

UN-REDD
PROGRAMME



Background report for identifying the drivers of deforestation and forest degradation in Myanmar

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Table of Contents

EXECUTIVE SUMMARY	5
1. OVERVIEW AND CONTEXT	24
2. ANALYTICAL FRAMEWORK AND METHODOLOGY	27
2.1 METHODOLOGY	31
3. DIRECT DRIVERS OF DEFORESTATION AND FOREST DEGRADATION	32
3.1. METHODOLOGY	32
3.2. FOREST COVER CHANGE AND COUNTRY CONTEXT	33
3.2.1 REGIONAL AND FOREST-TYPE PATTERNS OF NOTE	40
3.3 DRIVERS OF DEFORESTATION	44
3.3.1 AGRICULTURE	44
3.3.2 MINING	53
3.3.3 HYDROPOWER DEVELOPMENT	54
3.3.4 INFRASTRUCTURE (ROADS, PIPELINES, SPECIAL ECONOMIC ZONES, POWER LINES)	54
3.3.5 SUMMARY	54
3.4. DRIVERS OF FOREST DEGRADATION	55
3.4.1 ILLEGAL LOGGING	56
3.4.2 OVER-EXPLOITATION OF FOREST RESOURCES	57
3.4.3 FUEL WOOD USE	61
3.4.4 SHIFTING CULTIVATION	64
3.4.5 SUMMARY	66
3.5. ACTORS AND MOTIVATIONS	66
4. UNDERLYING DRIVERS OF DEFORESTATION AND FOREST DEGRADATION	71
4.1. METHODOLOGY	71
4.2 OVERVIEW OF UNDERLYING DRIVERS	72
4.2.1 A LEGACY OF OVER-HARVESTED FORESTS	72
4.2.2 SIGNIFICANT ILLEGALITY AND CORRUPTION	73
4.2.3 OVERLAPPING AND CONFLICTING PRIORITIES BETWEEN THE FORESTRY AND AGRICULTURE SECTOR AND POOR LAND TENURE	77
4.2.4 LEGAL FRAMEWORKS GOVERNING LAND DECISIONS AND SUSTAINABLE USE STILL GETTING UNDERWAY	85
4.2.5 POOR NATURAL RESOURCE REVENUE CAPTURE	88
4.2.6 STATE AND REGIONAL GOVERNMENTS' ROLE IN LICENSING AND TAXATION	90
4.2.8 LONG STANDING CONFLICT IN RESOURCE-RICH AREAS	95
4.2.9 CUSTOMARY LAND AND LAND CONFISCATION	97
4.3. RANKING OF UNDERLYING DRIVERS AND CORRELATING TO DIRECT DRIVERS	100
5. ANTICIPATING FUTURE DRIVER PRESSURES	100
5.1. METHODOLOGY	100
5.2. COMMODITY/REGIONAL ECONOMIC DEMAND FACTORS AND INCONSISTENT SECTOR POLICIES	101
5.2.1 TIMBER AND FOREST PRODUCTS	102

5.2.2 FUEL WOOD AND WOOD STOVES	104
5.2.3 AGRICULTURE	107
5.2.4 ENERGY	115
5.2.5 MINING	120
5.2.6 ROAD AND TRANSPORTATION NETWORKS	121
5.2.7 SPECIAL ECONOMIC ZONE DEVELOPMENT	123
5.4 FINANCIAL FACTORS – INTERNATIONAL	124
6. RECOMMENDATIONS FOR OPTIONS AND PATHWAYS TO ADDRESS DIRECT AND UNDERLYING DRIVERS	126
6.1 RECOMMENDATIONS FOR CRITERIA TO PRIORITIZE STRATEGIC OPTIONS AND PATHWAYS TO ADDRESS DIRECT AND UNDERLYING DRIVERS	127
6.2 RECOMMENDED INTERVENTIONS TO AFFECT DRIVERS	132
6.2.1. AGRICULTURE-RELATED	136
6.2.2 FORESTRY SECTOR	141
6.2.3 ENERGY (HYDROPOWER), MINING, INFRASTRUCTURE	145
6.3 AREAS FOR FUTURE RESEARCH	149
7. REFERENCES	151
8. ANNEXES	161
ANNEX 1: INTERVIEWS AND PERSONS CONSULTED	161
ANNEX 2: HARMONIZING LAND USE, LAND COVER AND FOREST COVER CATEGORIES	164

Tables

Table 1: Countries reporting the greatest annual forest area reduction (2010-2015)	33
Table 2: Forest Cover legal classification in Myanmar (2015)	34
Table 3: Change rates of forest cover periods 2000 – 2015 and 2005 – 2015 in Myanmar.....	37
Table 4: Land cover change matrix for the period 2005 – 2015.....	39
Table 5: Land use/ land use change in Myanmar 1995 - 2015 in ha according to DALMS data	40
Table 6: Subnational distribution of deforestation rates in Myanmar, years 2005 – 2010, 2010 – 2015, 2005 – 2015.....	41
Table 7: Summary of Myanmar REDD+ Readiness Roadmap (2013) drivers of deforestation from outside the forestry sector	44
Table 8: Agribusiness Concessions in Myanmar by State and Region, 2010-2013.....	46
Table 9: Tanintharyi districts with oil palm plantations.....	50
Table 10: Summary of key findings on drivers of deforestation.....	54
Table 11: Summary of Myanmar REDD+ Readiness Roadmap (2013) drivers of forest degradation, from within the forestry sector	55
Table 12: AAC prescriptions and MTE actual extraction	60
Table 13: Market segmentation by fuel type in rural areas	62
Table 14: Estimations of fuel wood harvest in Myanmar.....	63
Table 15: Summary of key findings on drivers of forest degradation.....	66
Table 16: Summary of actors, motivations and opportunities	66
Table 17: Seizures of illegal logging (April 2011 – June 2016).....	75
Table 18: Land utilization in Myanmar (2014/2015).....	77
Table 19: Administration, conflicts and tenure security in different land categories.....	80

Table 20: Summary of major land governance reform activities since 2010	82
Table 21: Desired Myanmar timber species in illicit markets and known remaining stocks.....	103
Table 22: Exports of Major Agricultural Commodities from 1996-97 to 2013-14.....	108
Table 23: Primary Energy Consumption in Myanmar (ktoe)	115
Table 24: Electricity sources and access.....	116
Table 25: Summary of known hydropower proposals and projects in Myanmar.....	118
Table 26:	131

Figures

Figure 1: Relationship between underlying and direct drivers of deforestation and forest degradation	28
Figure 2: REDD+ driver interventions, actors and scales	30
Figure 3: Forest cover change outside Permanent Forest Estate	35
Figure 4: National level forest cover assessment (draft version).....	36
Figure 5: Forest cover change estimations years 2000 – 2015	37
Figure 6: Mangrove land cover, Ayeyarwady Delta (1978, 1989, 2000 and 2011).....	47
Figure 7: Oil palm plantations, 2014 + Forest cover and deforestation between 2000-2014	52
Figure 8: Existing mining sites - Myanmar	53
Figure 9: Relationship between AAC and extraction	59
Figure 10 :	88
Figure 11: Distribution of armed conflict occurrence and minerals.....	95
Figure 12: Actual and projected biomass consumption amount for fuel wood (in dry 1,000 m ³).....	104
Figure 13: Projection of state/region fuel wood demand by 2020-2030 based on 2010 (dry biomass, m ³).....	105
Figure 14: Deforestation along road in Lenya National Park Extension (2000-March 2016).....	122

Boxes

Box 1: Myanmar's Teak Trade	58
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Acronyms

AAC	Annual Allowable Cut
ADB	Asian Development Bank
AIIB	Asian Infrastructure Investment Bank
ASEAN	Association of Southeast Asian Nations
CCFV	Central Committee for the Management of Vacant, Fallow and Virgin Land
CF	Community Forest
CFE	Community Forestry Enterprise
CFI	Community Forestry Instructions (1995)
CFNWG	Community Forestry National Working Group
CFPPAs	Community Forestry Product Producer Associations
CFUGs	Community Forest User Groups
CHRO	Chin Human Right Organization
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMC	Central Management Committee
CWC	Central Working Committee
CSO	Civil Society Organization
CSR	Corporate Social Responsibility
DALMS	Department of Agricultural Land Management and Statistics

DAOs	Development Affairs Organizations
DICA	Directorate of Investment and Company Administration
DRD	Department of Rural Development
DRI	Department of Research and Innovation
DZGD	Dry Zone Greening Department (MoNREC)
ECCDI	Ecosystem Conservation and Community Development Initiative
ECD	Environmental Conservation Department
ECDF	Ethnic Community Development Forum
EcoDev	Ecologically Progressive Ecosystem Development
EIA	Environmental Impact Assessment
EITI	Extractives Industry Transparency Initiative
ESIA	Environmental and Social Impact Assessment
EU	European Union
EUTR	EU Timber Regulation
FAB	Farmland Administration/Management Body
FAO	Food and Agricultural Organization of the United Nations
FD	Forest Department (MoNREC)
FDI	Foreign Direct Investment
FFI	Fauna & Flora International
FLEGT VPA	Forest Law Enforcement, Governance and Trade Voluntary Partnership Agreement
FMB	Farmland Management Body
FPIC	Free, Prior and Informed Consent
FRA	Forest Resources Assessment
FREDA	Forest Resources, Environmental Development and Conservation Association
FREL	Forest Reference Emission Level
FRI	Forest Research Institute (MoNREC)
GAD	General Administrative Department
GDP	Gross Domestic Product
GERES	Groupe Energies Renouvelables, Environment et Solidarites
GHG	Greenhouse gas
GMS	Greater Mekong Sub-region
GRO	Generating Rubber Opportunities
HCV	High Conservation Value
IDPs	Internal Displaced Persons
IFC	International Finance Corporation
ILO	International Labour Organization
INDC	Intended Nationally Determined Contribution
INGOs	International Non-Governmental Organizations
IPPs	Independent Power Producers
JICA	Japan International Cooperation Agency
JVA	Joint Venture Agreement
KDNG	Kachin Development Networking Group
KIA/KIO	Kachin Independence Army / Kachin Independence Organisation
KNLA	Karen National Liberation Army
KNU	Karen National Union
LAUSC	Land Allocation and Utilization Scrutinizing Committee
LCG	Land Core Group
LPG	Liquefied Petroleum Gas
LUC	Land Use Certificate
MEB	Myanmar Economic Bank
MEITI	Myanmar Extractive Industries Transparency Initiative
MERN	Myanmar Environment Rehabilitation-conservation Network
MIC	Myanmar Investment Commission
MLFRD	Ministry of Livestock, Fisheries and Rural Development
MoALI	Ministry of Agriculture, Livestock and Irrigation

MOECAF	Ministry of Environmental Conservation and Forestry
MoNRE	Ministry of Natural Resources and Environmental Conservation
MMK	Myanmar Kyat
MMT	Million Metric Tons
MRF	Myanmar Rice Federation
MRPPA	Myanmar Rubber Producers and Production Association
MRV	Measuring, Reporting and Verification
MTE	Myanma Timber Enterprise
NES	National Export Strategy
NFMS	National Forest Monitoring System
NGO	Non-Governmental Organization
NLD	National League for Democracy
NLUP	National Land Use Policy
NTFPs	Non-Timber Forest Products
OECD	Organization for Economic Co-operation and Development
PAS	Protected Area System
PAM	Policy and Measure
PFE	Permanent Forest Estate
PFM	Participatory Forest Management
POINT	Promotion of Indigenous and Nature Together
PPF	Protected Public Forest
RECOFTC	The Center for People and Forests
RF	Reserved Forest
REDD+	Reducing Emissions from Deforestation and Forest Degradation, Conservation, Sustainable Management of Forests and Enhancement of Forest Carbon Stocks
RELS	Reference Emission Levels
RLs	Reference Levels
SDGs	Sustainable Development Goals
SEZs	Special Economic Zones
SFM	Sustainable Forest Management
SIA	Social Impact Assessment
SLMS	Satellite Land Monitoring System
SLRD	Settlement and Land Records Department
SME	Small and Medium Sized Enterprise
TWG	Technical Working Group
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNODC	United Nations Office on Drugs and Crime
UN-REDD	United Nations collaborative initiative on Reducing Emissions from Deforestation and forest Degradation in developing countries
USDP	Union Solidarity and Development Party
VFV Law	Vacant, Fallow and Virgin Lands Management Law of 2012

Executive Summary

If Myanmar's deforestation and forest degradation continues at the levels it has in the past, its very future is at risk. Myanmar has the third highest deforestation rate in the world, behind Indonesia and Brazil, and has lost more than 1.3 million acres (546,000 hectares) of forest each year since 2010 (FAO, 2015). Recognizing this, the new Government of Myanmar has put a temporary national logging ban into place, in effect

until March 2017. Exports of round logs have been banned since 2014, but have continued illegally. The Myanmar Timber Enterprise is being restructured and reforms are taking place, but the scale of reform necessary, and the design of a new relationship with its forests presents a complicated pathway ahead.

Myanmar's Intended Nationally Determined Contributions (INDC), submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in 2015 reiterates Myanmar's 30-Year National Forestry Master Plan (2001-30) goals of achieving 30% of the land area being within the permanent forest estate (PFE) and 10% of the land area being within protected areas by the year 2030. In order to develop its capacity to meet these specific INDC targets, Myanmar has set about a number of activities under the Plan at the national and regional levels:

In 2011, Myanmar joined the UN-REDD Programme (United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries). In 2014, Myanmar expressed interest in negotiating a Voluntary Partnership Agreement with the European Union under the EU Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan. This would strengthen forest governance and regulation and regulate bilateral trade in timber products, ensuring that only legally-produced products are exported.

This report provides an assessment of key direct and indirect drivers of deforestation and forest degradation, as well as barriers for sustainable management of forests, and enhancement and conservation of forest carbon stocks in Myanmar. **The emphasis of this report is placed on underlying drivers and future pressures on forests, which are crucial given the rapid economic development Myanmar is currently, and will continue, to experience.** The rationale behind assessing direct and underlying drivers under various development scenarios and known development proposals is to provide Myanmar with a solid basis for ascertaining REDD+ policy and measure (PAM) response options.

This driver study is intended to provide a cornerstone of Myanmar's REDD+ National Strategy, but it must also relate to other relevant stakeholder and government priorities. It was developed with the intention not only to provide guidance on how Myanmar can fulfill its INDC targets related to forests (in alignment with FLEGT), but also, a) how crucial timber and forest land management issues can be addressed in the dynamic process of refining land governance in Myanmar, and b) to help enable positive solutions between ethnic regions and the Union government in the peace process, particularly given the role that forest access and management and benefit-sharing of revenues plays. Myanmar developed its first National Land Use Policy (NLUP)(version of January 2016), and is in the process of an inclusive public consultation process to carry the policy forth into law. Myanmar also held the Union Peace Conference (also called 21st Century Panglong Conference) in August 2016, seeking to restart negotiations with ethnic regions, in order to find solutions to long-standing conflict in natural resource-

rich ethnic state regions. Disagreements over land rights and land and resource governance sit at the core of these conflicts.

Forest cover change

This assessment relied on improved and corrected forest cover and forest cover change data, including development of a seven-category forest cover classification system, carried out by the RS-GIS section of the Forest Department in July/August 2016. These improved Forest Department forest cover data for 2005, 2010 and 2015 provided the basis for development of change matrices for 2005-10 and 2010-15. These forest cover change matrices are therefore based on the most current data, government-recognized definitions and interpretations of the forest cover change dataset.

The Forest Department has different legal classifications of forest, with the Permanent Forest Estate (PFE) accounting for 31% of the land area. The Reserved Forest (RF) category (areas of forest reserved by the government as they contained higher value timber) accounts for 18% of land area; Protected Public Forests (PPF), which contain lower value timber stands, usually for domestic supply, account for 6.05%; and 5.75% is in the Protected Area System (PAS). There is also 'unclassified forest' (areas with forest on them and managed by the Ministry of Agriculture, Livestock and Irrigation) with 9,607,490 acres (3,888,098 ha).

Myanmar's forests have changed from being almost 51.1% of land cover in 2000 to being 43.4% of land cover in 2015. RS-GIS Department information on deforestation within and outside the PFE between 2005 – 2010 indicates that the deforestation rate outside the PFE was higher than within the PFE, resulting in a 1.38% deforestation rate within the PFE, compared to a 2.37% annual deforestation rate outside the PFE. There is general consensus between various sources of data that there were high rates of change in closed forests during the early and mid-2000s, which decreased after 2006/07, though were still above the established Annual Allowable Cut (AAC).

Land cover change data at the national level for the ten years between 2005 – 2015, recently developed by the RS-GIS Department, indicates dynamic patterns of change. About 11.5 million ha (60%) of Closed Forests changed to Open Forests or Other Woodland below the threshold of the forest definition. Roughly 7.2 million ha (37%) of Closed Forests areas remained as Closed Forest 10 years later. During the same period, 3.1 million ha of Open Forests (20%) and 1.3 million ha (10%) of the Other Woodland category, and a small amount of Other Land (0.4 million ha) recovered back to Closed Forests. Open Forests partly recover back to Closed Forests (20%) but the majority shifted into Other Woodland with 5.3 million ha (33%) and 1.3 million ha to Other Land (9%). More information is needed to understand what has precipitated these changes, and the administrative aspects. In the Other Land category (cropland, grassland, settlements), 10.9 million ha (65%) remained as such 10 years later, but 3.6 million ha (28%) of Other Woodland, plus 1.3 million ha (8%) of Open Forest and 0.7 million ha

(3.6%) of Closed Forests, all changed to the Other Land category. 136,500 ha (27%) of Mangrove forests in 2005 change to Other Land (mainly cropland) by 2015, 90% of which occurred in the Ayeyarwaddy and Rakhine regions.

The land cover change dynamics need to be better understood, as the current data is not yet refined enough to describe, on a state/regional basis, what the forest transition dynamics are. The available classification of land use and land cover data is still too coarse. More assessment is required to understand how plantations of woody species such as rubber and oil palm are classified. For instance, rubber is considered an agricultural crop, though a forest cover assessment may code it as forest, as it contains woody biomass. This is unclear in the current forest cover change assessment.

The rates of change between forests and non-forest are quite different at the subnational level. according to the latest Forest Department data, which finds Ayeyarwady, Kayah and Mandalay had the highest rates of deforestation, while Yangon, Tanintharyi, Bago, Kachin and Shan states have the least deforestation, based on percentages. However, other forest cover assessments contain vastly different findings for Tanintharyi, Kachin and Shan. Thus, it is recommended that additional spatial analysis and consultation occur at sub-national levels to refine the assessments.

Direct drivers of deforestation

Agriculture: The largest driver shifting forest to non-forest uses has been from agricultural clearing or potential use for agriculture. Clearings for agriculture have occurred in the PFE and outside of it, and “Unclassified” forests, which typically have less tree cover, appear to be most vulnerable to shifting to agribusiness concessions. Vacant, Fallow and Virgin (VFV) land that may also contain forests (and customary land rights users) have seen such expansion. Between 2005 – 2015, the area under agriculture has increased by about 1 million ha, though there are differences of opinion as to which land use categories the expansion came from. More refined spatial assessments are necessary. **The allowance for large-scale agribusiness concessions does not thus far demonstrate concessions are delivering on intended outcomes, with few concessions achieving their intended purpose of developing modern agriculture.** The largest areas were allocated to large-scale agribusiness concessions on VFV land up to 2013 were for rubber, oil palm, rice, and jatropha, followed by sugarcane, and cassava. The most significant driver of mangrove loss in Myanmar is rice production in the Ayeyarwady Delta (Cyclone Nargis also had a severe impact in 2008), and aquaculture is found to have much less impact. Maize production is an increasing pressure on forests, particularly in Shan State through contract farming, largely to serve the Chinese market. Rubber is a priority export crop, and has expanded in recent years, though tapped area is still only 1/3 of the government’s 2030 production target. Rubber production increases are more likely from area expansion than from yield increases on existing plantations. Oil palm has expanded in Tanintharyi, with 405,000 ha of concessions granted, and deforestation has been highest in districts with oil palm

concessions. The social dimensions of oil palm production in Tanintharyi raise concern given the complexity of customary land use and Internally Displaced People (IDPs) in the Tanintharyi region.

Mining: Roughly 46,000 hectares of mining areas is believed to have been cleared since 2002, and an additional 37,000 hectares of cleared land that is highly likely to be mining. Roughly 0.4% of the total land area in Myanmar is under mining activities, and no assessment has been made of associated infrastructure development such as roads and settlement, and these are additional to the impacts of mines on forests. Kachin and Sagaing have the highest amounts of mining area.

Hydropower: RS-GIS Division data indicates that between 2005 and 2015, there was a 185,000 ha decrease in water across the country. In contrast, Treue et al's (2016) spatial assessment found that between 2002 and 2014, the area of water bodies increased by 9.27% from 0.79 to 0.88 million ha, presumably due to the construction of dams, and most occurred within forest reserves (RF & PPF).

Infrastructure: No spatial assessment was made of the impacts of infrastructure on forests for this study, yet this will be important for assessment of future driver patterns and impacts on forests, given the potential for much larger impacts on forests in the future from roads, hydropower development, pipelines, SEZs, power lines. Data from the Central Statistics Office in the settlement category which includes roads, railways, dams, villages, towns and cities indicate also only minor influences on the overall land cover change in the past.

Direct drivers of degradation

Illegal logging: Myanmar's illegal wood flow includes timber, fuel wood and charcoal. Demand from the wood processing industries and plantation sectors in China, Vietnam and Thailand exerts pressure on Myanmar's forests, due to logging controls in these countries' own forests, and Myanmar's stock of valuable species, notably its prized Teak (*Tectona grandis*) and rosewoods/redwoods (*Dalbergia* spp.). Environmental Investigation Agency research indicates that between 2001-13, 10.2 million m³ of Myanmar logs imported into global markets were not authorised for harvest, which would equate for a 47.7% illegal logging rate in the country related to exports. Any exports of semi-processed or finished products, and any domestic consumption, would add to this illegal logging rate and volume. This has likely decreased recently as Myanmar enacted a raw log export ban in 2014, and a logging ban for the 2016-2017 season. That said, the EIA research estimated that Tamalan (*Dalbergia oliveri/bariensis*) and Padauk (*Pterocarpus macrocarpus*)—could be logged to commercial extinction by 2017. Myanmar is one of the world's largest exporters of fuel wood and wood charcoal (2.8% of the global share), and all is transported overland, indicating all is illegal by Myanmar's laws.

Over-exploitation of forest resources: Government, research and CSO/NGO sources concur that over-exploitation of Myanmar's forests has occurred for various reasons, including overharvesting teak for decades, overharvesting other hardwoods such as dipterocarps in more recent years, allowing 'conversion timber,' and supplying an illegal timber trade. The Forest Department and MTE have taken steps in 2016 to reduce the annual allowable cut (AAC). However, more information is needed to assess stocking volumes and distribution of timber, and this will be a key activity of the National Forest Inventory.

Fuel wood: The amount of biomass for fuel wood harvested in Myanmar has steadily been increasing and is several times higher than the actual timber extraction. Fuel wood extraction for the period of 2000/01 – 2012/13, in terms of fresh biomass, can be estimated as being between 68 – 86 million m³ annually of which between 48 – 60 million m³ comes from natural forests, between 17 – 21 million m³ from trees on farmland and only a minor part with 3.4 – 4.3 million m³ from fuel wood plantations. Thus, fuel wood extraction, which is poorly regulated, is affecting millions of ha of natural forests and therefore is an important driver of forest degradation.

Shifting cultivation: About 42% of the country's population lives in upland areas and is likely to be practicing some form of shifting cultivation. Based on DALMS data, shifting cultivation affects between 2 – 4 million ha of mostly unclassified forested land areas. This assessment proposes shifting cultivation must be evaluated cautiously since it is an important livelihood sustaining activity in the hill regions. Shifting cultivation areas include a diverse mosaic agricultural system with many trees. Many shifting cultivation practices include setting aside areas from rotations to maintain as natural forest. An important means of further addressing the sustainability of shifting cultivation is to recognize the linkage between these practices and customary tenure rights.

Actors and motivations

This report explores a broad range of actors that play a role in or have a stake in Myanmar's deforestation and forest degradation, exploring their motivations, the scale the actor engages at and where in the supply chain they have influence, and opportunities for positive engagement towards REDD+ activities. The understanding of actors and motivations is an important aspect of defining how actors would respond to policies and measures to address driver pressure.

Underlying drivers

Underlying causes of deforestation and forest degradation are complex interactions of fundamental social, economic, political, cultural and technological processes that are often distant from their area of impact. This report interviewed experts in government, civil society, researchers, TWG members, and conducted a literature review. The findings presented summarize insights to date, but do not rank or prioritize underlying

drivers, as this a suggested activity to occur during National REDD+ Strategy development.

A legacy of over-harvested forests: The reasons for overharvesting have in the past included pressures to reach revenue targets, corruption and illegality, conversion of forest to agricultural use, conflict in ethnic regions, lack of tenure which disempowered land stewardship by local people, lack of environmental and social impact assessments, and a range of other issues that contributed to the problem. The raw log export ban enacted in 2014 and recent 2016/2017 logging ban and 10-year logging ban in the Pegu Yoma region are important steps towards government is taking to address this underlying driver.

Significant illegality and corruption: Related to the above point, government recognizes the significance that corrupt and illegal behavior has had in the past, and between 2011-2016, almost half of the more than 2,000 forest officials fired are believed by the Forest Department to have been involved in the illegal timber trade. Myanmar exports at least \$600 million worth of illegal wood-based products within East Asia and the Pacific region. UNODC notes that while the Forestry Department is making a concerted effort to fight forest crime, its resources are limited, it cannot complete investigations in serious cases, and it does not have a presence in many areas where illicit timber and wildlife exploitation and trafficking occur.

Overlapping and conflicting priorities between the forestry and agriculture sector and poor land tenure: Land governance and administration is fraught with overlaps in jurisdictional authority, bureaucratic inefficiency, and a lack of coherence between the spatial information sitting in various Ministries and Departments. The lack of transparency in what land is administered by MOALI or by MoNREC means very few farmers know who administers what. Yet figuring out who has rights to land and new proposals for land use on agriculture land with forests, or forest land with agricultural use, is complicated. Under both the Farmland Law and the Vacant, Fallow and Virgin Lands Management Law (VFV Law) of 2012, government has changed the way agricultural lands and fallow lands are regulated. Both laws fail to recognize customary and communal tenure systems in land, water, fisheries and forests. Perhaps as many as 21 million people, including most upland ethnic communities, do not have rights under these laws, as they are formally landless, without clear title to the land they live on or farm. The resultant 'landlessness' increases the risk of rural to urban migration, land grabs and issues related to internally displaced persons (IDPs) and returning refugees, which are sensitive topics in ethnic areas. Further, the VFV Law allows for reallocation of VFV land to domestic and foreign investors. While steps are being taken by the new government to address the easiest to solve farmland tenure problems first, the process will be a long and complicated one. It will be further complicated by future agricultural production interests. Of Myanmar's 67.66 million ha, MoALI statistics identifies 20 million ha as being suitable for cultivation, which is comprised of cultivable wasteland and 'other forests.' Current crop land totals 11.97 million ha. While most of the crop

land is used for grain production and livestock feed, steps are being taken to bring fallow and cultivable wasteland under cultivation, and DALMS estimates the largest concentrations of 'other forest' are in the far north and extreme south of the country (Kachin and Tanintharyi).

Legal frameworks governing land decisions and sustainable use still getting underway:

1. The lack of a **land use policy and related land use law** was identified by a significant portion of those interviewed as the largest underlying cause of deforestation and forest degradation in the past. Work to define a National Land Use Policy (NLUP) has begun in 2012 and finalized (version 6) in early 2016, and involved a comprehensive multi-stakeholder consultative process that was unprecedented in the context of Myanmar's land management and governance. The NLUP envisions further decentralization, with District level land use plans and zones, and seeks to recognize customary rights, and define processes for resolving conflicts at district levels. It is hoped that efforts leading to an eventual Land Law will bring greater clarity to land law harmonization in relation to tenure security and land resource administration, a national land inventory would be completed, and other actions such as participatory land use planning processes, improved land registration systems, and development of a government-managed open access spatial database (One Map Myanmar).
2. **Environmental and Social Impact Assessments (ESIA)** are a relatively new set of procedures since 2011 to guide development proposals and decisions, and efforts are still underway to grow capacity in this area, and apply the new procedures. Bringing environmental and social considerations into development decisions is an important step to minimize risks, but ESIA procedures cannot be expected to overcome sectoral conflicts or fill voids in or replace missing legislation. The capacity requirements to carry out robust ESIA's are still being developed, and it is unclear whether adequate information exists to make decisions (the diligence is on the proponent, and government agencies do not appear to have funding to independently assess risk or impacts). It will be important to move towards transparent ESIA's (particularly to local communities in the vicinity of project proposals), and demonstrate solid examples of robust ESIA processes that influenced or altered development proposals.

Poor natural resource revenue capture: Over many decades, the lack of transparency, accountability and adequate revenue capture by the government of natural resource extraction activities, have led to significant profits being absorbed by elites and companies both within and outside Myanmar, while the public finance coffers and local people largely did not benefit.

- Jade offers the starkest example: While the Myanmar Extractive Industries Transparency Initiative assessment of 2015 noted the Myanmar Gems Enterprise official reported emporium sales to be US\$1.53 billion in 2013/14, Global Witness research found Chinese government import data recorded US\$12.3

billion in Myanmar jade imports in 2014. The large gap between reported data and unofficial estimates is over US\$10 billion, and represents a huge opportunity for better governance and better revenue capture. The MEITI report noted that gems and jade contributed no tax revenue in 2013/14, while other minerals contributed a minor amount of tax revenues. The timber sector has a similar gap to the gems/minerals sector, though there has been less scrutiny of information. EIA researched UNCOMTRADE and Global Trade Atlas data in 2014 and found that Myanmar's trade partners such as India, China, Thailand and other countries reported levels of imports from Myanmar between 2000-2013 that are very inconsistent with Myanmar's reported exports, with the difference indicating a total of US\$5.7 billion of un-authorised log exports (an average of US\$413 million a year) when including land border trade into Yunnan, China. When excluding Yunnan trade (which would be considered illegal), unauthorized exports would still amount to US\$2.8 billion.

- Civil Society organizations in Kachin State and other regions are requesting information disclosure on natural resource extraction, taxation, licensing processes, and revenue sharing in respect of their "Right to Know." This has been tabled as a key demand in peace negotiations by ethnic groups. This presents an important opportunity for improved public revenue capture from natural resources, improved accountability and transparency, and opportunities for shared decision-making between the Union government and states/regions, and benefit-sharing.

State and regional governments' role in licensing and taxation: Local levels of government often have a strong emphasis on licensing and taxation, while less emphasis is placed on regulation and service provision. Licensing and taxation for teak and hardwoods fall under the jurisdiction of the Union government, but other forest products such as bamboo, firewood, soft wood trees, thatch, and bark falls within the jurisdiction of state and regional governments, and licensing and concession rights are similarly made at these levels. The land tax is jointly administered by the General Administration Department and the Department of Agricultural Land Management and Statistics (DALMS) on behalf of state and regional governments. The GAD also has a role in some land-titling activities. As most administrative authority for economic governance rests with the state and regional governments, local governments, and GAD, consideration of the incentives that drive land use decisions should take these structures into account. Distribution of natural resource revenues to subnational authorities will be a central component of any decentralization effort and could even feature in discussions around the creation of a more cohesive and inclusive Myanmar federation.

Community forests not yet achieving their objectives: Under the old Community Forestry Instructions (CFIs) of 1995, community forests did not provide communities with the income and certainty they needed, and within necessary timeframes. They could not harvest teak, could not sell into the domestic (or international) market, and

administrative hurdles to register CFIs were onerous. Fortunately, the August 2016 revisions to the CFIs seek to rectify the shortcomings of the old instructions. The new CFIs seek to address the basic needs of timber and non-timber products for local people, allow full access to resources, including teak, allow for commercial sales, seek to create job opportunities and income for poverty reduction, to increase the forest area and provide perpetual supply of forest products in a sustainable manner, promote participatory forest management, and support climate change mitigation and adaptation through conservation and addressing deforestation and forest degradation. Community forests could provide a means of recognizing customary rights to forest lands, and allow local people to manage resources and generate incomes, thereby also supporting solutions for peace. However, the Land Core Group has identified that a CF certificate would not be equivalent to a full titling of all incorporated village association's agricultural land parcels under customary communal tenure, so may not provide the tenure security some communities may be seeking. There are also differences in opinions about the utility of CFs, with some ethnic communities seeing this as a means to obtain some legal recognition of tenure security over village agroforestry land, but that may be at odds with the utility the Forest Department would grant a CF certificate for, which is to promote forest management. The Forest Department and CSOs will need considerable capacity to help support in CF enterprise development, to maximize the opportunity provided by the new CFIs.

Long standing conflict in resource-rich areas: The relationship between the Union government and ethnic-based states is based on governance arrangements created during the colonial times. The change from a military government in 2011, and democratic elections in November 2015 pave the way for a historic change in the relationship between ethnic communities and government. Significant gems and mineral deposits, largest intact areas of forests, and waterways proposed for hydropower development are in areas with active disagreement over governance and no ceasefire agreements. Many increasingly wonder if peace can be reached with ethnic armed states if simultaneous or concurrent agreements are not reached on recognition of customary land rights, shared decision-making between the Union and state/regional governments and satisfactory benefit-sharing from natural resources.

Customary land and land confiscation: Customary land uses occur primarily in the uplands of the country, predominantly in forested sections and ethnic regions. Though roughly 42% of the country's population living in these upland areas and practicing some form of shifting cultivation, their customary land rights are not recognized, and a large amount of these lands were recorded as "wastelands" in village records and under the provisions of the Wasteland Act of 1991, then VFV Law of 2012, and become available for allocation to concession-seekers or commercial ventures. Further, the second to last rule of the Farmland Rules, implementing the Farmland Law of 2012, state that the central farm land management committee shall seek to end shifting cultivation and to introduce terrace cultivation on high land. The Central Review Committee on Confiscated Farmlands and Other Lands, chaired by the Vice President, is

seeking to resolve the roughly 2000 cases of land confiscation, but can only handle a subset of the simplest cases to resolve. While emergent policies and dialogue platforms provide significant hope for more accountable and transparent land governance, the ability to operationalize the changes through existing governance structures is challenging. Concerns have been raised about the corruption in the land registration and acquisition process, with officials from the Department of Agricultural Land Management and Statistics (DALMS) and GAD (whose directors are appointed by the Burmese Army) sit in powerful positions that lack proper supervision and accountability. The Land Use Policy could provide an important means to address these long-standing conflicts over land rights, if the provisions in Version 6 are not weakened.

Future drivers

This report reviewed development plans, areas of active investment, and where possible, projects trends based on historical growth patterns, as a means to highlight future risks or hotspots for deforestation and forest degradation pressure. More refined quantitative projections on development patterns would be helpful to inform a prioritization and ranking of future drivers, this assessment did not rely on modelling.

Commodity/regional economic demand factors and inconsistent sector policies:

Myanmar is strategically situated between the two most populous countries in the world—India and China—and 40% of the world's population. Yet foreign access to Myanmar's labour and natural resources has been limited in the past, but this is expected to change. The new Economic Policy seeks balanced growth in all regions.

Timber: There is strong market demand for the country's timber, and a significant portion of that market does not currently screen for legality. With the difficulty of enforcing the 2014 raw log export ban, future trends for the next few years will likely track those of the last five years, as long as supply can be met. China's demand is strong, with import volumes increasing 52% between 2009 and 2013 (1.10 to 1.67 million m³). China's Hongmu (rosewood/*Dalbergia*) demand has been very strong, and the October 2016 listing of *Dalbergia* in Annex II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) offers fresh hope that demand will be dampened. Trade of *Dalbergia* species will only be allowed with permits. Whether Myanmar can stem the flow of illegal *Dalbergia*, and whether China can put in place controls within its large Hongmu supply chain and influence market demand for this wood remains to be seen. Myanmar put in place a logging ban for 2016/2017 and is in the early stages of pursuing a Voluntary Partnership Agreement under the EU Forest Law Enforcement Governance and Trade (FLEGT) Action Plan, which would allow Myanmar to go through a series of steps toward demonstrating legality. That would allow access to markets such as the EU, and likely also the US, as the Lacey Act requirements are similar.

Fuel wood: Though fuel wood is projected to account for less than half of total primary energy by 2030, compared to almost two-thirds currently, the demand for fuel wood

and charcoal will still increase, based on population increases. This report finds demand will reach 55 million cubic meters of dry biomass by the year 2030 from 32 million m³ in 2000 and 42 million m³ in 2010. The regions that will see the greatest increases include Ayayewaddy, Mandalay, Bago, Shan and Sagaing. Though the INDC proposes a goal of distributing approximately 260,000 cook-stoves between 2016 and 2031, but this is expected to only shift a small percentage of the roughly 10 million households reliant on fuel wood.

Agricultural products: The scale of leases/concession rights to major agri-commodity interests (roughly 13.5 million ha), and low utilization of those rights for productive purposes, makes projecting future use of these land unpredictable. The agriculture sector suffers from low productivity and yields, and across a range of products, the majority of production gains are made through expansion.

Rice is the staple crop, covering 8 million hectares, or 34% of the total planted area. Government plans to double exports from 2 million tons in 2015 to 4 million tons by 2019/20 will be hard to achieve without expansion. As rice cultivation has contributed to mangrove loss in the Ayeyarwady River delta region, rice expansion could have future impacts on mangrove forests (one source predicts Delta complete mangrove loss by 2026). Upland dryland cultivation of rice also occurs in shifting cultivation areas, but it is likely that if such areas were altered to provide larger-scale commercial rice cultivation, forests would be impacted.

Oil palm: Occurs in Tanintharyi region. Though only one-third of the licenced areas for oil palm plantations have been developed, the terms of license agreements mandate land clearance must occur within four years. The quantity of current production could not be identified for this report, but production standards are very low compared to other producers in the region. Further, due to years of conflict in Tanintharyi region, in some areas there might be layers of legitimate customary land rights claims on oil palm concessions.

Pulses, maize and other crops: Only maize is showing signs of potentially having larger impacts on forests in the future. Maize production in Myanmar is expected to grow due to increased maize growing area and strong international demand, mostly from China, mostly for livestock feed. While production increases can occur on existing agricultural lands, the economic model of expansion using local contract farmers can cause decreased food security and cycles of debt for producers, which then causes them to seek alternative forms of income such as logging and charcoal production (Shan State example).

Rubber: Rubber is a priority export crop, though exports have not been as strong in recent years due to low rubber prices. Myanmar's rubber production was expected to be about 195,000 tonnes, with 75,000 tonnes exported, over 90% of which goes to China and Malaysia. Most increases in production are to be gained by expansion of planted area, rather than increasing the yields on plantations. Rubber expansion into forests has occurred in Mon State and Tanintharyi Region,

but also in Kayin, Kachin, Shan and Rakhine States. With National Export Strategy prioritization of this commodity, recent Japanese assistance to improve the quality of production, interest to lower taxes in the rubber supply chain, and a recent uptick in rubber prices, production is presumed to increase in the future.

Overlapping and conflicting priorities between the forestry and agriculture sector is a major concern in the future. The significant shift in forest to non-forest uses, particularly agriculture, has been the largest driver of change in Myanmar's forests. With higher agricultural production goals, increased foreign investment, and increased exports, these historical patterns will only increase. **The Ministry of Agriculture, Livestock and Irrigation (MoALI) and Forestry Department are targeting the same lands to achieve their future goals and mandates. This creates an inherent and untenable conflict, and based on insights from expert interviews, there is not yet a process in government to resolve this substantial conflict. The challenges include:**

- MoALI's 30-year Master Plan for the Agriculture Sector (2000-01 to 2030-31) **aims to convert 4.05 million hectares of 'wasteland' for private industrial agricultural production**, with rubber, oil palm, paddy, pulses, and sugarcane for export being particularly encouraged. **Much of this land contains residents under customary use and unclarified tenure and also contains forests and significant biodiversity.** Asia Development Bank estimates that the 12.8 million ha of cultivated land holds the potential to be expanded by nearly 50%, by bringing the 5.67 million ha "virgin and fallow land" or "cultivable wasteland" into production.
- Though the Forest Law allows for management of trees outside of the Permanent Forest Estate, these lands are under the management of MoALI through the Vacant, Fallow and Virgin Lands Management Law. It is unclear how management of these forests can occur, given overlapping and potentially conflicting mandates.
- Myanmar is seeking to ensure that its Intended Nationally Determined Contribution to the global climate agreement (INDC) can be implemented, which seeks the increase of Reserved Forest (RF) and Protected Public Forest (PPF) to 30% of total national land area by 2030 (up from 24.5%), and 10% of the land within protected areas (this reinforces a previous commitment by the country under the Convention on Biological Diversity). For climate change mitigation, Myanmar has identified forests and energy as the key sectors, given that 54% of the country's greenhouse gas emissions are from the forestry sector. **The increase in RF and PPF would be roughly 4 million ha, which presumably would have to come from the 'wasteland' and/or 'other forest' category that MoALI seeks to increase agricultural production on.** Given the scale of unresolved customary land rights issues on these lands, achieving these goals presents challenges, but also opportunities if resolving land tenure conflicts is pursued as part of the solution.

Energy: Energy production will have a significantly larger impact on the land base than it has had in the past. Thirty-six million people do not have access to modern energy services (68% of Myanmar's total population). The oil and gas sector accounted for 36% of foreign direct investment in 2015. The National Electrification Plan aims to electrify more than 7.2 million households and provide access to electricity to all households by 2030. The Plan is not geared towards replacing or augmenting wood fuel for cooking, but rather household electricity (though this could presumably reduce some wood fuel demand as some households would shift to electric stoves and rice cookers).

- **Hydropower:** Myanmar has 3,005 megawatts of currently installed hydropower capacity. The IFC estimates that Myanmar's hydropower potential is up to 100,000 megawatts. The Myanmar Ministry of Electric Power is either currently constructing or approved construction of 34 hydropower projects, totaling 33,724 MW, mostly in Kachin and Shan states. Another six projects are on-hold or have unclear status at this time, totaling between 7,120 – 9,520 MW. The largest of these is the Myitsone hydropower project (3,600 – 6,000 MW) proposed for the Irrawaddy River, which has received considerable attention due to its scale and impacts on the Irrawaddy River system, land and communities, and that it would send 90% of its generation to China. The Salween River has come under recent scrutiny, with six dams approved by the Thein Sein government in 2013. The 8 dams proposed or under construction on the Salween River seek to generate 16,452 MW. The undammed Salween River flows entire 2,800 km from Tibet, into Yunnan and then into Shan, Kayah and Karen States in Myanmar. The Salween River runs through important forest areas, and there are concerns about the impacts on the hydrology, forests, fisheries, and ethnic people who depend on the river for food and livelihoods. The vast majority of these large-scale hydropower site locations are in largely forested areas that are still in civil conflicts, or just coming out of conflict, have post-conflict resettlement issues yet to be resolved, customary land tenure issues unsettled, and therefore present a challenge with regards to how to reconcile natural resource development before post-conflict rights and peace processes have been resolved.
- **Energy transmission and distribution:** A planned power connection between Thailand and Myanmar would be one of the largest in the region, at 11,709 MW, and travel through TaSang – Mae Moh, Mong Ton – Sai Noi, Hutgyi – Phitsanulok, Mai Khot - Mae Chan - Chiang Rai. As this report did not rely on spatial assessment of proposed transmission lines, it is not possible to estimate the impacts of these transmission corridors on forests in these regions, which are largely on the forested regions along the eastern border, in Shan and Karen States. As with the majority of hydropower facility siting, these transmission lines are proposed in largely forested areas with unsettled land claims with ethnic people.

Mining: No new permits are being issued at this time, but rather they are working on existing ones. The Mining Rules (of 1996) are under discussion for revision, and a new Mining Law has been drafted. Most mining occurs on forestland. No projections on future mining were made for this study, as government is revising its approach, the Myanmar Extractive Industries Transparency Initiative is underway, and foreign direct investment appears very unstable due to the conflicts in most regions with deposits.

Roads: The current road network is comprised of 150,816 km of roads, 33,014km of which are paved. Myanmar shares borders with Bangladesh, China, India, Lao PDR and Thailand, so its proximity to Asia's largest and fastest growing markets offers great opportunity for Myanmar to become the land link between China, India and the ASEAN countries. Existing cross-border road links with China, India and Thailand are limited and poor in quality. Under the Framework for Economic and Social Reforms, the Myanmar government has indicated high priority for infrastructure projects to fulfil the country's commitments under the Master Plan on ASEAN Connectivity. China's One-Belt-One-Road initiative, to be funded by the China-initiated Asian Infrastructure Investment Bank (AIIB), expects to deploy upwards of US\$40 billion for a Silk Road infrastructure fund, to boost trade and connectivity across Asia, and Myanmar is a focus for investment. Future road construction will impact forest areas, particularly those being developed in border areas near more heavily forested areas. But the larger impacts will likely be from associated development along roads, as oil palm and rubber expansion patterns in Tanintharyi and rubber concession expansion in Kachin and Shan states indicate. Larger settlement often follows road and concession development.

Special Economic Zone development: Currently, there are three SEZs in the country, with another seven planned. Current ones include Dawei SEZ in Tanintharyi, Kyaukphyu Economic and Technology Zone in the western Rakhine state, and Thilawa SEZ near Yangon. The seven other SEZs planned in addition: Tatkon in Nay Pyi Taw, Yadanarbon in Mandalay, Hpa-an, Myawaddy and Phayathonzu in Kayin state, Ponnagyun in Rakhine state and Namoum in Shan state. The Dawei deep seaport and SEZ development is of particular interest related to Tanintharyi's forests, as it seeks to establish itself on 196 sq km of coastal land, develop a deep sea port, and major road connection linking Myanmar with Thailand. An OECD review found that there are challenges with monitoring the environmental and labour standards in the SEZs in Myanmar. This is an opportunity for relevant government agencies (including the Forest Department) and affected regions/communities (particularly Dawei, Tanintharyi) to define more transparent and inclusive processes for deciding upon SEZ developments, evaluating social and environmental impacts, and monitoring mechanisms.

Financial factors – international: The US, Europe and Japan have lifted sanctions in stages since 2011, with the final lifting of US sanctions in October 2016. The scale of Foreign Direct Investment (FDI) flowing into Myanmar is unprecedented. As the fiscal year ended in March 2016, it became clear that FDI grew to nearly \$9 billion, more than double what it was in 2013/2014. In 2009/2010, the year before the military ceded

power, FDI was only \$329.6 million. Singapore is the largest source of foreign investors (and is recognized as a base for foreign investors to establish companies that can then invest in Myanmar), followed by China, Hong Kong and the Netherlands. That investment is flowing into the oil and natural gas sectors, special economic zones, transport, and telecommunications. Agriculture only accounting for 0.46% of FDI in 2014, but this may change given agricultural expansion needs in neighbouring countries, such as China. This estimate of agriculture sector FDI also may be significantly less than actual FDI, given the common practice of not reporting investments, to avoid taxes and fees.

The new investment law contains changes that are beneficial to land and forests, however the steps and procedures are different from current practice, and capacity will need to be developed to support a strong EIA/SIA process. Section 42 of the new Myanmar Investment Law prohibits businesses investing in businesses which may cause damage to the natural environment and ecosystem. Section 66 of the new law stipulates that a responsibility of investors is to ‘pay effective compensation for losses incurred, if the investor causes damage to the natural environment and causes socioeconomic losses, such as that caused by logging or extraction of natural resources, which are not related to the scope of the permitted investment.’ The section also stipulates that the permit or endorsement from Myanmar Investment Commission must have prior permission by the environmental conservation law and the procedures of analysis of environmental impact.

Recommendations for policies and measures to address pressures on forests

Myanmar is already implementing measures to reform the current governance in the forestry sector, has put in place a time-limited ban on logging, and seeks to restructure MTE. However, what is so far lacking, and needed, is an overall programmatic plan for forestry sector reform that includes the linkages to other sectors that put pressure on forests, is directed towards preparing for future pressures, and that supports REDD+ and improved transparency and legality (of which FLEGT is a large part) in a coordinated manner.

Due to the millions of people in Myanmar who derive benefits from forests, and the significant percentage of those under customary tenure arrangements, including those living in ethnic conflict areas, REDD+ PAMs should articulate an overall strategic architecture to guide a series of actions and interventions that will serve multiple benefits. In this manner, REDD+ policies and measures (PAMs) should seek to deliver on environmental, social and economic outcomes, thus defining a comprehensive approach to forest sector reform, embedding forests into sectoral activities including hydropower and energy, agriculture, livelihoods and forging cross-sectoral solutions for economic development that achieves green growth and social inclusion.

Based on this study's findings on direct and underlying drivers of deforestation and forest degradation, following strategic objectives are proposed for considering PAM options to achieve REDD+ objectives:

1. Develop a **long-term plan for addressing future pressures on forests from outside the forestry sector**, to reduce sectoral conflicts and achieve multiple benefits.
2. **Provide the operational plan for achieving Myanmar's INDC goals** related to the forest and land use sector, including the biomass energy component.
3. **Define tangible actions to help Myanmar operationalize SDGs**, such as solutions for poverty (such as increased revenue through Community Forests), and long-term social and economic benefit (such as through healthy, well-managed forests that can provide multiple benefits and values to people, support domestic needs and value-addition, and reverse degradation through enrichment planting and afforestation).
4. Provide a re-design of Myanmar's forest sector within the timeline of the logging ban which provides solution space, and far beyond into the future, with a strategic view as to **what REDD+ can help enable beyond the reforms already currently being undertaken**, and **how REDD+ can provide strategic architecture to guide a series of actions and interventions** that will serve multiple benefits.
5. Help provide viable **solutions that could be brought into the Peace process to address root causes of long-standing ethnic conflicts over land, to provide stability and security to people living in and relying on forests for their livelihoods**. This is inextricably linked to other related resource questions such as mineral rights, jurisdictional authority and decision-making over resources (e.g. co-management), revenue capture and distribution from natural resources, and the peace processes to resolve conflicts.
6. **Address illegal logging, corruption and related activities**, and therefore alignment with FLEGT is crucial to achieve greater transparency and accountability in forest sector governance and wood product flows.
7. **Defining a long-term vision for the management of Myanmar's forests** that seeks to retain existing in-tact and high-carbon, high-conservation value forests, while defining new business models for Myanmar's production forests, in ways that also supports the needs of local people, particularly those with customary tenure.

This report proposes a first set of interventions to affect drivers, which can be considered in the National REDD+ Strategy process, and further refined. As this report did not rank drivers, and sub-national consultations are still to occur, PAM intervention options are not ranked or prioritized. That said, reconciling disconnects between the agriculture sector and forestry sector is a clear priority. The Ministry of Agriculture, Livestock and Irrigation and Forestry Department are targeting the same lands to achieve their future goals and mandates. This creates an inherent and untenable

conflict, and there is not yet a process in government to resolve this substantial conflict. A critical enabling factor for success of most REDD+ interventions is finding resolution to long-standing conflicts in ethnic regions, which contain the most in-tact forests in Myanmar. While it is not yet clear whether a peace agreement and disarmament should come first, and then resolution of shared natural resource governance and benefit-sharing, or the other way around, the two are inextricably linked, along with the recognition of customary land rights. Finding a new management regime to address the over-exploitation of forest resources, illegal logging, corruption and trade are of high priority, and present the opportunity to define a new vision for Myanmar's forests. Given the autonomy that state and regional governments have on select activities, it would be beneficial for Myanmar to consider how an emergent revenue-sharing structure can incentivize sustainable land management at sub-regional levels.

Areas for further research are proposed at the end of the intervention options tables.

1. Overview and context

Myanmar's forests are important for ecological, social and economic reasons. Forests contribute to the livelihoods of roughly 80% of the population, reduce poverty and enhance food security, strengthen resilience and disaster risk reduction, and produce high-value commercial timber, such as teak and rosewood. In the middle of 2015, floods heavily impacted Myanmar, leaving 100 deaths and 1.2 million acres of damaged rice fields. The event was a reminder of the value of forests in helping to decrease flooding risk, which is a leading indicator of disaster risk. In July 2016, the Union Minister of Social Welfare, Relief and Resettlement, announced that Rakhine State became Myanmar's most vulnerable state to natural disasters due to deforestation. Since 2014, flood induced fatalities have been reported, over 20,000 residents have been made homeless, and flood waters have impacted roads, bridges, housing, farmland and caused riverbank erosion (Myitmakha News Agency, 2016). Flooding accounts for 94% of Myanmar's disaster risk, and is the source of greatest losses (UNISDR, 2015).

If Myanmar's deforestation and forest degradation continues at the levels it has in the past, its very future is at risk. Myanmar has the third highest deforestation rate in the world, behind Indonesia and Brazil, and has lost more than 1.3 million acres (546,000 hectares) of forest each year since 2010 (FAO, 2015). Recognizing this, the new Government of Myanmar has put a temporary national logging ban into place, in effect until March 2017. Exports of round logs have been banned since 2014, but have continued illegally. The Myanma Timber Enterprise is being restructured and reforms are taking place, but the scale of reform necessary, and the design of a new relationship with its forests presents a complicated pathway ahead.

Should Myanmar continue to degrade and lose its forests, its economy could incur losses (in monetary and non-monetary values) of more than MMK 16 trillion (US\$ 17 billion) by 2031 over the current situation. However, should Myanmar choose a development pathway that allows for forest conservation, its economy would benefit by an additional MMK 21 trillion (US\$ 22 billion) by 2031 (Emerton and Yan Ming Aung, 2013).

Myanmar recognizes the risks and opportunities its forests face, and is seeking ways to define sustainable economic development that allows for poverty alleviation and protecting the population against climate related disasters. However, Myanmar is also in a phase of unprecedented industrialisation and increased urbanisation that could lead to an increase of greenhouse gas emissions and deforestation, if not managed to mitigate impacts on the land. Therefore, Myanmar intends to implement a series of policies and actions to maintain the harmony between growth and mitigating climate change (Republic of the Union of Myanmar, 2015 (e)).

Myanmar's Intended Nationally Determined Contributions (INDC), submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in 2015 reiterates Myanmar's 30-Year National Forestry Master Plan (2001-30) goals of achieving 30% of the land area being within the permanent forest estate (PFE) and 10% of the land area being within protected areas by the year 2030. In order to develop its capacity to meet these specific INDC targets, Myanmar has set about a number of activities under the Plan at the national and regional levels:

- In 2011, Myanmar joined the UN-REDD Programme (United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries). The REDD+ Core Unit was established in the Ministry of Environmental Conservation and Forestry (now the Ministry of Natural Resources and Environmental Conservation (MoNREC)), and has the task of coordinating and guiding REDD+ related actions at national level. Myanmar developed its REDD+ Readiness Roadmap in 2013 and prioritised the activities for the implementation. In 2015 a new proposal was submitted for UN-REDD Support for the Implementation of the Myanmar REDD+ Readiness Roadmap.
- In 2014, Myanmar expressed interest in negotiating a Voluntary Partnership Agreement with the European Union under the EU Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan. This would strengthen forest governance and regulation and regulate bilateral trade in timber products, ensuring that only legally-produced products are exported (Republic of the Union of Myanmar, 2015 (e)).

When Myanmar finalized its **REDD+ Readiness Roadmap** in 2013, it began a process of engaging stakeholders in dialogue and through the work of three multi-stakeholder Technical Working Groups (TWG): Drivers and Strategies; National Forest Monitoring System and Forest RELs/RLs; and Stakeholder Engagement and Safeguards. Since 2014,

the UN-REDD Programme has provided support to the implementation of the Roadmap. The TWG for the Drivers and Strategies provided initial assessment and identification of several drivers from the forestry and non-forestry sectors with possible future trends in deforestation and forest degradation.¹ This study is intended to build on that assessment.

The UN-REDD Programme support seeks to build national capacity for the implementation of REDD+ under the UNFCCC. To do so, five outcomes are envisaged:

Outcome 1: Relevant stakeholders engaged and their capacities developed

Outcome 2: National institutions have capacity to implement effective and participatory governance arrangements for REDD+

Outcome 3: REDD+ safeguards defined and national safeguards information system developed

Outcome 4: Development of Myanmar's national forest monitoring system (NFMS) and preliminary forest RELs/RLs supported

Outcome 5: National REDD+ Strategy developed

Identification of drivers of deforestation and forest degradation is a critical component of **Outcome 5: National REDD+ Strategy developed**. In the Cancun Agreements, developing countries are requested to address the drivers when developing and implementing their national strategies or action plans.² Subsequent UNFCCC decisions affirm the complexities and importance of addressing the drivers, and encourage countries, international organizations and the private sector to continue working on this and share information via the UNFCCC web platform.³

This report provides an assessment of key direct and indirect drivers of deforestation and forest degradation, as well as barriers for sustainable management of forests, and enhancement and conservation of forest carbon stocks in Myanmar. It is intended to provide a platform of current knowledge on drivers, given the recent progress on direct driver identification (e.g. EU-funded EcoDev/Alarm project, "FLEGT Myanmar: Laying Foundations and mobilising civil society," Air Asia Survey data, Forest Trends, Global Forest Watch, FAO assessment for Myanmar's Forest Reference Emissions Level (FREL) and National Forest Monitoring System (NFMS), etc.). **However, the emphasis of this report is placed on underlying drivers and future pressures on forests, which are crucial given the rapid economic development Myanmar is currently, and will continue, to experience.**

The rationale behind assessing direct and underlying drivers under various development scenarios and known development proposals is to provide Myanmar with a solid basis

¹ Myanmar REDD+ Readiness Roadmap, UN-REDD Programme, July 2013, page 50-61.

² Decision 1/CP.16 the "Cancun Agreements"

³ Decision 15/CP.19 the "Warsaw Framework for REDD-plus"

for ascertaining REDD+ policy and measure (PAM) response options. Therefore, this national-scale assessment combines existing spatial data, with quantitative and qualitative data and projections, in order to help inform and develop specific REDD+ PAMs to address drivers and their underlying causes, based on criteria for PAM selection. This requires a nuanced approach, recognizing the political sensitivity of including all areas within Myanmar, including contested areas and states that are not within the Myanmar Forest Department's full jurisdiction, but which contain significant forest areas. For that reason, the study has been conducted in close partnership with the Myanmar Forest Department, Forest Research Institute, REDD+ focal point, UN-REDD Programme Management Unit, the Drivers and Strategies Technical Working Group (TWG), civil society organizations, research entities and other relevant entities (for a complete list of all those consulted during the completion of this study, please refer to Annex 1).

Therefore, **this driver study is intended to provide a cornerstone of Myanmar's REDD+ National Strategy, but it must also relate to other relevant stakeholder and government priorities.** It was developed with the intention not only to provide guidance on how Myanmar can fulfill its INDC targets related to forests (in alignment with FLEGT), but also, a) how crucial timber and forest land management issues can be addressed in the dynamic process of refining land governance in Myanmar, and b) to help enable positive solutions between ethnic regions and the Union government in the peace process, particularly given the role that forest access and management and benefit-sharing of revenues plays. Myanmar developed its first National Land Use Policy (NLUP)(version of January 2016), and is in the process of an inclusive public consultation process to carry the policy forth into law. Myanmar also held the Union Peace Conference (also called 21st Century Panglong Conference) in August 2016, seeking to restart negotiations with ethnic regions, in order to find solutions to long-standing conflict in natural resource-rich ethnic state regions. Disagreements over land rights and land and resource governance sit at the core of these conflicts.

2. Analytical framework and methodology

The analytical framework underpinning this study is based on Geist and Lambin's (2002) conceptualization of the following understanding of drivers of deforestation and forest degradation (and plus activities), causal factors, and intervention options that the public and private sector can have in response:

First, the definitions of deforestation and forest degradation are:

Deforestation is a process of clearing and converting forest land to another land use, such as for agriculture, mining, or development. In this regard, deforestation usually results in a change in land use, though if the land is cleared of forest and then not used for any other purpose, trees may grow back.

Forest degradation is understood as forest remaining predominantly forest, and not switched to a different land use, but the quality of the forest declines, and the carbon stocks of the forest are reduced.

The drivers of deforestation and forest degradation are the rationales and activities that cause change to forests. They can be human induced or naturally-occurring. Drivers of deforestation and forest degradation are caused by:

Direct (proximate) causes: human activities or immediate actions that directly impact forest cover and loss of carbon. Examples include:

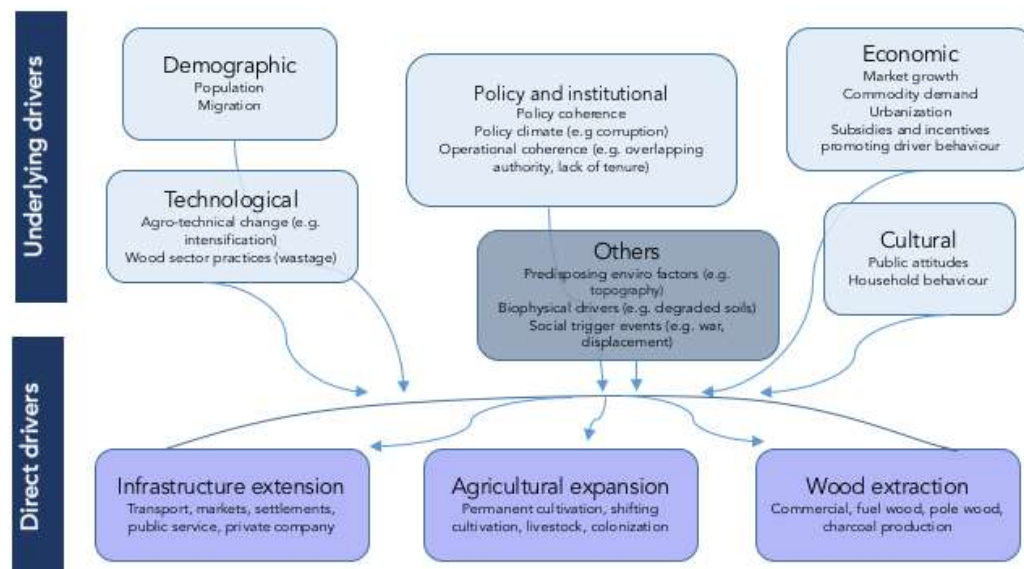
Deforestation: commercial agriculture, subsistence agriculture, mining, infrastructure and urban expansion

Forest degradation: logging, fires, livestock grazing in forest, fuel wood collection and charcoal production

Underlying/indirect causes: complex interactions of fundamental social, economic, political, cultural and technological processes - often distant from their area of impact.

The relationship between underlying drivers and direct drivers is nuanced, and describes a set of interactions and motivations that drive decisions and behavior in relation to forests (refer to Figure 1). Underlying drivers can be harder to identify, but are crucial for understanding what drives various actors to clear or degrade forests.

Figure 1: Relationship between underlying and direct drivers of deforestation and forest degradation



Adapted and modified from Geist and Lambin (2002)

The UNFCCC Conference of the Parties has agreed through various decisions that drivers of deforestation and forest degradation are important, and developing countries are encouraged to identify them (Decision 4/CP.15) and address drivers in their national strategies or action plans (Decision 1/CP.16), and ensure that the responses to drivers are adapted to national circumstances (Decision 15/CP.19). The text of the three decisions mentioned can be found below:

Paragraph 1 of decision 4/CP.15:

Requests developing country Parties, on the basis of work conducted on the methodological issues set out in decision 2/CP.13, paragraphs 7 and 11, to take the following guidance into account for activities relating to decision 2/CP.13, and without prejudging any further relevant decisions of the Conference of the Parties, in particular those relating to measurement and reporting:

(a) To identify drivers of deforestation and forest degradation resulting in emissions and also the means to address these;

Paragraph 72 of decision 1/CP.16:

Also requests developing country Parties, when developing and implementing their national strategies or action plans, to address, inter alia, drivers of deforestation and forest degradation, land tenure issues, forest governance issues, gender considerations and the safeguards identified in paragraph 2 of annex I to this decision, ensuring the full and effective participation of relevant stakeholders, inter alia, indigenous peoples and local communities;

Warsaw Framework decision on drivers (15/CP.19):

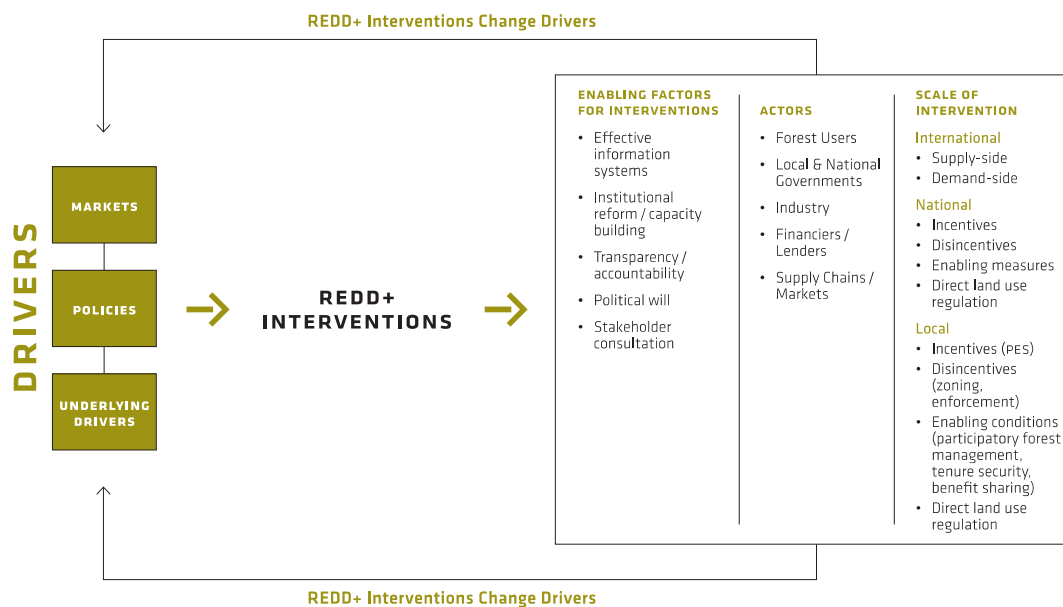
Also noting that livelihoods may be dependent on activities related to drivers of deforestation and forest degradation and that addressing these drivers may have an economic cost and implications for domestic resources,

1. Reaffirms the importance of addressing drivers of deforestation and forest degradation in the context of the development and implementation of national strategies and action plans by developing country Parties, as referred to in decision 1/CP.16, paragraphs 72 and 76;
2. Recognizes that drivers of deforestation and forest degradation have many causes, and that actions to address these drivers are unique to countries' national circumstances, capacities and capabilities.

Drivers of deforestation and forest degradation occur at all scales (global to local), and thus strategies to address drivers can occur at all scales. As this is a national study, the focus is primarily on national level interventions (policies and measures) to affect deforestation and degradation drivers. Interventions at international and local scales are also important to address drivers, and need to be considered when developing response

options, and assessment of the where interventions can best influence key actors should be considered. Defining what actions can best affect driver behavior at the most appropriate scale is an important consideration for policy and decision-makers. Figure X provides a conceptual framework for how REDD+ driver interventions and actors relate at different scales. Enabling factors such as effective information systems to guide decisions, institutional capacity, transparency and accountability, political will, and consultation with stakeholders underpin any strategy to affect drivers. For REDD+ to be successful, incentives, disincentives and enabling measures will need to reach the actors responsible for addressing the drivers of deforestation and forest degradation. These actors span all scales, from international commodity buyers to forest-dependent communities.

Figure 2: REDD+ driver interventions, actors and scales



Source: Kissinger et al., 2012

As Myanmar faces a very different future compared to its past, this study focuses considerable attention on the country's future. Understanding future pressures on forests requires a view into the political economy of future development pathways. This study focuses on known government policy commitments, private sector investment, and general assumptions around commodity and demand growth, in order to estimate future pressures. This understanding of Myanmar's future will need to evolve and adapt, as more becomes known about the National League for Democracy's plans for democratic reform, and opening of its economy after decades of isolation under military rule, as well as market responses to this change and increased foreign investment. At the very heart of this research resides an intention to provide solid and reliable information to help inform decisions on interventions on the country's forests to guide Myanmar's future development options while maintaining its social and natural capital.

2.1 Methodology

Based on the above analytical framework, this assessment drew upon existing information and data sets, as well as data collected by FAO through the UN-REDD Programme support, a comprehensive literature review, 29 structured interviews involving at least 80 individuals with government agencies and stakeholder groups, and other expert interviews (Refer to Annex 1, which summarizes key contact points from each organization, though is not a comprehensive list of all communications). The methodologies and specific activities carried out under this assessment included the following steps:

1. Assess the range and relative importance of current deforestation drivers and degradation patterns, based on currently available information. This will also entail identifying the primary actors responsible for forest clearing, to better understand how to shift actor motivations. There was no specific spatial assessment made for the purposes of this study beyond the work carried out by the RS-GIS Division of the Forest Department, which provided a timely update to update the forest classifications, and produced an initial forest change matrix assessment. No spatial activity data was generated, or correlation between spatial activity data and changes in forest cover;
2. Identify the range of underlying drivers (with emphasis on current and future ones) that impact forests. This will build on the findings of previous studies, Myanmar's REDD+ Roadmap, and other sources with more in-depth assessment, based largely on expert interviews and case studies, in the following areas: a) forest governance and capacity constraints (policy, legal, regulatory, institutional, socio-political, economic); and b) pressure from outside the forest sector (other sector governance, land allocation decisions, levels of jurisdictional authority, market pressure, what current incentives and disincentives impact forests);
3. Assess potential future deforestation and degradation patterns, based on current and projected patterns of market and commodity demand from within Myanmar and internationally, and likely scenarios (timber, agricultural commodities, etc.). Insights will be derived from review of investment plans, government development priorities in driver sectors, and identification of the scale and future projections of domestic demand and cross-border activity. Provide estimates of likely conversion threats, or priority areas;
4. Rank current and future drivers (direct and indirect/underlying) according to their physical impacts on forests, including complementary indicators addressing the dimensions of efficiency (i.e. difficulty/cost to change the dynamic of deforestation associated with the driver), attainability (can the driver be realistically affected by a REDD+ policy => increase in demand for biomass in absence of viable alternatives for instance), political acceptability and equality (is

the driver a central component of a development pathway). An initial estimate is made of driver rankings, however this must be updated once the direct driver assessment is completed with more robust spatial data. A refined correlation assessment between direct and underlying drivers can be carried out then, and will benefit from broader stakeholder consultation and input;

5. Develop criteria to prioritize strategic options and pathways to address drivers (including underlying drivers), with particular emphasis on how interventions could support multiple benefits (e.g. rural development and forest conservation). Work in close partnership with the Myanmar REDD+ focal point and relevant agencies, and coordinate with other stakeholders, relevant UN initiatives, and related Myanmar activities (e.g. FLEGT VPA and related capacity building) to ensure coherence and leverage with other initiatives; and
6. Identify options for potential policies and measures that could be implemented in the context of REDD+. Beyond government interventions, options should also identify those pertaining to private sector interventions and the range of relevant actors. Identify potential barriers and opportunities related to adopting proposed PAM interventions.

The methodologies carried out for each section are identified in more detail in each respective section.

3. Direct drivers of deforestation and forest degradation

3.1. Methodology

Direct drivers of deforestation and forest degradation (also referred to as proximate causes) are human activities or immediate actions that directly impact forest cover and loss of forest carbon (Geist and Lambin, 2001). These causes can be grouped into activity categories such as conversion of forest for commercial and subsistence agriculture expansion, infrastructure development, legal and illegal logging.

This assessment of the direct drivers sought to build on the Myanmar REDD+ Readiness Roadmap, completed in 2013, which initiated readiness and the development of the REDD+ process in Myanmar.

This assessment relied on improved and corrected forest cover and forest cover change data, including development of a seven-category forest cover classification system, carried out by the RS-GIS section of the Forest Department in July/August 2016. These improved Forest Department forest cover data for 2005, 2010 and 2015 provided the basis for development of change matrices for 2005-10 and 2010-15. These forest cover change matrices are therefore based on the most current data, government-recognized definitions and interpretations of the Hansen et al. (2013) forest cover change dataset.

This provides for more regional differentiation, including lands in and outside of the permanent forest estate, and more insight on forest cover change.

During the primary data gathering phase for this driver study, it became apparent that different interpretations of the Global Forest Watch and Hansen et al. (2013) data exist, largely based on different definitions of forest based on canopy cover and minimum thresholds. Both the Forest Department and Treue et al. (2016) apply the 10% threshold and minimum forest area, and both the data sources are also the same (Landsat medium resolution images).

The differences arise in the interpretation of the images, thresholds and classification. The canopy cover percentages are significantly different, Treue et al. (2016) use a >80% canopy cover threshold (though dry forests are treated differently), whereas Forest Department uses a >40%, and there are differences in overall forest area estimates.⁴

This driver assessment therefore sought to take stock of the range of data already existing in the Forest Department, what is being assembled for the One Map Initiative and Land Use Policy categorization of land uses, and the ability to pull in other sources of data such as the Treue et al. (2016) analysis and related data. **A shared understanding of direct driver patterns among stakeholders is crucial in order to provide a solid basis on which to build the subsequent stages of the driver analysis, including ranking drivers, correlating underlying/indirect drivers to direct drivers, projecting future patterns, and developing policy and measure (PAM) response options.**

3.2 Forest cover change and country context

Myanmar's 30.9 million hectares of forest comprises 44.2% of the country's land area of 167,189,030 acres (67,659,000 ha). Other wood lands account for another 23% of its land area.

Between 2010 and 2015

Myanmar had the third largest forest loss by area in the world, losing net 546,000 ha per year between 2010 and 2015—a 1.7% annual rate of loss (FAO, 2015a).

Myanmar's standard definitions, as per FAO reporting, is as follows: closed forest are defined as spanning more than 0.5 hectares, with trees higher than 5 meters and a

Table 1: Countries reporting the greatest annual forest area reduction (2010-2015)

Rank	Country	Annual forest area net loss	
		Area (thousand ha)	Rate (%)
1	Brazil	984	0.2
2	Indonesia	684	0.7
3	Myanmar	546	1.7
4	Nigeria	410	5.0
5	United Republic of Tanzania	372	0.8

Source: FAO FRA 2015

⁴ There is a difference of 13 million ha of forest in Myanmar between the two interpretations, FD data shows annualized deforestation rates to be considerably more than that of Treue et al. (2016), though degradation estimates appear to be more consistent between the two interpretations.

canopy cover of more than 40%; open and/or degraded forests are defined as spanning more than 0.5 hectares, with trees higher than 5 meters and a canopy cover between 10 and 40%.

The Forest Department has different legal classifications of forest, with the Permanent Forest Estate (PFE) accounting for 31% of the land area. The Reserved Forest (RF) category (areas of forest reserved by the government as they contained higher value timber) accounts for 18% of land area; Protected Public Forests (PPF), which contain lower value timber stands, usually for domestic supply, account for 6.05%; and 5.75% is in the Protected Area System (PAS). There is also 'unclassified forest' (areas with forest on them and managed by the Ministry of Agriculture, Livestock and Irrigation) with 9,607,490 acres (3,888,098 ha).

Table 2: Forest Cover legal classification in Myanmar (2015)

Legal classification	Area (hectares)	% Land area
Permanent Forest Estate (PFE):	21,113,288	31%
Reserved Forest (RF) and Protected Public Forest (PPF)	12,184,556	25.3%
Protected Area System (PAS)	3,890,595	5.75%

Source: Planning and Statistics Division, Forest Dept.

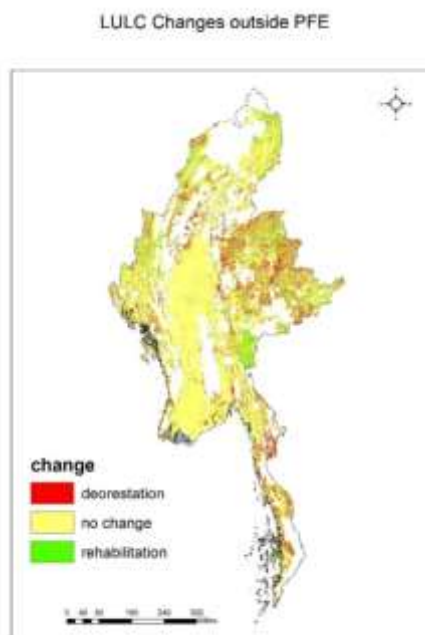
Myanmar's forests have changed from being almost 51.1% of land cover in 2000 to being 43.4% of land cover in 2015.⁵ The RG-GIS Section of the Forest Department is conducting on-going analyses of forest cover and land cover change and associated activity data to understand the changes. This information is summarized below, and will be updated once the analysis is complete.

The RG-GIS Section data layers cover the following years and sources: 1989, 2000 (1998-2000 Landsat), FRA 2010 (2005-2007 Landsat), FRA 2015 (2010 IRS Liss III), and 2015 (FAO TCP based on 2015 Landsat). Current efforts include harmonizing the categories across the timeframes between 2005, 2010 and 2015, for cross-comparison (refer to Annex 2 for a summary of land use, land cover and forest cover categories that are being harmonized). These spatial layers and categories are based on real source data, not projections. On-going work includes further ground-truthing, attuning the standardization methodologies (related to image classification, interpretations, etc.), field measurements, and refining administrative boundary issues. Although definitions are clear, the thresholds for closed forest, open forest and other wooded land present challenges in image interpretation (RS-GIS Section, FD).

Updated information from the Forest Department on deforestation within and outside the PFE between 2005 – 2010 indicates that the deforestation rate outside the PFE was

⁵ MRV TWG team, 18 August 2016 presentation.

higher than within the PFE, resulting in a 1.38% deforestation rate within the PFE, compared to a 2.37% annual deforestation rate outside the PFE. Refer to figure X for the spatial distribution. Treue et al. (2016) find that the increasing area of plantations outside forest reserves and protected areas to be fairly similar to that inside forest reserves. In principle, plantation species inside forest reserves could be entirely different from those used on agricultural land, e.g. teak/timber species vs. rubber trees, banana, betel nut, and oil palms, though field visits and ground truthing would be necessary to decipher between the two, without sufficient spatial data on forest composition changes.



Source: RS-GIS, Forest Department

Figure 3: Forest cover change outside Permanent Forest Estate

The updated data illustrates a significant drop in closed forests, while open forests saw a slight increase, and ‘other lands’ correspondingly increased dramatically. This indicates conversion of forests to other uses over the ten-year period, and more assessment is needed to understand how roughly 5 million hectares of closed forest may now be characterized as ‘other land.’ This trend is corroborated by other independent analyses which identify a similar trend, although the quantum differs (refer to Treue et al. (2016), Maung Maung Than (2015), Woods (2015(a), Springate-Baginski et al., (2015)(2014)). Springate-Baginski et al. (2014) found that between 1990 and 2010, dense forests (those with more than 40% canopy cover) covered only 18% of the land area in 2010, down from 45% of the land in 1990, showing an earlier historic trend that has continued to this time.

The percentage changes in land cover types between 2005 and 2010 similarly help graphically represent the shift from closed forest to other land uses (See Figure X below). **This trend suggests strong degrading forces on the forests in the past 15 years, but also a shift from more degradation of the forest historically, compared to mainly deforestation (actual forest loss) in more recent years.** Further assessment by the RS-GIS Section will help inform the corresponding activity data and related emissions factors, as part of NFMS and FREL development.

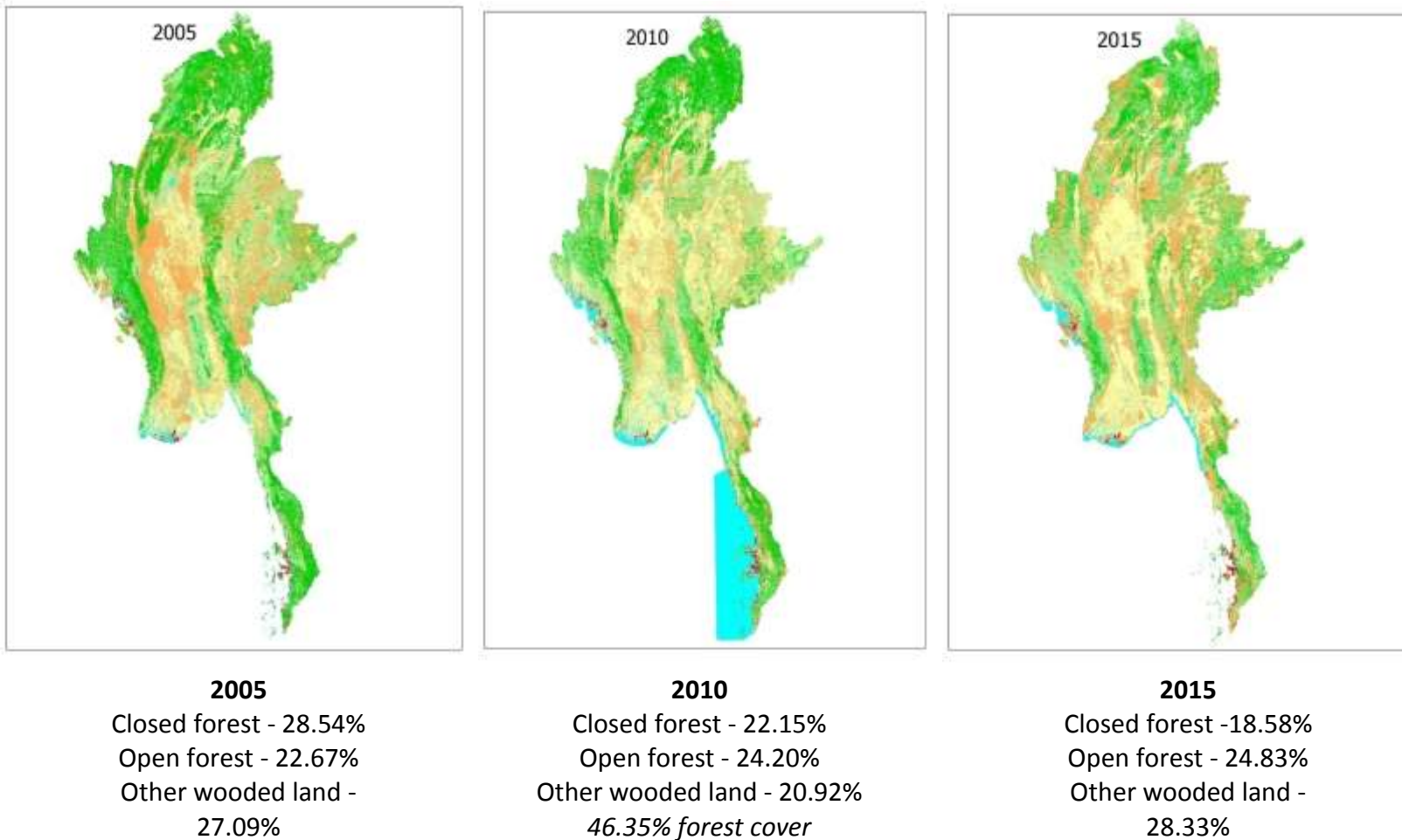
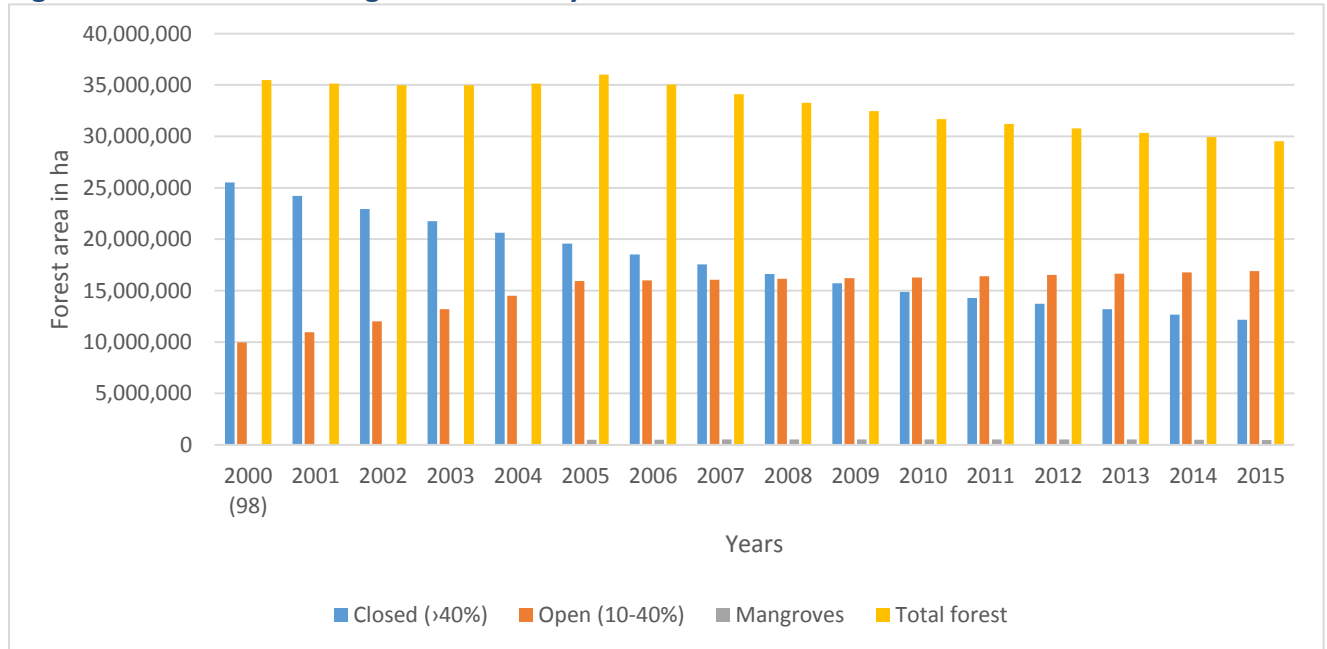


Figure 4: National level forest cover assessment (draft version)

The estimations of the dimensions of deforestation for Myanmar vary widely among different sources. Below are estimates from the Forest Department on forest cover change between 2000 – 2015.

Figure 5: Forest cover change estimations years 2000 – 2015



Source: Planning and Statistics Division, Forest Department, 2016

The forest cover change data for the years 2000 – 2015 (figure 5) indicate accelerating rates of deforestation over the last 10-15 years while the rates of opening up forests (proxy for forest degradation in Myanmar) are changing from very high rates during the early 2000s to lower but still considerable change rates in recent years (table 3).

The overall forest loss calculated for the 15-year period of 2000 – 2015 is 1.22% annually and for the last 10 years (2005 – 2015) nearly 2% per year (FAO, 2015a). The picture of high change rates in closed forests during the early and mid-2000s and corresponding decreasing change rates after 2006/07 until today are in line with finding from other studies which indicate increasing timber harvests between 1999 – 2008 and significant decreases of timber harvest after 2008, although still above the established AACs (Treue *et al*, 2016).

Table 3: Change rates of forest cover periods 2000 – 2015 and 2005 – 2015 in Myanmar

Forest type	Annual change 2000 – 2015, ha	Annual change 2005 – 2015, ha	Annualized change rate 2000 - 2015 (15 years)	Annualized change rate 2005 – 2015 (10 years)
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Closed forest	-889,104	-738,842	- 4.81%	- 4.63%
Open forest	+461,103	+95,707	+ 3.57%	+ 0.59%
Mangroves	N.A.	-4,328	N.A	- 0.9%
Total forest	-397,766	-647,463	- 1.22%	- 1.96%

Source: Planning and Statistics Division, Forest Department, 2016

Land cover change data at the national level for the last ten years, 2005 – 2015, (see table 4) at national level, although the available classification of land use and land cover data is quite coarse, indicate high dynamics between and among land cover categories suggesting the following:

- Around 11.5 million ha (60%) of Closed Forests changed to Open Forests or Other Woodland below the threshold of the forest definition, but only a minor part with 0.7 million ha into Other Land (3.5%)
- Only 7.2 million ha (37%) of Closed Forests areas remained as Closed Forest 10 years later
- But also 3.1 million ha of Open Forests (20%) and 1.3 million ha (10%) of the Other Woodland category, even a small amount of Other Land (0.4 million ha) recovered back to Closed Forests
- Open Forests partly recover back to Closed Forests (20%) but the majority of changes in this category go into Other Woodland with 5.3 million ha (33%) and 1.3 million ha of Other Land (9%). More information is needed to understand what has precipitated these changes, and the administrative aspects.
- In the Other Land category (cropland, grassland, settlements) 10.9 million ha (65%) remained as such 10 years later but 3.6 million ha (28%) of Other Woodland changed to Other Land as well as 1.3 million ha (8%) of Open Forest and even 0.7 million ha (3.6%) of Closed Forests
- For the Mangrove forest category, a dynamic between water and mangrove areas is evident, and changes from Mangroves to Other Land (mainly cropland in this case). 136,500 ha (27%) of Mangrove forests in 2005 change to Other Land in 2015, 90% of which is occurring in Ayeyarwaddy and Rakhine region.

Table 4: Land cover change matrix for the period 2005 – 2015

Area in ha	Land Cover 2015							
Land Cover 2005	Closed Forest	Open Forest	Mangrove	Other Woodland	Other Land	Water	Snow	Grand Total
Closed Forest	7,265,394	7,440,499	42,621	4,065,738	692,842	66,596	12,108	19,585,798
Open Forest	3,143,662	6,095,512	24,566	5,260,220	1,315,784	82,533	20,309	15,942,585
Mangrove	3,051	15,681	218,959	77,165	136,479	47,425		498,760
Other woodland	1,310,503	2,319,978	35,495	5,357,509	3,644,653	100,212	1,858	12,770,207
Other land	407,366	878,146	51,006	4,340,814	10,904,514	255,175	11,241	16,848,261
Water	21,524	72,629	82,798	144,940	415,133	1,079,715	5	1,816,744
Snow	39,328	78,056		64,938	4,360	16	68,863	255,560
Grand Total	12,190,827	16,900,501	455,445	19,311,323	17,113,764	1,631,672	114,384	67,717,916⁶

Source: Planning and Statistics Division, FD, 2016

The land cover change dynamics need to be better understood, as the current data is not yet refined enough to describe, on a state/regional basis, what the forest transition dynamics are. In some cases, a pattern of forests first opened up by degrading activities over many years such as overcutting for timber and fuel wood are observed, and these become open forests or are transformed in other woodland (below the threshold of the forest definition) and transformed to other land uses, such as agricultural land or other non-forestry uses. In other areas, it appears that concessions and allowances (such as for agribusiness plantations, mining, dam construction, road building) in closed forests or more open forests, leads to greater degradation as forests are cleared, settlers move in, and then forests may transition further to non-forest uses. The high change rates within forest categories suggest an important influence of degrading activities. The amount of biomass for fuel wood harvested in Myanmar has steadily been increasing and is several times higher than the actual timber extraction (refer to sections on woodfuel).

More assessment is required to understand how plantations of woody species such as rubber, oil palm and acacia are classified. For instance, rubber is considered an agricultural crop, though a forest cover assessment may code it as forest, as it contains woody biomass. This is unclear in the current forest cover assessment.

In the absence of more disaggregated land cover classifications presently used in the satellite land monitoring system (SLMS) of Myanmar, the use of general statistical data of Myanmar can be drawn upon, for the interpretation of change data in the Other Land

⁶ There is a difference of 231.7 square miles (60,082 ha) to the official total land area which is due to differences in the boundaries on the digital maps and the recognized overall land area of Myanmar.

category which includes cropland, grassland and settlement. However, there are limitations in the use of this data due to the lack of harmonization between between the FD and DALMS land use categories (Refer to table 5).

Table 5: Land use/ land use change in Myanmar 1995 - 2015 in ha according to DALMS data

Years	RF+PPF	Current fallows	Net area under agriculture	Cultivable wasteland other than fallow	Other forests and woodland	Other land	Total
1995-1996	10,320,707	1,231,055	8,909,972	7,971,100	22,078,454	17,146,546	67,657,834
2000-2001	12,913,530	685,943	9,909,141	7,205,030	19,785,908	17,158,282	67,657,834
2005-2006	15,707,078	368,264	10,922,070	6,279,108	17,828,442	16,552,871	67,657,834
2010-2011	17,915,854	230,266	12,020,388	5,395,678	15,629,378	16,466,269	67,657,834
2011-2012	18,234,342	321,725	11,919,621	5,373,825	15,348,121	16,460,198	67,657,834
2012-2013	18,304,757	439,489	11,840,303	5,360,471	15,206,886	16,505,928	67,657,834
2014-2015	18,697,707	456,486	11,773,125	5,292,484	14,840,645	16,597,387	67,657,834
Total increase (decrease) 2005 – 2015	2,046,902	(788,328)	1,063,515	(1,012,524)	(3,094,229)	921,875	
Annual increase (decrease) 2005 - 2015	204,690	(78,833)	106,351	(101,252)	(309,423)	92,187	

Source: Myanmar Data; Department of Agricultural Land Management and Statistics, 2015

Table 5 identifies that between 2005 – 2015, the area under agriculture has increased by about 1 million ha, while the area of cultivable wasteland (other than fallow land of shifting cultivation systems) has decreased by around the same amount. At the same time the area of Reserve Forests and Public Protected Forests has increased by around 2 million ha, as well as other land by more than 900,000 ha, both likely coming from other forests and wood land which decreased by around 3.1 million ha. However, forests as identified through the SLMS of the FD can be distributed over several DALMS categories such as current fallows (from shifting cultivation), cultivable waste land, other forests and woodland, other land and of course the Reserve and Public Protected Forests.

3.2.1 Regional and forest-type patterns of note

The rates of change between forests and non-forest are quite different at the subnational level. Between 2005-2015, according to the latest FD data the distribution of deforestation rates, Ayeyarwady, Kayah and Mandalay had the highest rates of deforestation, while Yangon, Tanintharyi, Bago, Kachin and Shan states have the least deforestation, based on percentages (Table 6). However, other forest cover assessments contain different findings (Treue et al., 2016; Bhagwat et al, 2016; Connette et al, 2016;

Woods, 2015; Baskett, 2015), and these are noted in the ‘observations’ column in Table 6.

Table 6: Subnational distribution of deforestation rates in Myanmar, years 2005 – 2010, 2010 – 2015, 2005 – 2015

State/Region	2005 - 2010	2010 - 2015	2005 - 2015	Observations
Ayeyarwady	-9.95	-4.98	-7.50	
Kayah	-1.67	-11.53	-6.73	
Mandalay	-4.60	-6.92	-5.77	
Mon	-4.31	-6.95	-5.64	
Magwe	-5.51	-5.17	-5.34	
Sagaing	+0.25	-5.96	-2.91	New openings along rivers and roads in the northern part of the region and on a much smaller scale in the hilly areas. Almost 40% of the area is reserved as RFs, PPFs, or PAs. There is modest (3.5%) expansion of the already large agricultural area, a rapid expansion of plantations (75.6%), and a 743.6% increase of mining by from 7,000 to almost 60,000 ha. The loss of intact forest is much greater outside RFs, PPFs, and PAs. Non-forest areas have increased 5.80% inside reserved areas, compared to 3.04% outside reserved areas. Non-forest and plantation expansion is concentrated within a few degraded Reserved and Public Protected Forests (Treue et al, 2016).
Rakhine	-3.93	-1.82	-2.88	Clusters of new non-forest are found on the coast (particularly around Koungbarmia bay) (Treue et al, 2016).
Kayin	-2.48	-3.12	-2.80	Clusters of new non-forest are found on the border with Thailand close to the main road connection between the two nations (Treue et al, 2016).
Chin	-1.80	-3.66	-2.73	Scattered new non-forest is also found at smaller scales in the hilly regions (Treue et al, 2016).
Naypyitaw	-3.19	-1.31	-2.26	
National total	-2.49	-1.38	-1.96	
Shan	-5.47	+3.27	-1.19	Stakeholder consultations so far indicate questions regarding how woody biomass on agricultural concessions are handled, and also that observable patterns contradict such a low deforestation rate. Degraded forest gives way to new non-forest land on a very large and more scattered scale (Treue et al, 2016). Has the highest rates of intact forest loss (Bhagwat et al, 2016)

Kachin	-0.85	-0.67	-0.76	<p>Stakeholder consultations indicate questions regarding how woody biomass such as rubber are handled, and also suggest that observed deforestation rates are much higher.</p> <p>Non-forest increased by 48,000 ha or 5.5% while plantations (mostly rubber) increased by 74,000 ha, or 68%, and the area of mining increased by 18,000 ha or 141.7%. New non-forest and new plantations are established primarily as extensions of existing agriculture and plantations along rivers on the edge of degraded and intact forest areas, also along roads in the southern part (Treue et al, 2016).</p>
Bago	-1.46	+0.89	-0.29	
Tanintharyi	+0.51	+0.04	+0.27	<p>This region has seen significant forest cover change in many areas now more accessible by roads, and significant concessions granted for rubber and oil palm. However, FD data indicates an increase mainly in Open Forests and Mangroves. However, it is unclear amongst stakeholders consulted in the region how this trend could have occurred, and it may indicate how transitional biomass areas (such as banana or bamboo) are classified, and how plantations such as rubber are considered.</p> <p>Non-forest expanded by 12.5% (from 280,000 to 316,000 ha), mostly in the southernmost part. This change is significantly more than the rate of change in Kachin and Sagaing. This likely corroborates Woods (2015) findings that commercial timber exploitation occurred in areas officially allocated for plantations that were then only partially established. The most rapid expansion has been in the area of established oil palms (a 101.9% increase, from 41,000 to 83,000 ha) followed by 'plantation', increasing 59.9% from 56,000 to 90,000 ha, and a large share of which is betel nut palms (Treue et al, 2016).</p> <p>About 1 million acres have been allocated for oil palm plantations, though only about one third have been planted. Lands allocated and not planted see timber harvesting (Baskett, 2015).</p> <p>Degradation varies greatly between the 4 different forest types in Tanintharyi: Only 34% of mangrove forest is intact, while 47.1% of mixed deciduous forest, 52.5% of lowland evergreen forest, and 72.9% of remaining upland evergreen forest are still intact (Connette. et al, 2016).</p>
Yangon	-7.81	+9.58	+0.51	

Sources: Planning and Statistics Division, FD, 2016; Treue et al., 2016; Bhagwat et al, 2016; Connette et al, 2016; Woods, 2015; Baskett, 2015.

The Bhagwat et al (2016) assessment used a different forest definition, thus findings are not easily comparable to FD data (though are based on Hansen data). However, their assessment provides a view in to observable trends in change of dense intact forest (defined as greater than 80% canopy cover, whereas the FRA threshold uses 40% canopy

cover for 'closed forest.'). Their findings indicate most intact forests are concentrated in Myanmar's hilly and mountainous regions, including Kachin, Sagaing, Tanintharyi, Shan, and Chin and intact forest losses are concentrated in these most forested regions. Shan and Sagaing experienced the highest overall losses in intact forest, likely due to their already being quite fragmented. Declines are also noted in high and more remote and inaccessible areas such as Kachin and Tanintharyi, and in other hill regions, including Chin, Bago, Kayin, and Rakhine.

The Forest Departments plans to carry out further sub-national consultations and data collection in order to further refine an understanding of regional differences in forest cover change and forest transition patterns.

Myanmar has the most significant area of dry deciduous dipterocarp forest in southeast Asia, but the least protection for these forests. These forests are characterized by their open canopy and abundant grasslands, which support high biodiversity that is unique and different from other tropical types, including important herbivores and grazers such as elephants and wild cattle. These forests also support tigers. Myanmar's deciduous dipterocarp forests cover 19.5 million acres (7.89 million ha), which is double that found in Thailand and triple that found in Cambodia. Very little dry deciduous dipterocarp forest is left in Lao PDR and Viet Nam. Myanmar's dipterocarp forests are predominantly in the northern part of the central dry zone (Sagaing and Shan State) as well as in small patches along the foothills of the Rakhine Yoma. While Myanmar's dry deciduous dipterocarp forests are significant, the proportion that is protected is less than 2%, whereas Thailand and Vietnam have protected roughly 35% of their dipterocarp forests (Wohlfart et al., 2014). Further, Treue et al. (2016) identify that large areas of lowland dipterocarp forests are part of rotational agricultural systems, which may increase pressure on them.

Mangrove loss in Myanmar has been higher than in ten other Southeast Asian countries between 2000 and 2012, by percentage. Myanmar's percentage mangrove loss was 5.53%, which is significantly more than Malaysia (loss was 2.83%) and Cambodia (loss was 2.28%). The Forest Department estimates Myanmar had 1.6 million acres of mangrove in 2000, and lost 164,000 acres between then and 2013 (Republic of the Union of Myanmar, 2015(d)). However, other Forest Department information indicates that in 1980 Myanmar had 1.74 million acres of mangrove, but by 2013 only had 738,575 acres, indicating a loss of 1,002,485 acres over the 33 year period (Nyi Nyi Kyaw, 2015). In Richards and Friess's (2016) regional assessment, only Indonesia lost more mangrove in this time period, which is plausible given that Indonesia has at least double the amount of mangrove forests as Myanmar. Richards and Friess (2016) indicate losses were greatest in Rakhine state, though Forest Department information indicates the Ayeyawady region had annual loss rates that were double that of Rakhine's. Interviews conducted as part of this study suggested mangrove loss was most significant in the Bogale area of the Delta region, perhaps indicating that awareness of mangrove depletions there is greater, and there is less awareness of losses

in Rakhine state. Richards and Friess (2016) indicate that the rate of mangrove replacement with rice agriculture was lower in the agricultural hotspot of the Ayeyawady Delta than in Rakhine State. Less than 5% of Myanmar's mangroves are protected (Republic of the Union of Myanmar, 2015(d)). Refer to the driver section 3.2.3 on agriculture, sub-section of rice, which further explores impacts of rice production on mangroves.

3.3 Drivers of deforestation

The Myanmar REDD+ Readiness Roadmap of 2013 identified that expansion of agriculture, including both subsistence and commercial agriculture, were ranked as having the highest impact, followed by mining, hydropower development, and infrastructure. Urbanization, resettlement and aquaculture development were also identified. The following section updates and expands upon these observations. For this

Table 7: Summary of Myanmar REDD+ Readiness Roadmap (2013) drivers of deforestation from outside the forestry sector

Driver	Impact	Underlying causes
Expansion of Agriculture (Subsistence and Commercial)	1	Low agricultural yields, population increase, land claims through utilization or cropping, weak forest land tenure, promotion of industrial plantations (palm oil, rubber, pulp wood etc.) by decision makers who value short-term profits over valuation of environmental services, ambitious production targets for the agricultural sector.
Mining	2	High global and regional demand, lack of strong EIA and mitigation plans, weak coordination of mining sector with Forestry sector (laws, approval process)
Hydropower development	3	High national and regional demand for electricity, lack of strong EIA and mitigation plans, weak coordination with energy sector
Infrastructure (road, pipeline, special economic zones, power lines)	4	Lack of EIA regulations for public infrastructure and lack of implementation and monitoring of mitigation plans, lack of coordination among relevant ministries

report, no new spatial analysis was completed to attribute activities to the change matrix analysis completed by the Forest Department. That is a recommended next step, to further refine an understanding of why changes occurred to the forest. Rather, this approach reviewed recently completed analyses, some of which

include recent spatial assessments, others relied on other methods.

3.3.1 Agriculture

As mentioned above in the summary of analyses estimating forest cover change to non-forest, the largest impacts have come from agricultural clearing or potential use for agriculture. Clearings for agriculture have occurred in the PFE and outside of it, although there are differences of opinion as to the relative depletions from each category.

This trend generally tracks findings by others indicating a marked shift of forest (from within and outside the PFE) to large-scale agricultural concessions. Treue et al. (2016) found that new non-forest attributed to agricultural expansion increased by approximately 988,000 ha (2,441,401 acres) and the establishment of 536,000 ha (1,324,484 acres) of plantations have been the biggest cause of deforestation in the

period 2002-14. The largest expansion of non-forest (738,000 ha/1,823,637 acres) has taken place outside forest reserves and protected areas but inside forest reserves this has also been the main cause of deforestation.

Forest Trends analyses found that between 2010 and 2013, land allocations for large-scale private agriculture concessions saw an increase of 170 % (from 809,371 ha/2 million acres to 2,104,365 ha/5.2 million acres). Most large-scale agriculture concessions are found to be allocated in forest reserves, thus de-gazetted in anticipation of the shift to agriculture. Between 2004 and 2005, 1.77 million acres (716,293 ha) of forests (protected forest reserves, unclassified forests, and “other” forests) were de-gazetted and shifted to other uses such as agriculture and mining. “Unclassified” forests, with typically less substantial tree cover, appear to be most vulnerable to shifting to agribusiness concessions (Woods, 2015(a)). Another more recent assessment found 3 out of 9 forest reserves in the Ayeyarwady Delta are now completely under agriculture and only 26% of the area is covered by forest in the remaining six (Maung Maung Than, 2015).

These shifts in land use show poor results in delivering on intended outcomes, with few concessions achieving their intended purpose of developing modern agriculture.

While the shift to non-forest uses is apparent, two case studies in Kachin and Tanintharyi reveal insights on the resultant investment and production by the agribusinesses not being demonstrated. Sixty percent of the agribusiness concessions were granted in these two states between 2010 and 2013, and yet only 12 and 19% were planted by the end of 2013 (Woods, 2015(a)). A 2013 review of Ministry of Agriculture and Irrigation agribusiness concession data around Myanmar found that despite the agreed development schedules, most concessions made little progress in implementing their development plans. Only 24% of the Vacant, Fallow Virgin land concessions and 27% of the forestland concessions were developed or planted, although most were granted over five years before the assessment and should have been fully developed according to the rules for concession grants (Byerlee et al., 2014). Table 8 below depicts agribusiness concessions granted between 2010 and 2014, and the percentage planted, by state/region.

A 2013 review of agribusiness models for inclusive growth reviewed government statistics and estimated that a total of 377 domestic companies had been allocated 2.3 million acres of Vacant, Fallow and Virgin land (Byerlee et al., 2014). It is unknown how much of that vacant and fallow land contained forest or what the forest impacts were as a result. Byerlee et al. (2014) reviewed official 2013 agricultural statistics and identified that the government allocated 822 companies or individuals were allocated 750,000 acres of demarcated forestland for industrial agricultural production (outside of Mon State where smallholder and medium-sized farmers predominate in land grants). The largest areas were allocated to rubber, oil palm, rice, and jatropha, followed by sugarcane, and cassava, for large-scale agribusiness use.

The lack of follow-through in delivering on more productive agriculture may be an unintended outcome of concession allocation decisions. After 2011, the transition towards democratic reform and the opening of the economy under former President U Thein Sein saw greater promotion of industrial agricultural development as an attractive sector for economic development, livelihoods and foreign investment. It was hoped that agricultural GDP would increase on average 1.8% per year in Fifth Five-Year short term plan (2011-2012 to 2015-2016) (JICA, 2013). The goal of the Ministry of Agriculture, Livestock and Irrigation's Master Plan for the Agriculture Sector (2000-01 to 2030-31) is to convert ten million acres of "wasteland" into private industrial agriculture production, with rubber, oil palm, paddy, pulses, and sugarcane for export particularly encouraged (***Note that this is a large disconnect that is further explored in section 4.2.3 on overlapping and conflicting priorities between the forestry and agriculture sector***). But a range of land governance issues related to lack of recognition of customary land tenure, lack of adequate redress and dispute resolution, poor investment climate, lack of strong producer organizations, weak extension services, poor access to technology, and a range of other issues has limited the intensification and increased production of the agricultural sector.

Table 8: Agribusiness Concessions in Myanmar by State and Region, 2010-2013

State/Region	Allocated	Allocated	Allocated	Planted	% Planted
	2010-2011	2011-2012	2012-2013	2013-2014	
Tanintharyi Region	671594	993887	1896970	359455	19%
Kachin State	596180	1396575	1381165	172348	12%
Sagaing Region	100057	259273	533406	19543	4%
Ayeyarwady Region	193353	285844	335331	212969	64%
Shan State	117096	160626	323833	120403	37%
Magwe Region	202492	211292	219578	95949	44%
Bago Region	19772	52238	200150	91074	46%
Rakhine State	0	7826	131667	13176	10%
Yangon Region	30978	30980	80208	76243	95%
Mandalay Region	10300	6262	56046	14497	26%
Kayin State	2161	4011	34946	15867	45%
Nay Pyi Taw	0	7408	17554	5217	30%
Chin State	0	1542	1743	118	7%
Kayah State	0	0	0	0	0%
Mon State	0	0	0	0	0%
Total	1943983	3417764	5212597	1196859	23%

Source: Shwe Thein (2014); Woods (2015a)

Treue et al. (2016) find that between 2002 and 2014, new large-scale plantations for agricultural products (which can include trees and palms, such as rubber, palm oil and betel nut) occurred in Kachin, Sagaing and Tanintharyi. Kachin's plantation area (mostly rubber) increased by 74,000 ha, primarily as extensions of existing agriculture and

plantations along rivers on the edge of degraded and intact forest areas. Sagaing had a modest (3.5%) expansion of the already large agricultural area, while plantations expanded by 75.6%. In Tanintharyi, new non-forest and new non-oil palm plantations (e.g. rubber, betel nut) tend to be extensions of existing agricultural and plantation areas along rivers and main roads.

Current agricultural crop production is largely focused on rice, though no assessment has been identified during the research for this study that estimates what overall impacts crop production have had on forests. Other important crops include pulses and sesame, and maize is a crop that has seen significant increases in production, largely related to Chinese demand. Aquaculture, jatropha, rubber and oil palm are other commonly found crops.

Rice

The most significant driver of mangrove loss in Myanmar is rice production, accounting for 87.6% of mangrove deforestation between 2000 and 2012 (Richards and Friess, 2016). Of particular concern is the Ayeyarwady Delta, an expansive alluvial floodplain originally home to the largest tract of mangroves in Myanmar, but which has sustained high rates of deforestation. The study on historical changes in land-cover in the Ayeyarwady Delta showed that almost all deforestation in the Delta has been for rice agriculture and that the Delta mangroves had been lost at a substantially greater rate than previously thought. A 2014 assessment found that the Ayeyarwady Delta mangrove forests shrank by 64.2% between 1978 and 2011, with much converted to smallholder rice production. Mangrove forests covered 2,623 square kilometers in 1978, but that declined to just 938 km² by 2011. An average of 51 km², or more than 3% of the forest was lost every year over the period (Webb et al., 2014).

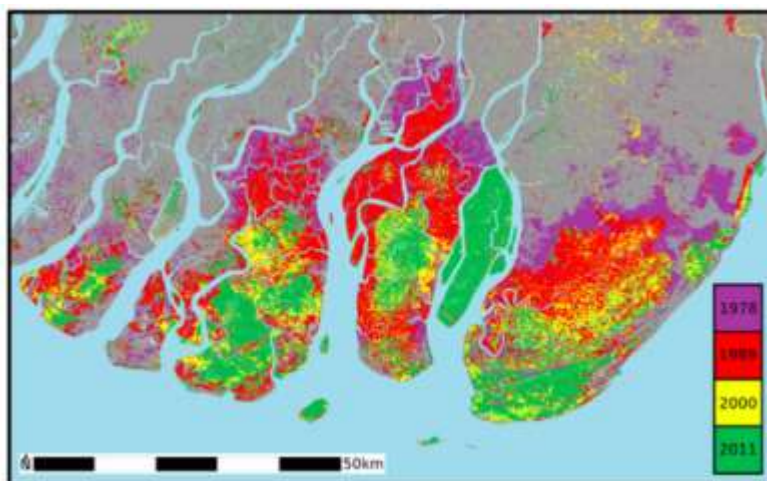


Figure 6: Mangrove land cover, Ayeyarwady Delta (1978, 1989, 2000 and 2011)

The vast majority (81%) of dense mangrove loss was caused by conversion to rain-fed rice paddy, some of which was abandoned and likely regenerated to degraded mangrove forest (13%). Webb et al. (2014) note that by 2011 the mangrove landscape was highly fragmented, with

smaller patches supporting significantly reduced marine and terrestrial resources and reduced coastal defense functions. It is believed that impacts of the Cyclone Nargis would have been far lower if mangroves were not so degraded in the Delta (Webb et al., 2014).

Maize

Maize production has played a role in deforestation, though its impacts have not been studied across all regions and more assessment is needed. However, the social and livelihood impacts of maize production have been mixed, and Section 5.2.3.3 covers future projections for maize. Maize is a key commodity increasingly farmed through contract farming, and the poverty and forest and land use dynamics are not well understood. For that reason, a study commissioned by the Land Core Group (LCG) examined the Charoen Pokphand Group's maize contract farming scheme in upland rural Shan State, relying primarily on field research. Industrial maize production is estimated to have covered 750,000 acres/303,514 ha in 2013. Seventy-five percent of that volume is imported by China. In Shan State, maize is now the second largest crop by acre planted and volumes produced, after paddy. Findings from this research indicate that farmers opting into contract farming often dedicate all their available farm land to the contract farming maize production. The result is often soil degradation (maize grown on its own strips soil of nutrients), and cycles of poverty and food insecurity as farmers shift from subsistence farming to contract farming and purchasing food. Importantly, findings indicate that forests provide a coping mechanism to this economic and food insecurity, based on logging and charcoal making (Woods, 2015b).

Aquaculture

Mangrove loss is often attributed to aquaculture (mainly shrimp) production, though a recent spatial assessment found that only 1.6% of mangrove deforestation between 2000 and 2012 could be attributed to aquaculture in Myanmar (Richards and Friess, 2016). Similarly, another spatial analysis attributes most mangrove losses between 2000 - 2013 to agricultural expansion and large scale deforestation, and while there was some evidence of mangrove clearing for aquaculture, this was minor compared to the other two causes of disturbance (Weber, 2014).

Jatropha

In 2005, a nationwide jatropha campaign was begun, and each state and region, regardless of size, was expected to plant at least 500,000 acres, for a national total of 7 million. A previous government directed states and regions to implement the target. Since that time, the Ministry of Agriculture and Irrigation has said that the cultivated area would extend up to 8 million acres (3.2 million hectares), or the size of Belgium

acres (Ethnic Community Development Forum, 2008). It is unclear whether this was ever followed up, and the acres planted to jatropha are unknown.

Rubber

The more established rubber plantations occur in the Tanintharyi Region, Mon and Kayin States. More recently, rubber production has been pushed in the north, along the Chinese border in Kachin and Shan States as perennial crop development substituting for opium poppy in border areas. Myanmar's rubber has contributed to the Chinese auto-manufacturing industry, which relies on rubber for tire production. Prices have recently fallen to a six-year low (Chan Mya Htwe, 2016(b)).

The government established a 30-year rubber development plan, and set the goal of reaching 1.5 million acres/607,000 ha and an annual production of 300,000 metric tonnes by the year 2030 (Kramer and Woods, 2012). That is significantly more than current production, but may be achievable given recent expansion. Indications are that production increases are more likely from area expansion than from yield increases on existing plantations. The National Export Strategy identifies that the production of natural rubber has more than tripled over the past decade, reaching a volume of 150,000 tons in 2011-2012, with a rapid expansion of the total tapped area, which exceeded 490,000 acres/200,000 ha in 2011-2012, compared with 267,000 acres in 2005-2006 (Republic of the Union of Myanmar, 2015b). The Settlement and Land Records Department (2013) identifies that of the different agricultural land types (the dominant ones being paddy and dryland), rubber land has expanded rapidly. As rubber is a land type under the Farmland Law of 2012, crop substitution possibilities are constrained.

The production on rubber has not been without controversy. Scurrah et al. (2015) refer to research since 2012 that indicates displacement of people in border areas due to large-scale rubber plantations, though the genesis of granting of these concessions was not necessarily to promote rubber. The Chinese government had an opium substitution program on the China-Myanmar borderlands that resulted in Chinese investors accessing large land concessions for agribusiness for purposes of smallholder development schemes involving ex-poppy growers. These border areas also attracted hybrid public-private investments that are found to result in dispossession (Kramer and Woods, 2012). Since this program's private business model was adopted in 2006, large tracts of land have been expropriated and converted to rubber in the uplands of Kachin and Shan States (Scurrah et al., 2015).

The large-scale rubber concession model that was evident in the opium substitution program in Kachin and Shan states was quite different from the state-backed, smallholder-driven rubber production programmes along the Thai border in the south of the country which have contributed to the livelihoods of smallholder farmers (Woods, 2012).

Oil palm

The Tanintharyi Region in Myanmar's south, contains suitable soils and climate conditions for growing oil palm, as well as rubber. A 30-year plan was launched in 1999 to develop this commodity, which sought to develop 500,000 acres as oil palm plantations, rising to 700,000 acres by 2030 (Aye Nyein Win, 2016).

The Tanintharyi Region is also home to 2.5 million hectares of largely intact Sundaic lowland forests, the largest extent remaining in the globally-significant Indo-Burma Biodiversity Hotspot. The vegetation and fauna are unique, lying in a transitional zone between lowland wet evergreen forest on the Malay Peninsula and the monsoon forests to the north, with unique biodiversity (Baskett, 2015).

About 1 million acres have been allocated by the Government of Myanmar to 44 oil palm plantation companies to develop plantations in the Kawthoung, Myeik and Dawei Districts in the Tanintharyi Region. The breakdown within each region as of 2014 is depicted in Table 9, along with the annual deforestation for both oil palm and rubber in each district. Deforestation for oil palm and rubber increased significantly after 2011, to a convergence of roughly 25,000 ha in each region in 2013. After 2013 rates increased to over 35,000 ha in Myeik, increased to roughly 27,000 ha in Kawthoung, and decreased to 20,000 ha in Dawei in 2014. Figure 7 below depicts Tanintharyi oil palm plantations and deforestation in the region between 2000 and 2014. Deforestation has been highest in districts with oil palm concessions. Of the 44 companies concerned, apparently 43 are Myanmar owned (three foreign companies have Joint Venture Agreements (JVA) with local companies), and one is the result of FDI (Baskett, 2015).

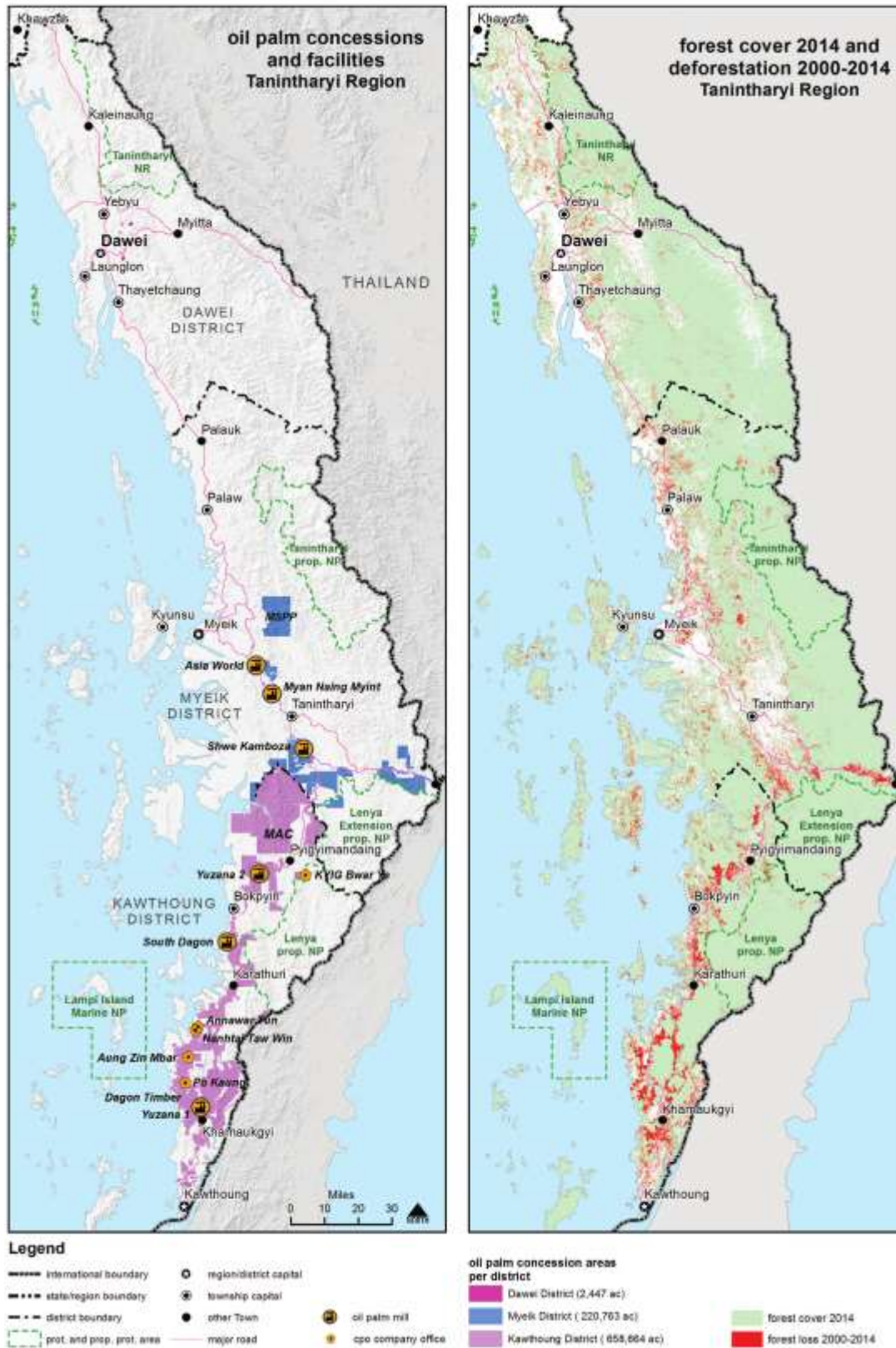
Table 9: Tanintharyi districts with oil palm plantations

	Area planted in 2014 (Acres/hectares)	Deforestation rate annually for both oil palm and rubber in 2014 (hectares)
Kawthoung District	283,296 / 114,646	27,000 ha
Myeik District	46,260 / 18,721	35,000 ha
Dawei District	17,001 / 6,880	20,000 ha
Total area planted:	346,557 / 140,247	
Total area allocated:	1,000,000 / 405,000	

Source: Adapted from Baskett (2015)

Assessments of land suitability for oil palm establishment has not been carried out, and field surveys of the region carried out by Baskett (2015) indicated significant logging and burning on steep slopes, and a lack of terracing, prior to planting. Further, the social dimensions of oil palm production in Tanintharyi raise concern given the complexity of

customary use of lands and ethnic Karen evictions over time. Land-use claims by Karen populations seeking to return to traditional territories since the tentative ceasefire with the KNU (armed Karen ceasefire group) present new challenges to the legality and ethics of oil palm production, rezoning for conservation, and resettlement of Internal Displaced Persons (IDPs) and refugees (Woods, 2015(a)).



3.3.2 Mining

The most relevant source of information on mining impacts on forests in Myanmar was recently completed by EcoDev, providing the first publicly-available, nation-wide inventory of potential mining areas in Myanmar. Using publicly available data such as from Google Earth, EcoDev researchers assessed aerial images across all of Myanmar, in order to identify mining sites and expansion of sites over time. A total of 46,000 hectares of mining areas was identified, of which 31.5% was newly disturbed bare ground where the vegetation had been removed since 2002. The assessment identified an additional 37,000 hectares of land that is highly likely to be mining, based on bare ground characteristics, but would require further ground-truthing to verify these. Sagaing and Kachin had the highest number of “high certainty” mines, accounting for 74% of all high-certainty mining areas in the country. Sagaing is estimated to have 33,394 ha of mining area, while Kachin is estimated to have 23,017 ha of mining area. Mandalay has the third largest area of high certainty mines (14,256 ha), but a higher proportion of those have lower certainty of actually being mining areas. Shan, Tanintharyi, and Bago have the next largest total areas of mining, ranging from 2,000 – 4,000 ha (Connette et al., 2016).

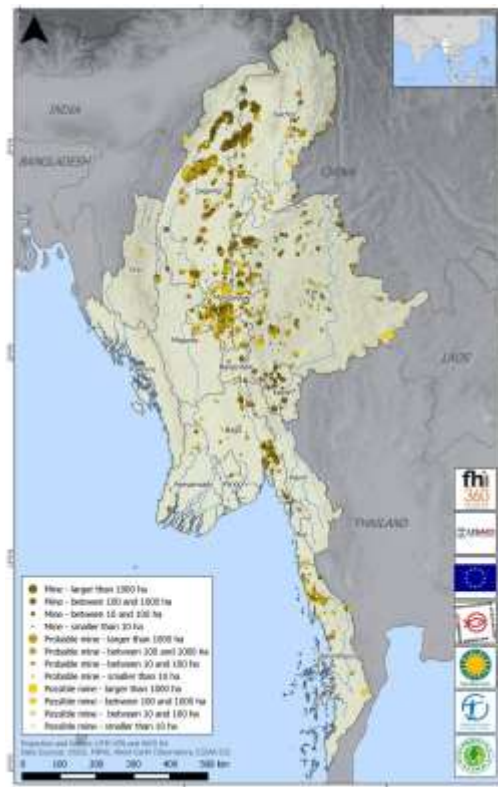


Figure 8: Existing mining sites - Myanmar

Source: Connette et al. (2016)

The Treue et al. (2016) analysis of Kachin State and Sagaing Region found that between 2002 and 14, the area of mines increased by 141.7% in Kachin and 743.6% in Sagaing, indicating significant change. Their locations were mainly established outside forest reserves and protected areas, yet many are sited along main rivers and tributaries, suggesting further assessment of impacts on water quality should be investigated. Mine establishment brings associated infrastructure development such as roads and settlement, and these are additional to the impacts of mines on forests.

Land grabbing for gold mining is occurring in Shan State, causing land loss and heavy pollution (Andersen, 2015), but it is unclear the degree to which these have resulted in exploration or concessions being granted.

3.3.3 Hydropower development

Hydropower has received considerable investment support in recent years, and Section 5.2.4.1 explores the future of hydropower development in more detail.

The area of water has increased mostly within forest reserves (Reserved Forests & Public Protected Forests), increasing 62% between 2002 and 2014, and amounting to 335,601 acres/135,815 ha (Treue et al., 2016). Only 50,572 additional acres/20,466 ha of water occurred outside RFs, PPFs, and PAs (ibid), suggesting that hydropower development has overwhelmingly occurred within forest reserves (again, both RFs and PPFs). Woods (2015a) identified that between 2011 and 2012, 110,777 m³ of timber was cleared for hydropower development, almost 17,000 m³ of which was comprised of teak.

Chinese traders indicate logging for clearings for hydropower development provides a source of timber from Kachin State, under a hydropower dam development scheme (example of the Yuandong company operating in Pianma)(EIA, 2015).

According to the Forest Department RS-GIS Division data (2016), between 2005 and 2015, there was a 185,000 ha decrease in water across the country, indicating that hydropower has not been a significant driver of deforestation in the past.

3.3.4 Infrastructure (roads, pipelines, special economic zones, power lines)

No spatial assessment was made of the impacts of infrastructure on forests in this study. This is a proposed area of further analysis by the RS-GIS Division of the Forest Department, as this will be crucial to assess future impact patterns and impacts on forests, given the potential for much larger impacts on forests from roads, hydropower development, pipelines, SEZs, and power lines. Data available through the Central Statistics Office (CSO) of Myanmar indicate rather minor influences of infrastructure development on the overall land use change in Myanmar over the period of 2005 – 2015.

3.3.5 Summary

Table 10: Summary of key findings on drivers of deforestation

Driver	Impacts (ha)	Considerations for ranking	Sources
Agriculture – commercial and commodity production	Between 2002-2014, 988,000 ha (2,441,401 acres), of which plantations	A significant portion of the 4,801,920 ha/11,865,802 acres that shifted to the	RS-GIS, Forest Department, 2016 Treue <i>et al.</i> , 2016 Woods, 2015

	were 536,000 ha (1,324,484 acres) (Treue et al.)	other lands category (cropland, settlement areas, and wetland) between 2005-2015 would have come from forests, though exact % is unclear (RS-GIS)	
Hydropower	135,816 ha/335,601 acres between 2002-2014		Treue <i>et al.</i> , 2016
Mining	46,000 ha + 37,000 ha possible in addition (but unclear how much from forest, and 31.5% of that was newly disturbed bare ground since 2002)		Connette <i>et al.</i> , 2016
Infrastructure	Unknown		

3.4 Drivers of forest degradation

Significant changes are underway in the forestry sector, and are largely focused on the managed timber estates under the direct control of the Myanmar Forest Department and Myanmar Timber Enterprise. This is in response to decades of unsustainable forest management and recognition that business as usual in Myanmar's forests is an untenable option. This section describes drivers of forest degradation, drawing from the significant amount of research, experience and advocacy that has focused on identifying the scale of the problem and the range of options to change these patterns, and deliver more long-term value to the people who depend on forest resources for their livelihoods and a range of other benefits.

Table 11: Summary of Myanmar REDD+ Readiness Roadmap (2013) drivers of forest degradation, from within the forestry sector

Driver	Impact	Underlying causes
Over-exploitation of forest timber (legal-illegal)	1	More accurate and conservative AAC, lack coordination between FD and Myanmar Timber Enterprise harvesting, political interference, transparency and accountability, security, market demand for timber
Over-harvesting of wood biomass as a source of energy	2	High demand for wood energy for domestic use and industrial use, lack of alternatives to fuel wood/charcoal
Unstable or pioneering shifting cultivation (not permanent conversion of forest into agricultural land)	3	Loss of traditional land due to investments (hydropower, agriculture), growing population, lack of land tenure over shifting cultivation areas and alternatives to this land use
Forest fires	4	Natural fires, shifting cultivation, hunting and pasture management, lack of forest tenure rights, droughts

The REDD+ Readiness Roadmap identified the over-exploitation of forest timber (both legal and illegal) as the largest driver of forest degradation. Based on a review of existing data, the literature review, and expert interviews, this view has not

changed. However, the scale of illegal logging is likely well beyond losses occurring through logging above the annual allowable cut (AAC), and the public losses are considerable.

3.4.1 Illegal logging

Overharvesting, either legal or illegal, is likely to be the largest driver of forest degradation. This topic is covered in far more detail in the underlying driver section 4.2.2 on illegality and corruption, and the future driver and recommendation sections. What follows is a brief summary.

Myanmar's illegal wood flow includes timber, fuel wood and charcoal. Myanmar is the fifth largest global exporter of wood in the rough or roughly squared format. Myanmar has developed a legal framework and tracking system to control the timber trade, under which all wood is considered legal if it has the hammer stamps of the state-owned Myanmar Timber Enterprise (MTE). However, a Swedish court upheld a ruling in October 2016 finding that an importer of Myanmar teak violated the EU Timber Regulation, which bans the sale of illegal or high-risk wood in EU markets. It was found that MTE's documentation did not provide adequate proof that the teak purchased was produced legally because it could not provide critical information about the origin of the teak, the logging company that harvested them, and whether or not the harvester was in compliance with Myanmar's forest legislation (Baker, 2016). Illegal cross-border trade of timber, particularly to China, is not only occurring in vast quantities, but has also continued to occur for more than two decades (EIA, 2015). In an effort to stem the flow of illegal timber from the country, the Government enacted a ban on the export of raw logs, which took effect on April 1, 2014, and has also put in place a logging ban for the 2016-2017 season, and 10-year logging ban in the Pegu Yoma region.

Demand from the wood processing industries and plantation sectors in China, Vietnam and Thailand exerts pressure on Myanmar's forests. All three of these countries have strict logging controls in natural forests and have turned to forest-rich countries in the region and beyond, especially Myanmar, Cambodia and Lao PDR, for raw material supplies. Myanmar is one of the main targets due to its stock of valuable species, notably its prized Teak (*Tectona grandis*) and rosewoods (*Dalbergia* spp.) (EIA 2015).

EIA research shows that, based on current trends, the two most targeted Rosewood (Hongmu) species in Myanmar—Tamalan (*Dalbergia oliveri/bariensis*) and Padauk (*Pterocarpus macrocarpus*)—could be logged to commercial extinction by 2017. Listed as a reserved species, only MoNREC has the legal right to harvest and trade in Tamalan and Padauk. Yet, through a vast illegal trade, it has become one of the most traded timber species over the China-Myanmar border. EIA identifies that thirty-three timber species are included in the 2000 China National Hongmu Standard, six of which are found in Myanmar and are captured in China's import data under its dedicated Hongmu Customs Code (HS Code: 44039930). These include Tamalan / Burmese rosewood

(*Dalbergia oliveri / bariensis*), Burmese Padauk (*Pterocarpus macrcarpus*), Burma Blackwood (*Dalbergia cultrate*), Ceylon ebony (*Diospyros ebenum*), Burma thinwin (*Millettia leucantha*) and Red Sandal (*Pterocarpus santalinus*). Of these, it appears that tamalan and padauk are the most commonly available and traded species, and the focus of Chinese traders, as sources and stocks have been depleted in neighboring countries (EIA, 2014). The COP 17 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) listed the *Dalbergia* genus onto the Appendix II of the CITES list on October 2016. This will require that nearly all the international trade of *Dalbergia* species only be allowed for trade with permits. Over 250 tropical species of *Dalbergia* species are to be listed onto Appendix II. West African countries petitioned CITES to include the listing (among other regions) which are serving China's strong demand for Hongmu.

EIA's research indicates that between 2001-13, 10.2 million m³ of Myanmar logs imported into global markets were not authorised for harvest, which would equate for a 47.7% illegal logging rate in the country related to exports. Any exports of semi-processed or finished products, and any domestic consumption, would add to this illegal logging rate and volume (EIA, 2014(a)).

In the Kamoethway region in Tanintharyi, permission granted by the government in 1994 to Thai companies resulted in significant logging, resulting in noted losses of biodiversity and significant floods in 2004. While no large companies are operating in the region now, illegal logging is occurring in direct violation of a ban by the Karen National Union (KNU), with logs being sold in Dawei (TRIP NET and RKPIN, 2016).

According to UN Comtrade, Myanmar is one of the world's largest exporters of fuel wood and wood charcoal, with an annual value of \$ 30.5 million, which forms 2.8% of the global share. Forest Trends (2014) identified that **charcoal exports to China**, which were almost non-existent in the early 2000's, boomed between 2006 and 2008, with volumes increasing by more than 2,500%. Overall volumes have stabilized around 0.5 million m³, and charcoal now represents 32% of Myanmar's total wood product exports to China. Forest Trends' research also suggests the primary use is in the smelting process for China's silicon metal industry, likely for solar panel production. Almost 100% of Myanmar's charcoal exports are registered in the Kunming customs district, indicating cross-border rather than overseas transport (Forest Trends, 2014), which means all is illegal by Myanmar's laws. Forest Department information indicates that between April and June 2016, 1,053 tonnes of charcoal were seized at the border (Myanmar-Chinese Website, 2016), indicating that this is part of regular illegal wood product seizures.

3.4.2 Over-exploitation of forest resources

Myanmar has a long legacy of teak harvests and is recognized as having the world's largest teak forests of superior quality, and is the largest producer of teak logs (refer to

Box 1 below on Myanmar's teak trade). Meeting export revenue targets is known to have driven decisions during many years, rather than annual allowable cut (AAC).

Box 1: Myanmar's Teak Trade

Myanmar has the largest area of natural teak forests, and is the number one producer of teak logs in the world. A 2015 FAO report on teak offers important insights based on accessible trade data:

Natural teak forests: Myanmar contains almost half of the 29 million ha globally, and these produce about a quarter of the globally reported teak log supply. Naturally grown teak logs are deteriorating in quality, and there is increased interest and investment in establishing and managing teak plantations.

Plantations: Roughly 390,000 ha, more than 40% of the global teak trade. Only India and Indonesia have more planted area for teak. Quality and prices are not as high as for natural teak.

Global market: India is the largest buyer of teak, importing 74% of the total trade volume from more than 100 countries. Thailand has 16% of the total, sourcing from 15 countries. China has 10% of the total, sourcing from 65 countries. Thailand's demand for teak has declined in recent years, while China and India's import volumes have increased. Future demand for teak is expected to grow, based on trends in the Asian market.

Myanmar supplies China with 81% and Thailand with 99% of their teak demand teak, but only 25% of India's teak imports. Since 2000, the global trade in teak logs by India, China and Thailand has more than doubled in volume (from 557,000 m³ to 1.2 million m³ in 2014), and more than quadrupled in value (from US\$166 million to US\$696 million), mostly due to Indian and Chinese demand. Imports from Myanmar increased by 27% between 2000 and 2014, but Myanmar's share compared to other producer countries has declined. China and India are increasingly meeting their growing demand from a number of Latin American and African countries. However, the quality of teak from those countries is poorer, as log prices indicate. Roundwood imports from Myanmar increased 27% between 2000 and 2014, from 383,000 m³ to 489,000 m³. Sawnwood imports from Myanmar over the same period increased 230%, from 21,000 m³ in 2000 to 48,000 m³ in 2014. But rising global demand for teak sawnwood is increasing faster than Myanmar's ability to meet the demand, and Myanmar's share of exports to India, Thailand and Taiwan fell from a high of 81% in 2002 to only 42% in 2014.

Teak log prices: The unit price of Myanmar teak logs in the Indian market started at US\$615/m³ in 2005 and reached a high of almost US\$1,000/m³ in 2014. In contrast, teak imports from Africa and Latin America commanded prices of US\$320/m³ in 2005 and US\$430/m³ in 2014.

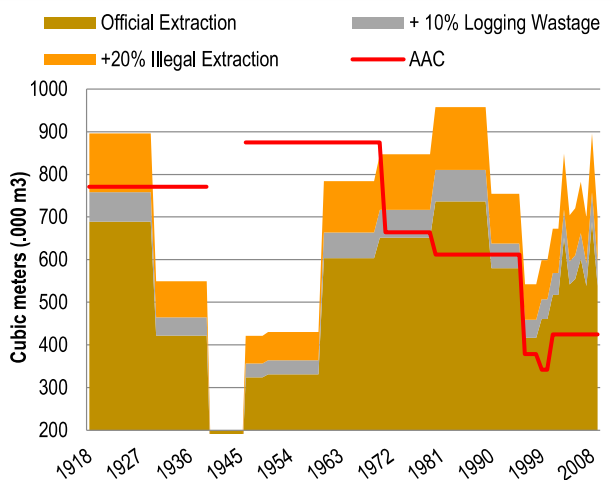
Myanmar's log export ban: Kollert and Walotek indicate the log export ban has had more impact on the Chinese market than on the Indian market. As China obtains 80% of its teak from Myanmar, the export ban precipitated a rapid increase in the demand for high-quality logs, and teak prices rose from about US\$750/ m³ at the end of 2013 to almost US\$2,000/ m³ in January 2014. The ban came into force on 1 April 2014. As India only imports 25% of its teak from Myanmar, prices have not responded as clearly, and it is hard to discern whether the ban has provided a market opportunity for African or Latin American exports.

Source: Adapted from FAO, 2015 (b).

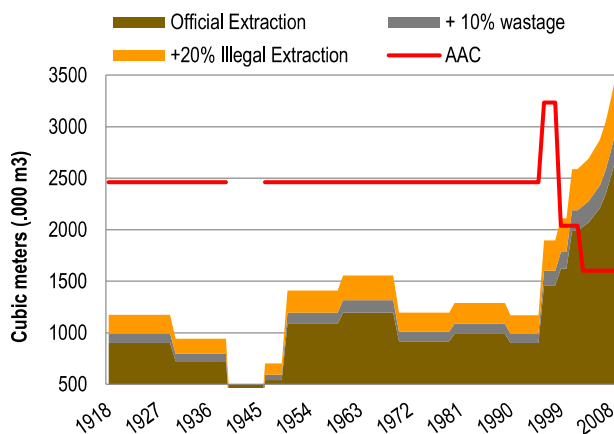
As documented by Springate-Baginski et al. (2015) the timber harvesting intensity for teak has, for decades, exceeded the estimated annual allowable cut (AAC) while the recorded harvest of other hardwoods, mostly dipterocarps, stayed well below the AAC until 2003 after which the harvest of this category also began to increasingly exceed the downwardly regulated AAC. The 20% illegal extraction level Springate-Baginski (2015) used likely varied in practice year to year, based on various factors, particularly related to policy and market changes such as the log export ban and demand for Hongmu in 2014, which EIA estimated resulted in a 47.7% illegal logging rate, based on imports registered in Kunming, China, directly related to the ban (EIA, 2014(b)).

Springate-Baginsky (2015) identify that forests have been systematically over-logged for

Teak: historical trends



Other hardwoods: historical trends



Source: Springate-Baginski et al., 2015

decades, with military governments in the past focussing heavily on export-oriented timber exploitation and significantly exceeding AAC for decades. Illegal logging was rampant over many years, and the lack of transparency and entrenched interests complicate the change pathway. The harvested volume and the saw grade quality of timber is far lower than in the 1980s, and marketable species have become scarce. The over-extraction of timber is closely tied to land-use change and shifting forest to 'non-forest.' Remote sensing data and visual observation indicates consistency in the pattern of secondary logged-over forests being converted to agriculture, but also of primary forests converted to agribusiness plantations, with 'conversion timber' rates being possibly very high. The industry is in the early phases of transition, shifting from a business model of raw log export to building value-added and further processing, yet is clearly not there yet. There has been an abrupt decline of the

Figure 9: Relationship between AAC and extraction

‘growing stock’ over the last 25 years, and recent reductions in AAC are signs that this is evident across the board. Domestic supply needs are a ‘major blind spot’ in forest governance, with domestic timber needs being largely illegal and ad hoc, and supply from reserved and unreserved forests further undermining sustainability.

Based on field observations in Kachin and Sagaing, Treue et al. (2016) note that harvested logs in natural teak forests were only just above the minimum girth of 6’6” at breast height (1.3m above ground level); compartments that were cleared for teak 7-10 years ago have not been allowed to recover for the prescribed 30 years, but rather were recently re-entered for extraction of ‘other hardwoods.’ In addition, former mixed-species forests that had been cleared of teak and ‘other hardwoods’ were used for unplanned and apparently uncontrollable commercial firewood production, which appeared to be the final stage before permanent conversion to agriculture or plantations.

Treue et al. (2016) note that the extent of degradation which would be visible as changes in species composition, such as from mixed teak-dipterocarp to dipterocarps only, cannot be identified through Landsat images. Hence, further forest inventory data would be necessary to understand the full extent of degradation. That said, Landsat imagery analysis indicates that teak has been systematically overharvested, and valuable species of ‘other hardwoods’ such as Padauk (*Pterocarpus macrocarpus*), and Tamalan (*Dalbergia oliveri*), are likely severely overharvested. Other more abundant species like Kanyin (*Dipterocarpus spp.*) may have only become over-harvested in more recent years.

Myanmar Timber Enterprise (MTE) is solely responsible for harvesting, processing and marketing of timber. Both the Forest Department (FD) and MTE need to cooperate in order for the silvicultural activities prescribed by the FD to be followed by MTE. The FD sets the AAC and defines teak and hardwood felling marking. MTE is responsible for harvesting, milling and downstream processing and marketing of forest products. Since 2014-2015, MTE has reduced the harvesting amount to be within the limit of AAC prescriptions set by Forest Department.

Table 12: AAC prescriptions and MTE actual extraction

Fiscal Year	Teak (tonne)		Hardwood (tonne)	
	Operation Plan	Actual Workdone	Operation Plan	Actual Workdone
2011-2012	371000	246755	1789400	1636155
2012-2013	269800	247989	1391600	1642235
2013-2014	186650	151101	787600	800028
2014-2015	60000	44361	670000	627652
2015-2016	60000	59640	670000	616310
*2016 (July)		18337		108891

Source: Myanmar Timber Enterprise, 2016, MTE Feednote

No harvesting is to occur in the 2016-2017 season, as per the temporary logging ban. Starting from the fiscal year of 2017-2018, as part of the 100-Day Plan of the new government, AAC will be set to 19,210 teak trees and 593,330 other hardwood trees. MTE plans to harvest only 15,280 ton of teak and 300,000 ton of hardwood which is under the limit of AAC (Myanmar Timber Enterprise, 2016)

3.4.3 Fuel wood use

Fuel wood accounts for more than 90% of biomass-sourced energy, most of which is harvested from natural forests (see table 13 below), and is used in both urban and rural areas. The average annual consumption of fuel wood per household is estimated to be roughly 2.5 cubic tons (4.5 m³) for rural households and 1.4 cubic tons (2.5 m³) for urban residents (ADB, 2012).

The majority of the population (85%) depends on solid fuels for cooking purposes. Firewood (59%) and charcoal (24%) are the most prevalent fuel sources followed by electricity (14%). Agricultural residues (rice husks) only account for 3%. In rural areas, 80% of the population depends on firewood, whereas in peri-urban areas, only 18% rely on firewood and 45% relies on charcoal (Emerging Markets Consulting, 2015). Access to modern fuels for cooking (such as liquefied petroleum gas) is limited to urban areas. Consequently, traditional biomass (wood and animal dung) is widely used and accounts for about 70% of primary energy consumption.

The most common type of stove used across country is the three stone open fire (35%), followed by the charcoal/multipurpose stove (27%) and the electric stove (15%). Charcoal stoves (46%) and electric stoves (35%) dominate in peri-urban environments, while three stone is the most predominant stove in rural environments (50%). Urban households tend to own and use more stoves than rural households. Households using iron, three stone fires and mud stoves are the most likely to only use 1 stove regularly. 95% of respondents indicated using the stove for water boiling, while only 18% for warmth, 7% for animal feeding, and 2% lighting (*ibid*).

Information from the Myanmar Household Cooking Survey in Ayeyarwaddy, Bago, Magway, Shan and Tanintharyi provides useful insights. In Ayeyarwaddy, Magway, and Shan States, respondents indicated relatively high rates of increasing difficulty in wood fuel wood collection. Survey results indicate that more fuel-wood is collected from plantations than indicated in the Forestry Master Plan, and far less from community forests and natural forests in these states, which could indicate that fuel-wood collection may have less of an impact on forest degradation in these states. 44% of respondents in Shan State indicated they source wood from natural forests, compared to only 8% in Tanintharyi. Overall, primary wood users cited reduced availability as the main reason for increasing difficulty of collection, indicating increasing pressure on local wood resources. Reduced availability is the most common reason across the states as well, indicating that wood collection could be reducing availability of wood fuels (*ibid*).

Overall, some 2/3 of the rural populations live in areas with wood fuel deficit conditions, indicating that wood fuel likely flows rural surplus areas into peri-urban and urban deficit areas. At the national level, the majority of respondents (59%) purchase their primary fuel from a market within their own village/town. Shan, Tanintharyi and Ayeyawaddy appear to have higher percentages of purchase from mobile sellers. (Over 50% of households tend to purchase their firewood for consumption. This number is relevant in regions such as Ayeyawaddy and Tanintharyi (71%) due to high deforestation levels. Also, there seems to be great variance in cost levels for this type of fuel. Around 28% of collecting households consider that this activity has become more difficult in recent years with Ayeyarwaddy having the highest percentage (38%). The great majority cite reduced availability (78%) as the main reason, with the main collection places being plantations (22%) and non-forest lands (22%) (Emerging Markets Consulting, 2015) Myanmar has abundant energy resources, particularly hydro and natural gas. Despite sitting on the huge energy resources, Myanmar has one of the lowest commercial per capita consumption in Southeast Asia. This low energy demand is due to its low per capita income and insufficient energy infrastructure, as reflected by its total electrification rate of only 26%. (Interim Country Partnership Strategy: Myanmar 2012-2014).

Table 13: Market segmentation by fuel type in rural areas

Fuel type	Market segment – demand observations
LPG	Extremely low. Interviews indicated that LPG in rural areas is mostly reserved for restaurants rather than households.
Electricity	Quite low, only witnessed in ~3% of rural households interviewed.
Charcoal	Second most predominant type of fuel users in rural environments (13%).
Wood	Largely the most predominant rural group (~80% of rural households). The largest part of this group cooks on open fires, while a smaller part happens on stoves.
Agricultural residues	Quite low penetration, witnessed in ~4% of rural household. Usually these household would cook on stoves designed to use agricultural residues.

Source: Emerging Markets Consulting (2015), based on household market surveys.

Bailis et al. (2015) estimate that Myanmar's fuel wood consumption is 22,136 kton, charcoal is 94 kton, and that total wood fuel emissions from this consumption is 47,850 ktCO₂e. However, they determine this is only 2-3% of the country's overall emissions of 354,516 ktCO₂e. Due to the predominance of plantations in some regions such as Ayeyarwaddy, Mandalay, East and West Bago and other areas, these regions might be considered more sustainable in their production of woodfuels. In contrast, other areas are noted for their compared non-renewability in wood fuel production, including Rakhine, Chin, Kachin, and eastern Shan States (Bailis et al., 2015). However, it should be noted that in the Bago region, heavy levels of timber extraction has extracted mature

trees, but firewood production is less selective, and is attributed to considerable extraction of trees of all ages, including young ones (Khin Wine Phyu Phyu, 2016)

The Forest Department promoted fuel wood plantations as a means to develop sustainable supplies of fuel wood, and decrease extraction from forest reserves. A total of 0.84 million ha of forest plantations were established between 1981 and 2010, 20% of which were for fuel wood. Plantation establishment has since slowed (ADB, 2012). Further, community forests were also intended as a means to increase the amount of forest area contributing fuel wood for community needs and is switching to a private ownership model. In 2007, commercial and fuel wood plantations comprised 87% of the total plantation area while only 13% were for conservation purposes, and there is concern that failed plantations have been a major cause of forest loss and degradation (Maung Maung Than, 2015).

The amount of biomass for fuel wood harvested in Myanmar has steadily been increasing and is several times higher than the actual timber extraction. Fuel wood extraction for the period of 2000/01 – 2012/13, in terms of fresh biomass, can be estimated as being between 68 – 86 million m³ annually of which between 48 – 60 million m³ comes from natural forests, between 17 – 21 million m³ from trees on farmland and only a minor part with 3.4 – 4.3 million m³ from fuel wood plantations (see table below). Thus, fuel wood extraction, which is poorly regulated, is affecting millions of ha of natural forests and therefore is an important driver of forest degradation.

Table 14: Estimations of fuel wood harvest in Myanmar

Year	Energy ktoe	in tonnes (dry biomass)	in m ³ (dry biomass)	in m ³ (fresh biomass)	Estimated origin of fresh biomass in m ³ ⁷		
					Natural forests	Trees on farmland	Fuel wood plantations
2000	7,723	17,015,789	34,031,579	68,063,157	47,644,210	17,015,789	3,403,158
2001	7,912	17,432,206	34,864,412	69,728,823	48,810,176	17,432,206	3,486,441
2002	8,105	17,857,435	35,714,871	71,429,741	50,000,819	17,857,435	3,571,487
2003	8,388	18,480,958	36,961,917	73,923,833	51,746,683	18,480,958	3,696,192
2004	8,401	18,509,601	37,019,201	74,038,403	51,826,882	18,509,601	3,701,920
2005	8,561	18,862,123	37,724,245	75,448,490	52,813,943	18,862,123	3,772,425
2006	8,879	19,562,760	39,125,519	78,251,039	54,775,727	19,562,760	3,912,552
2007	9,131	20,117,982	40,235,963	80,471,927	56,330,349	20,117,982	4,023,596
2008	9,401	20,712,862	41,425,725	82,851,449	57,996,014	20,712,862	4,142,572
2009	9,665	21,294,523	42,589,047	85,178,093	59,624,665	21,294,523	4,258,905
2010	9,993	22,017,193	44,034,386	88,068,773	61,648,141	22,017,193	4,403,439
2011	9,506	20,944,205	41,888,410	83,776,819	58,643,773	20,944,205	4,188,841

⁷ Estimations by the Forest Department: 70% from natural forests, 25% from trees on farmland outside of forests and 5% from fuel wood plantations

2012	9,708	21,389,264	42,778,527	85,557,054	59,889,938	21,389,264	4,277,853
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Source: Data on primary energy consumption years 2000/01 – 2012/13 provided in Second Draft Renewable Energy Policy of Myanmar (2016)

3.4.4 Shifting cultivation

Shifting cultivation, called in Myanmar language “shwe pyaung taung ya” is the dominant agricultural system in Myanmar’s upland areas. In English, the terms shifting cultivation, swidden, and rotational agriculture are all used to refer to this cultivation method. In shifting cultivation systems, land is cleared and planted with a diverse array of crops for 1-3 years and then left fallow for a longer period for soil and vegetation to regenerate. The fallow period varies from around 5 years to over 20 years. After the fallow period, the same areas are cleared again for cultivation. Though fallow periods are identified to be shortening in some regions, the reasons for this vary, ranging from needing to produce more to seeking to demonstrate more permanent settlement.

There is no recent estimate of land under shifting cultivation for Myanmar. Even without knowing the exact figures, it is possible to say that most people living in rural upland areas in Myanmar practice shifting cultivation and it has an enormous importance for food security and livelihoods. About 42% of the country’s population lives in upland areas and is likely to be practicing some form of shifting cultivation (Anderson, 2015).

Shifting cultivation is one component of customary tenure systems, which also include permanent agriculture gardens, orchards, and forests, including protected watershed forests and riparian areas. Customary tenure systems with well-developed rules for shifting cultivation have been documented across the country, from Kachin and Naga systems in the north, to Chin in the west, Ta’ang and Pa-Oh systems in the east, and Kayah and Karen systems in the south (ECDF, 2016; TRIP NET, 2016).

Shifting cultivation land is held under communal tenure with some mechanism for communities to decide where to clear land each year, though there are many variations in the specific ways that land is claimed and allocated. In northern Chin State, for example, the community holds communal tenure over blocks of land called lopils that cleared each year in turn and allocated to households by lottery. In this and other systems, the land under shifting cultivation is clearly identified by the community, and forests are not cleared outside of the defined area.

Research by Resource Rights for the Indigenous Peoples (RRtIP) on Naga customary land tenure systems has combined digitized scale maps of community land use types with forest cover change remote sensing data to show clearly that over the last decade, the studied communities have only cleared land within the shifting cultivation area that they defined on the map, and have not cleared areas that are designated as community

protected forest or household woodlots. Forest clearing is not in new areas, but in established shifting cultivation areas that have been under cultivation for decades.

A meta-analysis of 250 studies concludes that there is no evidence that policies designed to “sedentarize” shifting cultivation will increase ecosystem-level carbon stocks, and may in fact incentivize forest conversion by intensive agriculture (Ziegler et al. 2012). The transition from shifting cultivation to more intensified agriculture often contributes to permanent deforestation, loss of biodiversity, increased weed infestations, declines in soil fertility, and accelerated soil erosion (Van Vliet et al., 2012).

CHRO and POINT provided input to this report, providing the perspective that shifting cultivation areas should not be compared to primary forest and declared “degraded” but instead should be considered a diverse agricultural system with many trees. Shifting cultivation entails the conversion of primary forest to secondary forest at some point in history, and this conversion does alter the species composition and carbon storage of the ecosystem. Forest conversion that occurred decades ago for shifting cultivation should not be equally weighted as cause of carbon emissions than forest clearing for other types of agriculture that have caused more permanent forest loss. Shifting cultivation systems with long fallows may be comparable to some agroforestry systems and tree plantations for carbon sequestration, and are superior to continuous annual cropping (Brunn et al. 2009). Shorter fallow periods will sequester relatively less carbon, but should be managed to maintain soil fertility. Further, CHRO and POINT identify that shifting cultivation promotes food and nutritional diversity, with the types of vegetables planted in shifting cultivation sometimes exceeding 40 varieties. These composite agricultural systems work together to produce a variety of subsistence and commercial crops, while maintaining agricultural and biological diversity and managing soil and pests without intensive agrochemical inputs.

Should shifting cultivation move into forest areas where it has not been practiced before, or the rotation cycles shorten or involve more nutrients or irrigation/water demand, then clearly there is a greater need to assess the sustainability of the practice. In most cases the most likely alternative to this use is more intensified agricultural production and permanent conversion to non-forest uses.

Recognizing the linkage between shifting cultivation and customary tenure rights (which are explored in more detail in the underlying driver section) is important. The National Land Use Policy (version 6) recognizes land under customary tenure, including shifting cultivation land, though processes to recognize those rights to land are yet to be defined. For purposes of this assessment, more dialogue is needed between stakeholders and government to identify how to deal with shifting cultivation in the REDD+ context.

3.4.5 Summary

Table 15: Summary of key findings on drivers of forest degradation

Driver	Considerations for ranking	Sources
Illegal logging	Sources indicate a range between 20 - 47.7% of all exports were illegal. All fuel wood and wood charcoal is illegal (2.8% of the global share). 233,484 tonnes of teak and timber have been seized by the police between 2011 to the present.	EIA, 2014; Springate-Baginski, 2015; Min Kyaw Thu, 2016; data collected by Inspections Department, Forest Department
Over-exploitation of forest resources	AAC exceeded for decades for teak and since mid-2000's for dipterocarps. <i>Dalbergia</i> (rosewood/redwood) and <i>Pterocarpus</i> (Padauk) may be near extinction	Springate-Baginsky, 2015; Treue et al, 2015; EIA, 2014
Fuel wood collection	Between 2000/01 – 2012/13, in terms of fresh biomass, can be estimated between 68 – 86 million m ³ /yr, of which 48 – 60 million m ³ comes from natural forests, between 17 – 21 million m ³ from trees on farmland and only 3.4 – 4.3 million m ³ from fuel wood plantations. Volume is several times higher than actual timber extraction	UN-REDD PMU, based on Second Draft Renewable Energy Policy of Myanmar (2016)
Shifting cultivation	Requires further assessment	

3.5 Actors and motivations

A range of actors play a role in or have a stake in Myanmar's deforestation and forest degradation. Below is a general framing of various actors, their motivations, the scale the actor engages at and where in the supply chain they have influence, and opportunities for positive engagement towards REDD+ activities.

Note that the typology for **scale of intervention of actors** is at international, national, regional (state), and local scales. The **supply chain** is defined as: international markets/processors/manufacturers, investors, national market, national processing/manufacturing, distribution, production, local with land rights/tenure, local without clear land rights/tenure, lobbying, influencing decision making

Table 16: Summary of actors, motivations and opportunities

Actors	Motivations	Scale actor engages at and where in supply chain	Opportunities
Civil society			

Forest users & forest dwellers/ shifting cultivators	Livelihoods	Local – majority lacking clear tenure	Potential for stewardship strong, depends on tenure and ability to achieve livelihood needs
Civil organisations	Organizing campaigns for local people rights; Review of existing laws and policies; establish national dialogues	Local, regional (state) and national - lobbying	Provide better information/community awareness, capacity, encourage community participation and collaboration in managing forests
Political groups			
Ethnic parties	Representation in democratic process and resource sharing	Regional (state)- national peace building, development processing	Potential for national peace process and good governance
NLD	Governor/Administrative Authority; Promoting Freedom and harmonizing environmental protection and national development planning	Regional(state)/national-planning/decision making	Potential to meet the goal of peace process, environmental protection and development goals
Armed and ceasefire groups	Peace Building/Benefit Sharing on Natural Resources	Regional (State)-	Potential for peace process
Military and USDP ex-military party	Powerful in administration	National - planning	Potential for discussion on peace process, land use issues, and revision of existing legal frameworks to be harmonized with country transitional trend
Self-administered Areas	Power Sharing and regional development	Regional-planning/decision making	Potential for collaboration in land use planning and regional development planning. Have limited powers are limited but do have a role in promoting economic development
Government bureaucracy			
State/Regional government	State/regional governance, though capacity is low	State/Regional governance	Constitution of 2008, which grant more tax collection and decision-making authority to local levels. But still unclear how this can function.
Forest Department	Mandate for	Local, regional (state),	Engage with FLEGT for

	environmental conservation and sustainable forest management (SFM)	national and international – national planning and processing	timber legality, membership of REDD+ for forest and land resources assessment and tenure, and governance system; development of income for communities through CFE, modification of Myanmar Selection System for SFM; protected area management
Environmental Conservation Department	EIA/SIA assessment for resource extraction and mining projects	Local, regional (state), national and international – national planning and processing	Potential for effective monitoring and environmental safeguards; managing future environmental revenues - under environmental management fund
Mining Department	Licensing of Mining Projects	Project level, regional development of mines	Potential for effective monitoring and environmental safeguards
Dry Zone Greening Department	Dry Zone Greening/Rural Livelihoods Development	Local, regional (state) – regional planning	Potential to facilitate more cookstoves business, income generation and livelihood development programs
Myanmar Timber Enterprise	Timber Extraction and Marketing	Production and processing, sub-contractors no longer allowed. International markets	Potential for timber legality under FLEGT VPA process and timber tracking
Ministry of Agriculture, Livestock and Irrigation	Administrative Department for Agriculture and Land Management	Licensing, concession granting, production, processing, marketing and domestic and international sales	Potential to collaborate in land use planning, key for cross-sectoral conflict resolution and land governance
Department of Energy and Department of Hydropower	Energy Development	Domestic market, but export market is largest market share for hydro	Potential for infrastructure development and national electrification
National Planning and Economic Department	Formulate National Comprehensive Development Plans based on all ministry sector targets and plans	Planning	Potential for national economic development; SEZ; infrastructure and human resource development

Department of Rural Development	Rural and Livelihood Development	Local, regional, national	Support technical and financial assistance to local communities for their livelihood development through revolving fund, infrastructure development, water supply, electrification, sanitation etc.
Ministry of Commerce - Trade Dept	Nat'l Export Plan, increasing exports	International	Improving product standards, seeking new markets
Ministry of Planning and Finance	Cross- sectoral planning, customs controls, fiscal incentives	Planning, role in public finance management has been weak (this could change)	Improving customs controls, building smart fiscal incentives
DICA/MIC	Trade and Business	National, international - investors, national market, national processing/manufacturing	Investment permits, land lease agreement, and CSR
Ministry of Home Affairs - General Administration Department	Oversees local development, land access, decisions on local land use through the village land management committees	Land access, local administration	Has been largely dominated by military
Police	Local law enforcement, and Forest Police, tasked with policing forest crimes	Local levels	Key for tracking illegal timber flows
Private sector			
Forest user	Livelihoods/Tenure Rights/CFE-CF certificate	local with land rights/tenure, local without clear land rights/tenure	Potential to develop local forest resources based business; agroforestry and mangrove friendly aquaculture (in case of mangrove area)
Non-forest users	Livelihoods/local business	Local-regional (state) – local with land rights/tenure; local without clear land rights/tenure	Potential for domestic timber market; facilitation more local business
Small to medium enterprises	Increased income/Trade and Business Promotion	Local, regional (state), national – investors, manufacturer, national markets	Potential for networking and support for local production systems, improved efficiency of agriculture production and value adding to forest

			products
Domestic saw mills and traders	Businesses/Trading	Local, regional (state), national – national processing/manufacturing, distribution, production	Potential for domestic timber sector business
Companies/business interests outside Myanmar that depend on (illegal) timber supply	Monetary interests of Commercial Wood Supply, Border Trade	National, international - international markets	Potential for corruption through poor governance; Collaboration with regional government/local authorities will be required for effective protection
Agribusiness companies	Land possession and expanding land area	Regional (State), National, international- national and international investors	Potential to happen land use conflicts with local communities; comprehensive land law is necessary to issue.
Mining companies	Natural resources (jade, minerals, pearl, gold, gas & oil) etc. production	Regional (State), national, international – national and international investors, processing and production	Collaboration with regional government/local authorities will be required. An effective EIA assessment and monitoring system will be required.
Service Providers (Forestry) e.g. Royal Trees in Myanmar	EIA Services/Private Forest Plantation Establishment	Regional (state) – national investors, processing, traders	EIA assessment/private-owned forest plantation establishment (may have potential for export promotion)
Myanmar Forest Products Merchant Federation (MFPMF)	Investment and Trading	National – investors, traders	Currently engage in FLEGT process as a leading agency for Private Sector
International companies – investors and joint ventures	Trade and Business Promotion	International- investors	Potential for export promotion, value adding and implementation
Foreign investors - public	Economic Development	International- international markets/processors	Potential for co-benefit, capacity development, financial assistance in economic and infrastructure development projects
Foreign investors - private	Economic Development	International- international markets/processors	External investments in large-scale agriculture and development activities; export

			strategy and pricing
Multi-lateral and Bi-laterals			
Bi-lateral or Multi-lateral Development Organizations	For those investing directly in driver activities, such as JICA (agriculture, Dawei SEZ) or World Bank (energy), ADB for road development, motivation is economic development. Some consider social/environmental impacts, others are less concerned.		

4. Underlying drivers of deforestation and forest degradation

4.1 Methodology

Underlying causes of deforestation and forest degradation are complex interactions of fundamental social, economic, political, cultural and technological processes that are often distant from their area of impact. These underpin the direct causes and either operate at the local level or have an indirect impact from the national or global level. They are related to *international* (such as markets, commodity prices), *national* (such as population growth, domestic markets, national policies, governance) and *local* circumstances (such as change in household behaviour) (Geist and Lambin, 2001; 2002)

In order to assess underlying deforestation and forest degradation drivers in Myanmar, a broad-based literature review was completed and key informant interviews (see Annex 1) conducted in order to ascertain governance, institutional, policy, social, economic and cultural aspects of relevance, and for all of these topical areas, consider the actors and motivations that influence behaviour. Both interviews and the literature review informed the range of underlying drivers identified, as well as the relative importance of the underlying drivers identified. Beyond peer review by experts and TWG members, the findings have not yet been fully presented and validated by a broader set of stakeholders, and nor has a prioritization exercise been completed. It is suggested that this be done as part of National REDD+ Strategy development.

This assessment adds to and updates the 2013 REDD+ Readiness Roadmap, and such updating is necessary given the significant economic and political changes Myanmar is experiencing. The REDD+ Readiness Roadmap of 2013 identified the following

underlying drivers (*note that some of these may be redundant now due to changes since 2013*):

1. Current institutional setup (Central Land Management Committee headed by the Ministry of Agriculture and Irrigation and sub-national Land Management Committees at township level headed by the Ministry of Home Affairs/General Administration Department) makes it easier to convert forest which is not included in the Permanent Forest Estate (non-reserved or un-classified forest);
2. Overlapping and conflicting mandates of different land management committees:
 - a. Central and sub-national Land Management Committees (based on Farm Land Law and headed by MoALI),
 - b. National Committee on Land Scrutinising and Land Allocation (created by Presidential Decision and headed by MOECAP) and
 - c. Central Vacant, Fallow and Virgin Land Management Committee (based on the new VFVLM law and headed by MoALI) reduces efficiency of land management and land use planning.
3. Weak enforcement of the law;
4. Land grabbing facilitated by insufficient or ineffective protection of traditional land or forest tenure rights coupled with the lack of fair and transparent land conflict resolution mechanisms and structures;
5. Poverty and lack of alternative livelihoods;
6. Increasing demand for resources from growing middle class;
7. Eco-system services of forest undervalued and/or not considered in policy and investment decisions.

Significant political changes have occurred in Myanmar since 2013, with the new NLD-led government, and it is particularly timely to consider underlying drivers in the context of historic levels of foreign direct investment, and current socio-economic and political changes. Thus, while many of the underlying drivers identified in the Readiness Roadmap are still highly relevant, this section updates those and introduces new ones. Others, such as poverty and urban-rural linkages, are brought into the topic headings below, as they cross-cut a few underlying drivers.

4.2 Overview of underlying drivers

4.2.1 A legacy of over-harvested forests

As elaborated in Section 3.3.2, the management of Myanmar's forests over decades has resulted in a significant decrease in forest area and quality. The pressures to reach revenue targets, corruption and illegality (see next section), conversion of forest to agricultural use, conflict in ethnic regions, lack of tenure which disempowered land stewardship by local people, lack of environmental and social impact assessments, and a range of other issues contributed to the problem.

As of August 2016, government is addressing the problem by announcing a new logging ban intended to run until the end of March 2017, and 10-year logging ban in the Pegu Yoma region. Current stockpiles will be relied upon for its domestic wood processing industry and international markets, as these stockpiles are believed to be sufficient to meet projected demand for 3 years. All exports of round logs from the country have been banned since April 2014.

Access to these stockpiles will be controlled by the MTE, which is also currently undergoing restructuring (including ceasing to use contractors). Controls will need to be in place to ensure there is traceable chain-of-custody for all stockpile sales, in order to prevent illegally logged timber being laundered through the system. The next year provides an important window to create a new paradigm for Myanmar's forest management.

4.2.2 Significant illegality and corruption

The export value of Myanmar's primary timber products was about US \$1.7 billion in 2014 (ITTO, 2015). Estimating what portion of that value was legal versus illegal, it is possible that between US\$438 million and US\$1.2 billion worth of illegal wood-based products were exported annually within East Asia and the Pacific region from Myanmar between 2000-2014 (UNODC, 2015; EIA, 2014(a)). The value would have fluctuated annually. A significant amount of that goes to China, which is recognized as the leading destination for most of the illegal logs exported from many countries around the world. A US\$7 billion flow of illegal wood-based products is attributed to China, and a significant percentage of that flows from its neighboring countries for processing in China. East Asia and the Pacific is believed to account for approximately 70% of the global illegal timber exports (either as tropical timber products or other wood-based products) (UNODC, 2015).

In May 2006, the "Interim measures to manage timber and mineral cooperation between Myanmar and Yunnan Province," was issued by the Office of Yunnan Provincial People's Government. This sought to formalise cross-border trade by requiring advance approval for timber "cooperation projects," which requires registration of timber importers, and endorsement from the central Government of Myanmar (EIA, 2015). However, illegal timber continued to flow from Myanmar into Yunnan, China. Myanmar timber has been considered legal by Myanmar standards if it was officially exported through Yangon's port, with the necessary Myanmar Timber Enterprise (MTE) stamps. However, in Yunnan Province, timber crossing the border has been considered legal to enter China if the necessary import taxes are paid at the checkpoints.

Dong et al. (2016) describes the earlier Myanmar-China timber trade as flowing raw materials in to China for processing, manufacturing and product development in eastern China, destined for export markets in Europe and the U.S. However, since 2008 supply

chains have shifted to serving more demand in China (i.e. less export to Europe and USA). The trade relies on intermediaries on both sides. Intermediaries in China are registered companies that have legal permission to import timber from Myanmar. They are actually called "customs clearance agent companies." Intermediaries in Myanmar are usually Chinese who immigrated to Myanmar in the mid-1990s, and many were originally businessmen in Yunnan Province.

Because of the 2006 Yunnan Regulation, only registered companies (with permission) can import timber from Myanmar legally. Therefore, some registered enterprises became intermediaries (customs clearance agent companies), which could assist private (non-registered) Chinese companies with timber transportation. Intermediaries were necessary as Chinese companies could not import timber from the Myanmar-China border independently. These intermediaries may play a role obtaining the necessary permission from ethnic armed state entities for extraction and transport. Yunnan processing companies pay a fee as a deposit to the Myanmar intermediaries before they imported timber from Myanmar, and traders would get a "free entry" certificate for them to pass through Myanmar border timber check points (Dong et al., 2016).

Forest Trends found that while roughly 94% of China's timber import volumes from Myanmar in 2013 were registered in Kunming, and therefore illegal,⁸ 6% of timber volumes imported directly to China from Myanmar traveled by sea from Yangon to China's eastern seaboard, and indirect flows that go from Yangon to ports in Hong Kong, Thailand, and Malaysia before being re-exported to mainland China (Forest Trends, 2014). Chinese state-owned enterprises appear not to be involved in the illegal timber trade, and rather the actors are all in the Chinese private-sector. Further, the Chinese government has discouraged business people from working with the KIA, in an attempt to assist the Myanmar central government (Shen, 2011).

In an effort to stem the flow of illegal timber from the country, the Myanmar government enacted a ban on the export of raw logs on April 1, 2014. In January 2015, 155 Chinese nationals were arrested in Kachin State, in a crackdown on illegal timber smuggling across the Myanmar-China border, though they were released later as part of an amnesty agreement. In 2015, Eleven News reported that timber smuggling was increasing each year due to corruption among government officials, and that the government was taking action against 700 Forestry Department employees suspected of timber smuggling (Eleven News, 2015). Seemingly in a race to obtain as much as possible before the ban, Chinese imports of the desirable hardwood species of rosewood (Hongmu) saw a 225% increase in March 2014 over the previous month, just before the ban came into effect. After the ban came into effect, imports continued at a rate roughly 30% higher than the averages before February 2014 (EIA, 2014(b)). However, anecdotal evidence suggests that from early 2015, there has been a dramatic reduction in rosewood imports to China,

⁸ Legal timber can only be transported from the port of Yangon.

The Forest Department seizures of illicit timber are depicted in Table 17 below. The increasing trends are evident, but most notable is the upswing after the log export ban was put into place in 2014, and the significant increase in reported teak seizures, to an unprecedented 20,000

tons so far in 2016 (Min Kyaw Thu, 2016; Forest Department). UNODC found that previously, seizures of teak were very high in 2009-2010, tapered off after that, and then increased again from 2011-12 onwards. General trends indicate that the volume per seizure is declining (UNODC, 2013). Seizures of hardwoods made a dramatic upturn and

almost tripled since 2011-12, while seizures of an array of other types of wood have remained relatively stable at about 16,000-18,000 tonnes per year (Min Kyaw Thu, 2016; Forest Department, 2016). These figures correspond with import statistics in Kunming, indicating a significant 52% demand increase in China of hardwood species, particularly Hongmu (both padauk and tamalan), in 2013 over 2012, amounting to 237,000 m³ of hardwoods (EIA, 2014(b)).

Timber is seized by the Myanmar Forestry Department in various regions, but Sagaing tends to have the highest number of seizures, along with Pegu (Bago). Teak and other hardwoods are the predominant species, as well as pine wood, gumkino wood, and wood oil trees. Shan State also has a high number of seizures (Forest Department, 2016). Though in 2012-13, both Taunggyi and Lashio had seizures of 'other' woods, but in 2013-14, a shift occurred with more teak being seized in Taunggyi, and mainly hardwood seized in Lashio. In Kachin, where the volume of seized timber significantly increased in the last few years, there has been a shift from 'other' species to more hardwood species (UNODC, 2015).

UNODC notes that while the Forestry Department is making a concerted effort to fight forest crime, its resources are limited, it cannot complete investigations in serious cases, and it does not have a presence in many areas where illicit timber and wildlife exploitation and trafficking occur. Investigations have focused more on low level actors, and not the prominent controllers of the criminal supply chain. The illicit trade in timber should be viewed as an organised crime within the Forest Department and within the criminal justice system. It must also be acknowledged that a range of other actors,

Table 17: Seizures of illegal logging (April 2011 – June 2016)

Fiscal Year	Teak (Tonne)	Hardwood (Tonne)	Other (Tonne)	Total (Tonne)
2011-2012	7085	6739	16503	30327
2012-2013	7624	6353	17594	31571
2013-2014	13146	16307	16011	45465
2014-2015	11401	18081	22242	51725
2015-2016	15747	10438	19967	46153
2016-2017	8345	5431	14456	28233
Total (Ton)	63348	63349	106773	233484

Source: Min Kyaw Thu (2016); Forest Department corroborated with 'timber seizures' data collected by Inspections Department, Forest Department

including the military, businesses and ethnic armed groups, help facilitate the trade. Some higher level prosecutions have been undertaken, but they have been the exception rather than the rule, and only targeted middle level players (UNODC, 2015). Since the announced 2016-2017 logging ban, violent acts by loggers in the Bago region have increased.

Su et al. (2016) note that a key rationale for illegal timber exports from Kachin is due to the long-standing conflict and restriction of agricultural development and other forms of economic diversification. The lack of capacity in all aspects of the value chain has meant that even at the initial logging stage, there has been reliance on Chinese labour. Su et al. indicate there exists a treaty between the KIA and Chinese traders, and the KIA also sells permission to log to Chinese traders.

Myanmar's 2014 timber export ban has had a notable effect on prices (Su et al., 2016; FAO, 2015 (b)), which likely increases illegal activity based on how lucrative it is. As China obtains 80% of its teak from Myanmar, the export ban precipitated a rapid increase in the demand for high-quality logs before the ban came into effect, with prices rising from about US\$750/ m³ at the end of 2013 to almost US\$2,000/ m³ in January 2014 (FAO, 2015 (b)). Su et al. (2016) estimate an additional price increase of 30% after the ban, but this has likely stabilized since. Prices of secondary and value-added wood products also increase following the price change of raw logs.

Little insight exists relative to the flow of illegal timber across the border into Thailand. Woods (2013) identifies that it was more common for timber to flow over the Thai border during the 1990s (mostly in Kayin and Karen States) but shifted north to Kachin State in the 2000s. Loopholes allowing for legal exemption of overland log exports from Myanmar to Thailand have occurred in the past, though this has been significantly reduced and seizures of illegal timber along the Thai border have increased. That said, Woods (2013) notes that although current Thai regulations on the import and domestic transport of timber mandates the adherence to Myanmar's rules regarding legal timber (that timber be shipped by sea via Yangon with proper Myanmar government permits), the Thai government can grant special exemptions for Myanmar log imports across the shared land border. Though this has occurred infrequently in the past decade, smaller quantities of unprocessed logs do cross overland without Thai governmental approval. Processed wood, especially teak furniture, can be legally imported across the Thailand border with the correct paperwork to verify it has been sourced and processed in Myanmar. It is unclear whether truck trade routes from Shan State to the Thai Mae Hong Son provincial border posts are still operational, but these were active in the 1990s and 2000s. Lertchavalitsakul (2015) describes the traders as being either pick-up truck drivers or women from Shan State (though they likely traded other products, not timber), trading with ethnic Shan in Thailand. The pick-up truck traders collected products from Shan State and transport them from Myanmar to Thailand, using 'yellow-truck drivers' on the Thai side to register with Thai authorities to get products across (Lertchavalitsakul, B., 2015).

Corruption and illegality within the Myanmar forest sector complicates efforts to bring greater transparency and accountability to the forest sector. The International Tropical Timber Organization reports Myanmar Forest Department findings that under the previous government, between 2011-2016, of the more than 2,000 forest officials fired almost half were said to be involved in the illegal timber trade (ITTO, 2016). Anecdotal insight from interviews suggests that it was not uncommon for sub-contractors to MTE to cut more than AAC prescriptions, and to resist oversight from local people that try to report wrongdoings.

4.2.3 Overlapping and conflicting priorities between the forestry and agriculture sector and poor land tenure security

Out of Myanmar's total geographical area of 67.66 million ha/167.1 million acres, MoALI statistics identifies 20 million ha/49,421,076 acres as being suitable for cultivation, which is cultivable wasteland and 'other forests' in the table below (Reserve Forests are not included). Current crop land totals 11.97 million ha/29,578,514 acres. While most of the crop land is used for grain production and livestock feed, steps are being taken to bring fallow and cultivable wasteland under cultivation (Yar Zar Myo Thant; Htay Htay Win, 2016).

Table 18: Land utilization in Myanmar (2014/2015)

	Million Hectares	Percentage
<i>Net Area Sown</i>	11.97	17.7
<i>Fallow Land</i>	0.44	0.7
<i>Cultivable Wasteland</i>	5.27	7.8
<i>Reserved Forests</i>	18.57	27.5
<i>Other Forests and Woodland</i>	14.73	21.8
<i>Others</i>	<u>16.66</u>	<u>24.6</u>
Total:	67.66	100%

Source: Yar Zar Myo Thant; Htay Htay Win, 2016

Byerlee et al. (2014) identify that agricultural land area expanded considerably, and agricultural land is officially classified into various classes according to its crop suitability. Paddy and Yar land (dryland) constitutes the majority of area, with 7,411,000 ha/18,312,979 acres in paddy and 3,736,000 ha/9,231,857 acres in dryland conditions. Rubber land has been expanding fastest. These land types have been preserved in the new Farmland Law, severely constraining crop substitution possibilities such as the growing of sugarcane on paddy land. At the same time, the DALMS of MOALI estimates the largest concentrations of 'other forest' to be in the far north and extreme south of the country. To this could be added severely degraded land that was previously forested but still under the jurisdiction of the MoNREC.

Yet finding out who has rights to land and new proposals for land use on agriculture land with forests, or forest land with agricultural use, is complicated. Under both the Farmland Law and the Vacant, Fallow and Virgin Lands Management Law (VFV Law) of 2012, government has changed the way agricultural lands and fallow lands are regulated, causing significant concern among those within communal or customary tenure rights (MCRB, 2015; Andersen, 2015). By May 2013, a review of agribusiness models for inclusive growth reviewed government statistics and thereby estimated that a total of 377 domestic companies had been allocated 2.3 million acres of VFV land, and the average

concession size was 6,170 acres. In addition, 822 companies or individuals had been allocated a total of 0.8 million acres of forest land (outside of Mon State where SMFs predominate in land grants). Though most companies were nominally domestic, at least three foreign investors had been allocated 0.27 million acres. By far the largest areas were

allocated to rubber, oil palm, rice, and jatropha, followed by rice, sugarcane, and cassava (Byerlee et al., 2014). Research and interviews completed for this study did not provide more recent updates to these figures.

The Farmland Law and the Vacant, Fallow and Virgin Land Law were passed in 2012, and change the way agriculture land is regulated:

Farmland Law: allows land to be bought, sold and transferred in a land market with land use certificates. In practice, there have been difficulties in farmers having what is necessary to show proof of title.

Vacant, Fallow and Virgin Land Law: defines “vacant and fallow” land as that which were used in the past, but the past tenant no longer uses it, and the land could have been abandoned for any reason. “Virgin land” is land which may be new land or other wood land in which cultivation was never done before. It may or may not have forest, bamboo or bushes and can include land legally cancelled from Reserve Forest (Republic of the Union of Myanmar, 2012 (a)). Allows for reallocation to domestic and foreign investors.

Both laws fail to recognize customary and communal tenure systems in land, water, fisheries and forests. Millions of farmers, including most upland ethnic communities, do not have rights under these laws.

Conflicting mandates and land rights are of great concern to farmers and is one of the largest topics the new government must resolve. Part X of the Land Use Policy (2016) makes clear that “...a new National Land Law shall be drafted and enacted, using this National Land Use Policy as a guide for the harmonization of all existing laws relating to land in the country.”

Land governance and administration is fraught with overlaps in jurisdictional authority and bureaucratic inefficiency. Scurrah et al. (2015) find that the most fractious overlap occurs between the Settlement and Land Records Department (now the Department of Agricultural Land Management and Statistics) of the Ministry of Agriculture, Livestock and Irrigation (MoALI), and the Forestry Department. The DALMS administers and

registers land classified as “farmland,” while the Forestry Department does the same for land designated as “forest.” Under the 2012 Farmland Law, the issuing of LUCs only applies to land classified as “farmland”. While “vacant” land and “other woodland” can be reclassified as “farmland” and be formally registered by DALMS, land classified as “forest” is not eligible and falls under the purview of FD/MoNREC. Scurrah et al. (2015) identify a legal risk that farmers who are cultivating in designated “forest” land could be determined to be “illegal squatters” and could be legally evicted. However, even farmers may not know which ministry should make decisions on the land that they use. Based on research carried out in Chin and Shan states in 2014, farmers largely do not know what land is administrated by MOALI or by MoNREC, as all the land they know is community/village ancestral land (Andersen, 2015).

The Farmland Law states that the Central Farmland Management Body shall confiscate farmland that is not cultivated within six months. Further, rights to utilize vacant, fallow and virgin lands, permitted by the Central Committee for the Management of Vacant, Fallow and Virgin land, for agriculture, livestock and poultry, and aquaculture purposes shall be considered as stable cultivated farmland under the Farmland Law when crop production is stable (Republic of Union of Myanmar, 2012(c)).

The majority of rural land users are formally landless, without clear title to the land they live on or farm. Though there are no clear estimates, it is believed that 40% of the population practice shifting cultivation, which could indicate that as many as 21 million people, live under customary land use. This landlessness increases the risk of rural to urban migration, land grabs and issues related to internally displaced persons (IDPs) and returning refugees, which are sensitive topics in ethnic areas. While steps are being taken by the new government to address the easiest to solve problems first, the process will be a long and complicated one.

The One Map Initiative is one viable means of bringing coherence between the spatial information sitting in various Ministries and Departments, and various committees are now sharing information. These are important mechanisms to resolve conflicts and bringing greater transparency, but the pathway is still unfolding. Srinivas and Hlaing (2015) note that DALMS holds data on agribusiness ventures and other permits while forest land data is with MoNREC and the Department of Rural Development (DRD) and GAD and there is no unified database on land concessions or land permits for development. Fishery lease data that was with the Department of Fisheries has been decentralized to state/regional levels, making it challenging to obtain information and track. What was clear in the series of interviews held for this study was that different ministries and agencies hold information tightly on their management and areas of jurisdictional authority, and are not always willing to share it, despite the interest of the Forest Department to review information and reciprocally share as necessary.

RECOFTC notes the deficiencies in securing land tenure by local communities in all categories of land, with the possible exception of farmland in cases when records exist.

The issue is urgent in view of the opening up of the economy for foreign (and domestic) investment, and one of the key challenges for Myanmar's transition. RECOFTC also notes the overlap in mandates of different government organizations in administering public forest (virgin) land, and vacant and fallow lands.

Table 19: Administration, conflicts and tenure security in different land categories

Land category	Administrative authority	Nature of land conflicts	State of tenure security
Reserved forest land	FD, MoNREC DoF, MLFRD FMB, MoALI	State logging operations, agro-conversion	Weak tenure security of rural populations for farming or traditional use of these lands; not allowed for other land use by the public. However, villagers can obtain tenure rights over the encroached permanent farmland and settlements inside the reserve forest land. According to the Fishery Act, the licensee can fish inside the community forests in reserved forests of the Ayeyarwady Delta.
Protected public forest land	FD, MoNREC	Non-recognition of customary communal use of protected forest lands, high risk of encroachment	Weak tenure security of rural populations for farming or traditional use of these lands; not allowed for other land use by the public.
Public forest land (virgin land)	FD, MoNREC DALMS, MoALI CCVfV	Agro-industrial developments, non-recognition of customary use of public forest lands, high risk of encroachment	Weak tenure security of rural populations for farming or traditional use of these lands often located in upland areas.
Vacant and fallow land	DALMS, MoALI CCVfV, MoALI	Agro-industrial developments, non-recognition of customary communal land use, conflict between grazing and agriculture	Weak tenure security of rural populations for farming or traditional use of these lands often located in upland areas. No tenure or tax records issued.
Farmland	DALMS, MoALI FMB, MoALI	Agro-industrial developments, non-recognition of customary	Greater land tenure security than in other land classes because of records of land-use rights. Weaknesses in tenure security because of lack

		communal land use, buying and selling of land outside of prescribed rules or procedures, land conflicts among individual farmers	of information on value of land, poor record keeping, ability of the government to acquire land for other purposes, including business promotion.
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Note: FD = Forest Department; MoNREC = Ministry of Environmental Conservation and Forestry; DoF = Department of Fisheries; MLFRD = Ministry of Livestock and Fisheries and Rural Development; FMB = Farmland Management Body; MoALI = Ministry of Agriculture, Livestock and Irrigation; DALMS = Department of Agricultural Land Management and Statistics; CCFV = Central Committee for the Management of Vacant, Fallow and Virgin Lands.

Source: Adapted from RECOFTC, which adapted from Oberndorf (2012).

One of the consequences of the lack of customary land rights and farmers willing to try escaping poverty is the rise of contract farming. Contract farming is being pursued by Myanmar agribusiness companies in the paddy sector, and contract farming is on the rise as a way to connect smallholders into commodity value chains, and to diversify sourcing strategies, in addition to agribusiness concession holdings. The government has encouraged entrepreneurs from China, Thailand, Bangladesh, and Kuwait to invest in contract farms in Myanmar, and as of 2014, more than a million hectares of farmland in the Ayeyarwady delta and other regions were estimated to be under some sort of contract farming. Roughly 20 million people engage in smallholder farming production, and roughly one-fifth of smallholders (4 million) are engaged in mass production and export of seasonal crops, mostly through contract farming. As smallholder farm sizes are decreasing and landlessness is on the rise (Srinivas and Hlaing, 2015), farmers have engaged these different activities, without long-term success in most cases. Cycles of indebtedness in Shan State due to maize contract farming was mentioned previously in this report (Woods, 2015b), and interviewees also identified the example of watermelon production serving the Chinese market in the Mandalay region.

The table below which provides a summary of major land governance reform activities since 2010 provides an overview of the relevant decision-bodies established to resolve land conflicts.

Table 20: Summary of major land governance reform activities since 2010

Entity	Function	Tasks
Farmland Administration/Management Body (FAB) <ul style="list-style-type: none"> • Region or State Level • District Level • Township Level • Ward or Village Tract 	Established every township and higher administrative levels (district, State/region and national) after passage of Farmland Law in 2012, includes representation from land-related line ministries and agencies.	FABs responsible for: <ul style="list-style-type: none"> • Reviewing applications, recognizing/approving rights, and submitting to DALMS for registry, for the use of farmland; • Conducting valuations of farmland for tax and acquisition compensation purposes; • Issuing warnings, imposing penalties or rescinding use rights if conditions for use of farmland are not met; and, • Resolve disputes that arise over the allocation and use of farmland use rights. Central Farmland Management Body with the Union Minister for Ministry of Agriculture and Irrigation as a Chairman, Deputy Minister for Ministry of Agriculture and Irrigation as Vice Chairman, Director General for the Settlement and Land Records Department as Secretary and the relevant government department officials as members of the body
Central Committee for the Management of Vacant, Fallow and Virgin Lands (CCVFV)	Oversees the granting and monitoring of use rights over VFV lands in the country for agriculture, livestock Poultry Farming and Aquaculture; and mining and “allowable other purposes” under the law, in coordination with concerned Ministries and Regional or State Governments.	Union Minister for Agriculture and Irrigation appointed as a Chairman, Director General of the Settlement and Land Records (now as Land Management and Statistics Department) as Secretary
Investigation Commission for Letpadaungtaung Copper Mining Project in Saligyí Township	Formed in 23 rd Nov, 2012 to find out the true situation on the following cases and submit assessment for ensuring the rule of law along with comment (President Office Notification 95/2012)	Daw Aung San Suu Kyi as Chairperson, U Lun Thi, U Than Myint, Daw Khin San Hlaing, U Zaw Myint Pe, U Maung Maung Aye, U Win Htein, U Myint Swe, U Tin Myint, U Hla Maung Thein, Dr. Myint Thein, Lt-Col Aung Than, U Bo Than, U Aung Zaw Oo, U Bo Htay are as members, U Kyaw Tint Swe as Secretary
Land Investigation Commission	Established by Myanmar Union Government to prepare for the President a report on illegal land acquisitions	
Land Allocation and Utilization Scrutinizing Committee (LAUSC)	Not active now, and has changed to Land Resource Management	DG of FD acts as Secretary of LAUSC

Community Forestry National Working Group (CFNWG), and Community Forestry Unit in Forest Department	Committee Formed in 2013 by the initiative program of RECOFTC in collaboration with FD. To facilitate CF issues to policy level and to have more collaboration among govt. institutions in solving CF issues and to visit for CF sites to learn and hear FUG's voices	DDG of FD acts as chair and the other relevant line agencies, CSOs and academic representatives are members
Vacant, Fallow, Virgin Land Law Central Committee	Provides rights to use VFV land agriculture; livestock, poultry and aquaculture; mining and other allowable government purposes within the law; for 30 years and in allotments of 5000 acres at a time up to a maximum of 50,000 acres both perennial plants and industrial crops.	Led by the Union Minister of MoALI as chairman and the Director General of DALMS as Secretary, and representatives of other government departments participating as members.
Central Review Committee on Confiscated Farmlands and Other Lands	Announced in April 2016, purpose is to address Burma's complex legacy of land confiscation and the dispossession of impoverished farmers. It may be part of the National Land Use Council	Headed by Vice President Henry Van Thio
National Land Use Council	Implementation of National Land Use Policy and related laws, and determine its roles and responsibilities. Coordination, management and information sharing for consistency of the existing land records, maps and registration systems of all relevant Union level ministries and departments; Transparently providing precise and correct land information that the stakeholders need to use when deciding the amount of land area necessary for projects related to national development, environment conservation, land use planning and investment;	Vice-President Van Thio assigned as Chairman and the relevant Union Ministers and Chief Ministers of the Regions or States as members, and a person elected and assigned by the members as the Secretary. <ul style="list-style-type: none"> To effectively and uniformly supervise the implementation of the National Land Use Policy in respective locality in the country
Region and State Land Use Committee		Chief Minister as Chairman, Ministers for the Ministries related to land use, relevant region or state level government departments and organizations, representatives of farmers selected by local associations, representatives from all local ethnic nationalities, experts, women and elders as members, and a person elected and assigned by the members as the Secretary
Land Use Committee at Union Territory (Nay Pyi Taw Council)		The Chairman of Union Territory (NPT Council) as Chairman, member of the Union Territory, responsible persons from the relevant Union Territory level government departments and organizations, representatives of farmers selected by local associations, representatives from all local ethnic nationalities, experts, women and elders as

	Maintaining a system of correct boundary maps, land types and classification, in order to recognize legitimate land use and land tenure rights, reduce land conflicts, and easily resolve any and all land disputes	members, and a person elected and assigned by the members as the Secretary
Self-administered Division or Self-administered Zone Land Use Committees; District Land Use Committees, Township Land Use Committees, Village-tract or Ward Land Use Committees with appropriate persons		
Special Economic Zone (SEZ) Central Management Committee and Central Working Committee	CMC will be required to submit a detailed report to the Union government regarding proposals for new SEZs, their locations, boundaries, logistical requirements, and negotiating points to be considered with state and divisional authorities. CMC will also organize sub-committees to plan and manage projects, as well as address different business categories and separate enterprises by appropriate size for investors. They will also fix rates for fees, tax, capital and exemptions.	CMC chaired by Vice President Henry Van Thio and CWC chaired by Minister of Commerce Than Myint. SEZ management committee consists of 15 members including multiple Union ministers. CWC has 15 members, including permanent secretaries from multiple ministries.

Sources: Srivinas and Hlaing (2015); Woods (2015), McQueen (2015); Irrawaddy (2016), National Forest Policy (2016), (Republic of the Union of Myanmar, 2012 (a)), MCRB (2015), and personal communications.

4.2.4 Legal frameworks governing land decisions and sustainable use still getting underway

Land Use Policy and Land Law

The lack of a land use policy and related land use law was identified by a significant portion of those interviewed as the largest underlying cause of deforestation and forest degradation in the past. Luckily, work to define a Land Use Policy was begun in 2012 and finalized (as per version 6) in early 2016, and involved a comprehensive multi-stakeholder consultative process that was unprecedented in the context of Myanmar's land management and governance. The Land Use Policy truly provides the basis for an inclusive process to define land uses and activities, involving every level of government and administration, and engaging stakeholders in the process.

The new National Land Use Policy indicates significant land allocation and use decisions will be made at district levels. Relevant basic principles (4 out of 15 are emphasized here) include:

- To adopt international best practices such as voluntary guidelines on the responsible governance of tenure of land, fisheries and forests in the context of national food security (the FAO guidelines are mentioned as a principle);
- To promote inclusive public participation and consultation in decision making processes related to land use and land resource management;
- To prioritize the interest of public citizens over private companies in land use decision making (will be important to track how this plays out in decision-making processes, particularly as emphasis is also on decentralization);
- To decentralize decision making related to land;

As mentioned below in Section 4.2.9, with more detail on the LUPs recognition of customary rights, and definition of a process for resolving conflicts at district levels, these are important indications of potential pathways to resolve conflicts.

The LUP envisions District level land use plans, and District Land Use Committee's may define the following zones, and additional zones as necessary, in the proposed land use planning maps: urban and rural development zone; agriculture zone; livestock breeding and fishery zone; protected area zone or national security zone; commercial zone, industrial zone or mining zone; grazing land zone; forest zone. Once these are finalized, these approved land use zone records will be fed back to national, region or state, and self-administered division or self-administered zones so that can revise land use plans in response.

The next step is to enshrine the commitments in the Land Use Policy in a National Land Use Law, which is underway. The new government of Myanmar, with support from the donor community, is moving forward to carry out the next steps to support the National Land Use Policy, through various pilot programmatic activities. These pilots generally consist of conducting ongoing work on law harmonization in relation to tenure security and land resource administration in the country, conducting a national land inventory, developing participatory land use planning processes, modernizing the land registration system, securing land resource tenure rights at the village or community level, developing local dispute resolution mechanisms, and development of a government-managed open access spatial database (One Map Myanmar). All of these activities are interrelated, are designed to be scalable over time, and all pilot activities will feed into and support the development of the One Map Myanmar concept (Oberndorf, 2016).

Environmental and Social Impact Assessment

Environmental and Social Impact Assessments (ESIA) are a relatively new set of procedures to guide development proposals and decisions, specifying the assessments required for projects that could cause environmental and social harm, in order to understand potential impacts. Before 2011, these procedures did not occur and in the last few years, awareness of the need for ESIA, procedures to guide evaluation of proposals, and capacity has grown in this area. The Environmental Conservation Law first introduced the concept in 2012, then this was improved in 2014, and a new version of EIA and SIA was approved in December 2015. That said, anecdotal information from interviews suggests that the new procedures are not yet being incorporated into evaluations, and only the old version is being used.

The National Environmental Policy (4th draft, of February 2016) carried out an the institutional and legal analysis, and thus recognized the, "... recent approval of the Environment Impact Assessment (EIA) Procedures (*which*) helps clarify uncertainties among sectoral institutions, and solves many of the gaps existing in sectoral legislation. The incorporation of the mandate to conduct EIA, along with Social Impact Assessment (SIA) in sectoral legislation (legal harmonization) will lead the way for mainstreaming environmental concerns into development projects." While that is likely true, ESIA procedures cannot be expected to overcome sectoral conflicts completely, such as the one identified in this report of a serious overlap between future agricultural expansion and expansion of the PFE to meet GHG emission reduction goals (and related benefits such as ecosystem service provision, etc.). ESIA procedures also will not fill voids or replace missing legislation, such as the lack of a regulations and rules for domestic timber. ESIA will also not help address land use decision processes at local levels, if adequate information is lacking (such as cumulate watershed impacts or geotechnical risks when evaluating hydropower projects).

Importantly, the National Environmental Policy draft does recognize, "(Section 4.5) the need to build capacities in ESIA and Health and Safety in the Environmental

Conservation Department of MoECAF and in key sectoral ministries that have permitting licensing authority is clear and agreed by all stakeholders.” Section 4.6 notes that, “achieving harmonization will require political will and additional human and financial resources at MoECAF/ECD and in relevant institutions in development sectors - many with environmental conservation mandates and licensing authority.” Section 4.7 finds, “inter-sectoral communication, cooperation and collaboration is reported to be weak and in need of policy guidance and political support (Republic of the Union of Myanmar, 2016(c).”

These observations within the National Environmental Policy are corroborated by interviews carried out for this research. ECD identified that it was not general practice of earlier governments to bring environmental considerations into development decisions. Now, with ESAI procedures being followed with more frequency, the screening process involves considerable time and effort. Even at the proposal stage, there can be back-and-forth dialogue with project proponents, there are over 1000 proposals that have been received, but the ability to process all of these is constrained given limited numbers of staff, and the limited skill of the staff due to lack of training or coming from different backgrounds. There are 10 staff within ECD working on ESIA application reviews. The Cabinet has an established 39-member review team for EIA which involve different line ministries, for final approval decisions, after proponents have made it through initial screening.

During the interviews with natural resource ministries that are either part of the proposal review stage, or have representation on the Cabinet-level review team, it became clear that while there is strong awareness of the need to carry out ESIA, it is not clear whether adequate information exists to make decisions (the diligence is on the proponent, and government agencies do not appear to have funding to independently assess risk or impacts), whether the procedures are transparent (particularly to local communities in the vicinity of project proposals), and whether there are solid examples of robust ESIA processes that dramatically changed or altered development proposals.

The interviews did reveal a sense that the Letpadaung Copper Mine in southern Sagaing region (would be one of the ten largest copper mines in the world), was considered a ESIA success story. The area underwent considerable conflict with the community, but the proponents—Wanbao Mining Copper Ltd. Company and Union of Myanmar Economic Holdings Ltd. which is a Myanmar army-owned conglomerate—did ESIA which went through multiple revisions, resulting in a final ESIA report being issued. However, media reports indicate the conflicts with the local community have not been resolved, with concerns over the land appropriation process and land being fencing off for the project, and no plans to compensate villagers annually for money they would have otherwise made from crops on land appropriated from them (Radio Free Asia, 2016).

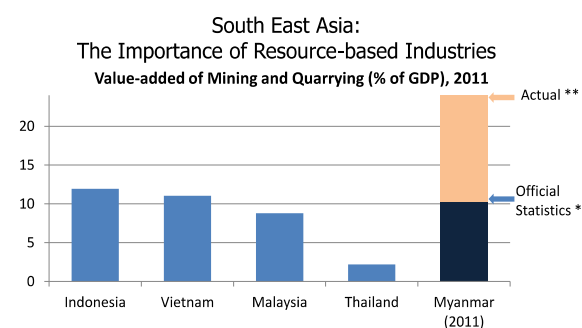
Therefore, increased capacity-building and efforts to increase the effectiveness of ESIA procedures will be essential, as well as increasingly transparent and inclusive processes

that involve civil society and a range of stakeholders that can help support government in these important processes.

4.2.5 Poor natural resource revenue capture

Myanmar has a complex history of deriving profit from its vast natural resources, and sharing those profits with its people. Stemming from the British colonial period, through decades of military rule, the establishment of ‘crony’ business structures, and opaque governance, the current government faces a significant challenge in bringing transparency and accountability to natural resource management. Recent government announcements regarding willingness to include environment and social impact assessments as part of project siting and foreign direct investment procedures, and Myanmar’s recent documentation through the Extractives Industry Transparency Initiative (EITI), illustrate the shift occurring within government, as well as the scale of the reform challenge. Civil Society organizations in Kachin State and other regions are requesting information disclosure on natural resource extraction, taxation, licensing processes, and revenue sharing in respect of their “Right to Know” (Burma Partnership, 2016). Nevertheless, the lack of transparency, accountability and adequate revenue capture by the Union government of existing natural resource extraction activities leads to significant profits being absorbed by elites and companies both within and outside Myanmar, while the population does not benefit, and suffers significant burdens.

Dapice and Nguyen (2013) illustrate the disconnect between revenues generated from natural resources (mining) and revenue capture by government. The figure below depicts two important aspects; a) the large gap between officially reported statistics on mining revenues, and b) when properly accounted for, natural resources are much more important in Myanmar than in neighbouring countries. Dapice and Nguyen note that



- Official statistics puts the value of Myanmar’s mining sector at a very low level.
 - The resource-rich economy of Myanmar:
 - GDP estimate (2011, IMF): US\$51.9 bn
 - Gas: US\$ 3.3 bn
 - Jade (estimated): US\$ 8.8 bn
- * Official exports of minerals for 2011 include official gas and 80% of “other.” No other mineral exports were specified.
 ** Actual exports include official gas exports and authors’ estimates of jade at emporium values.

Figure 10 : Mining and quarrying as % of GDP in Asia

Source: Dapice and Nguyen, 2013.

the discrepancies between reported jade exports, and reported jade sales in the Nay Pyi Taw emporium have been vastly different in the past, and insights from interviews in Kachin State, where the Hpakant Mines are located, indicate most sales went directly to China, and never even reached Nay Pyi Taw.

The first ever Myanmar Extractive Industries Transparency Initiative assessment, released in 2015, relayed Myanmar Gems

Enterprise's officially reported sales at the emporiums reported as US\$1.53 billion in the fiscal period 2013/14 (MEITI, 2015). A regional mining website references the potential annual revenue at up to US\$31 billion annually, almost half of Myanmar's GDP (ASIA Miner News, 2016). Global Witness research found Chinese government import data recorded US\$12.3 billion in 2014, though less than one third of Myanmar's official jade production entered China legally. Further, Global Witness research indicates jade mining companies connected to the Tatmadaw may have extracted jade valued at almost US\$31 billion in 2015, and over the last decade could be more than \$120 billion (Global Witness, 2015). Regardless of the variations in officially reported data between 2011/12 and 2013/14, the large gap between reported data and unofficial estimates is significant, and represents an opportunity for better governance and better revenue capture. Further, and of greatest concern to the Burmese economy, is that the government may have received less than US\$374 million in official jade revenues in 2014 (Global Witness, 2015).

Dapice and Nguyen note that reasonably taxing natural resource extraction would in fact provide the country with the necessary resources to address the significant poverty reduction and economic development needs Myanmar has. Their estimate is that reasonable taxation could yield more than US\$1 billion per year, and through revenue-sharing, this could be split between (a more formally recognized) Kachin State, Union government, and other states (Dapice and Nguyen, 2013).

The MEITI review identified that gems and jade contributed no tax revenue in the fiscal period 2013-2014, while other minerals contributed a minor amount of tax revenues. Non-tax revenues such as production sharing splits, land fees, signature bonuses and other compulsory payments mandated by contracts contributed 15% of revenues from the extractives sector (MEITI, 2015). In contrast, the oil and gas sector generated 2,569 billion Kyats or US\$ 2.1 billion in oil and gas taxes, equity returns, signature bonuses, custom duties, royalties and in-kind production in 2013-2014, contributing approximately 40.5% of Union government fiscal revenues in 2013/14, excluding payments from state-owned economic enterprises (Bauer et al., 2016).

The market value and profitability of Myanmar's natural resources results in the control of the resources being very valuable, and this is as true of minerals and jade as it is for timber. This presents Myanmar and its natural-resource-rich ethnic state regions with complex interconnections of armed conflict and resource access rights. The Natural Resource Governance Institute calls for project-by project production and payments data, disaggregated by revenue stream, as necessary to implement a resource revenue sharing system that benefits producing regions in Myanmar (Bauer et al., 2016). In March 2016, 61 CSOs from Kachin State have called for recognition of the need to adequate revenue sharing ratios and mechanisms, and for these to be developed with their free, prior, informed consent (FPIC) and recognizing their local context, history and culture (Burma Partnership, 2016).

Land allotments through concession rights has not proven to generate the expected revenue streams for the government, as investors have been reluctant to invest above nominal amounts on land (Srinivas and Hlaing, 2015). This may change with increasing political stability.

Dapice and Nguyen argue that a similar picture occurring in the gems/minerals sector exists for timber, though there has been less scrutiny of information. Based on UNCOMTRADE and Global Trade Atlas data, a 2014 assessment found that Myanmar's trade partners such as India, China, Thailand and other countries reported levels of imports from Myanmar between 2000-2013 that are very inconsistent with Myanmar's reported exports, with the difference indicating a total of US\$5.7 billion of unauthorised log exports (an average of US\$413 million a year) when including land border trade into Yunnan, China. When excluding Yunnan trade (which would be considered illegal), unauthorized exports would still amount to US\$2.8 billion (EIA, 2014(a)).

As there are strong parallels between these sectors that is important to explore both for improved governance and potential benefit-sharing options. Given the potential for taxing resource extraction to fund government and societal needs, Dapice and Nguyen (2013) posit that foreign aid is better placed in support of enhancing the efficiency, transparency and stability of governance systems, particularly a comprehensive public finance system with adequate revenues and well-directed spending.

Beyond their economic value, forests are a considerable asset for Myanmar. Income earned from forest utilisation accounts for less than 15% of the value of forest ecosystem services, whereas 85%, or around MMK 6 trillion (US\$ 6 billion), comes from forest ecosystem services that maintain the productivity of other sectors, add value to their output, and help them to avoid costs, losses and damages (Emerton and Yan Min Aung, 2013). In Kamoethway, Tanintharyi, communities recognize that although the forest provides 6% of cash income, mostly through non-timber forest products, it accounts for more than half (56%) of non-cash income, and the remainder comes from agriculture (TRIP NET and RKPIN, 2016).

4.2.6 State and regional governments' role in licensing and taxation

Myanmar's decentralization process, largely defined by the 2008 Constitution, has created new opportunities for state and regional governments to collect revenue and can reform economic governance in areas including municipal governance, fisheries, forestry, land, agriculture, and others. Research into the economic governance in Myanmar⁹ by Bissinger (2016) indicates that most administrative authority rests with the state and regional governments, which have final authority for licensing and oversight in economic sectors for which state and regional parliaments make laws and

⁹ Based on states Ayeyarwaddy (townships Patheingyi, Myingyi, and Thabeikkyin), Tanintharyi (township Dawei and Myittha Town), Shan (township of Taunggyi).

state and regional governments collect revenues, though they do not have the final say in licensing and economic oversight of economic activities for which the Union Parliament makes laws and the Union government collects revenues.

The land tax is jointly administered by the GAD and the Department of Agricultural Land Management and Statistics (DALMS) on behalf of state and regional governments. The GAD also has a role in some land-titling activities.

The Department of Forestry is an important sectoral ministry at the local level in Myanmar, and engages with a range of actors in the timber supply chain. The Department of Forestry collects the following taxes:

- A tax on hardwoods (to Union government)
- A tax on forest products such as bamboo, some softwood trees, etc. (to state and regional government)
- A tax on shops that sell furniture made of timber or forest products
- A tax on elephants used in timber production (depending on elephant height, first registration is 100,000 kyat and annual renewals are 20,000 kyats) (Bissinger, 2016).

Local levels of government often have a strong emphasis on licensing and taxation, while less emphasis is placed on regulation and service provision. However, the structure of taxation is skewed heavily towards an “up-front, fee-for- permission” system. Teak and hardwoods fall under the jurisdiction of the Union government for licensing and taxation, but other forest products such as bamboo, firewood, soft wood trees, thatch, and bark falls within the jurisdiction of state and regional governments, and licensing and concession rights are similarly made at these levels. License fees for most forest products are based on production, but prepaid based on the agreed-upon production amounts specified in the license, and paid up front to avoid problems of tax collection and compliance. Chains of communication occur between state and regional governments and the Union government system, but state and regional governments have clear autonomy on select activities (Bissinger, 2016).

Development Affairs Organizations (DAOs) are a significant interface between the Union government and the general public, along with the GAD and DRD. They are under the control of state and regional governments, however they are fully self-funded, must use their revenues in the township where they were collected, and they have significant discretion over revenue use. DAOs play a critically important role through providing the licenses, permits and other approvals required for the functioning of local businesses, and especially for small- and medium-sized enterprises (SMEs). This means that while economic governance is dominated by the Union Government, its line ministries and township offices (which provide business permits and licenses for the lucrative natural resource sectors), much jurisdictional authority and decision-making will increasingly occur at more local levels, and with DAOs (Arnold et al, 2015). Therefore, any efforts to

boost SME growth for local job creation, such as increasing local manufacturing of wood products, would need to interact with DAOs.

The new government has indicated interest to work towards a fairer distribution of profits from natural resource extraction, within the federal union arrangements. Furthermore, regional and state leaders and several ethnic armed groups have pointed to natural resource revenue sharing as a key component in national reform, fiscal decentralization and peace processes. As such, distribution of natural resource revenues to subnational authorities will be a central component of any decentralization effort and could even feature in discussions around the creation of a more cohesive and inclusive Myanmar federation.

4.2.7 Community forests not yet achieving their objectives

“With peace building as the central priority of the new Government, there is huge opportunity to scale-up a transfer of forest resources to communities, develop their livelihood option through business development, and thereby support a peace dividend that will strengthen democratic reforms (McQueen, 2015).” The old community forestry rules and practices severely limited that possibility, but fortunately the 1995 Community Forestry Instructions (CFI) have been revised as of August 2016.

The new CFIs hold great potential to address the challenges experienced under the old rules. One of the biggest changes is the allowance for Community Forest User Groups (CFUGs) to commercially extract and market their timber (including teak), which was not allowed under the old Instructions. A Community Forestry National Working Group (CFNWG), and Community Forestry Unit established in the Forest Department created the venue to address community forestry redesign and functions. Reform to the forest law to back these advances was anticipated in 2016 (McQueen, 2015), but has not yet occurred.

There exist about 840 forest user-groups comprised of 33,512 members, which have registered under various objectives of community forests, including community forest (timber, fuel wood, NTFPs), protection forest, religious forest, conservation forest, and indigenous/ traditional forest. In total, 83,204 ha are managed by communities (FAO and MoECaF, 2016), which is far short of the 900,000 ha target for CFs by 2030 identified in the Forestry Master Plan (2002-2031).

The new Community Forest Instructions objectives are to address the basic needs of timber and non-timber products for local people, to create job opportunities and income for poverty reduction, to increase the forest area and provide perpetual supply of forest products in a sustainable manner, to promote participatory forest management, to enhance environmental services which support for climate change mitigation and adaptation through conservation and addressing deforestation and forest degradation (Republic of the Union of Myanmar, 2016e).

The areas allowed for establishment of CFs under the new instructions include degraded forest areas where it's difficult to naturally regenerate, areas with potential to supply forest products and to create income opportunities, village fuel wood plantations established by Forest Department with the permission of Director General, areas where it is necessary to conserve the soil and water resources and is suitable to conduct CF implementation, natural forest areas which should be managed by local people for a reason, areas where local people traditionally and customarily managed land (*ibid*).

Applications for CFs would be made through District Forest Officers, under 30 year terms, and forest user groups must submit a management plan after the land is approved by District Forest Officer. 'Facilitators' are Forest Department staff and INGO/NGO organizations who assist and advice to local people in CF applications, formation of the user group, Management Plan formulation, and CF implementation activities and process. The Forest Department is tasked with helping to build the capacity of local people through providing technical and socio-economic related training courses; organizing community forest products-based economic associations; coordinating between producers and buyers/traders for market and market access; supporting networking at village level, township level, regional/state level then to national level to become strong CFs or CFEs, facilitate the required investments to develop CFEs, facilitate for international certification of timber and non-timber forest products as well as forest based services of CF; and to implement nature-based tourism under CF based enterprises with the permission of MONREC (*ibid*).

Note that there are currently no government management plans that include community forests as a potential source of timber for the country's domestic needs, and it will be up to CFUGs to develop business plans, management plans and negotiate the sale and marketing of their timber, under the new CFIs. The Forest Department will now help support CFs with development of CF management plans, as per the new CFIs (assuming there is capacity to do so). There is still no certification program targeting community forests, but hopefully this will be developed in the future.

The CFI allows for Community Forest based Enterprise or Community Forest Enterprises to be established, with the aim of adding value and trade in forest products through commercialization. The CFI instructs the FD to assist forest user groups in connection with governmental departments, national and international organizations, economic organizations, and private enterprises to obtain support in CFE development. It is unclear the degree to which the FD has the capacity and staff to do this, and this area holds huge potential for RECOFTC and many others to assist forest user groups (Nepal can provide a highly relevant example).

Community forests could provide a means of recognizing customary rights to forest lands, and help mobilise local people behind constructive peace building efforts, by allowing local people to manage resources and generate incomes, thereby also

supporting solutions for peace (McQueen, 2015). However, Land Core Group research into CF certificates raised concerns that while it could provide a way to recognize customary rights, **a CF certificate would not be equivalent to a full titling of all the incorporated village association's agricultural land parcels under customary communal tenure** (Andersen, 2015). There are also differences in opinions about the utility of CFs, with some ethnic communities seeing this as a means to obtain some legal recognition of tenure security over village agroforestry land, but that may be at odds with the utility the Forest Department would grant a CF certificate for, which is to promote forest management.

Interviews with various stakeholders revealed how previous to the adoption of the new CFIs, community forests did not provide communities with the income and certainty they needed, and within necessary timeframes. The Forest Resources, Environmental Development and Conservation Association (FREDA) initiated a community forest project in the Mindon area in the Dry Zone, with funding from Germany. The project was in a *taungya* system, adding fuel wood, commercial species and mango trees, along with funds for two years to offset loss of profits while they awaited income from the forest. However, it took five years to get the certificate for the community forest—an unviable timeframe for communities—and the process was very expensive (and indications are it was unlikely to succeed without the donor support). This indicates the significant bureaucratic challenges of getting applications through the system.

The organization Conservation of Natural Resources and Sustainable Development (OIKOS) stressed that communities often want income in the first 2-3 years, need to see incentives to see value from the forest. Both OIKOS and FREDA stressed that a) community forests need to be able to serve the domestic timber market, and be viewed as a sustainable source of timber, b) the development of cottage industries and SMEs for processing and other services to enable production is the most important aspect to be developed in order for community forests to succeed. But they can't access finance or market development assistance. Therefore, the idea of using community forests as collateral, in order to overcome barriers to accessing credit are important to pursue.

The Ecosystem Conservation and Community Development Initiative (ECCDI) has forged a model for developing CFs which provides assistance through vegetable growing, improved rice seeds, and piggery for livestock sales to bridge the gap before trees begin to provide value through products. McQueen (2015) proposes that the Community Forestry Practitioners Network and efforts in Kachin can provide models and impetus for reform of the forest law plus broader desired changes to legislation and institutions under the new Government relative to community forests. Financial support provided through MERN members could promote the emergence of community forestry product producer associations (CFPPAs) at township and state levels, and encourage further exploration of how these might be commercially viable. Business development concepts will need to be developed in line with recognized access to resources, and registering and restoring community forest areas. In Kachin, several community forest

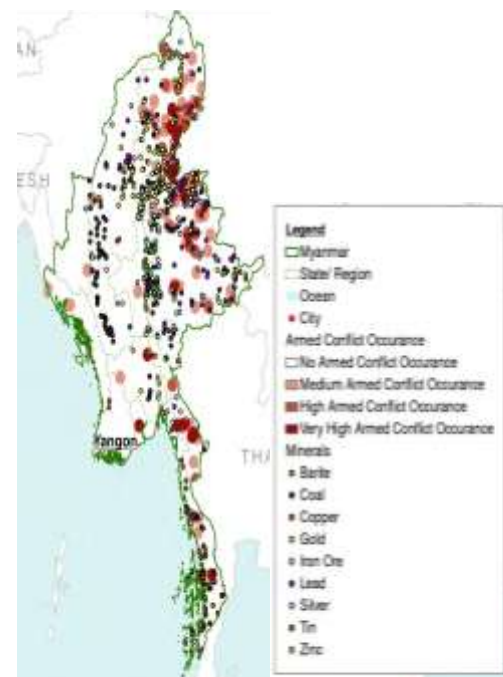
user groups clustered through the Kachin Forest Users Association are developing. The La Myang Community Forest Rattan and Bamboo Group business provides one example, and ideas for a sawn timber processing business and an integrated bamboo processing business are also being actively explored.

4.2.8 Long standing conflict in resource-rich areas

The relationship between the Union government and ethnic-based states is based on governance arrangements created during the colonial times. The change from a military government in 2011, and democratic elections in November 2015 pave the way for a historic change in the relationship between ethnic communities and government. The 21st-century Panglong Conference, convening on August 31 2016 was the first step by the NLD government to bring parties together to discuss these long-standing conflicts and disconnects. Ethnic communities have suffered through sixty years of civil war, ethnic farmers have struggled to survive through land confiscations and displacement, and communities have watched government-authorized extraction of natural resources from traditional lands ethnic areas using top-down and non-inclusive approaches (ECDF, 2016).

A partial ceasefire was signed in late 2015 under the Thin Sein government, prior to elections. It was an important milestone for the government, but also criticized because 7 of the 15 armed groups invited to participate declined to sign due to disagreements with the Union government. Significant gems and mineral deposits, largest intact areas of forests, and waterways proposed for hydropower development are in areas with active disagreement over governance and no ceasefire agreements. Many increasingly wonder if peace can be reached with ethnic armed states if simultaneous or concurrent agreements are not reached on satisfactory benefit-sharing of natural resources in these states.

The track record so far for settling both conflict and benefit-sharing of natural resources is not strong. The Karen National Union (KNU) signed a ceasefire agreement in 2012, after 70 years of conflict. However, after signing the agreement, a notable rush for resources occurred in the Tanintharyi region, with increased forest converted to agricultural plantations and mining (TRIP NET and RKPIN, 2016).



Source: Min Kyaw Thu (2015)

As Figure X illustrates, the highest concentration of minerals sits within the ethnic regions of

Figure 11: Distribution of armed conflict occurrence and minerals

Kachin and Shan States. Recent experiences at the Hpakant jade mines illustrates how inextricably linked the issues are of natural resource revenues, land rights and recognition of ethnic state rights, and the significant hardship endured by local people. Ninety percent of the world's jade is mined in Hpakant, Kachin State. A major landslide in 2015 resulted in a significant number of deaths, and raised concerns over social and environmental impacts of mines. The Kachin National Social Development Group plans to present a six-point plan to parliament, and calls on government to suspend jade mining until better mining laws can be passed, and mechanisms put in place to ensure public benefits, to take action against mining companies responsible for deadly landslides, to crack down on related road accidents, to ensure companies are held accountable for the environmental damage caused by mining operations (including forest depletion and water pollution), and to form an investigation commission to look into mining industry abuses (Chan Mya Htwe, 2016).

On March 1, 2016, 103 leaders of Kachin State from 61 organizations ranging between civil society organizations, political parties, and religion organizations agreed on a statement seeking: a) federalism with the administration, judiciary, and legislation put in place at the Kachin State level, which the central government would endorse through the state minister elected by the Kachin State Hluttaw; b) recognition that the people of Kachin State are the rightful owners of all natural resources in Kachin State, c) that ultimate management authority of natural resource extraction, taxation and management, and revenue sharing be in the hands of Kachin State government; d) that all project operation and natural resource extraction be stopped in ethnic areas that have not resolved conflict, as it provokes conflicts in ethnic areas; e) that "Free, Prior, Informed and Consent" with local community be ensured before issuing operational permission for any projects; f) that all information on natural resource extraction, taxation, licensing processes, and revenue sharing be disclosed transparently, and grievance mechanisms in place, g) that corruption, environmental degradation, armed conflict, and social problems occur due to natural resources, and therefore accountability and monitoring is crucial, h) that recommendations on revenue sharing mechanism and the ratio in Kachin should be avoided by local and international researchers and experts without acknowledging and analyzing the local context, history and culture (Burma Partnership, 2016).

Section VIII in the Land Use Policy (2016) covers Land Use Rights for Ethnic Nationalities, and affirms that the intent is to, "formally recognize and protect the customary land tenure rights and related local customary land management practices of ethnic groups, whether or not existing land use is registered, recorded or mapped (found in Article 66)." Decision-making processes and dispute resolution related to land tenure rights of individuals or groups practicing traditional cultivation methods on customary lands shall involve ethnic leaders, elders and women.

Articles 73 and 74 affirm that "...ethnic customary land dispute resolution procedures currently used shall be defined in the new National Land Law, and the respected

influential representatives from the ethnic groups shall participate in dispute resolution decision making processes.” Further, to resolve the needs of “...ethnic nationals who lost their land resources where they lived or worked due to civil war, land confiscation, natural disasters or other causes, that desire to resettle to their original lands, adequate land use rights and housing rights shall be systematically provided in accordance with international best practices and human rights standards.”

4.2.9 Customary land and land confiscation

Customary land uses occur primarily in the uplands of the country, predominantly in forested sections and ethnic regions. The use of customary land (and inherent lack of tenure security) is often accompanied with shifting cultivation practices (*taungya*), which occurs on roughly 23-25% of the country. Large areas are maintained as fallow lands in *taungya* cultivation, to accommodate the moving, clearing, cultivating, and regrowth of biomass and resting of land that is characteristic of this type of agricultural system. These large areas maintained as fallow were recorded as “wastelands” in village records and under the provisions of the Wasteland Act of 1991, then VFV Law of 2012, and become available for allocation to concession-seekers or commercial ventures (Srinivas and Hlaing, 2014). Although the Constitution of 2008 recognized *taungya* as a land-use practice, individual *taungya* holdings were never formally registered or surveyed. Further, the second to last rule of the Farmland Rules, implementing the Farmland Law of 2012, state that the central farm land management committee shall seek to end shifting *taungya* and to introduce terrace cultivation on high land.

The subsequent problems of land grabbing in Myanmar is widespread across the country. The Land in Our Hands Network interviewed 2000 individuals in 62 townships in six states (Kachin, Kayah, Kayin, Mon, Chin, Shan (North & South) and seven regions (Yangon, Bago, Ayeyarwady, Mandalay, Sagaing, Magway and Thaninthayi), and found that the accumulation of reported land confiscations has reached roughly 2200 cases since 2010, with almost half being attributed to the military (Land in Our Hands Network, 2015). All of these cases are ongoing. Displacement either occurs as farmers being moved off the land entirely, or their rights to the land being taken and held by another entity, who then allows the farmers to stay on the land in exchange for paying rent or share payments. The interview responses indicate that the possession of legal documents did not provide any significant defense or protection against land grabbing for farmers as 42.5% said they possessed legal documents issued by the government when their land was confiscated, while 39.8% said that they did not possess any such kind of document (*ibid*).

Landlessness is increasing, with associated poverty and displacement risks increasing. The number of farm-dependent households was 5.4 million in 2010 (almost doubling from 1993 levels), however over the same period, the average farm size decreased from 6.23 acres in 1993 to 4.5 acres per household in 2010. The increase in landlessness is

especially apparent in the Ayeyardwady delta and dry zone (Bago-Bagan-Mandalay region), where it is reported that one-fifth of the households in some villages were landless and engaged in wage labor, and one-fifth of households had marginal landholdings of less than one acre. Village tract leaders and residents reported that landlessness had been increasing over the past 4-5 years, with forced sales due to indebtedness being the leading cause of land alienation. Rates of landlessness in Upper Myanmar were found to range between 25 to 40% in every village (Srinivas and Hlaing, 2015).

It is now widely agreed that the problems due to lack of recognition of customary land, *taungya* practices and lack of clear, documented tenure which encourages land grabbing, and subsequent deforestation and/or forest degradation should be addressed. Though there are initial moves to fix the problem, many steps are necessary to change practices. The new government brings hope to resolving the long-standing issues related to land grabbing and displacement, after President U Htin Kyaw established the Central Committee for Re-scrutinising Seized Farmlands and Other Lands in May, 2016, and appointed the Vice President Henry Van Thio to chair this committee. The Land Use Policy should also provide a means to address this, but the current government is quiet about next steps.

Movement towards recognition of customary rights has been building within the Union government since 2011. Article 64 of the Land Use Policy (2016) states that, "Customary land use tenure systems shall be recognized in the National Land Law in order to ensure awareness, compliance and application of traditional land use practices of ethnic nationalities, formal recognition of customary land use rights, protection of these rights and application of readily available impartial dispute resolution mechanisms." This recognition of customary rights is an important first step, but there will be much work to be done within the governance reform and peace process to define processes for resolving conflicts at district levels. The Land Use Policy states that District level land use plans are envisioned, and District Land Use Committee's may define the following zones, and additional zones as necessary, in the proposed land use planning maps:

- (a) Urban and rural development zone;
- (b) Agriculture zone;
- (c) Livestock breeding and fishery zone;
- (d) Protected area zone or national security zone;
- (e) Commercial zone, industrial zone or mining zone;
- (f) Grazing land zone;
- (g) Forest zone.

Once these are finalized, these approved land use zone records will be fed back to national, region or state, and self-administered division or self-administered zones so that can revise land use plans in response (Land Use Policy, 2016).

Importantly, Article 68 of the Land Use Policy (2016) affirms that, “the customary lands of ethnic groups used traditionally that fall under current forest land or farmland or vacant, fallow and virgin land classifications shall be transparently reviewed, registered, and protected as “customary land”, in accordance with the Constitution of the Republic of the Union of Myanmar, and land allocation to any land user, other than for public purposes, shall be temporarily suspended until these lands are reviewed, recognized and registered as customary lands.”

The Land Use Policy is an important step toward legally enshrining these rights in a future federal constitution and decentralized legal framework. Whether and how the protection and recognition of ethnic customary land management systems become legally recognized and enforced is unclear at this time, but this is a major concern of ethnic communities. Further, ethnic communities are communicating through various fora the need to place a moratorium on land acquisition and granting of rights in areas where customary land management systems are being implemented or were implemented before displacement due to armed conflicts (Ethnic Community Development Forum, 2016; Burma Partnership, 2016), which is consistent with the Land Use Policy (2016) but not yet recognized in Burmese law.

While emergent policies and dialogue platforms provide significant hope for more accountable and transparent land governance, the ability to operationalize the changes through existing governance structures may take significant time and effort. The Ethnic Community Development Forum carried out research over three years in various townships and villages across ethnic areas and observed that, “Although MoECaF and MoALI appear to have the main land management powers, a more significant actor on the ground is the General Administration Department (GAD). The GAD is within the Ministry of Home Affairs and its directors are appointed directly by the Burma Army. At the Township level, a GAD representative heads each Farmland Administration Body (FAB), which is the authority that deals directly with village tract representatives. With the current rampant land grabbing taking place throughout the country, land demarcations and registrations conducted by Central Government and the Burma Army have raised suspicion and fear among the villages ECDF visited, heightened by the long history of civil war and related human rights abuses by the Burmese military acting with impunity. Furthermore, the corruption in the land registration and acquisition process has been widely documented, with officials from the DALMS and GAD in key powerful positions that lack proper supervision and accountability (ECDF, 2016).”

Ethnic resistance governments in Karen and Mon States have developed land registration and management systems in areas managed by ethnic governments. These systems provide land rights and clarity in land use zones, rules of use in those areas, and conservation of certain areas. Such decentralized land management systems have evolved to respond to the needs of the locality and forest community needs, often prioritizing sustainable livelihoods and environmental protection, with participatory governance, judiciary and administrative systems that operate outside of the domain of

the Union government. Such systems are usually holistic, incorporating lands, waterways and forests within specified village boundaries (Ethnic Community Development Forum, 2016; TRIP NET and RKPIN, 2016).

The Land Core Group has looked at the issue through two case studies in Chin and Shan state that provide helpful examples of challenges and limitations in identifying legal ways to register land under the Farmland Law of 2012 and Association Law of 2014. The hope was to protect untitled agricultural uplands, including the fallows of upland shifting cultivation that are possessed by ethnic nationalities that manage their lands under customary communal tenure (Andersen, 2015).

4.3 Ranking of underlying drivers and correlating to direct drivers

The underlying causes of deforestation and forest degradation are inter-linked and often the socio-political and economic factors underpinning these, along with governance and increasingly market aspects complicate the matrix of variables. In most cases, the direct drivers of deforestation and forest degradation (e.g. agricultural expansion, illegal logging) will not shift if government and stakeholders avoid addressing the underlying causes. Further, the socio-political and economic dimensions are crucial to shifting behaviour and extraction patterns, given the livelihood dependencies on forest resources and the potential to create a new paradigm that delivers far more value to forest peoples.

This assessment did not include any focused discussions with the Drivers and Strategies Technical Working Group members, or sub-regional working groups, to review the information gathered and thereby derive a ranking of underlying drivers based on stakeholder assessment of the results from interviews and research. This activity is prioritized for further follow-up, as part of National REDD+ Strategy development. The summary tables of intervention options in Section 6.2 contain information on which underlying driver relates to each driver, and further consideration by stakeholders could assess the degree to which these play out differently at national and sub-regional levels.

5. Anticipating future driver pressures

5.1 Methodology

The methods used for anticipating future driver pressures centered on identifying current government plans for sector expansion, domestic and regional commodity demand and expected growth, and relevant private sector plans in different sectors impacting forests. Sources of data included select government documents and plans such as sector plans and development proposals, interviews with key departments

(refer to appendix 1), and a literature review. Consideration was also given to development with significant and growing foreign direct investment.

Myanmar's economy has been developing rapidly since the easing of international sanctions in 2012 and political transition. Its GDP grew at 7.7% on average between 2011 and 2014, largely due to the opening of parts of its economy and an inflow of foreign direct investment (OECD/IEA, 2015). Though more refined quantitative projections on development patterns would be helpful to inform a prioritization and ranking of future drivers, this assessment did not rely on modelling, but rather summarizes known development plans, areas of active investment, and where possible, projects trends based on historical growth patterns, as a means to highlight future risks or hotspots for deforestation and forest degradation pressure.

5.2 Commodity/regional economic demand factors and inconsistent sector policies

Myanmar's future is expected to look quite different from its past. The country is opening up after decades of military rule, and foreign direct investment is increasing. Myanmar is strategically situated between the two most populous countries in the world—India and China—and 40% of the world's population. Yet foreign access to Myanmar's labour and natural resources has been limited in the past, but this is expected to change. Myanmar has considerable reserves of natural resources, including gold, jade, timber, rubies, oil and natural gas, and yet many of those resources lie in territory controlled by ethnic armies.

Myanmar's population of 53 million is young, with 29% of the population being children under the age of 15 and 66% of the population is between 15-64 years old. The United Nations population projections for Myanmar, in the medium variant scenario, project population to increase from 53.9 million in 2015 to 60.2 million by 2030.

Growth is expected to accelerate to an expected 7.3% per year over the next 5 years, which will be driven mainly by foreign investment in large projects, particularly in heavy industries such as oil and gas, power and infrastructure. The rapid growth of the telecommunications sector, with mobile network coverage of the population expected to grow to 70% by 2017, will also boost investment. In addition, the construction sector will also contribute significantly to growth as more infrastructure projects continue to be undertaken (PWC, 2015). The Asian Development Bank Greater Mekong Sub-Region program seeks to boost investments for infrastructure, agriculture and trade. The new government has released the Economic Policy of the Union of Myanmar, which provides a sense of the direction the country will take in growing its economy. Overall, the Policy seeks to enable national reconciliation and balanced growth in all regions. The Policy emphasizes the need for electricity, roads and infrastructure; building environmentally sustainable cities and protecting and conserving cultural heritage; supporting SME

development as generators of employment and growth; improving the operations of state-owned enterprises and privatizing them when appropriate; and establishing an economic model that balances agriculture and industry and supports the holistic development of agriculture, livestock and industrial sectors so as to enable rounded development, food security and increased exports (Republic of the Union of Myanmar, 2016(g)).

5.2.1 Timber and forest products

There is general consensus that Myanmar's timber stocks are degraded. The 2014 log export ban, July 2016 temporary national logging ban and a 10-year logging ban in the Pegu Yoma region, and MOECF (and now MoNREC) and President's Office steps to reform MTE and commitment to future sustainability by harvesting only within revised Annual Allocable Cut (AAC) levels rather than the former model of revenue-based targets are recent steps taken, and will help reduce degradation in Myanmar's forests.

Any assessment of future demands on Myanmar's forest products must take into consideration that though policies, sector governance and institutions, and even supply chains may change, there is still enormous market demand for the country's timber, and a significant portion of that market does not currently screen for legality.

Myanmar was party to the decision taken at the 10th ASEAN Ministerial Meeting on Transnational Crime, to add 'trafficking of wildlife and timber' to the list of regional priority transnational crime threats (ASEAN, 2015). This decision elevates the importance of wildlife and forest crime, and compels ASEAN Member States to implement stronger law enforcement and criminal justice responses.

Both the United States Lacey Act amendments of 2008 and the 2010 European Union Timber Regulation set strict rules around market access in these jurisdictions. The Lacey Act started as a ban on the trafficking of illegal wildlife, but was broadened in 2008, to include timber and paper. The amendments define the terms of a ban on trading plants or plant products harvested in violation of the law; and a requirement to declare the scientific name, value, quantity, and country of harvest origin for some products. The EUTR prohibits placing illegally sourced timber and products derived from such timber into the EU market, and requires EU traders who place timber products on the EU market to exercise due diligence in order to minimise the risk that any timber products they place on the market contains illegally-harvested timber.

Myanmar is in the early stages of pursuing a Voluntary Partnership Agreement under the EU Forest Law Enforcement Governance and Trade (FLEGT) Action Plan, which would allow Myanmar to go through a series of steps toward demonstrating legality, and hence, access to these markets. These steps include creating a platform for discussion and agreement on a transparent legality system and forest governance issues being satisfactorily addressed, stakeholder engagement through the process, and

independent third party independent monitoring with credible civil society participation in the process for transparency and accountability.

However, recent trends are alarming, and developing future projections may only provide a rough guess. What is clear is that China's economic slowdown may help dampen demand for Myanmar's natural resources. China's economic growth hovers at 6.7% in the second quarter of 2016, and indications are that the housing boom has flattened out. Nevertheless, Chinese market demand for timber continues to grow. Between 2009 through 2013, export volumes of timber to China increased by 52% (1.10 to 1.67 million m³), while the value increased by 234% (US\$186 million to US\$621 million) (Forest Trends, 2014). With the difficulty of enforcing the raw log export ban and other measures, future trends for the next few years will likely track those of the last five years, as long as supply can be met.

The question of supply of highly sought-after rosewood (Hongmu) species is a concern. The most desired Myanmar species by Chinese furniture manufacturers are padauk and tamalan. In 2013, Hongmu imports into China from Myanmar grew 52% over the previous year, high value luxury Hongmu timbers made up a staggering 39% of China's total hardwood log imports in 2013. Between 2000-13, China imported 624,000 m³ of Hongmu logs worth US\$737 million from Myanmar (EIA, 2014(b)).

Insights from Chinese traders indicates that timber supplies closer to the border are exhausted, causing operators to look farther afield in Kachin State, and increasing amounts of illicit timber flows through Kachin from Sagaing Division (source of tamalan) and north Shan State (source of teak)(EIA, 2015).

Responding to a range of countries concerned over the depletions of their *Dalbergia* forest stocks, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) just listed the *Dalbergia* genus (including 250 tropical species) onto the Appendix II of the CITES list in October 2016. This will require that trade of *Dalbergia* species will only be allowed for with permits. Whether Myanmar can stem the flow of illegal *Dalbergia*, and whether China can put in place controls within its large Hongmu supply chain and influence market demand for this wood remains to be seen.

Teak is recognized as a state-owned resource, and therefore is reserved. Other non-state owned species that are within Group 1 and reserved include padauk and tamalan, and other species. The announcement of a logging ban in 2015 is largely understood to refer to teak. Future supply and forest depletions will not mirror historic patterns for some species, simply because stocks have been so reduced, particularly for teak and Hongmu species of padauk and tamalan (EIA, 2014(b)). (refer to Table 21 below).

Table 21: Desired Myanmar timber species in illicit markets and known remaining stocks

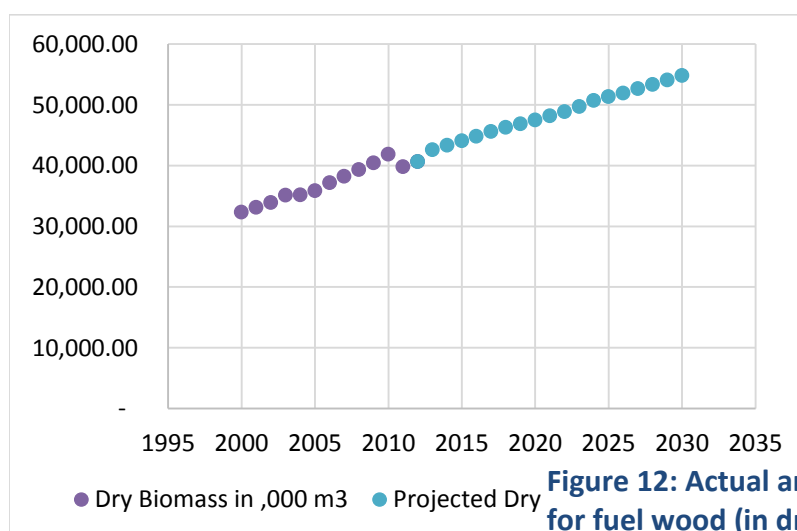
Local name	Scientific name	Status under Forest Act	Remaining stocks
Kyun	<i>Tectona grandis</i>	State Owned	
Tamalan	<i>Dalbergia oliveri</i>	Reserved	Total Estimated Stocks: 1.6 million m ³ Sagaing: >2 million trees/ 850,000 cubic tons / 1,203,600 m ³ Shan: 900,000 trees/ 250,000 tons / 354,000 m ³ Madalay, Kachin, others have 100-150,000 tons / 141,600 – 212,400 m ³ combined
Pyinkado	<i>Xylia dolabriformis</i>	Reserved	Used to be 10% of forest species, but now 1%
Padauk	<i>Pterocarpus macrocarpus</i>	Reserved	Total Estimated Stocks: 1.4 million m ³ Shan state: 1.125 million trees/450,000 cubic tons / 637,200 m ³) Magway: 250,000 tons /354,000 m ³) Mandalay: 150,000 tons / 212,400 m ³) Sagaing: 100,000 tons / 141,600 m ³) Plantation: estimated between 15,527 to 17,426 ha
Thingan	<i>Hopea odorata</i>	Reserved	
Thingan-magale	<i>Hopea minutiflora</i>	Reserved	
Thitya	<i>Shorea oblongifolia</i>	Reserved	

Source: Adapted from Forest Department and EIA (2014).

As mentioned in the underlying driver section above, the changes in the forest governance and management that is occurring now are crucial to address these pressures.

5.2.2 Fuel wood and wood stoves

With the increase of population increasing from 53.9 million in 2015 to 60.2 million by 2030, a forecast of fuel wood demands by states/region is provided below, based on the Myanmar Renewable Energy Policy assessment fuel wood demand from between 2000 to 2012. The analysis finds the demand for fuel wood and charcoal to continuously increase, reaching 55 million cubic meters of dry biomass by the year 2030 from 32 million m³ in 2000 and 42 million m³ in 2010. The regions that will see the greatest increases include Ayayewaddy, Mandalay, Bago, Shan and Sagaing (refer to Figure 12 below).

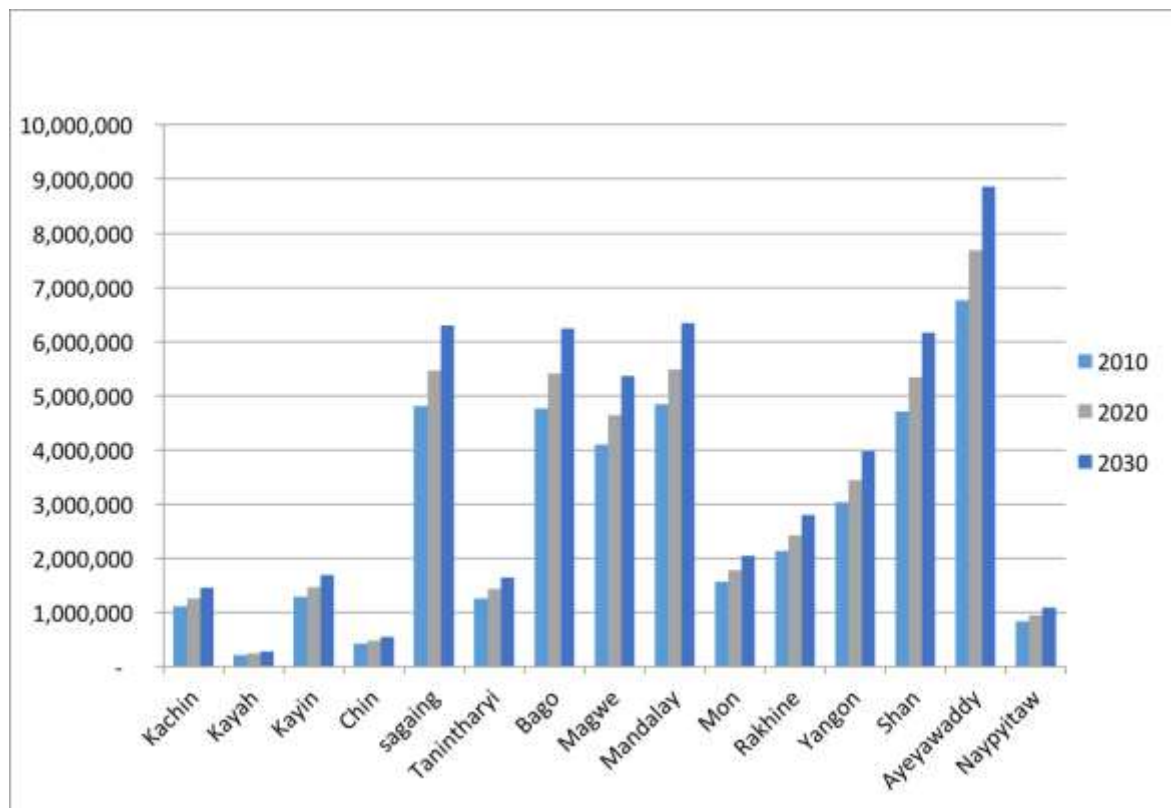


In order to meet the need of fuel wood demand, the Dry Zone Greening Department has focused on promoting the utilization of fuel wood substitutes in

Figure 12: Actual and projected biomass consumption amount for fuel wood (in dry 1,000 m3)

the Dry Zone areas covering Mandalay, Magway and Sagaing. The DZGD estimates that by using an efficient cooking stove, 1 tonne of fuel wood can be saved annually. However, the extensive awareness raising programs and advance technical knowledge would be necessary for improvement of cookstoves production, expansion of market and empowering private industries for production of fuel wood substitution. Besides, the harvesting practices for fuel wood collection should be designed in a sustainable way compatible with the specific forest conditions and socio-economics conditions of the states/regions.

Figure 13: Projection of state/region fuel wood demand by 2020-2030 based on 2010 (dry biomass, m³)



The National Forestry Master Plan (2001-2002 to 2030-2031), defined government's plan for bio-energy, forecasting an overall decrease in demand for fuel wood, with an increase in uptake of energy efficient stoves and greater access to electricity. By 2030, fuel wood is projected to account for less than half of total primary energy, compared to almost two-thirds currently. Myanmar's INDC proposes a goal of distributing approximately 260,000 cook-stoves between 2016 and 2031. MOECAP has distributed approximately 286,000 cook-stoves during 2001-15, as part of the Comprehensive Plan for Dry Zone Greening (2001-31), and plans to distribute an additional 260,000 cook-stoves between 2016 and 2031. This INDC goal falls under the National Forestry Master Plan, and the National Energy Policy, in order to reduce the use of wood from natural

forests for cooking by 2030 (Republic of the Union of Myanmar, 2015e). However, the target number of improved cook-stoves in the above plans will only shift a small percentage of the roughly 10 million households reliant on fuel wood.

More efficient cookstoves can reduce demand for fuel wood, but implementation on a large-scale has been limited. The Department of Forests worked in cooperation with UNDP and FAO since the 1990s on technology improvements and diffusion, and the Bago Yoma Greening Project does contain a cookstove component, intended to help reduce pressure on the forests within this 5.07 million ha region (ADB, 2012; Maung Maung Than, 2015).

Market segmentation by fuel type in rural areas, as a means to ascertain likelihood of switching indicates the importance of improving practices from open fires to a closed stove, such as clay (figure to mention). While the electric stove is the “aspirational stove” for most people, this perception may have been influenced by the LPG price spikes in 2014, and might switch in the future. As there is already a consolidated production of A1 and Clay stoves, EMC’s recommendation for GERES is to focus on supporting already existing procedures of stoves by improving their quality of production, market knowledge and access to finance, especially in improving their quality of production, market knowledge and access to finance, especially in Magway (for A1 stoves) and Patheingyi (focusing on producers of clay stoves). A1 stoves can reduce wood fuel use by up to 40%. Geographic range is the urban and peri-urban areas, with engagement in rural areas occurring to test the feasibility of rural households switching from three stone fires, and consideration of expansion in these areas should occur after the first years of EU-funded activities. Given the poor development of the cook stove supply chain, GERES is encouraged to support the establishment of an association to bring together actors to share information and create better market intelligence. This association could also help with product certification processes, and help boost quality (Emerging Markets Consulting, 2015).

Based on current trends of biomass consumption, UNEP estimates that if 25% of the country’s 13 million households shift from traditional to efficient cook stoves – potential emissions reduction would amount to 6.5 million tCO₂ per year. Recent studies however recommend caution in estimating the actual total reduction potential in Myanmar. A draft Renewable Energy Policy was created within the last year, with support from the Asian Development Bank. It was intended to assist in development of the national long-term energy master plan, and was formulated by the Renewable Energy Research Department under the Department of Research and Innovation (DRI), now housed within the Ministry of Education.

While not geared towards cooking fuel, the National Electrification Plan could provide an important means of shifting rural energy use, as it aims to electrify more than 7

million households and achieve access to electricity for 36 million people by 2030. Total electricity demand in the country is 2075 MW. Of the 64,436 villages in Myanmar; a) 3,802 are electrified by grid; b) 13,752 are electrified by off-grid systems such as mini-hydro, biomass (rice husks), diesel generators; and c) the remaining do not have electricity access. Achieving electricity access (which is also the UN SDG7 in Myanmar) is vital to poverty reduction and shared prosperity, and is a focus of investment of \$400 million by the World Bank, as part of Myanmar's call for \$5.8 billion in investments in grid and off-grid solutions (Ostojic et al., 2016). Only 11% of rural households with continuous access to electricity and 43% of urban ones use it as main cooking fuel. This can be attributed to a preference for cooking using traditional methods and the utilization for other activities such as electronic equipment recharge.

5.2.3 Agriculture

Reports published by MoALI/SLRD (now DALMS) and MoECAf (now MoNREC) on land use and State-land leases suggest that about 20% of all Myanmar's land has been awarded to foreign or joint venture investors for 30 to 70 years (Srinivas and Hlaing, 2015). MoALI's 2014 report (Myanmar Agriculture in Brief) indicated that only close to 20% of the five million hectares approved for land concessions had been developed. Senior government officials interviewed by Srinivas and Hlaing noted that State land leases/concessions have been negotiated and awarded in haphazard and inconsistent ways with negligible positive economic or social results (Srinivas and Hlaing, 2015). **The scale of leases/concession rights to major agri-commodity interests (roughly 13.5 million ha), and low utilization of those rights for productive purposes, makes projecting future use of these lands unpredictable.**

The agriculture sector suffers from low productivity and yields, and contributes roughly 10-15% to annual real GDP growth over the past 4 years, yet employs over half of the country's labor force (Rab et al., 2015). The new Economic Policy seeks to 'establish an economic model that balances agriculture and industry and supports the holistic development of agriculture, livestock and industrial sectors so as to enable rounded development, food security and increased exports (Republic of the Union of Myanmar, 2016(g)).' How the Economic Policy will achieve such balance, and how it will influence the sector goals is not yet clear. However, the intention of promoting 'holistic development,' mention of a financial system that provides sustained capital to farmers, households and businesses, strengthened property rights, and promotion of SMEs, all in the context of balanced development between the regions, offers hope that economic growth will seek to benefit all people. However, navigating the trade-offs and finding the best compatibility between sectors, particularly forests and water, is still to be defined.

Based on the general trajectory of increased in exports of major agricultural commodities as per Table 22 below, and the priority government is giving to agricultural development and exports, such increases are expected to continue.

Table 22: Exports of Major Agricultural Commodities from 1996-97 to 2013-14

	Categories	1996-97		2011-2012		2012-2013		2013-2014	
		Qty (000 MT)	Ks. (Mil)	Qty (000 MT)	Ks. (Mil)	Qty (000 MT)	Ks. (Mil)	Qty (000 MT)	Ks. (Mil)
1	Rice	93.1	125.8	707.2	267.2	1396.8	544.1	1192.3	460.1
2	Maize	102.5	107.2	166.5	46.6	566.2	200.1	933.6	285.8
3	Pulses	594.8	1272.1	1296.4	986.1	1483.7	961.7	1300.9	896.3
4	Sesame	52.5	191	35.5	57.9	182.8	278.3	172.3	340.6
5	Others	33	175	52.1	139.8	92.7	228.5	156.3	231.5

Source: Ministry of Agriculture and Irrigation, 2014: Country Statement of Myanmar

5.2.3.1 Rice and pulses

Rice is Myanmar's staple crop, covering 8 million hectares, or 34% of the total planted area of 23.5 million hectares in 2010. Paddy production has increased considerably since the introduction of high-yielding varieties in the late 1970s and the expansion of double cropping of summer (dry season) paddy since 1992. However, area growth has contributed 16% more to production increases than yield growth, indicating strong reliance on area growth (Raitzer, Wong, Samson, 2015). Further, Myanmar has the second lowest rice yields in Asia, despite more favourable water and growing conditions in the delta region. As rice cultivation has contributed to mangrove loss in the Ayeyarwady River delta region, rice expansion could have future impacts on mangrove forests. Upland dryland cultivation of rice also occurs in shifting cultivation areas, but these systems are largely sustainable mosaics of forest and agricultural land. However, if such areas were altered to provide larger-scale commercial rice cultivation, forests would likely be impacted.

The government of Myanmar set ambitious targets to export 2 million tons of rice by 2014/15 and 4 million tons by 2019/20. While the 2014/15 target was not met, exports are increasing and the opening of Myanmar's economy and recent policy measures liberalizing exports have had influence. China is turning into a large net importer of rice, and the European Union opened its lucrative market for duty-free imports from Myanmar under the "Everything but Arms Agreement." A key challenge for exports is the cost of doing business and poor infrastructure. Almost all exports of rice flow through Yangon Port, yet it is one of the the most expensive ports in the world (World Bank, 2014).

Dry season paddy has seen stagnant yield growth, which is largely unchanged over the past 10–15 years, unlike other countries in the region. No new irrigation dams will be constructed, and irrigated fields only comprises 10% of total cultivation, and the remaining 90% of paddy is rainfed, indicating irrigation is not the answer to boosting Myanmar's yields (Htet Naing Zaw, 2016). Total cropped paddy area increased by 1.71 million hectares between 2000 and 2010, and 91% of that is attributed to monsoon paddy. With improved varieties, the greater solar radiation achieved in the dry season can significantly boost yields, and this season has seen greatest yield growth in other countries in the region (Raitzer, Wong, Samson, 2015).

Most of Myanmar's rice production serves the domestic market and farm households, with production hovering around the 12.2 – 12.5 million metric tons (MMT) range, though production was down last year due to flooding (and forest loss contributed to flooding risk and impacts). Myanmar's rice exports are forecast to decline to 1.5 MMT in 2016 as a result of lower rice production in 2015/16 (USDA, 2016). Myanmar's rice yields are about 2.7 tons per ha, whereas Viet Nams' average 5.5 tons, and areas producing the bulk of the exports can reach 6.5-7.5 tons per ha. Experts estimate that 23% increases in average yields are achievable in Myanmar within 5–7 years if necessary varieties, farmer support, supply chain and policy measures are promoted (World Bank, 2014). Seventy-five percent of the mills in Myanmar can only produce low quality rice, resulting in 88% of 2012 exports suffering 25% or more grain breakage, and most exports were shipped to Africa (World Bank 2014). Low-quality rice markets are decreasing their proportional share of global rice markets.

Government support and policy: The Myanmar Agricultural Development Bank (MADB) provides seasonal crop production loans to farmers of 100,000 Kyat (Ks) (US\$80) credit per acre, covering up to 10 acres, to paddy and sugar farmers with an interest rate of 5%. Seasonal loans provided by MADB in 2014/15 totaled \$960 million. The government also rents farm machinery to farmers for a nominal fee (USDA, 2016).

Spatial expansion potential for rice:

No assessment has made on how these increase production targets will impact forests. But the challenges in meeting yield growth raises concern that intensification may be harder to achieve than expansion.

Certain regions and ecosystems will see more expansion potential than others. It is expected mangrove conversion to rice and other agriculture to continue to displace large areas of mangrove in Myanmar in the future (Richards and Freiss, 2016). In fact, Webb et al. (2014) predict that if historical deforestation rates continued, Ayeyarwady mangroves (outside of Meinmahla Kyun Wildlife Sanctuary) could be completely deforested by about 2026. Losses are predicted to occur at a rate faster than other mangrove deforestation hotspots in the region, such as the Mekong Delta. The other key agricultural item coming from mangrove areas is of course aquaculture, exerting

pressure on mangrove forests for wood and charcoal in fish drying. Aquaculture is expected to increase, simply due to market demand, and given production in neighboring countries.

5.2.3.2 Oil palm

Oil palm yields have been lower than expected due to a failure to carry out proper research, and land use disputes with local residents have raised concern. In response, the Tanintharyi Region's Agriculture, Livestock and Irrigation Minister U Myint San is quoted by The Myanmar Times as noting that there is a need to reduce impacts on local residents and to prevent further environmental degradation, thus regional government seeks to increase yields instead of extending the plantation area (Aye Nyein Win, 2016).

The context of initial siting of oil palm plantations in Tanintharyi is fraught with complexity, as the majority of oil palm plantation concessions were granted on land which had customary rights users on it, some of whom were displaced by previous conflict (IDPs), and indications are that compensation was not paid to customary rights holders. This is recently exemplified in a lawsuit brought against farmers for trespass on an palm oil plantation that was sited and established after IDPs were moved onto that land (Burma News International, 2016). Due to years of conflict in Tanintharyi region and the forced movement of people, in some contexts there might be layers of legitimate land rights claims. However, customary land rights holders are at a significant disadvantage in this context.

Review of the management practices on palm oil plantations indicates poor land management. In many cases, soil surveys and topographical information was not considered in site planning. Steep terrain with slopes exceeding 25°, or marginal and fragile soils should be excluded from the area to be felled or prepared for planting, along with primary forest and HCV areas. The use of fire for clearing should be avoided. Riparian buffer zones should be identified (Baskett, 2015).

Baskett (2015) also indicates that in 2015, the Forest Department cancelled inactive concessions on reserved forest land with intact forest cover using the vacant farm land law and has made significant progress on securing remaining HCV in collaboration with FFI (in Myeik/ Kawthoung Districts) and Wildlife Conservation Society (in Dawei District) through a recent 10-year District forest management planning process. This process has defined plantation and production forest and protection forest working cycles for reserved forest, and ensured that large contiguous remaining old growth/primary forests remain permanent production and protection forests.

Though only one-third of the licenced areas for oil palm plantations have been developed, under the terms of their license agreements, land clearance must abide by annual schedules within four years of the start date of the letter issuing the licence. Land not cleared risks being taken back by government, and annual targets for clearance

are set regardless of whether the management capacity is there to develop accordingly (Baskett, 2015). The regional government must find solutions to this complex web of license agreements on land that is largely contested, being resettled by customary land rights holders, some of whom are IDPs and some returning from Thailand, and in a nebulous legal environment.

As for the ability of oil palm concessions to deliver on Myanmar's need for edible oils, Byerlee et al. (2014) identify that the current business model of providing large concessions to inexperienced domestic and foreign investors to produce oil palm may have limited success in substituting imports. The consumption of edible oils in Myanmar (currently well below the developing country average of 16.7 kg/capita/yr), will grow rapidly, there is not yet indication that domestic palm oil would be preferred in the market. To date, foreign investors largely do not have any prior experience in oil palm, and present significant economic, social and environmental risks. Other constraints include poor roads and high transport costs which are a major hurdle currently (15% of the delivery price for one plantation), but this may change with investments in the expanding road network. The lack of financing for investing in mill capacity, no systematic program to access suitable genetic stock, lack of adaptive research and location-specific technical information on production practices, and high turnover for migrant labor recruited and housed by the plantations are all challenges. In contrast to other regional producers, Myanmar has very few smallholders and SME's engaged in the sector.

5.2.3.3 Pulses, maize and other crops

In 2011, the area planted to pulses was estimated at 4.4 million ha (roughly 55% of the area planted to paddy). They are sown mainly in the central dry zone, but are also found in the delta, hilly, and coastal zones (Raitzer, Wong, Samson, 2015). Beans and pulses in Myanmar are normally grown immediately after the harvest of the main rice paddy crop in the delta region. They are also grown as a monsoon crops in the central plains. India's demand accounts for 80% of Myanmar's pulse and bean exports (USDA, 2016). Unless a significant increase in pulse and bean production occurs, this crop is not expected to have much impact on forests.

Government support and policy: The export tax on pulses and beans was 10% from 1988, when the trade policy was liberalized, to 2010. But the export tax was reduced to 2% in 2011, levied as income tax paid by exporters on their export income. An export licensing requirement was lifted in February 2013 (Raitzer, Wong, Samson, 2015).

Maize production in Myanmar is expected to grow to 2 MMT in 2015/16 and to 2.1 MMT in 2016/17 due to increased maize growing area and strong international demand, mostly from China (USDA, 2016). Domestic maize consumption is expected to track with the growth of domestic livestock industries, particularly poultry and swine. Most domestic supplies are delivered to feed mills located in Rangoon, Mandalay, and Shan

State. Maize exports are forecast to increase around 50,000 MT in 2016/17, and it is expected that 95 – 97% of Myanmar’s maize exports occur on the border with China. About 90% of Myanmar’s major corn production area is located in the northwest and eastern parts of the country (USDA, 2016). The Charoen Pokphand Group has a near monopoly on maize production in Shan State and the border regions, and maize cash cropping (through contract farming arrangements) has decreased food security for low - and some middle- capital households (Woods, 2015b). Increased maize production is expected to impact forests, if expansion occurs in forested areas, such as Shan state.

Government support and policy: No subsidy programmes currently exist for corn production. The Ministry of Agriculture and Irrigation has developed corn seed varieties for research and commercialization and holds an estimated 8% share of the corn seed market. There are no trade restrictions for corn exports, however, permits are required for the import of corn (USDA, 2016).

5.2.3.4 Rubber

The National Export Strategy identifies that the National Plan for Rubber Planting and Production (2013-2014 to 2015-2016) anticipates a production of 195,131 tons by the fiscal year 2015-2016, and most increases in production are to be gained by expansion of planted area, rather than increasing the yields on plantations. In fiscal year 2015, Myanmar exported 75,000 tonnes of rubber, though exports by the end of the year were hoped to be 90,000 tonnes (Chan Mya Htwe, 2016b). Rubber expansion into forests has occurred in Mon State and Tanintharyi Region, but also in Kayin, Kachin, Shan and Rakhine States (Republic of the Union of Myanmar, 2015b). As a woody biomass crop, rubber plantations on degraded land could increase carbon stocks and increase forest cover. However, it appears that in the past, a significant amount of rubber plantations were established at the expense of forests.

Exports are dominated by raw natural rubber, with 90% of exports consisting of Ribbed Smoked Sheets (RSS) and Technically Specified Rubber (TSR). Over 90% of exports go to China and Malaysia. It is believed that official export figures understate the value of the industry, as many companies smuggle rubber across to China to avoid paying taxes. The International Trade Centre estimates that the rubber products sector is quite small, with an exported value of US\$215 million in 2012, based on United Nations Comtrade statistics. Rubber was the ninth largest export product in Myanmar in 2012. However, the sectors employment rate is notable, as it is estimated by Myanmar Rubber Planting and Producing Association (MRPPA) to provide income to between 350,000 - 400,000 people (in 2012), mostly in the upstream activities of planting and production of raw natural rubber (Republic of the Union of Myanmar, 2015b).

Myanmar’s National Export Strategy (2015b) identifies core challenges to the modernization and productivity of the sector: the low quality of the country’s natural rubber, fragmented and small-sized agricultural holdings which lead to low and

unpredictable yields, lack of quality control on production inputs, poor sector organization, low value-addition and the use of unskilled labour.

The National Export Strategy brings a focus on improving the technology and practices of smallholders through the Generating Rubber Opportunities (GRO) project in southern Myanmar and better genetics of rubber trees. The GRO project is funded through the Swiss Agency for Development and Co-operation. It seeks to increase incomes and social capital of smallholder rubber farmers by improving knowledge, market access, management, and technical skills, while also brokering relationships between actors. The project has a particular focus on women's economic empowerment and on securing access to land, including in former armed conflict areas. The focus on improved genetics seeks to apply modern cloning techniques to improving rubber tree stocks. The project is funded through the Myanmar National Budget, and carried out through the Ministry of Agriculture and Irrigation, the Department of Industrial Crops. Efforts will build the technical capability for improved cloning practices, and development of clones that are more suitable for different regional ecological conditions (Republic of the Union of Myanmar, 2015b).

A law will govern the private rubber sector and will be drafted by the commerce, industry and agriculture ministries, in consultation with the MRPPA. The Japanese government is currently assisting the local industry to improve production quality (and presumably adjust the export tax structure) and thereby access the Japanese market (Chan Mya Htwe, 2016(b)).

Government support and policy: Though government has endorsed the National Export Strategy, there are significant changes to the tax system that the NES seeks. Rubber is the only agricultural commodity that as a 5% commercial tax, whereas all other agricultural products do not pay commercial tax. The NES identifies that there are commercial taxes at three points the supply chain—planters pay 5%, traders pay an additional 5% and exporters an additional 5% for every transaction—which makes production costs high. A direct consequence of this taxation system is the existence of illegal exporters who try to evade taxes, hence putting legal traders at a disadvantage. Therefore, the NES recommends the revision of the taxation system for rubber in order to develop the sector (Republic of the Union of Myanmar, 2015b).

5.2.3.5 Overlapping and conflicting priorities between the forestry and agriculture sector

The Ministry of Agriculture, Livestock and Irrigation's (MoALI) and Forestry Department are targeting the same lands to achieve their future goals and mandates. This creates an inherent and untenable conflict, and based on insights from expert interviews, there is not yet a process in government to resolve this substantial conflict. For now, proposals for development are brought on a case by case basis before a Central Committee, which does not have a mandate to look at sector-wide and cross-

sector policy and target conflicts. The Land Scrutinizing Committee was disbanded earlier this year and replaced by the National Land Use Council, which will seek to implement the National Land Use Policy. *Note: Refer to the policy and measure options and recommendations section for more insight on how the National Land Use Council can rectify these disconnects.*

As indicated in the driver section, the significant shift in forest to non-forest uses, particularly agriculture, has been the largest driver of change in Myanmar's forests. There is no concrete indication yet that this will change, given the following challenges that will need to be overcome:

Conflicting goals:

- The stated goal of the MoALI 30-year Master Plan for the Agriculture Sector (2000-01 to 2030-31) **aims to convert 10 million acres of 'wasteland' for private industrial agricultural production**, with rubber, oil palm, paddy, pulses, and sugarcane for export being particularly encouraged.¹⁰ **Much of this land contains residents under customary use and unclarified tenure and also contains forests and significant biodiversity.** ADB estimates that the 12.8 million ha/31.6 million acres of cultivated land holds the potential to be expanded by nearly 50%, by bringing the 5.67 million ha/14.01 million acres classified as "virgin and fallow land" or "cultivable wasteland" into production (Raitzer, Wong, Samson, 2015).
- Though the Forest Law allows for management of trees outside of the Permanent Forest Estate, these lands are under the management of MoALI through the Vacant, Fallow and Virgin Lands Management Law (VFV Law). It is unclear how management of these forests can occur, given overlapping and potentially conflicting mandates.
- Myanmar is seeking to ensure that its Intended Nationally Determined Contribution to the global climate agreement (INDC) can be implemented, which seeks the increase of Reserved Forest (RF) and Protected Public Forest (PPF) to 30% of total national land area by 2030 (up from 24.5%), and 10% of the land within protected areas (this reinforces a previous commitment by the country under the Convention on Biological Diversity). For climate change mitigation, Myanmar has identified forests and energy as the key sectors, given that 54% of the country's greenhouse gas emissions are from the forestry sector (Republic of the Union of Myanmar, 2015e). **The increase in RF and PPF would be roughly 4 million ha/ 9.8 million acres, which presumably would have to come from the 'wasteland' and/or 'other forest' category that MoALI seeks to increase agricultural production on.** Given the scale of unresolved customary land rights issues on these lands, achieving these goals presents challenges, but also opportunities if resolving land tenure conflicts is pursued as part of the solution.

¹⁰ A major response to this goal was an Agri-business summit in 2014 hosted by the Federation of Chambers of Commerce and Industry (UMFCCI) and supported by the Ministry of Commerce: <http://www.myanmaragribusinessinvestmentsummit.com/>

5.2.4 Energy

Given Myanmar's strong interest to provide affordable and accessible power and electricity to its domestic households, growing industries, and to export to neighboring countries, **energy production will have a significantly larger impact on the land base than it has had in the past.** Thirty-six million people do not have access to modern energy services (68% of Myanmar's total population). By the end of 2015, total FDI in the oil and gas sector exceeded \$14 billion, comprising 36% of total FDI in Myanmar (United Kingdom Trade & Investment, 2015). Despite the significant fall in global energy prices, recent oil and gas deals suggest that the medium-term prospects of Myanmar's upstream oil and gas sector remain positive (PWC, 2015).

Access to energy and electricity is a national priority for the new government. While electricity consumption (kWh per capita) in East Asia has expanded rapidly in the past 40 years, Myanmar's electricity access rates are among the lowest levels in the world. Experience from other countries demonstrates how, with the right policies, access to energy could be expanded quite rapidly within a relatively short period of time. The World Bank estimates that investment of US\$ 2 billion per year over the next 15 years will be required for power generation, transmission and distribution (Rab et al., 2015). New customer connections to the grid is not expanding as quickly as hoped for. Only 200,000 new customers were connected each year from 2013, and the World Bank estimates that at this rate, it would take 40 years to achieve universal access. If the connection rate could be increased to 500,000 new connections per year by 2020, and stay at least at that level for another ten years (Ostojic et al., 2016).

A draft Renewable Energy Policy was created in 2015, with support from the Asian Development Bank. Table 23 below summarizes sources of energy from different sources between 2001-2013, highlighting the large role biomass (wood) plays.

Table 23: Primary Energy Consumption in Myanmar (ktoe)

Source	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Petroleum	1688	1738	1622	1460	1481	1667	1665	1351	1245	1207	1998	1942
Natural gas	294	414	465	422	475	568	664	734	642	617	713	519
Coal and lignite	72	77	120	66	140	186	265	204	114	257	261	285
Hydro	237	272	300	305	339	339	346	366	389	482	2288	2440
Biomass (wood)	7912	8105	8388	8401	8561	8879	9131	9401	9665	9993	9506	9708
TOTAL (ktoe)	10203	10606	10895	10654	10997	11639	12070	12055	12055	12555	14766	14894

Source: Myanmar Renewable Energy Policy, citing Energy Planning Department, Ministry of Energy

As mentioned in Section 5.2.2, the National Electrification Plan could provide an important means of shifting rural energy use, as it aims to electrify more than 7.2 million households and achieve access to electricity for 36 million people by 2030. The Plan is not geared towards replacing or augmenting wood fuel for cooking, but rather household electricity.

Table 24: Electricity sources and access

Electricity Source	All Day Access	Partial Access
National Grid	90%	10%
Solar Panels	29%	71%
Village Diesel Generators	8%	92%
Batteries	2%	98%

Source: Myanmar Household Cooking Survey, EMC Analysis

5.2.4.1 Hydropower

Hydropower development impacts forests in a variety of ways, including through reservoir flooding, river diversion, facility development, access roads and infrastructure (even in run-of-river projects which can still have significant project footprints), as well as from transmission corridors and access roads to transmit power to markets. Though Forest Department data indicates that coverage of water decreased at the national level by approximately 185,000 ha over 2005 – 2015, hydropower development (and reservoir creation) occurred. Planned and pending hydropower projects will flood areas, and the associated deforestation impacts would depend on each project’s design. Such an in-depth analysis was not carried out as part of this study.

Myanmar has among the largest technical potential for hydropower in Southeast Asia, and is the least developed. Myanmar produces just under 5000 MW now from all sources of power, and of that, hydropower contributes 68% of the power from 3,005 megawatts of currently installed capacity (Nam, et al. 2015). Hydropower has been viewed as an important potential source of power for Myanmar, with relatively low construction costs compared to global averages, and high profitability if the electricity is sold at wholesale prices of 4-6 cents per kilowatt-hour (and would be even more profitable if Myanmar raised retail market prices to the regional average of 10 cents per kilowatt-hour. Some existing dams underperform in the dry season, requiring backup power from thermal sources, which is notably expensive (Dapice, 2016).

The International Finance Corporation (IFC) convened the first meeting in August 2016 of a Myanmar [Hydropower Developer’s Working Group](#), in order to provide a platform for companies to influence policy and partner on solutions to improve sustainability and business operations of the hydropower sector in Myanmar. The government has been the largest hydropower developer, but began allowing private sector participation following the enactment of the Electricity Law, and Independent Power Producers (IPPs)

reached 10% of installed generation capacity by 2015 (Rab et al., 2015). The Asian Development Bank and JICA pledged to help implement hydropower projects in Myanmar within the next 5 to 10 years. The IFC estimates that Myanmar's hydropower potential is up to 100,000 megawatts is more than 30 times the current capacity.

The Myanmar Ministry of Electric Power is either currently constructing or approved construction of 34 hydropower projects, totaling 33,724 MW, mostly in Kachin and Shan states. Table 25 below summarizes all known hydropower projects in construction or proposed, and these were confirmed with the Department of Hydropower Planning. Another six projects are on-hold or have unclear status at this time, totaling between 7,120 – 9,520 MW. The largest of these is the Myitsone hydropower project (3,600 – 6,000 MW) proposed for the Irrawaddy River, which has received considerable attention. The Myitsone dam, a US\$3.6 billion project approved by the former military regime and suspended by former President Thein Sein, would send 90% of its generation to China. The dam proposal sought creation of a reservoir of 766 sq km, or 296 square miles. Though construction began in 2009, Chinese authorities have not yet reached agreement with the new Myanmar government on the scope of the project, or how to address the range of environmental and social impacts in Kachin state and across the important Irrawaddy River system.

Table 25: Summary of known hydropower proposals and projects in Myanmar

No.	Location	Name	River	Capacity
Projects approved or under construction				
1	Bago	Bawgata	Bawgata River	160 MW
2	Bago/Kayin	Thaukyegat I	Thaukyegat River	150 MW
3	Bago/Kayin	Thaukyegat II	Thaukyegat River	120 MW
4	Kachin	Chibwe	N'Mai River	2,000 MW
5	Kachin	Pisa	N'Mai River	2,000 MW
6	Kachin	Kaunglanphu	N'Mai River	1,700 MW
7	Kachin	Pashe	N'Mai River	1,600 MW
8	Kachin	Laiza	Mali River	1,560 MW
9	Kachin	Phizaw	N'Mai River	1,500 MW
10	Kachin	Lakin	N'Mai River	1,400 MW
11	Kachin	Yenam	N'Mai River	1,200 MW
12	Kachin	Lawndin	Nawchankha River	435 MW
13	Kachin	Tongxingqiao	Nawchankha River	320 MW
14	Kachin	Hkankan	Nawchankha River	140 MW
15	Kachin	Gawlan	Nawchankha River	100 MW
16	Kachin/Shan	Tarpien I	Tarpein River	240 MW
17	Kachin/Shan	Tarpien II	Tarpein River	168 MW
18	Karen	Weigyi	Salween River	4,540 MW
19	Karen	Hat Gyi	Salween River	1,200 MW
20	Karen	Dagwin	Salween River	792 MW
21	Karenni	Moby	Balu Chaung River	168 MW
22	Karenni (Kayah)	Nampon	Nam Pon River	130 MW
23	Karenni (Kayah)	Namtabat	Salween River	110 MW
24	Mon	Bilin	Bilin River	280 MW
25	Rakhine	Laymro	Laymro River	500 MW
26	Rakhine	Tha Htay	Laymro River	111 MW
27	Shan	Maing Thung Tasang/Mainton	Salween River	7,110 MW
28	Shan	Kunlong	Salween River	2,400 MW
29	Shan	Shweli II	Shweli River	460 MW
30	Shan	Shweli III	Shweli River	360 MW
31	Shan	Namkha	Nam Kha River	200 MW
32	Shan	Mantaung	Salween River	200 MW
33	Shan	Nam Kok	Salween River	100-150 MW
34	Shan/Naypyidaw	Paung Laung	Paung Laung River	280 MW
Projects on-hold or with unclear status				
35	Kachin	Myitsone	Irrawaddy River	3,600-6,000 MW
36	Karenni (Kayah)	Ywathit	Salween River	600 MW
37	Sagaing	Tamanthi	Chindwin River	1,200 MW
38	Sagaing	Shwesayay	Chindwin River	600 MW
39	Sagaing	Mawleik	Chindwin River	520 MW
40	Tanintharyi	Tanintharyi	Tanintharyi River	600 MW
Projects suspended				
41	Shan	Naungpha	Salween River	1,200 MW

Sources: Dapice, 2016, adapted from ADB 2012 Energy Sector Initial Assessment, updated verbally with Department of Hydropower Planning in May 2016.

The Salween River has come under recent scrutiny, with six dams approved by the government in 2013. The 8 dams pro

posed or under construction on the Salween River seek to generate 16,452 MW. The undammed Salween River flows entire 2,800 km from Tibet, into Yunnan and then into Shan, Kayah and Karen States in Myanmar. The Salween River runs through important forest areas, and there are concerns about the impacts on the hydrology, forests, fisheries, and ethnic people who depend on the river for food and livelihoods.

The proposed Maing Thung (or Mon Ton; also Tasang/Mainton) is 7,110 MW, making it one of the world's largest proposed dams, and is proposed for the Salween River. Concerns have been raised that agreements made with Chinese Sinohydro Corporation and EGAT (Thailand's Electricity Commission) occurred without any parliamentary debate or public consultation, and that the majority of power generated would be for export to Thailand. Impacts on important forests and communities that depend on these forests are expected, and Shan and Karen ethnic communities have expressed their concern over the dam proposals.¹¹

The KNU Karen National Union and their armed wing, the Karen National Liberation Army (KNLA) seek protection of the forests and wildlife in the Mutraw District as the [Salween Peace Park](#), and seek peace and environmental cooperation with the new NLD government, under a self-management arrangement. Management could likely occur through the Karen Forest Department (Fawthrop, 2016). Shan State parliamentarians have called upon government to consider a hydropower policy, in order to ensure there is public input and debate on the benefits and risks of hydropower projects in Shan State and within Myanmar. This followed an announcement on 8 July 2016 by the Ministry of Finance and Planning that it was suspending the Nongpha/ Naungpha hydropower project on the Salween River (Shan Herald Agency for News, 2016).

The vast majority of these large-scale hydropower site locations are in largely forested areas that are still in civil conflicts, or just coming out of conflict, have post-conflict resettlement issues yet to be resolved, customary land tenure issues unsettled, and therefore present a challenge with regards to how to reconcile natural resource development before post-conflict rights and peace processes have been resolved.

Myanmar has gone further to approve these projects than China has, on its portion of the Salween, which is referred to in China as the Nu river. All 13 dam projects on the Nu suspended in 2004 by then-Chinese Premier Wen Jiabao, after geologists warned of earthquake risks. The suspension also followed a campaign led by Kunming-based NGO Green Watershed. Yunnan Provincial Secretary Li Jiheng recently announced a plan to go beyond suspension of the hydro projects, proposing the establishment of a new national park instead (Fawthrop, 2016).

¹¹ See: <http://www.irrawaddy.com/news/burma/salween-in-focus-for-burmese-civil-society-on-rivers-day.html>

5.2.4.2 Energy transmission and distribution

Energy transmission between Myanmar and its neighbours is expected to increase dramatically, particularly if hydropower projects are developed as planned, and in order to move oil and gas from Myanmar's coast. It is predicted that China could double its Myanmar oil link capacity, in order to reduce shipping through the Malacca Straights, which are a transportation choke point (OECD/IEA, 2015).

Most of Myanmar's gas production occurs in offshore fields. The Yadana, Yetagun and Zawtika fields largely supply Thailand, while the offshore Shwe field largely supplies China's Yunnan province through a new pipeline. New licenses were granted in 2013 (16 onshore and 20 offshore), mainly going to major international companies.

The Association of Southeast Asian Nations (ASEAN) member countries have long supported the concept of interconnecting their power grids to facilitate cross-border electricity trade and to improve access to energy services. The Greater Mekong Sub-region (GMS) aims to facilitate a sub-regional market with interconnections and electricity trade among Cambodia, Lao PDR, Myanmar, Thailand, Viet Nam and China's Yunnan province. Proposed by the Asian Development Bank in 1992, the GMS initiative expects that more than 16% of the power supply in the sub-region will cross borders by 2025. The GMS initiative is currently at the stage of trading electricity between an independent power producer in one country and utilities in another using dedicated transmission lines, but the plan is to eventually enable electricity trade between any two countries using the transmission facilities of a third (OECD/IEA, 2015).

A planned power connection between Thailand and Myanmar would be one of the largest in the region, at 11,709 MW, and travel through TaSang – Mae Moh, Mong Ton – Sai Noi, Hutgyi – Phitsanulok, Mai Khot - Mae Chan - Chiang Rai. As this report did not rely on spatial assessment of proposed transmission lines, it is not possible to estimate the impacts of these transmission corridors on forests in these regions, which are largely on the forested regions along the eastern border, in Shan and Karen States. As with the majority of hydropower facility siting, these transmission lines are proposed in largely forested areas with unsettled land claims with ethnic people.

5.2.5 Mining

The future of mining in Myanmar is unclear at this time, as the Ministry of Mines is now under MoNREC and a new direction for the industry is being drafted. Based on our interview with the Mining Department, no new permits are being issued at this, but rather they are working on existing ones. The Mining Rules (of 1996) are under discussion for revision. Most mining occurs on forestland. The amount extracted from mining sites for most materials is not determined by the Department of Mines (such as gold, coal, precious stones like jade, pearl). Efforts are underway to address Illegal

extraction of minerals by improving collaboration between regional and state ministers and authorities, and the mining staff in each of state and region. Staff capacity building trainings have been supported by Korea and Japan. A project with a German Organization is being pursued for 2 years with the aims to train inspectors for better conservation of the mine areas and environment. In southern Shan State, a model project is being developed for community engagement. Efforts are also underway (as per newly revised Mining Law) to include medium-scale mines (including the area, occurrence and amount of extraction allowed), which was a new addition to the Law. Further, the Department is handing some authority to regional governments for power-sharing (personal communication, Mining Department).

Though no new licenses/permits are being granted, mining at existing operations continue at a strong pace. The Asia Miner website reports that 29 mining trucks (91 and 55 tonne capacity) have been delivered to the Hpakant mine area, and are now working every day, only undergoing scheduled stoppages for planned maintenance and servicing (ASIA Miner News, 2016).

Information consultations with Canadian mining companies that have investigated joint-ventures or investment opportunities in Myanmar indicates strong unwillingness to invest in areas with ethnic conflict, due to reputational and operation risk issues, even if potential profits were very high. Indications are that companies that already have relations (such as Chinese companies) would not face the same risks to attract finance.

No projections on future mining were made for this study, as government is revising its approach, the Myanmar Extractive Industries Transparency Initiative is underway, and foreign direct investment appears very unstable due to the conflicts in most regions with deposits.

5.2.6 Road and transportation networks

The current road network is comprised of 150,816 km of roads, 33,014km of which are paved. Myanmar shares borders with Bangladesh, China, India, Lao PDR and Thailand, and thus sits in the historically and geographically advantageous position of being at the crossroads between China, South Asia and Southeast Asia. KPMG notes that Myanmar's proximity to Asia's largest and fastest growing markets offers great opportunity for Myanmar to become the land link between China, India and the ASEAN countries. Existing cross-border road links with China, India and Thailand are limited and poor in quality (KPMG, 2013).

Myanmar's transport sector is very under-developed compared to its neighbors, though that has potential to change. In 2011, Myanmar's number of vehicles per 1000 people was about 38, much lower than Thailand's ratio of 432 and Lao PDR's of 171. The number of vehicles in Myanmar has more than doubled from 960,000 in 2004 to

2,354,000 in 2011, and the strong growth trajectory is expected to be maintained as the economy continues to expand (ibid).

Under the Framework for Economic and Social Reforms, the Myanmar government has indicated high priority for infrastructure projects to improve land connectivity and transportation links with regional economies to boost economic integration and fulfil the country's commitments under the Master Plan on ASEAN Connectivity. Also emphasized is rural-city connectivity and the maintenance and upgrading of existing road infrastructure. China's One-Belt-One-Road initiative, to be funded by the China-initiated Asian Infrastructure Investment Bank (AIIB), expects to deploy upwards of US\$40 billion for a Silk Road infrastructure fund, to boost trade and connectivity across Asia, and Myanmar is a focus for investment.

New road links with key trading partners are expected given the boom in Myanmar's commodities sector and growth in foreign trade. A Chinese firm is building the 312km Myitkyina-Pangsau Pass (connecting to India's Arunachal Pradesh state) section of the 1,079km Stilwell Road. A road linking the city of Dawei with Thailand's province of Kanchanaburi was recently completed. It is expected that new cross-border links will also complement existing road links, such as the Mandalay-Lashio-Muse road with China, and meet additional connectivity requirements as a result of upcoming special economic zone projects in Kyaukphyu and Dawei (KPMG, 2013).

Future road construction will impact forest areas, particularly those being developed in border areas near more heavily forested areas. But the larger impacts will likely be from associated development along roads. Flora and Fauna International has mapped deforestation between 2000 and March 2016 around

Lenya and Lenya Extension in Tanintharyi region. The figure at right illustrates how proximity to roads enables deforestation, with dark orange patches clearance between 2010-2015, and red patches indicating change between 2015-2016. This is the road between Thea Hpyu and Maw Taung near the Thai border (FFI, 2016, unpublished).

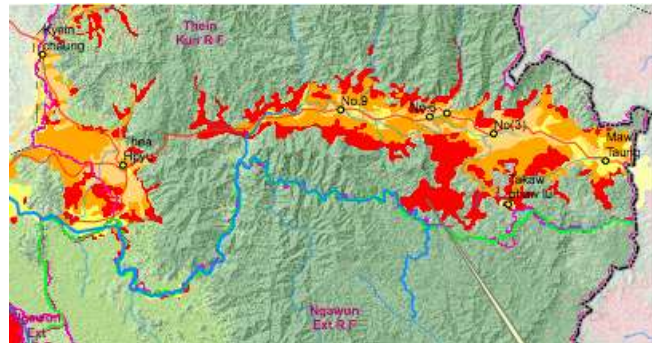


Figure 14: Deforestation along road in Lenya National Park Extension (2000-March 2016)

Source: Flora and Fauna International, 2016, *unpublished*

Similar patterns have been identified by Kramer and Woods (2012) with the rapid establishment of rubber concessions in Kachin and Shan states along roads. In Kachin, every major road constructed since 2005 now contains rubber plantations along it includes the routes leading out from provincial capital Myitkyina northwest to Namti and Danai, southwards to the KIO-controlled town of Laiza, and further down to Bhamo.

In Northern Shan State, thousands of hectares of agricultural concessions (mostly rubber) are found along the Burma Road, leading north from the city of Lashio to Muse on the Yunnan, China border. Other roads, such as the one leading from Lashio to Mone Yaw, and from the town of Nam Tu to Muse, as well as around Thein Ni town, are also lined with rubber plantations. Eastern Shan State shows similar patterns. The establishment of rubber plantations is often accompanied by the creation of “rubber plantation villages” which brings in labour from other areas, increasing land and natural resource use pressures, and even displacement of existing residents, in these areas.

5.2.7 Special Economic Zone development

The 2014 Special Economic Zone (SEZ) Law allows for investment permits, and businesses operating in these contexts can access benefits including a seven year income tax exemption after commencing commercial operations, the opportunity to lease and develop land for a period not exceeding 50 years (renewable after 25 years), the ability to engage in import-export activities, and a mechanism for repatriation of capital and profits.

Myanmar seeks to promote foreign direct investment through three SEZs:

1. Dawei Special Economic Zone in the Special Economic Zones / Industrial Zones southern Taninthayi region, with Thai investors, and government support from Myanmar, Thailand and Japan.
2. Kyaukphyu Economic and Technology Zone in the western Rakhine state, with investment from China’s CITIC Group of Companies. A deep sea port is envisaged, with pipeline project to transport of oil and gas into China’s southwestern provinces.
3. Thilawa Special Economic Zone near Yangon, with assistance from Japan.

Myanmar has 18 private-operated industrial zones across the country, which contribute about 20% of the country’s gross domestic product. The country also plans to establish 7 local industrial zones in addition: Tatkon in Nay Pyi Taw, Yadanarbon in Mandalay, Hpa-an, Myawaddy and Phayathonzu in Kayin state, Ponnagyun in Rakhine state and Namoum in Shan state.

The Dawei deep seaport and SEZ development is of particular interest related to Tanintharyi’s forests, as it seeks to establish itself on 196 sq km of coastal land, develop a deep sea port, and major road connection linking Myanmar with Thailand, and establish large-scale industries such as a petrochemical power plant and steel mills. However, concern has been raised that the Dawei SEZ might encroach upon the lives of 22,000 to 43,000 people, and has already destroyed farmland, polluted bodies of water with heavy metals and fertiliser chemicals, blocked access to coastal areas for small-scale fishing, and tripled local cancer rates (Franco et al., 2016).

The Dawei Special Economic Zone Company Limited is providing financial assistance, while the MIE Company Limited has finished implementing basic infrastructural development, including that of the deep seaport, on 27 square kilometers of land (2,700 hectares).

As of August 2016, the new government has announced two committees—a SEZ Central Management Committee and Central Working Committee—to review existing and new SEZ's and related operational aspects and to liaise with state and divisional authorities.

An OECD review of investment policies in Myanmar notes that in general, SEZs around the world are noted often missing broader development goals, creating enclaves with limited connections to the local economy, where foreign companies mainly contribute to export hubs, rather than fostering dynamic industry clusters, and can have negative socio-economic impacts. The OECD identifies the following risks for Myanmar's SEZs: government-dominated SEZ oversight boards (lack of private sector and community representation), challenges with monitoring the environmental and labour standards in the zones, and the need to improve the general investment climate in Myanmar, not just focussing on attracting capital to SEZs. The OECD finds the SEZs could be used as effective pilot schemes for testing new approaches to boost the investment climate, streamlining registration and licensing procedures (testing the effectiveness of the one-stop services stipulated in the SEZ laws), and building capacity for monitoring the environmental, social and economic impact of the investments in the zones (OECD, 2014). This provides a potential opportunity for relevant government agencies (including the Forest Department) and affected regions/communities (particularly Dawei, Tanintharyi) to define more transparent and inclusive processes for deciding upon SEZ developments, evaluating social and environmental impacts, and monitoring mechanisms.

5.4 Financial factors – international

Many of the pressures from regional and international demand is already covered in Section 5.2 on commodity and regional economic demand factors. This section covers the financial dimension, through increased Foreign Direct Investment (FDI), which ranges from rice demand to hydropower purchase contracts. While the US, Europe and Japan have lifted sanctions in stages since 2011, with the final lifting of US sanctions in October 2016, the scale of FDI flowing into Myanmar is unprecedented.

As the fiscal year ended in March 2016, it became clear that FDI grew to nearly \$9 billion, more than double what it was in 2013/2014. In 2009/2010, the year before the military ceded power, FDI was only \$329.6 million. Singapore is the largest source of foreign investors (and is recognized as a base for foreign investors to establish companies that can then invest in Myanmar), followed by China, Hong Kong and the

Netherlands. That investment is flowing into the oil and natural gas sectors, special economic zones, transport, and telecommunications.

In 2014, the Directorate of Investment and Company Administration (DICA) shared that power, oil and gas comprised 2/3 of all FDI. Other sectors include manufacturing, transport & communication, mining, real estate, and hotels and tourism, and combined with power, oil and gas, accounted for 97.72% of FDI in 2014. Agriculture only accounting for .46% of FDI. This estimate of agriculture sector FDI also may be significantly less than actual FDI, given the common practice of not reporting investments in order to avoid taxes and fees. Domestic investments are mainly concentrated in the manufacturing, construction, hotel and tourism sectors. Mining and agriculture only account for .28 and .01 of domestic investments (PWC, 2015).

The Myanmar Investment Commission (MIC) has the power to approve or reject investments entering Myanmar, and is currently in a reorganization process under Myanmar's new government, according to the new Foreign Investment Law and the Myanmar Citizens' Investment Law. The New Investment Law will enable MIC and DICA to operate as a separate entity and no longer under the Ministry of Planning and Finance.

The Myanmar Investment Commission Notification No. 26/2016 lists the following relevant economic activities under prohibition, a) activities which are deemed to deteriorate the watershed forests, sites for religious and spiritual affairs, pasture land, cultivated farm land and water sources, and b) the management of natural forests (Republic of the Union of Myanmar, 2016 (a)). Natural resource-based investments need Myanmar-based partners, and all other industries do not require this arrangement. That said, foreign investment is allowed on a case by case basis, through joint-ventures or production sharing contracts. Different standards appear to exist in contested ethnic regions.

The new investment law contains changes that are beneficial to land and forests, however the steps and procedures are different from current practice, and capacity will need to be developed to support a strong EIA/SIA process. Section 42 of the new Myanmar Investment Law prohibits businesses investing in businesses which may cause damage to the natural environment and ecosystem. Section 66 of the new law stipulates that a responsibility of investors is to 'pay effective compensation for losses incurred, if the investor causes damage to the natural environment and causes socioeconomic losses, such as that caused by logging or extraction of natural resources, which are not related to the scope of the permitted investment.' The section also stipulates that the permit or endorsement from MIC must have prior permission by the environmental conservation law and the procedures of analysis of environmental impact and 'shall report the conditions of measure and necessary analysis of environmental and social impact to the Commission along the period in which the activities of the investments taking permit or endorsement of the Commission.' (Republic of the Union of Myanmar,

2016 (b)). The practice between the 2012 investment law and the new draft version allowed DICA to issue investment permits after consulting the line agency/ministry, and then the environmental and social impact assessment (EIA/SIA) could be submitted by the applicant within 6 months after the permit is granted (personal communication, DICA Policy and Legislative division). Current practice indicates that the older EIA/SIA procedures are being applied, not the new procedures the ECD has put forward. Further, **it appears that environmental compliance licenses are applied for in parallel with MIC application processes, making it difficult for MIC to really evaluate environmental compliance and potential impacts.**

The new Investment Law allows investors to lease and develop land for a period not exceeding 50 years, but renewable for two terms of 10 years each. The initial 50 year lease period can be lengthened for investors investing in less economically developed and remote regions. The law allows for repatriation of capital and profits, at market values, after tax obligations are met (Republic of the Union of Myanmar, 2016 (b)). Land lease agreements are important for approvals (personal communication, DICA Forestry, Agriculture, Livestock, Fisheries, and Food Processing Division)

In practice, businesses can operate and investors can invest without the MIC permit, as an MIC permit is not compulsory. Businesses and investors can simply work with local governments for approvals, so it is at the businesses discretion to decide whether to seek a permit or not. Those seeking a permit will likely decide to apply if they can benefit from MIC incentives, such as tax exemption, or foreign worker permits.

Companies are requested by DICA to provide input on their Corporate Social Responsibility (CSR), so that there is some social benefit (1-2% of overall profits). Companies are asked to submit their financial statements yearly, so that MIC can review (personal communication, DICA Policy and Legislative division).

6. Recommendations for options and pathways to address direct and underlying drivers

Myanmar is already implementing measures to reform the current governance and institutional arrangements in the forestry sector, restructure MTE, and create the space for defining solutions by instituting a time-limited ban on timber production. **But what is so far lacking is an overall programmatic plan for forestry sector reform that includes the linkages to other sectors within its scope, that addresses not only the deforestation, forest degradation, and “plus” activities of REDD+, but also the immense need for improved transparency and legality, domestic market needs and opportunity to better serve communities.** As Springate-Baginski et al. (2014) succinctly describe relative to implementing FLEGT reforms: “Reforming the legality of the timber trade without addressing its underlying non-democratic nature would neither fulfil

citizens' democratic aspirations nor have lasting impact and political stability. With democratisation emerging after almost half a century of military dictatorship and more than a century of colonial disenfranchisement before that, the task of social and institutional reorganisation is inevitably profound. Effective forest sector reform therefore demands a fundamental programme, in which the FLEGT process can play a necessary part, but is not in itself sufficient.” The same framing applies to the REDD+ context (which will rely on improved legality to reduce pressure on the forest) and also applies to how Myanmar achieves UN Sustainable Development Goals (SDGs), given how closely livelihoods are inextricably linked to the forests.

Therefore, this section proposes criteria for selection of PAMs that can achieve greatest synergy with multiple goals.

6.1 Recommendations for criteria to prioritize strategic options and pathways to address direct and underlying drivers

This section provides an initial basis for considering policy and measure (PAM) measures in the REDD+ context. This section should be deliberated on and revised by the various technical working groups as part of refining the REDD+ National Strategy.

The Cancún Agreement (COP 16) on REDD+, *“Decides that the (REDD+ activities) undertaken by Parties should be implemented in phases beginning with the development of national strategies or action plans, policies and measures, and capacity-building, followed by the implementation of national policies and measures and national strategies or action plans that could involve further capacity-building, technology development and transfer and results-based demonstration activities, and evolving into results-based actions that should be fully measured, reported and verified (Decision 1/CP.16, paragraph 73).”*

This driver assessment seeks to document the range of pressures in Myanmar’s forests primarily looking into the future, in order to provide a stronger sense of what policies and measures could be put in place today to anticipate those future driver pressures.

Based on the development of Myanmar’s REDD+ programme, the governance changes underway in the country after years of economic isolation, and the progress the country is making in land sector governance reforms, **Myanmar’s REDD+ programme should seek to define a transformational pathway for forest management, which also supports greater coordination and alignment with other sectors that drive pressures on forests.** Given that FLEGT seeks to achieve many of the same objectives, efforts to align REDD+ and FLEGT initiatives is prudent. Due to the millions of people in Myanmar who derive benefits from forests, and the significant percentage of those under customary tenure arrangements, and including those living in ethnic conflict areas, REDD+ PAMs should articulate an overall strategic architecture to guide a series of

actions and interventions that will serve multiple benefits. In this manner, REDD+ PAMs should seek to deliver on environmental, social and economic outcomes, thus defining a comprehensive approach to forest sector reform, embedding forests into sectoral activities including hydropower and energy, agriculture, livelihoods and forging cross-sectoral solutions for economic development that achieves green growth and social inclusion. One model of how this can work is Brazil's success with the Plan for Prevention and Control of Deforestation in the Legal Amazon,¹² which defined a series of comprehensive, integrated and intensive PAM interventions including: improved regulatory enforcement, incentive-based mechanisms, reversing fiscal incentives that drove unsustainable land use, defining clear and secure land rights, increased monitoring, and changing other sector plans to align with priorities (one example being the steel sector development towards lower carbon emissions and less deforestation, particularly illegal logging for charcoal production).

The new government's 100-Day Plan emphasizes the intention for peace and tranquility, protecting national economic well-being, national reconciliation and peace, genuine federal democracy and promotion of socio-economic conditions for people. The 100-Day Plan directs MoNREC to reduce pressures on forests, increase finished products, reduce illegal products of teak, wildlife and natural trees, implement 10 Year district Forest Management Plans in 68 districts and promote tree planting (Republic of the Union of Myanmar, 2016f).

Box: Sustainable Development Goals

SDG 1: No poverty
 SDG 2: Zero hunger
 SDG 3: Good health and well-being
 SDG 4: Quality education
 SDG 5: Gender equality
 SDG 6: Clean water and sanitation
 SDG 7: Affordable and clean energy
 SDG 8: Decent work and economic growth
 SDG 9: Industry, innovation, infrastructure
 SDG 10: Reduced inequalities
 SDG 11: Sustainable cities and communities
 SDG 12: Responsible consumption, production
 SDG 13: Climate action
 SDG 14: Life below water
 SDG 15: Life on land
 SDG 16: Peace, justice and strong institutions
 SDG 17: Partnerships for the goals

Source: United Nations (2016)

The Sustainable Development Goals (SDGs) provide a useful lens for Myanmar to evaluate development options in order to best serve multiple benefits, and they are highly relevant to evaluating REDD+ intervention options, in the context of providing sustainable economic development. While many of the SDGs (refer to box above) pertain to REDD+ implementation in Myanmar, the most directly related ones include SDG 13, "Climate action," to take urgent action to combat climate change and its impacts, and SDG 15, "Life on Land," which seeks to sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss (United Nations, 2016).

¹² See: <http://www.mma.gov.br/florestas/control-e-preven%C3%A7%C3%A3o-do-desmatamento/plano-de-a%C3%A7%C3%A3o-para-amaz%C3%B4nia-ppcdam>

Based on the direct and underlying drivers identified in this report, policy and measures to achieve REDD+ objectives should seek to deliver on the following strategic objectives:

8. Develop a **long-term plan for addressing future pressures on forests from outside the forestry sector**, to reduce sectoral conflicts and achieve multiple benefits.
9. **Provide the operational plan for achieving Myanmar's INDC goals** related to the forest sector, and also the woodfuel/cookstoves component.
10. **Define tangible actions to help Myanmar operationalize SDGs**, such as solutions for poverty (such as increased revenue through Community Forests), and long-term social and economic benefit (such as through healthy, well-managed forests that can provide multiple benefits and values to people, support domestic needs and value-addition, and reverse degradation through enrichment planting and afforestation).
11. Provide a re-design of Myanmar's forest sector within the timeline of the logging ban which provides solution space, and far beyond into the future, with a strategic view as to **what REDD+ can help enable beyond the reforms already currently being undertaken**, and **how REDD+ can provide strategic architecture to guide a series of actions and interventions** that will serve multiple benefits.
12. Provide viable **solutions to long-standing ethnic region and land tenure conflicts, to provide stability and security to people living in and relying on forests for their livelihoods**. This is inextricably linked to other related resource questions such as mineral rights, jurisdictional authority and decision-making over resources (e.g. co-management), revenue capture and distribution from natural resources, and the peace processes to resolve conflicts.
13. **Address illegal logging, corruption and related activities**, and therefore alignment with FLEGT is crucial to achieve greater transparency and accountability in forest sector governance and wood product flows.
14. **Defining a long-term vision for the management of Myanmar's forests** that seeks to retain existing in-tact and high-carbon, high-conservation value forests, while defining new business models for Myanmar's production forests, in ways that also supports the needs of local people, particularly those with customary tenure.

Relative to point number 5 above on solutions related to ethnic region conflicts, a recent report by the Special Rapporteur of the Human Rights Council on the rights of ethnic minorities in land management defines clear steps government of Myanmar can take in recognizing and accommodating the rights of ethnic minorities in land management, decision-making and sustaining livelihoods (see box below).

Observations from the Special Rapporteur of the Human Rights Council on rights of ethnic minorities in land management:

- Undertake all necessary measures for the effective implementation of the United Nations Declaration on the Rights of Indigenous Peoples and ratify the ILO Indigenous and Tribal Peoples Convention No. 169.
- Adopt all necessary policy, legal and administrative measures for the full recognition of the rights of indigenous peoples over their lands, territories and resources as enshrined in international human rights law.
- Review and harmonize the environmental, legal and institutional framework with their obligations regarding the rights of indigenous peoples and ensure that a rights-based approach is applied to (land management, including concession rights being granted, creation or expansion of protected areas, etc.).
- Comply with the duty to consult and obtain the free, prior and informed consent of indigenous peoples (before making decisions on) initiatives which may affect their rights.
- Support partnerships between government authorities and indigenous peoples to encourage intercultural engagement in order to build trust and collaboration
- Comply with judgments and decisions of international and regional human rights monitoring mechanisms regarding indigenous peoples' rights.
- Establish accountability and reparation mechanisms for infringements on indigenous rights and provide redress for historical and contemporary wrongs (Tauli-Corpuz, 2016).

Proposed criteria for evaluating PAM options:

Driver assessment (the content of this study):

1. What are the primary direct and indirect drivers of deforestation and forest degradation currently? How are they different in each state/region?
2. How will future driver pressure differ from historic ones?
3. What are the enabling or underlying driver forces that influence the driver?

Strategic assessment of PAM options:

1. How to have the largest impact on key drivers? 'Impact' in this context should be defined as bringing about significant change from business as usual, and having the largest ability to positively impact forest carbon stocks.
2. How to best affect the relevant actors that drive change in the forest, and at the relevant scales (from local to national and international)

3. How to promote the enabling factors that are critical for the interventions to succeed (such as capacity-building and transparency/accountability)?
4. How can interventions contribute to the PAM strategic objectives, such as INDC goal, SDGs, solutions to ethnic region and land tenure conflicts, illegality, etc.
5. How can interventions contribute to multiple REDD+ objectives simultaneously (emissions reductions and non-carbon benefits such as providing for livelihoods)
6. How can inclusion of stakeholders and adequate consultation be promoted in assessment of PAM options?
7. What current priorities policies, activities and programmes exist to address the driver? Are they effective?
8. What priorities, policies, activities and programmes work against addressing the driver (or promote it)?

Pathways forward:

1. What is necessary to operationalize the PAM intervention?
2. Which ministries/departments need to part of the solution, and which one is best positions to take a lead? Who are the key stakeholders necessary to forge solutions? What mechanisms are required to operationalize the PAM intervention (e.g., legislation, ministerial decree, private sector commitment etc.)?
3. What incentives operate at what scale (local, national, international)? What is the best tool to influence these (e.g. incentives ('carrots'), regulations ('sticks'), or both) that can minimize public risk while maximizing public gain, and also maximize aligned private investment?
4. What underlying or enabling factors need to be in place to effectively operationalize the PAM? This may include socio-economic factors, governance and institutional factors.
5. How can the PAM promote better policy and incentive coherence?
6. What are the environmental, economic and social impacts of PAM interventions? How are the short-term impacts different from long-term ones? How can negative impacts be minimized, and benefits maximized for rural communities and stakeholders?
7. How can compliance and enforcement with existing and new laws can be enabled?

Consideration can also be given to the non-carbon benefits that are related to PAM interventions across the range of REDD+ activity areas, as Table 26 below identifies:

Table 26:

REDD+ activities	Indicator	Possible interventions	Non-carbon benefits
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Reducing emissions from deforestation	Reduced rate of forest loss	Restrictions on conversion timber and degazettement of forest to other uses	Increased local, CSO and District-level CSO involvement in forest governance
Reducing emissions from forest degradation	Reduced rate and volume of timber extraction	Export ban, logging ban, reduced logging, harvesting within AAC	Longer-term ecosystem service and economic benefits to support local communities
Conservation of forest carbon stocks	Strengthening and expansion of protected area network	Policy targets of PFE, extending PFE as per INDC	Improved provision of ecosystem services
Sustainable management of forests	Increased land under sustainable management	Strengthening SFM, improved timber tracking, FLEGT, Land Use Policy, Community Forests	Increased local value from timber and NTFPs, ecosystem service provision
Enhancement of forest carbon stocks	Increase in reforestation and afforestation, natural regeneration and enrichment planting	Reforestation (large scale and through community forests), Agroforestry	Increased revenue for Community Forests, utilization of diverse species for food, fuel, timber

6.2 Recommended interventions to affect drivers

The list of drivers and potential PAM options below is not prioritized yet by relative importance, **though reconciling disconnects between the agriculture sector and forestry sector, over-exploitation of forest resources, and illegal logging** and trade are clearly areas of high priority.

REDD+ PAMs in Myanmar should be viewed as a comprehensive bundle of interventions comprised of a series of objectives, many of which are interdependent on each other. More detail will be defined as part of development of the REDD+ National Strategy to refine strategic objectives, and thus this section provides a basis for stakeholder consultation and input on possible PAM interventions. Once stakeholders have forged a final set of strategic priorities and objectives and it will be helpful to set operational targets to achieve objectives. Policy and measure interventions then carry out the objectives.

General considerations regarding cross-sectoral coordination:

- Ministry of National Planning and Finance is beginning an integrated planning process, based on sectoral plans, so this is a key avenue (among a few that are

- necessary) to avoid conflicts between sectors. The FD could convene a working group on sectoral coordination through these channels.
- The National Land Use Council is building towards the National Land Use Law, and this provides a crucial opportunity to define solutions. Work is underway on spatial planning for regions and states, the Land Use Policy must be finalized, and One Map is not yet finished.
 - The National Land Use Plan envisions that, "...a new National Land Law shall be drafted and enacted, using the National Land Use Policy as a guide for the harmonization of all existing laws relating to land in the country (Republic of the Union of Myanmar, 2016(d))." Yet the LUP defines that District level land use plans, and District Land Use Committee's may define the relevant zones in their Districts, and once these are finalized, these approved land use zone records will be fed back to national, region or state, and self-administered division or self-administered zones so that they can revise land use plans in response. It is unclear how a national view towards national land use planning (such as overcoming the conflicts between the agriculture and forestry sector, such as identifying most suitable areas for PFE expansion) can be achieved in this context. It is unlikely Districts will have a national-level perspective in their planning, in order to evaluate whether increasing forest cover or allowing more agricultural expansion makes sense. However, if Districts had recommendations from line ministries on suitability of specific uses, or particular risks such as downstream impacts from allocating a certain % threshold of land to commercial uses, that could enable national- and regional-level evaluation of trade-offs. More information is needed to understand this process, and how **multi-sectoral trade-offs can be evaluated in the process of District-level land allocation decisions**.
 - There is an opportunity to see how REDD+ safeguards can help support development of monitoring and evaluation information, processes and assessments which the LUP identifies as part of the process, with recommendations, "(to) be annually reported to parliament, Union Government and relevant departments, and the public." The M&E process is envisioned to follow a range of criteria to evaluate effectiveness against, including adequate inter-ministerial cooperation, safeguards, compliance with laws, multi-stakeholder processes for development of new laws, and others.
 - The details of the National Land Law are not yet known, nor is the roadmap clear as to how each ministry will implement these components, timelines for doing so, timelines for district level LUPs, etc. So, much to stay on top of here as government moves forward with operationalizing this policy, and we really need to better understand the One Map initiative, and how the land use planning maps to be completed as part of this policy fit, among many other components of this jigsaw, the potential impact of decentralization on a national commitment such as REDD+, etc.

General considerations regarding revenue-sharing:

- First, REDD+ provides a framework for countries to access performance-based payments for verified emissions reductions. Many countries participating in REDD+ hope that such payments will be forthcoming now that the Paris Climate Agreement has been adopted, and the Green Climate Fund operationalized. While Myanmar holds great potential to achieve performance-based payments after the readiness phase is complete, and Myanmar implements PAMs to reduce pressures on its forests, the benefits to Myanmar from better governance and revenue-capture in forest-rich regions could far exceed REDD+ payments. Myanmar has an important opportunity now, with the new governance reforms occurring, logging ban, restructuring of MTE, new rules for Community Forests, to fundamentally bring far greater value from better management of Myanmar's forests to its people. These reforms should contribute to achieving REDD+ objectives. It will be beneficial to view the governance reform, improvements in information systems (such as NFMS), strategic interventions and PAMs, safeguards, MRV capacity-building as tools to achieve the transformational change in the forestry sector that is necessary to bring better value to Myanmar's people. As such, performance-based payments may then be 'icing on the cake.'
- The new government has indicated interest to work towards a more fair distribution of profits from natural resource extraction, within federal union arrangements. Civil Society organizations in Kachin State (and other regions) are requesting information disclosure on natural resource extraction, taxation, licensing processes, and revenue sharing in respect of their "Right to Know" (Burma Partnership, 2016). These will be crucial elements in resolving conflicts with ethnic regions, fiscal decentralization processes and providing more fair distribution of natural resource revenues.
- The 2008 Constitution mandated that all public oil, gas and mining tax and non-tax revenues are collected directly by the Union government or state-owned entities. The land tax is jointly administered by the GAD and the Department of Agricultural Land Management and Statistics (DALMS) on behalf of state and regional governments. The GAD also has a role in some land-titling activities. Dapice and Nguyen (2013) propose changes to the land tax to include a 20 acre deductible (the upper 7% of holdings are > 20 acres twenty acres) to help fund local services and even to provide compensation for past land seizures. A land tax would also discourage large speculative and unproductive holdings of land. More insights are necessary to understand what options can have positive impacts for forests.
- Transfers of these resource revenues and general revenues to subnational governments have been made on an ad hoc basis, but this could change. As Myanmar decentralizes and devolves power to subnational authorities, the overall size of transfers is also increasing every year (Bauer et al., 2016).

- State and regional governments are expected to increase their role in revenue collection and can reform economic governance in areas including municipal governance, fisheries, forestry, land, agriculture, and others. Most administrative authority rests with the state and regional governments, which have final authority for licensing and oversight in economic sectors for which state and regional parliaments make laws and state and regional governments collect revenues. But they do not have the final say in licensing and economic oversight of economic activities which the Union Parliament makes laws governing, and collects revenues from. The Forest Department currently collects a tax on hardwoods and a tax on shops that sell furniture made of timber or forest products. Revenue from log exports and sales also are collected at the Union government level (Bissinger, 2016). But the revenue streams in the forestry sector, similar to mining, are terribly opaque. The pressure in the minerals/gems sector and oil and gas for increased transparency in extractives payment and revenue streams is growing (MEITI, 2015), and this will likely transfer into the forestry sector as well, which also suffers from lack of transparency.
- Transparency in tracking revenues will be an important step toward finding equitable solutions a resource revenue sharing systems, particularly with resource-rich regions and states. Bauer et al. (2016) note that Myanmar does not disclose enough data to understand how the current allocations work, or make projections on altered formula's and options. Nevertheless, these are details that will be developed and shared over time.
- **Given the autonomy that state and regional governments have on select activities, it would be beneficial for Myanmar to consider how an emergent revenue-sharing structure will evolve in a federal governance system and can incentivize sustainable land management at the sub-regional level. This can potentially be achieved through creating a criterion for 'land health,' in a distribution formula, to incentivize state and regional governments to value effective land management over the long-term.** Land health might be measured by retention of forests (forest cover % changes from a reference level), and a combination of other measures such as soil fertility (which is harder to quantify).

General considerations regarding resolving conflict:

- Careful consideration must be made regarding how to reconcile the long-standing conflicts in most of Myanmar's natural-resource-rich ethnic areas. The 21st-century Panglong Conference, convened in August 2016, providing a new platform to address long-standing conflicts and disconnects. What is not yet clear is whether a peace agreement and disarmament should come first, then resolution of shared natural resource governance and benefit-sharing, or the other way around? Either way, both are inextricably linked.

- As per the recommendations identified by international best practices on consultation and accommodation of indigenous rights to land (Tauli-Corpuz (2016); FPIC) and ethnic regions in Myanmar (Burma Partnership, 2016), there is a strong need to define the rules of engagement, and how rights will be upheld in processes, from the start. That means that consideration must be given defining space for discussion that ensures adequate airing of concerns, ethnic region voices can be heard on their own terms, grievances filed, and reconciliation sought as per the needs of each region. This could take years of dialogue, but an inclusive process is essential for productive outcomes.

The following interventions (which could be refined to be policies and measures) are proposed, within a framework of identifying the direct driver, the underlying driver patterns or enabling factors for the driver, what historic use patterns are known, future driver patterns, proposed interventions, known activities already underway to affect the driver, any additional activities of relevance, enabling factors or actions crucial for success of PAMs, key actors and linkages to other sectors.

6.2.1. Agriculture-related

Direct driver: Large-scale agricultural concessions

Underlying driver relation and/or enabling factors: Unclear tenure rights (customary use lands), lack of transparency and accountability in previous concession decision processes, Farmland and VFV Law allow for concession granting without resolving tenure disputes, lucrative nature of land rights, patterns of land being granted for agriculture but then being cleared of timber value and not planted (or planted, but with marginal yields)

<i>Historic/current patterns:</i>	<ul style="list-style-type: none"> • Shift of forest (from within and outside the PFE) to agricultural use, and would include some portion of the 4,801,920 ha/11,865,802 acres that moved from forest to the other lands category, which includes cropland, settlement areas, and wetland between 2005-2015 (FD RS-GIS, 2016). • New non-forest attributed to agricultural expansion increased by approximately 988,000 ha (2,441,401 acres) and the establishment of 536,000 ha (1,324,484 acres) of plantations between 2002-2014 (Treue et al., 2016). • A large amount of concessions did not achieve their intended outcomes and purpose of developing modern agriculture.
<i>Future patterns:</i>	<p>The scale of past granting of leases/concession rights to major agri-commodity interests (roughly 13.5 million ha), and low utilization and productivity of those, makes projecting future use of these land highly unpredictable. Variables for estimating future patterns may depend on:</p> <ol style="list-style-type: none"> 1. The new government's position on granting new large-scale concessions. 2. Degree to which government can incentivize better utilization of existing concessions. 3. Market demand for commodities, such as rubber, maize, cassava, etc.

	<p>regionally and internationally.</p> <ol style="list-style-type: none"> 4. Production mechanisms allowing for expansion without additional lease/concessions being granted such as contract farming and outgrower schemes. 5. Degree to which FDI increases (agriculture has not yet been a focus of FDI in Myanmar (though Chinese companies have been active), and that will likely change given low labour rates and costs of production, and large market demand in the region).
<i>Proposed activities/policies/measures:</i>	<ul style="list-style-type: none"> • Public review of all agriculture concessions to date, in order to check legality and review degree to which concession holders effectively utilized their access rights for productive purposes. • On the operational side, consider how the Ministry of National Planning and Finance can play a role, as they are tasked in the 100-Day Plan to develop basic planning of District Planning Office in States and Regions
<i>Activity currently underway to affect driver:</i>	Central Review Committee on Confiscated Farmlands and Other Lands and National Land Use Council could play a role. Unclear where this mandate sits with government right now. Can it be made a priority?
<i>Additional activities:</i>	<ul style="list-style-type: none"> • Could develop criteria to guide future decisions by Districts and by MoALI so that more stringent evaluation occurs at the outset. Burden of proof should be on applicant, • Though late to do so, influence Foreign Direct Investment rules to ensure there is demonstrated benefit to Myanmar (% stake in businesses, # of jobs for local people) and allow for community/CSO review with monitoring ability and process for grievances. • Ensure EIA/SIA provisions are applied before large-scale concession rights are granted (not in parallel), based on the NEW procedures, not old ones.
<i>Enabling factors/actions:</i>	
<i>Key actors:</i>	Forest Department, Ministry of Agriculture, Livestock and Irrigation, State/regional and district governments, ethnic region governments, Central Review Committee, concession-holders and applicants, customary rights holders and communities
<i>Linkages to other sectors:</i>	Water, energy (bioenergy, biogas)

Future direct driver: Disconnects between agriculture sector and forestry sector goals

Underlying driver relation and/or enabling factors: Both sectors would benefit from more coherent alignment in long-term sector goals, lack of coordination between the two ministries, a need for resolution on customary land tenure issues to mitigate risks, future regional demand for arable land and agricultural commodity production (serving domestic and export needs) will likely grow far beyond pre-2011 levels

<i>Historic/current patterns:</i>	The emphasis is on future patterns. It is unclear the degree to which MoALI is still operating under the mandate identified in the 30-year Master Plan.
<i>Future patterns:</i>	<ul style="list-style-type: none"> • Ministry of Agriculture and Irrigation's (MoALI) 30-year Master Plan for the Agriculture Sector (2000-01 to 2030-31) identifies conversion of 10 million acres of 'wasteland' for private industrial agricultural production, with rubber, oil palm, paddy, pulses, and sugarcane for export being particularly

	<p>encouraged.</p> <ul style="list-style-type: none"> • The INDC seeks an increase in Reserved Forest (RF) and Protected Public Forest (PPF) to 30% of total national land area by 2030 (up from 24.5%), and 10% of the land within protected areas. The RF and PPF increase would be roughly 4 million ha/ 9.8 million acres, which presumably would have to come from the 'wasteland' category that MoALI seeks to increase agricultural production on. • There are 3.1 million ha/7.7 million acres of intact forest and 6.07 million ha/15 million acres of degraded forest outside of the PFE which is under the management of Ministry of Agriculture and Irrigation through the VFV Law. Though the Forest Law allows for management of forests outside of the PFE, it is unclear how that can be achieved given the overlapping mandates.
<i>Proposed activities/policies/measures:</i>	<ul style="list-style-type: none"> • Minister of MoNREC could share these issues with Vice President Van Thio, Chairman of the National Land Use Council and request that a technical working group comprised of representatives from MoALI and FD/MoNREC, and stakeholders/CSOs, to resolve vacant fallow land and issue and how to initiate joint planning present a list of options to the NLUC. • Though the NLUC seeks to implement the National Land Use Policy, it is unclear how such sectoral conflicts can be resolved. At a minimum, any recommendations would help inform District-level identification of appropriate land use zoning. But attention will also need to be directed towards sectoral goals (production, area requirements), and defining policy direction. • Will the 30 Year Master Plan be revised? What is the process for doing so?
<i>Activity currently underway to affect driver:</i>	The new Economic Policy (of 29 July 2016) identifies government will support the agriculture and livestock sectors to promote inclusive growth, enhance food security, increase exports, and boost living standards. Farmers will be given full production freedoms, while the state will support high value-added crops and livestock breeding. Only in relation to sustainable urban growth is there mention of the natural environment, so there is no indication that agriculture sector goals are being balanced with forest/water protection. However, in resolving ethnic area conflicts, this connection would presumably be more strongly linked?
<i>Additional activities:</i>	N/A
<i>Enabling factors/actions:</i>	Crucial to consider risks related to customary use and unclarified tenure in any solution.
<i>Key actors:</i>	Forest Department, Ministry of Agriculture, Livestock and Irrigation, State/regional and district governments, Ministry of Finance and Planning, ethnic region governments, Central Review Committee, National Land Use Council and related bodies, customary rights holders and communities
<i>Linkages to other sectors:</i>	Emphasis is on coordination between the two sectors.

Direct driver: Rice production

Underlying driver relation and/or enabling factors: Poor productivity, need to provide for domestic food security while also producing for export markets (though quality of product are currently low)

Historic/current patterns: 87.6% of mangrove deforestation between 2000 and 2012 is believed to be

	attributed to rice production (Richards and Friess, 2016).
<i>Future patterns:</i>	No assessment has made on how these increased production targets will impact forests, but it is likely a significant portion of yield growth will come from expansion into forests/wetlands rather than intensification. Mangrove forests are at highest risk, and if historical deforestation rates continued, the Ayeyarwady mangroves (outside of Meinmahla Kyun Wildlife Sanctuary) could be completely deforested by about 2026 (Webb et al., 2014); Richards and Friess, 2016).
<i>Proposed activities/policies/measures:</i>	<ul style="list-style-type: none"> The MoALI is providing increased support to small-scale rice farmers (100,000 Kyat for 1 acre) and helping to develop clustering bases such as cooperatives. This could provide a channel for defining practices and commitments for reduced deforestation pressure from rice production. The Myanmar Rice Federation (MRF) is also a key actor (various supply chain levels, mostly millers and traders)
<i>Activity currently underway to affect driver:</i>	Unknown
<i>Additional activities:</i>	Unknown
<i>Enabling factors/actions:</i>	Unknown
<i>Key actors:</i>	Cooperatives, GAD/FAB
<i>Linkages to other sectors:</i>	Unknown

Direct driver: Maize production

Underlying driver relation and/or enabling factors: Predicted growing demand from China for livestock feed, outgrower schemes have been associated with some cases of increased local food insecurity and need to augment income from other activities with grater impacts on forests (e.g. charcoal)

<i>Historic/current patterns:</i>	Contract farming to produce maize increasing, and the poverty and forest and land use dynamics are interlinked and need to be better understood (example of logging and charcoal making as means of farmers in Shan State coping with indebtedness).
<i>Future patterns:</i>	75% of maize volume produced exported to China. Maize production in Myanmar is expected to grow to 2 MMT in 2015/16 and to 2.1 MMT in 2016/17 due to increased maize growing area and strong international demand, mostly from China (USDA, 2016).
<i>Proposed activities/policies/measures:</i>	Gather more insight on this driver, in collaboration with MoALI, to better understand regional differences.
<i>Activity currently underway to affect driver:</i>	Unknown
<i>Additional activities:</i>	Unknown
<i>Enabling factors/actions:</i>	Unknown
<i>Key actors:</i>	GAD/FAB
<i>Linkages to other sectors:</i>	Unknown

Direct driver: Rubber production

<i>Underlying driver relation and/or enabling factors:</i> Low yields, most increases in production in future are predicted to come from expansion of planted area, rather than increasing the yields on plantations. Customary land rights issues, notably in Tanintharyi and Mon, but also Kayin, Kachin, Shan and Rakhine States. Employment opportunities for smallholders a benefit.	
<i>Historic/current patterns:</i>	Goal of 1.5 million acres/607,000 ha by 2030 may be achieved, was at 490,000 acres/200,000 ha in 2011-2012. Of the mostly rubber plantations established in Kachin State between increased by 74,000 ha, or 68%.
<i>Future patterns:</i>	Over 90% of exports go to China and Malaysia, prices are at a low, roughly 90,000 tonnes were expected in 2015, but the NES identifies a goal of 195,131 tons in 2015/2016, with most increases in production likely gained by expansion of planted area, rather than increasing the yields on plantations.
<i>Proposed activities/policies/measures:</i>	<ul style="list-style-type: none"> • A law will govern the private rubber sector and will be drafted by the commerce, industry and agriculture ministries, in consultation with the MRPPA. The FD should have a role in reviewing and defining the parameters of the law, particularly if there are criteria included for establishment of new rubber plantations. • Look objectively at taxes and incentives reform: Taxes are high, NS illegal exporters who try to evade taxes exist. Consideration could be given to restructuring taxes in order to promote greater intensification, but also increased transparency in rubber supply chains in order to identify non-legal actors and improve standards (such as granting concessional loans and access to improved genetics if producers can demonstrate adherence to key production standards). • Chinese investors should use a smallholder plantation model instead of concessions, which could include rubber agroforestry to minimize environmental costs. Labourers from the local population should be hired rather than outside migrants in order to funnel economic benefits into nearby communities. Transparency in contract negotiations, including of financing, would help build trust with local communities (Kramer and Woods, 2012). • Consider how rubber plantations, including small-holder plantations, on degraded land can contribute to increasing tree cover and carbon stocks, as well as provide a source of future timber.
<i>Activity currently underway to affect driver:</i>	The Japanese government is currently assisting the local industry to improve production quality and thereby access the Japanese market (Chan Mya Htwe, 2016(b)). Generating Rubber Opportunities (GRO) project. NES seeks to restructure the taxes on rubber.
<i>Additional activities:</i>	
<i>Enabling factors/actions:</i>	Land tenure aspects, access to capacity to increase yields without expansion
<i>Key actors:</i>	Myanmar Rubber Planting and Producing Association (MRPPA)
<i>Linkages to other sectors:</i>	

Direct driver: Oil palm production

Underlying driver relation and/or enabling factors: Complex overlapping claims between Karen customary land tenure and concession holders (Asia World law suit is one example), poor investment in the sector and low yields

Historic/current patterns: In Tanintharyi, planted area in 2014 was 346,557 acres/140,247 ha while land

	allocations cumulatively totaled up to 1,000,000 acres/405,000 ha.
<i>Future patterns:</i>	Unclear prospects for the future, but significant areas allocated to domestic and foreign investors/companies that are inexperienced in producing palm oil, and production constraints and costs (e.g. roads) may limit production growth. Prices for CPO are at US\$580/metric tonne, which is low, and far below its peaks of US\$1,150/metric tonne. Unless prices increase, there may not be much reason to supply export markets, but domestic markets may have potential.
<i>Proposed activities/policies/measures:</i>	Review decisions to allocate land on existing concessions, and cross-reference with customary tenure use (due to IDP's, can have multiple layers of overlapping claims). Consider a moratorium on palm oil development to ensure no new forest clearing and no new licenses granted, until more is understood about the risks (such as land claims) on current concessions.
<i>Activity currently underway to affect driver:</i>	Regional government seeks to increase yields instead of extending the plantation area.
<i>Additional activities:</i>	Unknown
<i>Enabling factors/actions:</i>	Unknown
<i>Key actors:</i>	MoALI, GAD/FAB
<i>Linkages to other sectors:</i>	TBD

6.2.2 Forestry sector

Direct driver: Over-exploitation of forest resources

Underlying driver relation and/or enabling factors: Corruption, illegality, exceeding AAC to meet revenue targets, lack of coherent forest governance at all levels, lack of transparency and accountability, lack of a viable and legal domestic market for timber

<i>Historic/current patterns:</i>	High levels of illegal logging; over-exploitation of Teak and Hungmu species resulting in 10.2 million m ³ of Myanmar logs imported into global markets not having been authorised for harvest between 2001 and 2013; roughly 0.5 million m ³ exported to China as charcoal each year.
<i>Future patterns:</i>	Political interest/willingness to address historic patterns of forest depletion appear strong, AAC is being revised, but unclear the degree to which illegal activity can be brought under control (FLEGT VPA crucial here), and market demand for high-value species tempered
<i>Proposed activities/policies/measures:</i>	<ul style="list-style-type: none"> • Update to forest inventories and a revised plan for AAC trajectories moving forward, based on sustainability goals and assumptions regarding losses through illegality (which deplete forests at a significant rate, which undermines the credibility of AAC). • Similar to the process recently completed for Myanmar Extractives Industries Transparency Initiative (EITI), review revenues from the timber sector (legal and illegal), engage civil society in this process, and report publicly what the findings are, as a basis for inclusive discussions on how to reform and shift the timber revenue model in Myanmar. • Define pathways towards peace, cessation of conflict and natural resources management and revenue-capture/benefit sharing in forested ethnic states and regions (particularly Kachin, Shan,

	<p>Tanintharyi) that enables strong stewardship and recognition of customary and indigenous rights.</p> <ul style="list-style-type: none"> Consider how emerging revenue-sharing structures between Union government and states/regions/districts can incentivize sustainable land management at the sub-regional level, such as through a 'land health' criterion. Better use of under-utilized species, promote value-addition and processing, SME development, value and supply chain development that has strong chain-of-custody transparency and standards Establish a plan for reforestation/enrichment planting, with incentives and oversight at district or community levels. Integrate agroforestry into this approach, particularly in shifting cultivation areas. Revise the the Forestry Law to reflect the intentions of the new Community Forest Instructions.
<i>Activity currently underway to affect driver:</i>	<ul style="list-style-type: none"> Logging ban, reduction in AAC, restructuring of MTE, activities underway via FLEGT Interim Task Force, change to Community Forest Instructions and capacity development to assist forest user groups MTE improving income generation by improving local timber marketing and milling through open tenders of timber sales, producing value-added wood-based products, producing higher-value products by utilizing lesser-used species, and promoting ecotourism (MTE Feednote, 2016). Plantations have been established, but are underperforming
<i>Additional activities:</i>	Changes to Community Forest Instructions are a big step forward, but providing the necessary capacity-building and support to forest user groups, and growing CF's to 2.27 million acres by 2031 (30-Year Master Plan goal) is unclear. Needs a Community Forest master plan for development (with associated business plan support and macro and individual CF levels) to guide efforts.
<i>Enabling factors/actions:</i>	<p>Accountability, transparency, improved governance are all key, as well as linking improved forest governance to other priorities within national reconciliation and economic development (such as peace processes, resolving conflict, defining solutions to natural resource revenue questions (including gems/minerals), recognition of land claims, promoting SMEs and value-chain development for domestic timber product use and value creation</p> <p>Consider what can be applied from the success story of Nepal's enabling CFs through transferring significant management to willing FUGs, and redefining the Forestry Department's role to provide extension and capacity-building (in the Forest Act of 1993). These two actions catalyzed uptake at scale. Now 1.6 million people are involved in CFs.</p>
<i>Key actors:</i>	Forest Department, sub-regional governments, ethnic areas and local governance, law enforcement officials, Myanmar Forest Products Merchant Federation, MTE, communities, export markets such as India and China (China/Yunnan is priority), other markets that screen for production standards and/or legality (EU, US). Consider IFC or other partners that can help develop supply chains and private sector growth, while adhering to standards.
<i>Linkages to other sectors:</i>	TBD

Direct driver: Illegal logging

Underlying driver relation and/or enabling factors: Weak forest sector governance, law enforcement, armed conflict, markets that value access to materials and low cost over legality

<i>Historic/current patterns:</i>	<ul style="list-style-type: none"> • Timber: Between 2001-13, 10.2 million m³ of Myanmar logs imported into global markets were not authorised for harvest, which would equate for a 47.7% illegal logging rate in the country related to exports (EIA, 2014a) • Charcoal: Rate stabilizing to 0.5 million m³, representing 32% of Myanmar's total timber product exports to China.
<i>Future patterns:</i>	<ul style="list-style-type: none"> • Given on-going demand of Hongmu and desirable species from Myanmar in the Chinese market, and prices trending upwards relative to increasing scarcity in Southeast Asia, and increasing demand, there is no indication of demand slowing. See Chinese Redwood Committee insights: http://www.zghm.org/qwfb/421.html • Chinese charcoal demand shows no signs of slowing
<i>Proposed activities/policies/measures:</i>	<ul style="list-style-type: none"> • Continue pursuing FLEGT processes • Better understand the domestic market, and domestic demand. Set legal parameters for domestic timber markets that are transparent and accountable (can make sure there is link to community forests). • Map the key players in the supply chain likely to be trading illegal timber and make information publicly available to law enforcement • Develop systems for better timber traceability and verification of legality • Work with CSOs and communities to improve community enforcement capacity • Work with CSOs and communities to develop risk ratings of key supply chain actors • Develop capacity at mills for traceability, and mandate that mills demonstrate legal compliance • Monitor the progress of actors in the supply chain to encourage continual improvement • Raise to raise the bar in policing and investigations, shifting from lower level/occasional players to the most prominent controllers of the criminal supply chain (UNODC, 2015). • Create joint investigative teams between the police and forestry officials (UNODC, 2015). • Apply financial investigation techniques to follow the money which fuels illegal logging operations and identify high level players and companies facilitating the illegal trade • Create an electronic permit allocation system and a national registry of all documentation that needs to accompany timber sourced in or transited through the country. • Expand INTERPOL capabilities, particularly access to the I-24/7 secure communications system, to forestry department to increase secure information exchange on forestry crime issues with neighboring countries. • Seek legal reciprocity from strategic timber trade partners, such as China so that Myanmar can enforce its laws along the Myanmar/China

	<p>border (EIA, 2014). Revise <i>Yunnan Temporary Management Rules for Timber and Mining Cooperation with Myanmar</i> to respect Myanmar's ban on log exports, ending approvals for log imports. Any timber MOU between China and Myanmar should reinforce the FLEGT VPA objectives, incorporating the same governance standards.</p> <ul style="list-style-type: none"> • Encourage Chinese banks to stop providing cross-border timber loans to frontier activities, governments should ensure banks follow timber trade policy changes and Chinese banks should bring more stringent oversight on how these loans are deployed (Zhou, 2005). • Now that <i>dalbergia</i> is listed in Convention on International Trade in Endangered Species (CITES) Appendix II, which includes at-risk Hongmu species – <i>Dalbergia oliveri</i> / <i>bariensis</i> (Tamalan) and <i>Pterocarpus macrocarpus</i> (Padauk), enforcement mechanisms will be important.
<i>Activity currently underway to affect driver:</i>	<ul style="list-style-type: none"> • FLEGT process – thematic groups looking into timber tracking options, streamlining regulations, understanding domestic market. VPA process would start in 2017. • How to respond to CITES listing of <i>Dalbergia</i> in Annex II? How is Myanmar planning to improve tracking to ensure adherence to CITES? Similarly, how can China track, and also help curb demand?
<i>Additional activities:</i>	How to reduce Chinese demand for Hongmu and teak species?
<i>Enabling factors/actions:</i>	Transparency, accountability
<i>Key actors:</i>	Forest Department, sub-regional governments, ethnic areas and local governance, armed groups, law enforcement officials, Myanmar Forest Products Merchant Federation, MTE, 'crony' companies, new entrants to private sector (are there any?), communities, export markets such as India and China (China/Yunnan is priority), Thailand which does receive some illegal timber, other markets that screen for production standards and/or legality (EU, US).
<i>Linkages to other sectors:</i>	Law enforcement, natural resource governance, banking and investment (sanctions lists or screens to decipher risky investments)

Direct driver: Fuel wood collection

Underlying driver relation and/or enabling factors:

Historic/current patterns:

- Roughly 45 million people rely on some form of wood fuel. In rural areas, 80% of the population depends on firewood, whereas in peri-urban areas, only 18% rely on firewood and 45% relies on charcoal (Emerging Markets Consulting, 2015). The average annual consumption of fuel wood per household is estimated to be roughly 2.5 cubic tons (4.5 m³) for rural households and 1.4 cubic tons (2.5 m³) for urban residents (ADB, 2012).
- Myanmar's fuel wood demand was 32 million m³ of dry biomass in 2000 and 42 million m³ of dry biomass in 2010. Regional differences indicate plantations in Ayeyarwaddy and Mandalay may contribute to more sustainable use, whereas, Rakhine, Chin, Kachin, and eastern Shan States rely more on natural forests for wood fuel and are

	therefore less sustainable.
<i>Future patterns:</i>	Population to increase from 53.9 million in 2015 to 60.2 million by 2030, thus extrapolating from historical patterns, fuel wood demand is projected to reach 55 million m ³ of dry biomass by 2030. The regions that will see the greatest increases include Ayayewaddy, Mandalay, Bago, Shan and Sagaing.
<i>Proposed activities/policies/measures:</i>	<ul style="list-style-type: none"> Establish community forests for fuel wood provision (only a portion of the current 83,204 ha of CF's provide wood fuel)
<i>Activity currently underway to affect driver:</i>	Dry-Zone Greening Department activities
<i>Additional activities:</i>	Department of Rural Development is implementing a national extension project focused more on grid and off-grid energy, but does consider how to diversify from wood/bamboo use. Maybe potential for partnership?
<i>Enabling factors/actions:</i>	Is a priority in the INDC: proposes a goal of distributing approximately 260,000 cook-stoves between 2016 and 2031, though will only shift a small percentage of the roughly 10 million households reliant on fuel wood.
<i>Key actors:</i>	Community forest user groups, Forest Department, Dry-Zone Greening Department
<i>Linkages to other sectors:</i>	

6.2.3 Energy (hydropower), mining, infrastructure

Direct driver: Mining

Underlying driver relation and/or enabling factors: Conflict in ethnic areas (regions seek a larger role in governance and resource-sharing, lack of transparency in sector, significant loss of revenue from gems sector (PFM aspects), FDI could increase in future, but still too risky

<i>Historic/current patterns:</i>	<ul style="list-style-type: none"> 46,000 hectares of mining areas identified, of which 31.5% was newly disturbed bare ground where the vegetation had been removed since 2002, but unclear what % cleared forest (Connette et al., 2016). Separate analysis in Kachin state and Sagaing region found the area of mines increased by 141.7% in Kachin and 743.6% in Sagaing between 2002-14, with locations mostly outside forest reserves and protected areas, but often along rivers (Treue et al., 2016). No spatial assessment of related infrastructure/roads and impacts on forests.
<i>Future patterns:</i>	Unclear, and much depends on government oversight and regulation in the future. Foreign Direct Investment potential is very large after current investment risks are minimized.
<i>Proposed activities/policies/measures:</i>	<ul style="list-style-type: none"> Within MoNREC, review proposed mining sites, and identify potential impacts from future stings. Jointly review the Myanmar Mines Law of 1994 and Mines Law Amendment via Law No. 72/2015 to identify ways to include stronger provisions for environmental and social standards, so that these intentions dictate the terms by which any new concessions would be granted, rather than leaving it to the ESIA processes (which may not

	<p>be operationally strong enough yet).</p> <ul style="list-style-type: none"> Continue to identify parallels between mining and timber revenues via the Myanmar Extractives Industries Transparency Initiative (EITI) and assessment of equitable revenue capture and distribution for producing regions. Find ways to strengthen civil society engagement in this process, increase transparency in reporting and monitoring and evaluation (M&E). Define pathways towards peace, cessation of conflict and natural resources management and revenue-capture/benefit sharing in forested ethnic states and regions (particularly in resource-rich Kachin State) that enables strong stewardship and recognition of customary and indigenous rights.
<i>Activity currently underway to affect driver:</i>	<ul style="list-style-type: none"> MoNREC has committed to not renewing jade and gems mining permits until new laws are in place Government will extend the EITI remit to include the mining industry (not just oil and gas), and will also weigh up the costs and benefits of economic policies for their impact across the entire country.
<i>Additional activities:</i>	ESIA should be applied at outset, and consider bringing on more CSO engagement to assist government in reviewing applications and conducting due diligence to assess risk or impacts
<i>Enabling factors/actions:</i>	Increased transparency and accountability in this sector
<i>Key actors:</i>	MoNREC/Mining Department, Forest Department, ethnic areas and local governance, armed groups, law enforcement officials, Chinese gems/jade/minerals buyers and markets, 'crony' companies with a hand in the trade, communities, MIC/DICA.
<i>Linkages to other sectors:</i>	

Direct driver: Hydropower development

Underlying driver relation and/or enabling factors: Huge need for electricity domestically and has been prioritized for export as well, regional market linkages are favoured, FDI pressures (lucrative investments)

<i>Historic/current patterns:</i>	<ul style="list-style-type: none"> 414,200 ha increase in water across the country between 2005-2015 (Forest Department RS-GIS Section data, 2016), and this is likely attributed to hydropower reservoirs. Treue et al. find the area of water has increased most radically within forest reserves (Reserved Forests & Public Protected Forests), increasing 62% between 2002-2014, and amounting to 335,601 acres/135,815 ha (Treue et al., 2016). Only 50,572 additional acres/20,466 ha of water occurred outside RFs, PPFs, and PAs (ibid), suggesting that hydropower development has overwhelmingly occurred within forest reserves (both RFs and PPFs). Hydropower supplies 58% of the country's power from less than 5000 MW now from all sources in Myanmar, and 2,600 megawatts of currently installed capacity of hydropower. No spatial assessment of related infrastructure/roads and impacts on forests.
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<i>Future patterns:</i>	<ul style="list-style-type: none"> • IFC estimates that Myanmar's hydropower potential is up to 100,000 megawatts is more than 30 times the current capacity. • The Ministry of Electricity and Energy is either currently constructing or approved construction of 34 hydropower projects, totaling 33,724 MW, mostly in Kachin and Shan states. • Concerns have been raised over social and environmental impacts (with the Myitsone hydropower project (3,600 – 6,000 MW) proposed for the Irrawaddy River and series of projects proposed for the Salween River, especially the Maing Thung/Tasang 7,110 MW project in Shan State), as well as the balance of exports versus serving domestic needs.
<i>Proposed activities/policies/measures:</i>	<ul style="list-style-type: none"> • Joint review of energy-related developments with the Ministry of Energy and MoNREC/Forest Department: 1) Complete spatial assessment of the complete project footprint of pending and proposed mines, 2) estimate future forest removals, 3) develop a joint plan to minimize social and environmental impacts (forests are one attribute of many). Develop a tiered list of hydro proposals based on estimated impacts, share this publicly for assessment and consultation. • Include tree removals for dam construction and utilities/roads in AAC calculations and reduce allowable extraction levels to reflect this supply. • Strictly control harvests in clearance areas to prevent illegal timber from surrounding areas being laundered into legitimate timber from clearings • ESIA procedures are crucial – support international, CSO and community assistance in reviewing submissions, independently evaluating impacts, seek transparency and inclusiveness in processes.
<i>Activity currently underway to affect driver:</i>	Unknown
<i>Additional activities:</i>	
<i>Enabling factors/actions:</i>	As hydropower development decisions are clearly within the remit of the Department of Electric Power Planning, Ministry of Electricity and Energy, it should be fairly easy to create a spatial assessment of proposed new sites and potential impacts on forests, to inform discussion on mitigation options, share with stakeholders, and provide a basis for establishing more coherent siting guidelines or 'high-risk' areas.
<i>Key actors:</i>	Department of Electric Power Planning, Ministry of Electricity and Energy, ethnic states/regions (Kachin, Shan, Kayin, Kayah states), ADB and World Bank, IFC and Hydropower Developers' Working Group (with support from Australia Aid), MIC/DICA
<i>Linkages to other sectors:</i>	

Direct driver: Energy-related infrastructure

Underlying driver relation and/or enabling factors:	
<i>Historic/current patterns:</i>	Not a major concern in the past, as energy generation and transmission/distribution systems have been limited compared to regional and global standards.
<i>Future patterns:</i>	<ul style="list-style-type: none"> • Energy production will have a significantly larger impact on the land base than it has had in the past. Thirty-six million people do not have access to modern energy services (68% of Myanmar's total population). • Growth is expected to continue, both to serve large domestic needs and for export. The National Electrification Plan seeks to shift rural energy use, as it aims to electrify more than 7.2 million households and achieve access to electricity for 36 million people by 2030. The World Bank expects US\$ 2 billion will be required per year over the next 15 years for power generation, transmission and distribution. • By the end of 2015, total FDI in the oil and gas sector exceeded \$14 billion, comprising 36% of total FDI in Myanmar (United Kingdom Trade & Investment, 2015). • China could double its overland Myanmar oil link capacity, in order to reduce shipping through the Malacca Straights, which are a transportation choke point (OECD/IEA, 2015)
<i>Proposed activities/policies/measures:</i>	<ul style="list-style-type: none"> • Government is preparing an infrastructure policy, which will focus on producing and distributing power, building and maintaining rural roads, and developing better port facilities. This is an opportunity to define in the policy how development can occur while safeguarding natural capital, forests and ecosystems. • Develop a joint task-force between MoNREC/Forest Department and Ministry of Electricity and Energy/ Department of Electric Power Planning to identify future build-out scenario, widths of transmission corridors, access roads, ASEAN connector routes, etc. Develop joint recommendations for how to minimize impacts, consult with affected communities and regions in the process and allow for public and CSO input. • More clearly guide energy-related FDI: currently, environmental compliance licenses are applied for in parallel with MIC application processes, making it difficult for MIC to really evaluate environmental compliance and potential impacts Find ways to front-end review, and develop guidelines and spatial planning guidance to accompany the new infrastructure policy that identifies 'high-risk' areas (e.g. natural forest areas) versus 'low-risk' areas such as adjacent to current infrastructure (e.g. existing roads, powerlines)
<i>Activity currently underway to affect driver:</i>	Infrastructure policy
<i>Additional activities:</i>	TBD
<i>Enabling factors/actions:</i>	TBD
<i>Key actors:</i>	Ministry of Electricity and Energy, MIC/DICA, MoNREC, affected communities and regional centres, China and Thailand (in the context of pipeline connectivity and infrastructure linkages)
<i>Linkages to other sectors:</i>	

Direct driver: Roads and transportation

Underlying driver relation and/or enabling factors:

<i>Historic/current patterns:</i>	Current road network is comprised of 150,816 km of roads, 33,014 km of which are paved. Rubber plantations and oil palm development highly correlated to road networks (FFI, 2016; Kramer and Woods, 2012). Special Economic Zones (Kyaukphyu and Dawei) are focused areas of investment, though Kyaukphyu will focus more on pipeline development, while Dawei is a critical road linkage between the port and Thailand.
<i>Future patterns:</i>	<ul style="list-style-type: none"> The number of vehicles in Myanmar more that doubled between 2004 and 2011, and a strong growth trajectory is expected. Under the Framework for Economic and Social Reforms, the Myanmar government has indicated high priority for infrastructure projects to improve land connectivity and transportation links with regional economies to boost economic integration and fulfil the country's commitments under the Master Plan on ASEAN Connectivity. There is generally a high correlation between road access and deforestation and forest degradation, best depicted by Flora and Fauna International around Lenya and Lenya Extension in Tanintharyi region, and the rapid establishment of rubber concessions in Kachin and Shan states along roads (Kramer and Woods, 2012). Future road construction will impact forest areas, particularly those being developed in border areas near more heavily forested areas.
<i>Proposed activities/policies/measures:</i>	<ul style="list-style-type: none"> Government is preparing an infrastructure policy, which will focus on producing and distributing power, building and maintaining rural roads, and developing better port facilities. This is an opportunity to define in the policy how development can occur while safeguarding natural capital, forests and ecosystems. FD could prepare guidance or spatial planning criteria to guide siting decisions (particularly at different levels, for different types of road such as rural or cross-border routes).
<i>Activity currently underway to affect driver:</i>	None identified
<i>Additional activities:</i>	Look into GAD- One Stop Service – see if possibility to add filters to decipher environmental and social impact risk early in application process
<i>Enabling factors/actions:</i>	
<i>Key actors:</i>	TBD
<i>Linkages to other sectors:</i>	TBD

6.3 Areas for future research

This study provides an overview of a broad range of issues related to historical trends of pressures on forests, future trends, underlying drivers and some initial options for addressing them. In preparation for the National REDD+ Strategy, and more generally to support the efforts of a range of stakeholders working to improve forestland

management that benefits the climate and people, the following are offered as areas for future research:

1. While this assessment sought to more clearly identify deforestation and forest degradation drivers, based on recent spatial assessments and the data existing in the Forest Department, this was not possible. The interpretation of satellite imagery varies dramatically across users based on different definitions and how to categorize less decipherable vegetation types such as plantations (e.g. rubber and palm oil) and regrowth areas (e.g. bamboo), also based on various types of land use (e.g. shifting cultivation, which would have different clearance patterns than large-scale agricultural uses). The change matrix developed by the Forest Department for this study is a start in this direction, but more analyses, ground-truthing and checking the patterns with stakeholders is important, in order to the data to be validated and verified.
2. Once the change matrix is further refined, another spatial analysis should be conducted to identify activity data of land uses, and this should be correlated with the land cover change matrix, in order to attribute what uses drove changes in land cover. Such an activity can revise and update the loose projections made here on the relative scale of existing drivers, and provide a basis point for spatially projecting future drivers.
3. This report does not systematically capture regional patterns, and this is a noted shortcoming. Due to the differences between states/regions with regards to driver activity and what underlying driver patterns occur in each state/region, it would be useful to develop a 'risk indicator' for each state/region. For instance, this could compare the observed activities and future risk of occurrence of the range of drivers and underlying drivers. Those with high incidences of conflict and illegal activity, for instance, are then differentiated from areas where those risks are not prevalent, but others might be more pressing such as industrial commercial agriculture production.
4. It would be helpful to better understand the supply chains of various products that impact forests, such as charcoal, rubber, wood fuel, and other products. In conducting this research, it was found that very little is known about the supply and demand for key products and supply chains, and difference between government sources of data and others can be significant (such as the scale of illegal timber exports that is registered as 'imports' in Kunming, China). Such information would greatly improve the basis from which to define policies and measures to address driver patterns.
5. This assessment did not include any focused discussions with the Drivers and Strategies Technical Working Group members, or sub-regional working groups, to review the information gathered and thereby derive a ranking of underlying drivers. This activity is prioritized for further follow-up, as part of National

- REDD+ Strategy development, and through sub-regional workshops and dialogue.
6. Based on the assessment of future drivers, where possible, this report identifies future scenarios and projections and an analysis of future deforestation and forest degradation pressure, with emphasis on specific regions or hotspots. More efforts are needed to refine this assessment, once the direct driver analysis is updated.

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8. Annexes

Annex 1: Interviews and persons consulted

29 structured interviews and more informal interviews occurred involving at least 80 individuals and experts with government agencies and stakeholder groups, and other expert interviews (this is a partial list).

No	Name	Organization
1	U Kyaw Kyaw Lwin	Forest Department, MONREC
2	U Ohn Lwin	Forest Department, MONREC
3	U Ngwe Thee	Forest Department, MONREC
4	Dr. Myat Su Mon	Forest Department, MONREC
5	Dr. Thaug Naing Oo	Forest Research Institute, Forest Department, MONREC
6	Dr. Tin Tin Myint	Myanmar Timber Enterprise, MONREC
7	U Ye Tun	Myanmar Timber Enterprise, MONREC
8	U Ohn Lwin	Department of Mining, MONREC
9	U Hla Mg Thein	Environmental Conservation Department, MONREC
10	U Sein Lin Tun	Environmental Conservation Department, MONREC
11	U Min Maw	Environmental Conservation Department, MONREC
12	U Ba Kaung	Dry Zone Greening Department, MoNREC
13	U Tin Myint	General Administrative Department, Ministry of Home Affairs
14	Daw Swe Swe Naing	General Administrative Department, Ministry of Home Affairs
15	U Khin Mg Kyaw	General Administrative Department, Ministry of Home Affairs
16	U Win Khaing Moe	Department of Research and Innovation, Ministry of

		Education
17	Daw Khin Ohmar Aung	DICA, Ministry of National Planning and Economic Development
18	Daw Phyu Hnin Wutyi	DICA, Ministry of National Planning and Economic Development
19	Daw Nyein Nyein Ei	DICA, Ministry of National Planning and Economic Development
20	Daw Yi Yi Htwe	DICA, Ministry of National Planning and Economic Development
21	U Aung Soe	Ministry of Commerce
22	Daw Khet Khet Nwe Phoo	Ministry of Commerce
23	U Tha Toe Aung	Department of Agricultural Land Management and Statistics, Ministry of Agriculture, Livestock and Irrigation
24	Dr. Win Htut	Department of Agricultural Land Management and Statistics, MoALI
25	U Win Myint	Department of Agricultural Land Management and Statistics, MoALI
26	U Khant Zaw	Department of Rural Development, MoALI
27	Dr. Zarni Min	Department of Rural Development, MoALI
28	Daw Aye Kyawt Hlaing	Department of Rural Development, MoALI
29	U Win Zaw Tun	Department of Rural Development, MoALI
30	Daw Mai Tom Aung Sein	Department of Rural Development, MoALI
31	Daw Zin Mar Oo	Department of Rural Development, MoALI
32	U Soe Myint Tun	Department of Irrigation, MoALI
33	Daw Sein Nwet	Department of Irrigation, MoALI
34	Prof. Theingi Myint	Agriculture Economics Department, National University, Yezin
35	U Hein Htet	Myanmar Department of Hydropower
36	U Myint Oo	Myanmar Department of Hydropower
37	U Saw Sithu Hlaing	Myanmar Department of Hydropower
38	Daw Su Su Hlaing	Department of Hydropower Planning, Hydropower Project Mapping
39	U Aung Thant Zin	Myanmar Environmental Conservation and Rehabilitation Network (MERN)
40	Julia Fogerite	International Union to Conserve Nature (IUCN)
41	U Than Htike Oo	Asia Air Survey
42	U Wunna Htun	Asia Air Survey
43	U Htet Oo Kyaw	Asia Air Survey
44	Dr. Kyaw Tint	Ecosystem Conservation and Community Development Initiative (ECCDI)
45	U Mehm Ko Ko Gyi	Ecosystem Conservation and Community Development Initiative (ECCDI)
46	Richard Holloway	EcoDev/ALARM
47	U Win Myo Thu	EcoDev/ALARM
48	Mark Grindley	Flora and Fauna International (FFI)
49	Hugh Speechy	FLEGT and EU Delegation

50	Delphine Brissonneau	EU Delegation
51	U Than Nwai	Forest Resource Environment Development and Conservation Association (FREDA)
52	U Tin Ohn	Forest Resource Environment Development and Conservation Association (FREDA)
53	U Kyaw Nyein	Forest Resource Environment Development and Conservation Association (FREDA)
54	Daw Khon Ja	Kachin Peace Network
55	Kevin Woods	Forest Trends
56	Dr. Sein Win	Myanmar Forest Products Merchants Federation (MFPMF)
57	Daw Devi Thant Cin	Myanmar Green Network
58	Mariateresa Calabrese	Instituto OIKOS Myanmar
59	Leonardo Gueli	Instituto OIKOS Myanmar
60	Alex Diment	Wildlife Conservation Society (WCS)
61	Harald Mathisen	Royal Norwegian Embassy, Yangon
62	Siri Damman	Rainforest Foundation Norway
63	Franz Arnold	UNREDD PMU Staff
64	Daw Khin Hnin Myint	UNREDD PMU Staff
65	Daw Thin Thitsar Kyaw	UNREDD PMU Staff
66	Keiko Nomura	UNREDD Programme/UNEP
67	Phyu Phyu San	National Consultant, UNREDD Programme Myanmar/FAO

Annex 2: Harmonizing land use, land cover and forest cover categories

No	Land use categories	IPCC	FRA	APFnet
1	Broadleaved forest closed	Forest land	Closed forest	Broadleaf closed
2	Needleleaf closed			Needleleaf closed
3	Mixed forest closed			Mixed forest closed
4	Evergreen forest closed			Broadleaf closed
5	Mangrove			Wetland (mangrove forest)
6	Broadleaved forest open		Open forest	Broadleaf open
7	Needleleaf open			Needleleaf open
8	Degraded Forest			Mixed forest open
9	Evergreen forest open			Broadleaf open
10	Bamboo			Bamboo
11	Forest open		Dry forest	
12	Scrubland		Other wooded land	Scrub
13	Fallow Taungya/Active Taungya	Shifting cultivation		
14	Forest Plantation	Broadleaf		
15	Grassland / Grazing Land	Grassland		Grass
16	Crop land floating	Cropland	Others	Crop land floating
17	Paddy/Commercial Agriculture/Tree Crops/Permanent dryland ag.			Crop land (agri)
18	Alluvial land			Alluvial land
19	Unclassified	Otherlands		Cloud/cloud shadows
20	Snow			Snow
21	Permanent Bare Land/Sandbars			Sand
22	Fish Pond			Urban & built-up
23	Shrimp Pond			Urban & built-up
24	Salt pan			Urban & built-up
25	Settlements/ Buildings /			Settlement
26	Roads	Road		
27	Swamp / Wetland	Wetlands		Wetland (fresh water swamp) forest
28	Water - Rivers/Water - Lakes		Water	Water

Source: RS-GIS Department

