

Myanmar forestry policy and institutional arrangement: case study of mangrove deforestation during 1980 and 2015

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Abstract— Mangrove in Myanmar, among 8 major forest types, is playing a key role in providing ecosystem services to coastal communities and the nation. It is found along the coast (2400 km), from Naff River in Rakhine State to Pachyan River in Tanintharyi Region. It is threatened by increase of socioeconomic needs, and climate change. Objectives of the study include understanding existing law and policy, and institutional arrangement status, the cause and barriers, and ways cope with deforestation. The results are expected to be supportive in achieving sustainable development in parallel with conservation. There have been several reports on mangrove cover change in Myanmar. FAO (FRA2007 & 2015) reported the mangrove cover decreasing from 555,500 ha (1980) to 299,000 ha (2015). In addition Forest Department (FD) reported the degradation rate of about 11,088 ha/yr. In term of policies and institution arrangement, forest Law was amended in 1992, Forest Policy (1994), Environmental Conservation Law (2012) were enacted. Mangrove Section

under Watershed Management Division of FD, Environmental Conservation Department (2012) has been established, and the ministry was reformed in 2016. Despite specific law, policy, and regulations, forest degradation in Myanmar is still happening in many ways. Consequently, mangroves are conserved by establishing administrative boundary such as Reserved Forest and Protected Area since 1896 but (e.g, in Ayeyarwaddy) 136,448.26 ha of mangroves were degraded between 1980 and 2002. Myanmar needs clear and strong legal framework followed by enhancing institution, conservation methods activities, collaboration, raising awareness, alternative job opportunities, to protect mangrove taking into account these data from FAO and FD.

Keywords— Mangrove, Ecosystem services, institution, deforestation, policy,

II. INTRODUCTION

Myanmar, the largest country of mainland in Southeast Asia with varied topographic regions, is a rich country in natural resources, with forest covering 46.69% of the total land area (677,000 km²), and a population of 51.42 million as of 2014 census. Its socio-economic development is very reliant on natural resources including territorial and coastal forest or mangrove. It consists of diverse topographies including a long coast line bordering with Bay of Bengal in the West and with Andaman Sea in the South; a low and flat dry zone, mountainous zones, and even snowcapped mountains in the northernmost part of the country.

Mangrove in Myanmar, among 8 major forest types, is playing a key role in providing ecosystem services to coastal communities and the nation. Myanmar had mangrove vegetation of 555,500 ha in 1980, 536,100 ha in 1990, 518,646 ha in 1999, 516,700 in 2000 but it goes down to 507,000 ha in 2005 [1] and 502,911 ha in 2010 [2]. It stood at third with its area in 2005 in Asia even though it had declined since 1980. This followed Indonesia (2,900,000 ha) and Malaysia (565,000 ha). Annual change is (-1940 ha or (-0.3%) of its total) between 1980 and 1990, -1940 ha or (-0.4%) between 1990 and 2000, -1940 ha or -0.4 % between 2000 and 2005 [1].

Myanmar forests are being systematically managed especially with selection system known as Myanmar Selection System (MSS) since 18 century, during British colonial time. Forest Department (FD), Ministry of Natural Resources and Environmental Conservation (MONREC) is focal agency in term of forest management and conservation and Environmental Conservation Department

(ECD). MONREC is focal agency in term of environmental conservation and addressing climate change. FD is planning to set up a "Mangrove Section" under Watershed Management Division, FD since 2014 for strengthening mangrove management. In the context of policy, Forest Policy, forest law, forest rules, wildlife and wild animal protection law, community forestry instruction, periodical regulations are critical tools of Myanmar forest management system.

Even though it has policy tools and system institution, mangrove forest had deteriorated, both by natural and anthropogenic actions, outbreaks of insects; outbreaks of diseases, severe weather events, such as snow, storm, drought, etc.[3]. The current study is conducted to understand existing law and policy, and institutional arrangement status, the cause and barriers, and ways to cope with deforestation.

III.METHODOLOGY

A. Study area

A 2400 km long coast line (between (southernmost of 9°54'22.63"N, 98°30'26.94"E) and (northernmost of 21°24'49.75"N, 92°21'28.44"E)) and between (easternmost of 11°39'14.24"N, 99°37'34.92"E) and (westernmost of 21°6'43.44"N, 92°9'54.48"E)) is belong to Myanmar and facing Bay of Bengal in the west of the country and Andaman Sea in the south. It composes 3 main coastal zones; Rakhine coastal zone (RCZ) of 740 km; Ayeyarwaddy Delta Coastal zone (ADCZ) of 460 km; and Tanintharyi Coastal zone (TCZ) of 1200 km. It belongs to 6 (2 States and 4 Regions) out of 14 States and Regions.

Mangrove grows well along the coast but those are being degraded and deforested due to natural and anthropogenic pressures. FD is trying to protect it in terms of enhancing institutional capacity, establishing plantation and community forest (CF) in degraded areas,

extending numbers of RF, and international cooperation.

B. Methods

This study firstly evaluates the overall mangrove cover change and then analyzes the cause and barrier of mangrove deforestation, and current policy and institutional arrangement to find potential and suitable measures or ways coping with mangrove deforestation for sustainable mangrove management (Figure B1).

Mangrove cover changes for 30 years were analyzed based on official documents, Forest Department’s Management Plan (1995-2005) , (2005-2015), and (2015-2025), reports such as “Myanmar forest register” [4], and FAO’s forest assessment reports [1 and 3] etc. Cause and vulnerability assessment has been analyzed by conducting questionnaire interview with local community and semi structured interview with FD officials reviewing official records of FD. Policy and institutional system has been assessed based on in-depth study on existing governance system and tools. During a preliminary survey in Ayeyarwaddy Delta Coastal Zone, questionnaire interview with 16 heads of households and semi-structured interview with 12 forest officers were carried out. Their satisfactions and comments on policy and management activities were analyzed. Cause and barrier of mangrove deforestation are extracted from interview results as well. Necessary information and knowledge were as well documented during both questionnaire and semi-structured interviews and field observation.

All data as much as collected were put into excel sheet and SPSS programme, and analyzed frequency of individual variable by

applying descriptive statistics tool so that mangroves changes and local livelihoods status can be assessed.

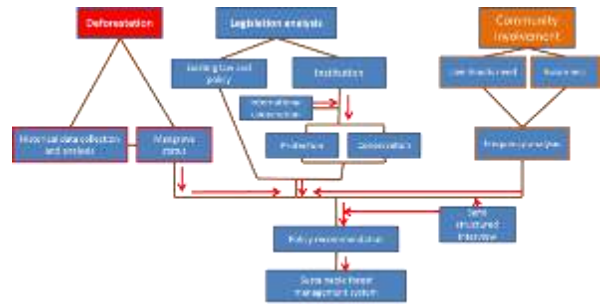


Figure B1. Methodology of the study

TABLE B1: GOVERNANCE TOOLS IN ENVIRONMENT AND FOREST MANAGEMENT

Categories	Components	Sources
Policy	International policy	IPCC, UNFCCC, IUCN
	National policy -Environmental Policy -Forest Policy -Land use policy -Agriculture policy -Fishery policy -Tourism policy -Transportation policy	ECD, FD of MOECAAF, DOA of MOAI, DOF of MOLFRD, MOT, MOE (official documents and their websites)
Law	Sectoral laws including Forest Law, Environmental Conservation Law, and Disaster Risk Management Law	ECD, FD of MOECAAF, DOA of MOAI, DOF of MOLFRD, MOT, MOE, DRR of MOSWRR, GAD of MOHA (official documents and their websites)
Regulations and instruction	Regulations and instructions released by local governments and departmental	Departments and local governments
Plan	Forest Management Plan for every ten years since 1995	Forest Department

IV. RESULTS

Mangroves are growing well in 9 out of 17 Townships (TSPs) along Rakhine coast line of (RCZ). Its cover area in Rakhine State in 1995-96 of 152,111.8 ha or 9.28 % of total forest area of 1639378.25 ha (Figure B2). In Ayeyarwaddy Region, mangrove grows in 7 out of 26 Townships. It is surveyed as of

81,851.75 ha or 19.22% of total forest of 425,832.75 ha (Figure B3). Altogether 21 reserved forests (RFs) and unreserved forests (URFs) covering mangrove of 253,118.3 ha, 8 RFs in Ayeyarwaddy Region, one RF and one URF in Rakhine State, and 11 RFs in Tanintharyi Region are observed in 2013 [5] (Table B2). Four Protected Areas or wildlife sanctuaries, 2 in Ayeyarwaddy Region and 2 in Tanintharyi, have also been established (Table B3). Furthermore, 10,421 ha of URPFs and CF are being processed for approval of cabinet (Table B4).

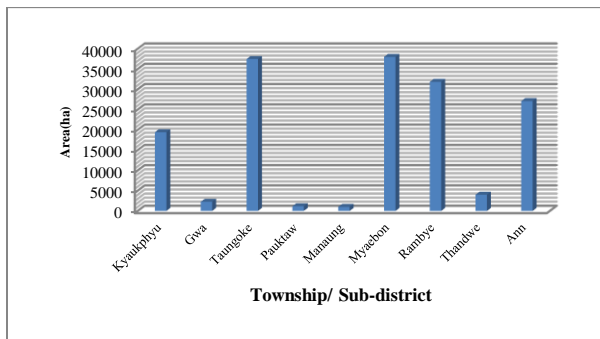


Figure B2: Mangrove in Rakhine State in 1995-96 (major part of Rakhine Coastal Zone)

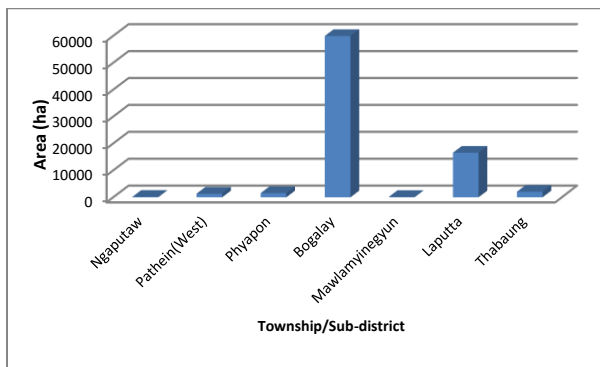


Figure B3: Mangrove in Ayeyarwaddy Region in 1995-96 (including a part (Patheini-west) of Rakhine Coastal Zone)

Mangrove coverage is significantly declining from 659,018.83 ha in 1980, 485,622.77 ha in 1990, 404,685.64 ha in 2000, 326,506.04 ha in 2010 (MOECA, 2014) to 299,000.00 ha [3] in 2015 (Figure B3) due to various factors such as population pressure, weakness and gaps in forest policy, environmental policy, forest law,

forest rules, regulations, instructions, and conservation activities.

Mangrove deforestation at a rate of 72,003.77 ha/yr. has been observed (Figure B3). Deforestation rate of 0.51 % in RF and 1.21 % in un-reserved forest were observed. Within 35 years, from 1980 to 2015, mangrove area of 405,581.99 ha was lost (Figure 4). The area loss of 64,730.06 ha in Rakhine State, 19,789.24 ha in Ayeyarwaddy Region, and 111,062.69 ha in Tanintharyi Region were found (Figure B5). It means deforestation rate in un-reserved forests is 2.37 times higher than that of in RFs [3].

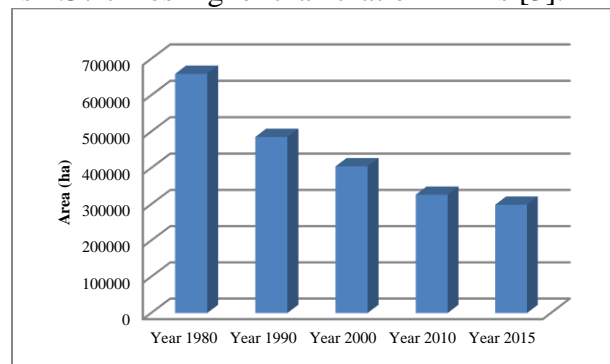


Figure B3: Mangrove cover changes within 35 years in Myanmar

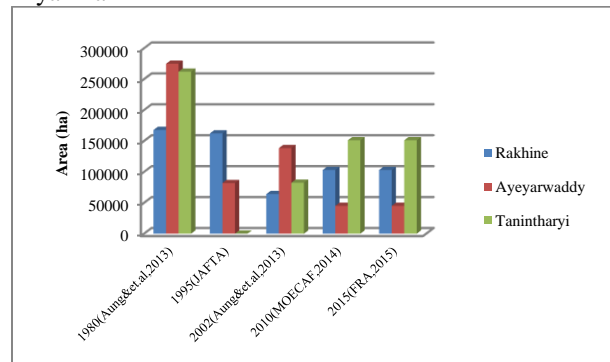


Figure B5: Mangrove cover change in three main States and Regions between 1980 and 2015 [3, 4, 6]

Two main causes; anthropogenic and natural actions, have been identified as cause of mangrove deforestation.

Forest Department is trying to reforest mangrove or establish mangrove forest plantation of 997.98 ha in Rakhine, 5789.47 ha in Ayeyarwaddy, and 121.46 ha in Tanintharyi between 1981 and 2015 (Figure B7) in the degraded areas but area of mangrove forest plantation are still far to meet the lost and

degraded mangrove area of 405581.99 ha (Figure B5).

In the context of international cooperation for mangrove and its ecosystem conservation, the government attention can be seen getting higher based on some progress such as development of national strategy (NSDPM) and action plan on mangrove, forming a national coordinating body (NCB) on 10th Oct 2014, membership of mangroves for future (MFF) in 2014.

In the context of policy, Ministry of Natural Resources and Environmental Conservation (MONREC) has the main responsibility to manage and conserve the forests, forest products, their ecosystems, and finally environmental conservation and addressing climate change. Forest Department (FD) has the mandate to manage and protect forests and their ecosystems simultaneously Environmental Conservation Department (ECD) has the mandate for coordinating environmental affairs among stakeholders and mainstreaming environmental conservation and addressing climate change into those and different sectors (Figure B6).

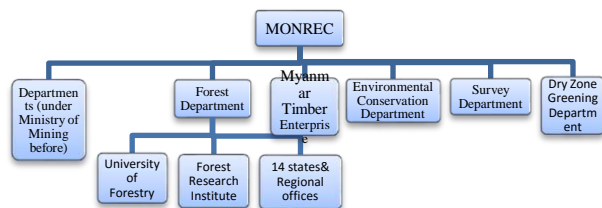


Figure B6: MONREC organization structure

Forest Law was enacted in 1902 and amended in 1992 after 90 years by the ministry of forestry (MOF) currently MONREC for meeting existing politic and socioeconomic status. The article 4 and 6 of the Forest Law amended says that the reserved forest is an area to conserve the environmental factors and to maintain a sustained yield of forest products. The Ministry may, with the approval of the Government, constitute the following categories of reserved forest by demarcating land at the disposal of the Government:

- 1) commercial reserved forest;
- 2) local supply reserved forest;
- 3) watershed or catchment protection reserved forest;
- 4) environment and biodiversity conservation reserved forest;
- 5) other categories of reserved forest.

Forest and forestry are defined as the allowed land use and activities in the reserved forest in Forest Law. Any trespassing, felling, burning, settlement, etc. in the reserved forest (RF) without permission of FD are not allowed, and the person who violates the act can be punished in accordance with the Forest Law [7].

TABLE B2: MANGROVE RFS AND URPFs ESTABLISHMENT IN MYANMAR COAST

State/Region	RF no.	Established
Rakhine	2	Since 1931
Ayeyarwaddy	8	Since 1896
Tanintharyi	11	Since 1920
YGN	3 URPFs	Since 2015

TABLE B3: PROTECTED AREAS (PAs) ESTABLISHED IN MYANMAR COAST

State/Region	PA no.	Established
Rakhine	0	
Ayeyarwaddy	2	Since 1970
Tanintharyi	2	Since 1927
YGN	0	

TABLE B4: MANGROVE URPFs TO BE ESTABLISHED

State/Region	Proposed / Proposing	No. of URPFs/ CF
Rakhine	Proposed	4 URPFs
	Proposing	4 URPFs
	Proposed	1 CF
Ayeyarwaddy	Both	0
Tanintharyi	Proposed	3 URPFs
YGN	Both	0

Article 42 in Forest Law highlights restriction and punishment, “whoever commits any of following acts shall be punished with fine 20,000 kyats or imprisonment, or both

- a) felling, cutting, girdling, injuring in RF

- b) extracting, moving or keeping timber from RF
- c) establishing saw mill⁴) environment and biodiversity conservation RFs
- d) other categories of reserved forest.”.

Forest policy has been announced in 1994 in consideration with six main categories such as protection, sustainability, basic needs, efficiency, people participation, and public awareness. FD has submitted its policy being amended for the cabinet approval.

Environmental policy (1994) is being amended and **environmental policy framework (EPF)** is being developed under a joint project between UNDP-Myanmar and ECD since 2015 [8]. **EPF** would include mission “committed to leading the integration of environmental perspectives into socio-economic policies, laws, regulations, plans, strategies, programmes and projects across the Republic of the Union of Myanmar”.

Community Forest Instruction (CFI) was notified in 1995 [9]. In this regards, MONREC is encouraging community forest (CF) in both degraded RFs and other land. Currently, FD is amending CFI to meets actual needs and overcome its weakness based on 20 years of experience.

On the other hand, **national land use policy** has been developed through coordination of different ministries in January 2016 and forest law is being amended by FD. It includes 13 parts. But, illegal timber and forest production extraction and conversion of forest into other land use are observed.

Simultaneously, development of national strategy (NSDPM) and action plan on mangrove is being processed and a national coordinating body (NCB) on 10th Oct 2014, membership of mangroves for future (MFF) has been formed with the ministry’s order number of “10-9-2014” in September 2014.

NCB has been reformed in 2015 with main objective of managing coastal and mangrove resources in effective and sustainable ways.

Regarding lesson learnt from Cyclone Nargis’s impacts on mangrove ecosystems, local community in 2008, awareness has been highly pushed up. Except TCZ, ADCZ has been most destroyed and RCZ secondly in the disaster. Mangrove section is being established in Watershed Management Division (WMD) of FD since 2014 [5].

Institutional structure has been reformed for 2 times within 5 years; Ministry of Forestry to Ministry of Environmental Conservation and Forestry (MOECAF) in 2011 and MOECAF to Ministry of Natural Resources and Environmental Conservation (MONREC) in 2016 (Figure B6).

Results of questionnaire and semi-structured interviews conducted during preliminary survey with 16 local interviewees living among mangroves in Ayeyarwaddy Region confirm that mangrove areas are losing by conversion of mangrove into agriculture land / shrimp ponds (56.3% agree), degrading by cutting trees for fire woods and construction (31.3% agree), and (12.5% did not answer) Most of mangrove deforestation was caused by livelihoods needs (87.5% agree and 12.5% did not answer) as 18.8% of respondents are working on agriculture/ rice farming, 18.8% on shrimp pond farming, 18.0% on fishing, and 43.8% on both agriculture and shrimp pond farming.

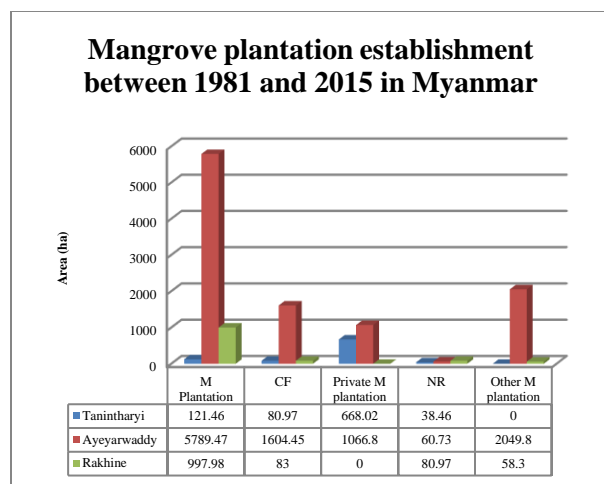


Figure B7: Mangrove plantation in Myanmar

V. DISCUSSION

Land use policy recently developed in 2016 is expected to be a tool to minimize deforestation and conversion of forest to other land use. There is significant mangrove deforestation at a rate of 72,003.77 ha/yr. even though analyzed data variation are observed among different researchers, JAFTA, FAO, and FD. Two main drivers, anthropogenic and natural actions, on mangrove deforestation are observed. Anthropogenic actions includes population pressure; increasing from 28.91 million in 1973 to 35.31 million in 1983 and 51.49 million of 10,877,832 households in 2014 [10], limited job opportunity, increasing community needs on forest products such as wood, pole, post, for construction, different aquatic animals such as fish, shrimp, crab, medicinal plants, and low income of community, land conversion (both illegal & legal), are observed. In the context of natural actions, Cyclone Nargis among 11 cyclones within 126 years is observed as most destructive natural disasters on both community and mangrove ecosystem in Myanmar. Illegal conversion of mangrove into agriculture land and cutting trees is more significant issues than climate change impacts even though there are forest law, rules, and policy.

Weakness in law enforcement, limited quantity, capacity, and facility of human

resource and institution, overlapping or not clear items among sectoral policy, laws, and rules, and less number of researches on mangrove ecosystem, coastal ecosystem are identified as potential barriers in mitigating process of mangrove deforestation.

To fulfill the needs of people is one of 6 categories of Myanmar forest policy but people demand is exceeding the potential supply of mangrove ecosystem and government support through a milling and marketing service of Myanmar Timber Enterprise (MTE). There are also weaknesses in law enforcement due to insufficient human resources capacity and quantity, lack of logistic support or facility for patrolling among mangrove, weakness of policy concern on mangrove ecosystem and its vulnerability, law, rules, and regulation. Community Forest Instruction (CFI) is technically sound but it is filled with risky issues of legislation, socio-economy, management, communities, and institutional constraints in development of CF after CF certificates were issued as confirmed by the results of semi-structured interview and self-experience. It is clear that Myanmar needs clear and strong legal framework followed by enhancing institution, collaboration, raising awareness, alternative job opportunities, to protect mangrove taking into account data from FAO, FD, and other available technical data.

VI. CONCLUSION

Myanmar has systematic forest management known as sustainable forest management plan (SFM) and institutional arrangement but mangrove degradation and deforestation are still on going and complicated issue. Due to construction of massive bunds, excessive land reclamation for agriculture and aquaculture, tree cutting for timber, fuelwood and charcoal production on a commercial scale, 10 out of 13 unreserved and reserved forests in the Ayeyarwaddy Delta Coastal Zone have been converted in to agricultural land, shrimp pond and settlements. To fulfill the needs of people

it should be considered by the MONREC in alternative ways including CF establishment. The ministry should try to strengthen law enforcement, human resources capacity and quantity, logistic support or facility for patrolling among mangrove through coordination with concern ministries and international technical and financial support. The concern ministry should encourage mangrove management techniques, research and development, such as plantation establishment, natural regeneration activities, and research on mangrove ecosystem, coastal ecosystem. Law and policy amendment in multisector especially forest law, policy, community forestry instruction should be encouraged as well.

Mangrove forest plantation establishment and natural regeneration activities should be encouraged much more than current status. Community forestry practice being applied by FD technically sounds good but monitoring and evaluations on user groups are still weak. Specific Mangrove management working plan should be developed as existing Forest Working Plan is generally focus on terrestrial forest rather than mangroves. Development of a mangrove forest working plan is also urgently required as the existing Forest Working Plans generally focus on terrestrial forest rather than mangroves. Finally, more effective community awareness programmes should be conducted regularly.

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