIA, IEE, and EMP reports. However, the need for post-EIA monitoring, inspection, and audit is a major weakness of the environmental governance regime.	Environmental monitoring, compliance, and audit needs to be urgently improved to ensure that E&S impacts are being effectively implemented in compliance with the EMP and ECC conditions.	Compile a list of projects that the EIA Division and PCD are monitoring at state and region level.	S	EIA Division, PCD, State / Region governments
		Legal and institutional review on EIA Division and PCD on compliance, inspection, and monitoring.	S	MONREC, ECD, UAG, JICA, and ADB
		Design process linking EIA, IEE, and EMP approval to monitoring and compliance.	M	ECD and development partners
		Strengthen the ECD's monitoring and inspection capacity in terms of facilities, infrastructure and financial sustainability at the state and region level.	M	ECD, state/ regional governments, World Bank Group, and IFC
ECD has set ambitious targets to recruit more than 19,000 staff by 2025 and establish 73 offices at district level and 365 at township level. A considered approach will be needed to ensure that the roles and responsibilities of EIA Division and positions are well defined.	Staffing levels of the union, state, and region EIA Division needs to be increased significantly to address the backlog and to review new EIAs, IEEs, and EMPs submitted. Specialist technical knowledge needs to be developed within the division and brought in from sector agencies.	Complete an organizational review of ECD based on the current staffing levels.	S	ECD and UNDP
		Determine strategy for the ECD to fill all assigned positions.	M	MONREC, ECD, and UCSB
		Train and recruit staff from sector agencies and within MONREC.	M	MONREC, UCSB, Sectoral Ministries
		Design position descriptions for specialist technical knowledge, that is, biodiversity, socioeconomic, and hydrology.	M	MONREC and UCSB
		Prioritize District and Township offices for EIA division based on risk or investments.	L	MONREC

Context	Key Message	Action	Time Frame (S, M, L)	Responsibility
Staff reported that they do not have adequate time to review EIAs, IEEs, and EMPs and also perform administrative tasks. The internal processes are also contributing to delays in EIA review and approval.	The EIA Division needs restructuring to separate administrative tasks from the review process, adopt a team approach to review and will also require modernizing to manage the EMIS.	Organizational review to reorganize the EIA Division.	S	ECD and UNDP
		Training needs assessment for managing current tasks and operating EMIS.	S	ECD and development partners
Operationalizing financial mechanisms				
The planned budget allocation for the 2017/18 financial year for the ECD was just under US\$2 million. The ECL (2012), ECR (2014), and EIA Procedure (2015) establish mechanisms for obtaining fees for PES and the review and approval of EIA and monitoring.	Allocating funds through the EMF and relevant sections of EIA Procedures (2015) to cover costs associated with the EIA review, approval, monitoring, inspection, and audit. The NECCCCC may also need to set fees for submission of EIAs and IEEs and for PES.	Review budget for ECD and EIA Division.	S	ECD and UNDP
		Prepare projected budget for increasing staffing levels and capacity, funding EIA review and monitoring.	M	ECD, UNDP, and WWF
		Design proposal for using EMF to fund these activities or for designing a subnational level revenue collection and management system for the EIA review and approval and monitoring, inspection and audit.	M	ECD, UNDP, WWF, and NECCCCC
The 2008 Constitution provides states and regions with the right pose tax on extractive industries. This provides a potential source of revenue for environmental monitoring and compliance at subnational level.	State and region governments can also start authorizing posing tax on natural resources extraction to fund environmental management activities.	Assess pipeline projects related to natural resources extraction and ecosystem services at State and Region levels.	M	ECD, UNDP, and MOPF
		Determine mechanisms for State and Regions to allocate a percent of natural resource rent for environmental management.	L	MONREC, UNDP, MOPF, and NECCCCC

Solid waste management and air quality

Context	Key Message	Action	Time Frame (S, M, L)	Responsibility
Solid waste management				
<p>Without improving financial sustainability of solid waste management, improving the waste collection service and environmental sustainability of solid waste system will not be feasible.</p> <p>Improving environmental sustainability of solid waste collection and disposal is also a key necessity.</p> <p>Reducing plastic leakage from Myanmar to ocean plastics as well as plastic use.</p>	<p>Income from solid waste management services is insufficient to cover the costs of solid waste collection and disposal and represents 25–50 percent of the operational expenditures.</p> <p>Increase the solid waste collection to 100 percent on large cities and stop the practice of open dumping through investments and operation of sanitary landfills.</p> <p>Need to define a plastic action plan outlining the policy actions and investments to reduce plastic leakage and plastic use.</p>	Need to optimize costs and increase revenues of solid waste management. Several options are included in the report which will further be analyzed in the Sub-national Expenditure Review.	S	ECD, YCDC, MCDC, sectoral ministries
		Measures to increase solid waste collection and options to rehabilitate dumpsites to sanitary landfills or new landfills are included in the ongoing ASA on Solid Waste and Pollution Management.	S-M	ECD, sectoral ministries
		Establish the priority plastic items for public policy based on the identification of top 10 priority plastic items.	M	ECD, CDCs, development partners
		Analyze negative economic impacts of plastic mismanagement.	S-M	ECD, World Bank Group
		Analyze efficiency and effectiveness of potential plastic policies based on international experience.	S-M	ECD, World Bank Group
		Estimate the plastic leakage from key priority cities into the waterways and analyze the range of accompanying annual leakage from priority cities.	S-M	ECD, World Bank Group, development partners

Context	Key Message	Action	Time Frame (S, M, L)	Responsibility
Air Quality				
Without an established air monitoring network, monitoring and enforcement of the emissions guidelines continue to be a challenge also due to the low capacity of the regulator.	Improve arrangements for air quality monitoring and pollution control.	Establish ambient air quality monitoring network for Yangon, Mandalay, and other large cities.	S-M	ECD, development partners
		Strengthen capacity of laboratories for referencing air quality to the standards.	S-M	ECD, development partners
	Diagnosis of air pollution severity and sources.	Develop an air pollutant emission inventory for Yangon/Mandalay.	M	ECD, development partners
		Source apportionment to measure and understand the different sources and sectors of air pollution, and their pathways and distribution to the ambient air quality.	M	ECD, development partners
		Air quality modeling. Simulations on policy analysis, cost effectiveness, and cost benefit should be modeled to identify the most cost-effective and viable measures and investments to reach the air quality targets.	M	ECD, development partners
	Preparation of AQMP.	Prioritize cost-effective policies and investment options.	M	ECD, development partners
		Prepare AQMP.	M	ECD, development partners



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