MANGROVE CONSERVATION EFFORTS IN AYEYARWADY DELTA

Hein Myat Thu*

Abstract

Mangrove conservation is very important for the people in Myanmar. Mangrove provides environmental protection, food sufficiency and socio-economic life. Mangrove also promotes an opportunity for future generations to meet the needs of vital livelihood. These consequences highlighted the need for conservation of mangrove. In Myanmar, mangroves are mainly found in three geographical regions, the Ayeyarwady Delta, and Rakhine and Taninthayi Coasts. Among them, Ayeyarwady Delta was the largest mangrove degradation. Population growth, lead to changes in land-use and over-utilization of resources. Moreover, under the State Law and Order Restoration Council (SLORC) and State Peace and Development Council (SPDC), the government's agriculture and aquaculture expansion policies led to massive depletion of mangrove. The Forest Department (FD) has responsibility to conserve the mangrove. Thus, the FD, in collaboration with the UNDP and the FAO, started UNDP/FAO projects in 1991. The Cyclone Nargis struck Myanmar on 2 May 2008 and devastated quite a number of Ayeyarwady mangroves. Governments have encouraged the private sector to participate in mangrove plantation. In collaboration with NGOs and IGOs/INGOs, the FD conducted their tasks for community development and protection and conservation of mangrove systematically through community participation before and after 2008. The research aims to contribute the findings for the development of mangrove conservation which helps not only to safeguard natural ecosystems but also to alleviate poverty in the Ayeyarwady Delta. The objective of the research is to analyze how mangrove forests can be conserved in collaboration with Government agency, Local NGOs and IGOs/INGOs.

Keywords: Mangrove, conservation, forest department, community forestry, reserved forest

Introduction

Myanmar is one of the countries which is bestowed with vast forests and wetlands and they are the country's major natural wealth. Mangroves are evergreen forest between the land and sea, found essentially in the intertidal zone and occupying large tracts along sheltered coasts, estuaries and in Deltas where they are influenced by tides. Myanmar has faced mangrove depletion, especially in the Ayeyarwady Delta. One of the major causes of mangrove degradation in this focus area is due to growing population, which led to changes in land-use and over-utilization of resources. In the Ayeyarwady Delta, the local communities heavily utilized mangroves as a source of fuel wood and charcoal, especially for four million people in Yangon between 1970 and 1992. From 1995 to 2000, over five hundred thousand of mangroves was cleared and rice production was the government's priority for foreign income. The World Bank provided loans for the paddy I and paddy II projects and the mangroves were cut and converted into paddy cultivation. Moreover, mangroves were depleted due to Cyclone Nargis in the Ayeyarwady Delta in 2008. Therefore, it is necessary to rehabilitate the mangroves. The research aims to analyze the collaborative mangrove conservation efforts in the Ayeyarwady Delta among the Forest Department (FD), the Non-Governmental Organizations (NGOs), the Intergovernmental Organizations (IGOs) and the International Non-Governmental Organizations (INGOs). The FD established many mangrove plantations to meet the needs of the local communities as well as it implemented the regeneration of mangrove forest projects in cooperation with the NGOs and IGOs/INGOs.

Myanmar, one of the Southeast Asian countries, is the largest country in mainland ones. Myanmar has a total length of 2,832 kilometers of coastline and the Ayeyarwady Delta, with the area of about 35,000 kilometer square (km^2), lies in the southern part of the country. The

* Dr, Tutor, Department of International Relations and Political Science, University of Yangon

Ayeyarwady Delta consists of the interminable and fertile plain, which is 180 miles long and 150 miles wide. According to the FAO, mangrove forests covered 194,925 acres in the Ayeyarwady Delta in 2015. In the Ayeyarwady Delta, between the years 1980 and 2015, almost 537,597 acres, has been lost (FRA, 2015). In this area, mangrove has been distributed in Myaung Mya Township (Lae Pyauk and Kyauk Kone Reserved Forests (RFs)), in Laputta Township (Ka Ka Yan, Kyakankwinpauk, and Pyinalan RFs), in Mawkyun Township (Laputkwe, Kalayike, and Nyi Naung RFs), and in Bogalay Township (Kadonkani, Pyindaye, and Meinmahla RFs) that can be seen in Appendix (I).

Materials and Methods

Using the descriptive qualitative method, the research analyzed the role of cooperation among the FD, NGOs, and IGOs/INGOs for mangrove conservation and rehabilitation. It used both primary and secondary sources, which are government documents, reports, newspapers, official forestry journals, reliable internet documents and personal interviews. This paper consists of three parts: the first part explained the activities of FD and CF, the second part examined collaboration between FD and NGOs, and the third part focused on cooperation between FD and IGOs/INGOs.

Activities of Forest Department (FD) and Community Forestry (CF)

The FD is the main arm of the Government for forest sector policy and programme implementation. The 1992 Forest Law demonstrated a shift from the concept of revenue generation and restriction to motivation and share of management responsibilities with people's participation. It provided opportunities for the promotion of private sector involvement in forestry sector. It encouraged community participatory approach in managing the forest resources.

The public involvement is essential for mangrove forest management and conservation and this will probably help make sustainable forest management in the future. As a result, it is necessary to encourage the public participation in mangrove forests management and conservation. All people of the seasonal settlement in mangrove forest areas were the main users. They should participate in all aspects of the mangrove management. They need to protect their mangrove resources with traditional knowledge. However, mangrove resources cannot be managed without the participation of the local communities. If the absence of their participation, mangrove degradation issues could not be solved.

With the support of the 1992 Forest Law, the FD initiated the Community Forestry (CF) as well as issued the Community Forestry Instructions (CFIs) in 1995. However, challenges in implementation of the CF were illegal cutting in community forests, and encroachment into community forests for the purpose of agriculture and shrimp farming. Moreover, some local people had no interest in the CF. On the other hand, some local community searched for crabs and shrimps in the community plantation. In addition, law enforcement was weak in taking proper actions to those who violate the rule. Some forest staff did not understand on concept and process of CF. Under the procedure for the 1995 CF, the villagers did not understand how to practice because they have no experience. Lack of fund and qualified staff were also the constraints in implementation of the CF. However, the NGOs and IGOs/INGOs have played a key role to promote the CF. Moreover, in 2016, the minister of Ministry of Environment Conservation and Forestry (MOECAF) replaced the 2016 CFIs. It was changed in accordance with the requirements of the local people. As a result, local communities were interested in the sector of the CF.

In compare with the 1995 CFIs and the 2016 CFIs, the 1995 CFIs emphasized on the forest conservation. Therefore, the local communities had doubt about the 1995 CFIs. On the other hand, the 2016 CFIs highlighted the rights and interests of the local communities. Moreover, changing over from the 1995 CFIs to the 2016 CFIs enforced the 2018 Forest Law.

In 2018, the former 1992 Forest Law was replaced with the New Forest Law which promulgated by the Pyitaungsu Hluttaw. Hence, the 2018 Forest Law came into force on 20, September, 2018. The 2018 Forest Law proved the legal framework to implement forest policies. Moreover, carrying out global climatic changes and the Sustainable Development Goals (SDGs) are the significant factors in the 2018 Forest Law. Daw Aung San Suu Kyi government confirmed its commitment to protect the planet through sustainable natural resources management and environmental protection. Moreover, the government pledged to implement the tasks of economic development in parallel with the environmental conservation.

Concerning the sector of reforestation, the FD has carried out mangrove plantation programmes in terms of restoration of mangroves and coastal forests. Moreover, the FD has worked in collaboration with the local communities and encouraged people's participation in planting activities. The FD planned to rehabilitate the mangrove forests through the CF, Private, Natural Regeneration (NR) and other programmes. Mangrove reforestation programmes in the Ayeyarwady Delta was as follows.

Table 1 Mangrove Reforestation Programmes in the Ayeyarwady Delta from 1981-82 to 2018-19

Region/Delta	Township	Mangrove Forests Areas (acres)			
		CF plantations	Private plantations	N/R plantations	Others plantations
Ayeyarwady	Bogalay	250	-	280	3,994
	Laputta	1,946	490	-	770
	Pyapon	3,767	2,145	-	305
Total		**5,963**	**2,635**	**280**	**5,069**

CF- Community Forest, N/R- Natural Regeneration

Source: ***Mangrove Data (Abstract),*** Naypyidaw, FD, Ministry of MONREC, February, 2019

Table (1) shows that mangrove reforestation of the CF, Private, N/R and other programmes were planted in Bogalay, Laputta and Pyapon Townships, Ayeyarwady Delta from 1981-82 to 2018-19. According to the Table (1), the total 5,963 acres of mangrove plantations were planted by the FD in order to establish the CF. To promote community participation in mangrove restoration programmes, the FD allowed establishment of 2,635 acres of private forest in Laputta and Pyapon Townships. The FD also established about 280 acres of natural regeneration plantations in Bogalay. Moreover, in collaboration with the Japan International Cooperation Agency (JICA), Forest Resource Environment Development and Conservation Association (FREDA) and Myanmar Environmental Conservation and Rehabilitation Network (MERN), the FD established about 5,069 acres of other plantations in Bogalay, Laputta and Pyapon Townships as protected areas.

Cooperation between FD and NGOs

The FD closely cooperated with Non-governmental Organizations (NGOs). Forest Resource Environment Development and Conservation Association (FREDA) is one of the NGOs in the forest sector of Myanmar. It was established in 1996. In cooperation with FD, FUGs, Action for Mangrove Reforestation (ACTMANG) and Tokio Marine (T2M), FREDA conducted the Mangrove Reforestation Project through community participation in Pyindaye Reserved Forest (RF), Ayeyarwady Delta in 1999. The aim of the project was to recover mangrove forests in Pyindaye RF where deforestation has been increased year by year in an alarming rate. As long as mangroves recover, original mangrove ecosystem could restore for the sake of communities in

Pyindaye. On the other hand, it was anticipated to absorb carbon that partly causes global warming through mangrove reforestation.

Table 2 Establishment of Community Forestry Mangrove plantation in Pyindaye RF, Pyapon Township from 1999 to 2008

Phase (I) **Unit: acres**

Year	Village	HH	1999	2000	2001	2002	2003	Total
Area	10	310	126	350	375	400	263.5	**1514.5**

Phase (II) **Unit: acres**

Year	Village	HH	2004	2005	2006	2007	2008	Total
Area	12	375	533	388	260	250	250	**1681**

HH- Household

Source: ***FREDA office***, NGO, Yangon, 2015

The Table (2) mentioned that establishment of community forestry mangrove plantation in lower part of Pyindaye RF, Ama Sub-township, Pyapon Township, Ayeyarwady Delta, from 1999 to 2003. In phase I, the project completed 1,514.5 acres by 310 households of FUG member from 10 villages (OakPho Kwin Chaung, Tae Pin Seik, War Kone, Ka Nyin Kone, Khar Chin, Kyawe Tae, MaMhwe Kwin, 2-Ba Wa Thit, 3-Ba Wa Thit and Padauk Pin Seik). In phase II, project from 2004 to 2008, the area of 1,681 acres was established by 375 households of FUG from 12 villages (OakPho Kwin Chaung, War Kone, Ka Nyin Kone, Kyawe Tae, MaMhwe Kwin, 2-Ba Wa Thit, ThaMein PaLae, Padauk Pin Seik, War Pa Nar, U Pae, A Shae Phyar and 3-Ba Wa Thit). Therefore, a total of 3,195.5 acres were successfully reforested by the CF within ten years.

During the year 2007, with the financial support of Diakonie Katastrophenhilfe (DKH), Germany about 200 acres of mangrove plantations including Byushwewa (*Bruguiera sexangualar*), Thamegyi (*Avicennia officinalis*) and Kanaso (Ye) (*Heritiera fomes*) were established in Kadonkani RF. Similarly additional 400 acres of mangrove plantations were established in the same RF in 2008 and 2009. The target area would serve as a model and inject stimulus to grow more and more mangrove trees by the community.

During the Mangrove Reforestation Project; Phase III (2009-2013), the area of 1,550 acres was established by 146 households of FUGs from 17 villages (OakPho Kwin Chaung, Tae Pin Seik, War Kone, Ka Nyin Kone, Kyawe Tae, 2-Ba Wa Thit, 3-Ba Wa Thit, Lay Pin Chaung, Padauk Pin Seik, Nauk Pyan Toe, ThaMein PaLae, War Pa Nar, U Pae, Kyauk Tine, Ba Aye Kan Kye, Aung Kone, and Pho Htoo Taung Ya. Moreover, in 2017, Community Forestry Certificates were issued to 1,083 FUGs from 22 villages who proposed about 10,278 acres of plantations to the FD in Pyapon Township (Ama Sub-Township) with the support of FREDA for 30 years. In 2018, in collaboration with the FD, FUGs, ACTMANG, and T2M, FREDA continuously implemented the Mangrove Reforestation Project through the community participation in Pyindaye RF, Ayeyarwady Delta. After the project, area of mangrove plantations 375 acres and mangrove seedlings 347,000 were established by 736 households of FUGs from 16 villages in the target area.

Mangrove Service Network (MSN) is a local NGO working in participation with the Government Organizations, Local and INGO communities in mangrove conservation programmes which was established in December 2001. MSN cooperation with United Nations Development Programme (UNDP) and Food and Agricultural Organization (FAO) carried out the Sustainable Livelihood Development Project in the Ayeyarwady Delta under Human Development Initiative

Programme from 1994 to 2001. The project established mangrove plantations 1200 acres in 360 villages under the CF programme.

MSN implemented a small project on Ecological Mangrove Restoration by necessary technical assistant of Mangrove Action Project (MAP) in Pyinalan RF in collaboration with the FD in Laputta Township which was started in 2006. The project was provided by financial support from Global Green Grant (GGG). The cost of project was US dollar 2500.00. The project period was four-year. The Project aimed to observe the nature of mangroves regeneration in the Ayeyarwady Delta, to demonstrate Ecological Mangrove Restoration and to promote mangrove conservation activities in the region. The target area was 100 acres in the Block number (62) in Pyinalan RF, Laputta Township. Before implementation of the project, the area was old traditional shrimp pond kept back by the FD. The land was flat plain and totally dry and clear. In surrounding area dominant species were Madama (*Ceriops decandra*), Tayaw (*Excoecaria agallocha*), Thamegyi (*Avicennia officinalis*), Rhizophora spp: Kyana (*Xylocapus mluccensis*) and Kantbalar (*Soneratia apetala*). Source of seeds and seedling were available within one mile radius of the project site. The Ecological Mangrove Restoration method was no need for a mangrove nursery or for planting of mangrove seedlings. The method used low cost techniques. Moreover, the mangrove plantation growth rate was faster man-made plantation.

In addition, MSN worked with JICA project for natural condition/ zoning and site condition survey in mangrove area from 2003 and 2007. After the Cyclone Nargis, with supporting from FAO and United Nations (UN), the MSN nursed over 210,000 mangrove seedlings of Byu-Chedauk-Apho (*Rhizophora sp*) and Thamegyi (*Avicennia officinalis*) in two villages (La Wine Kyun and Ma Kyin Myaing Kyun) in Bogalay Township. MSN distributed seedlings to those villages to grow at their village vicinity and sold to other villages. The MSN also planted mangrove plants on 36.16 acres of village land in six villages in Satsan village tract with community participation. MSN established about 9,000 seedlings alongside the road from Satsan to Da Min Taung village.

Cooperation between FD and IGO/INGOs

For mangroves rehabilitation and conservation, the FD on its part has started the establishment of mangrove plantations since 1980s. The FD in collaboration UNDP and FAO had undertaken the Feasibility Study on Mangrove Reforestation (MYA/90/003) Project from 1991 to 1993. The possibility of forming mangrove nurseries for large scale plantations was investigated and species trial plantations were established. This MYA/90/003 project was initiated at the request of the Government of Myanmar (GOM) to redress the growing fuel-wood supply-demand imbalance in the Ayeyarwady Delta and to develop the planting technology needed to rehabilitate degraded and denuded areas to conserve the mangrove environment and enhance its protective functions. The objectives of the project were to initiate mangrove studies, species trials, pilot plantations to rehabilitation critically degraded mangrove areas in selected sites within the Ayeyarwady Delta. UNDP and FAO contributed US dollar 328,250 for the project. The GOM provided kyat 2,054,990. Two experimental trial plantings of 75 acres and 100 acres were successfully established in Bogalay and Laputta townships respectively.

Moreover, four fellows were sent to Thailand and Malaysia to familiarize themselves with all aspects of mangrove management and charcoal processing. The technical and managerial capability of the Ayeyarwady staff at all levels has been considerably strengthened through on-side training as well as the fellowships provided. The MYA/90/003 project outputs would contribute to the sustained use of mangrove wood and non-wood resources by enhancing skills, basic knowledge and awareness of the problem of mangrove degradation as well as by enhancing national capabilities to plan and rehabilitate degraded forests.

With the experiences from (MYA/90/003) project, Community Development of Ayeyarwady Mangroves Project (MYA/93/026) was carried out to lay down the methodology to restore mangrove through people's participation. It was signed on 26 January 1994 by the GOM, UNDP and FAO. This Project was during the period from 1994 to 1996. The development objective of this project was to promote sustainable human development by improving the socio-economic welfare of disadvantaged communities in critical areas in the Ayeyarwady Delta through mangrove environmental regeneration and protection, improved fisheries, income generation and sufficiency in fuel-wood and wood products. UNDP and FAO contributed US dollar 2.006 million for the project. GOM provided kyat 17.87 million.

A total of 50 project villages was selected in two townships (48 regular villages and two forest villages in RF area). Villagers raised 4,800 acres of plantations and planted 6.4 million seedlings, equivalent to 6,400 acres, along river banks and roadsides, while maintaining and protecting 1,400 acres of natural regeneration area. All together a forest area equivalent to 12,600 acres was established.

The MYA/93/026 project achieved to improve rural capacity to manage income-generation activities based on mangrove-land. A total of 1150 villagers were trained in various aspects of agriculture, fisheries, forestry and home industries for income-generation, while income-generation group members received training in the operation of revolving funds. Ten township officials and 14 project villagers visited mangrove areas in Vietnam, Thailand and Malaysia to be exposed to various income-generation and mangrove conservation activities.

Forestry groups organized villagers in such activities as nursery raising, the creation of plantations and agroforestry species trials. Nursery raising and agroforestry created a wide impact as income-generation activities. Wood-saving stoves were popularized in the villages by women's groups. The project organized demonstrations and training for wood-saving stoves and supplied 2,000 stoves, thus creating a demand for improved stoves. About 3,000 fuel-wood saving stoves were distributed in Laputta and Bogalay Townships from March 1994 to October 1996. A training-cum-production centre was set up in a project village, at which 38 women were given tailoring training and supplied with sewing machines and 24 women were given weaving training and supplied with weaving looms for income generation.

In addition, the project entitled "the Environmentally Sustainable Food Security and Micro-income Opportunities in the Ayeyarwady Delta" (MYA/96/008) was started in 1996. It provided the local people how to conserve the mangrove forests and to make the region self-sufficient in food as well as provided them the micro-income opportunities. The MYA/96/008 project was implemented in Laputta, Bogalay and Mawkyun Townships from 1996 to 1999. The project focused on five main activities in environment and forest such as education and extension, community forestry, stove popularization, bank stabilization and village greening. UNDP and FAO contributed US dollar 30.6 million for the project. GOM provided kyat 16.82 million.

The project's assistance has been directed towards more than 15,000 households of 252 poor villages in the three project Townships. About 12,555 fuel wood saving stoves were distributed in Laputta, Bogalay and Mawkyun Townships. The approach was built strong emphasis on building self reliance of local communities for participatory development as well as on the range of provisions of alternative ways of making livelihood to the villagers so that they could earn continuous flows of income in the short run while they engage in longer task of the CF development including conservation and protection of mangroves.

Moreover, the project entitled "the Integrated Mangrove Rehabilitation and Management (IMRM) Project through Community Participation in the Ayeyarwady Delta" was undertaken by the JICA study team with close cooperation of the Myanmar counterpart personnel of the FD. The

IMRM project was realized in 2 villages from Laputta and Bogalay Townships from 2002 to 2005. JICA contributed US dollar 2.5 million to the project. Mangrove-plantlets about 700,000 were planted in the target areas. In addition, the JICA continuously carried out the IMRM project in Laputta, Bogalay and Pyapon Townships, Ayeyarwady Delta from April 2007 to March 2013. The Japanese side provided ¥ 750 million and Myanmar also contributed 100 million Kyats to the project. The project purpose was the community and the mangrove forests co-exist in a sustainable manner in the selected areas where project activities were implemented within the Ayeyarwady Delta. Regarding its objective, mangrove forest coverage increased from 110,000 acres in 2007 to 116,200 acres in 2013 in the selected areas where project activities were implemented. The JICA also established about 1,401 acres of mangrove plantations as Action Research Plantation (ARP) in the Ayeyarwady Delta from 2008 to 2012. During the project period from 2007 to 2012, in cooperation with the FD, JICA supported about 1,523 acres of plantations and 680 acres of natural forest to 418 households from Bogalay, Laputta and Pyarpon Townships for the CF.

The project entitled "Mangrove restoration Myanmar project" was implemented due to propose of Professor Dr. Nang Mya Han, Head of Myeik University (Marine Science) to the establishment of Mangrove Parks in Myanmar. The project was followed up by Professor Dr Khin Maung Cho, Head of Marine Science Department of Pathein University. The MOECAF signed the Memorandum of Understanding (MOU) with the Worldview International Foundation (WIF) due to part of a large scale national plan to be developed as this first university climate park in Myanmar. The Mangrove restoration Myanmar project was in cooperation with the WIF, Pathein University, Myeik University, Forestry University and MOECAF. The Chief Minister of Ayeyarwady Region gave supported the project. The Letten Foundation from Norway contributed US dollar 1.3 million to the project. This project was the first mangrove park project in Myanmar. It started in July 2012. It was three years research project. This is based on needs to further develop capacities of coastal universities to deal with urgent challenges in mangrove conservation and restoration, as well as other sustainable environmental issues.

During the research period (2012-2015), it is estimated that Myanmar has potential to restore 1,235,000 acres lost mangrove forests (50 percent of its lost area since 1980), with capacity to mitigate up to 500 million tons CO_2. This is a considerable contribution to global climate efforts, in addition to effectively protecting standing forests of 247,000 acres with carbon sink of 1 billion tons (estimated tonnage by using data from the Intergovernmental Panel on Climate Change (IPCC) in 2011).

During the research period, capacity building of the universities has been one of the main tasks. The project has supported the establishment of computer labs and other development needs, as well as research grants to 47 students and academic staff. In addition to practical research in testing out various methods of mobilizing local communities as well as established a mangrove university park on 1,800 acres land, with the first mangrove gene bank of its kind (Photograph-1).

Photograph (1): **Pathein University Mangrove Park in Ayeyarwady Region**

Source: Three years research project Mangrove restoration Myanmar July 2012-June 2015, https://media-openideo-rwd.oiengine.com/attachments/dc012e47-203d-41cf-bd56-cf5e43e79c9c.pdf

Globally, there are at least 68 mangrove obligate species, with 65 in Myanmar representing one of the world's richest bio resources. It is therefore of great importance to protect and take care of this bio rich resources in Myanmar. For the future conservation and protection of mangrove, it is important to establish a mangrove gene bank which can fulfill the concept of a comprehensive mangrove park. This can become an important source for future funding and can generate significant income from carbon climate markets.

The research project has provided to support for local initiatives of community development. Moreover, it included practical efforts to introduce fuel saving stoves and low cost solar lamps. It has provided solutions for community participation with increased income from creation of new livelihood initiatives. In 2015, it provided new livelihoods by training of women in the use of mangrove bark natural colours for clothes, utilization of medicinal mangrove based products, honey production in mangrove areas and orchid production in mangrove forests. In nursery establishment and restoration management, valuable capacity is inspired by mobalizing coastal communities. A test project with 43 villagers in Kan Su contributed greatly to the production of 36,000 seedlings in their own nurseries. If no effective action is taken, the vital mangrove forest could be lost It is therefore restoring mangrove forests in Myanmar is important not only for national but also for the global society.

Regarding the mangrove restoration, the organization known as the Sustainable Surf conducted to save and restore threatened mangrove forest ecosystems. The global surfing community understands the real value of restoring coastal ecosystem. Therefore, they launched the "See Trees" project. Michael Stewart was the co-founder of the Sustainable Surf. The first place to benefit from the Sea Trees project was the Thor Heyerdahl Climate Park in Myanmar (Photograph-2).

Photograph (2): **Thor Heyerdahl Climate Park in Ayeyarwady Region**

Source: Surfers ride the wave of ocean action in Myanmar blue forest, ***The Global New Light of Myanmar***, Yangon, News and Periodical Enterprise, 1, February, 2019, p.4

The reforestation projects have brought new mangrove trees (five millions in number). This also has led hundreds of job opportunities for local and at the same time thousands of families are supported with living and educational resources. In order to restore more than 4,940 acres of degraded coastal forest, in 2015 the Worldview International Fund led a project which focus on planting about 3.5 million mangroves. The Thor Heyerdahl Climate Park has also driven the use of cutting-edge technology in blue carbon projects.

The co-founder of the Sustainable Surf stated that mangroves are in facts super ecosystems. Mangrove conservation and restoration were necessary for a healthier coastal environment and a sustainable future for hundreds of millions of people throughout the world. In February 2018, UN Environment recognized the Thor Heyerdahl Climate Park as a potential world-changing, scalable model for rapid mangrove restoration throughout Southeast Asia and globally, and in November the project gained the Verified Carbon Standard (VCS) certification. The climate park project became the very first VCS certificated project in Asia. This made it the largest mangrove reforestation project to receive this certification and be able to produce carbon credits for international markets, laying the market foundations for Sustainable Surf's goal to be achieved. The project grew and fulfilled its potential to grow another five million trees. The global surfing community considered climate change to be the biggest challenge humans face. Therefore, the goal was to plant one million trees on behalf of the global surfing community in 2019.

Conclusion

In the Ayeyarwady Delta, variety of paddy are widely cultivated in the RFs in response to the growing population. Therefore, there is an urgent need to develop a clear-cut land use policy. Mangrove ecosystem is a great importance for marine creatures and environment.

Regarding Myanmar Forest Laws, the 1992 Forest Law emphasized people participation in forest management and private sectors involvement in forestry sector development. In addition, the 2018 Forest Law has a broader outlook, covering the environment, economic and social aspects such as conservation of biodiversity, establishment of commercial forest plantations for sustainable production by both the State and Private sectors, and formation of CF for the local communities. It provided strong support for forest management and reforestation. Concerning CF, the CF is a major breakthrough in the forestry sector. For CF Development, implementing organization needed

to ensure the livelihood support and poverty reduction by adaptive management for equitable sharing of benefits.

According to the aims of the Local NGOs and IGOs/INGOs projects, they protected the remaining resources, created awareness of the need to conserve mangroves and initiated numerous activities to enhance the socio-economic development of the project area in the Ayeyarwady Delta. Moreover, with the supporting of IGOs/INGOs, study tours were sent to foreign countries. This effort provided to obtain knowledge and experiences and to raise capacities building. In addition, trainings on mangrove nursery management, bank stabilization techniques, financial management, and fuel-wood saving stoves were contributed by NGOs and IGOs/INGOs, to the villagers in the target areas. This approach enhanced the living standard of villagers enabling them to earn an income in the short-term while simultaneously engaging in the long-term conservation of mangroves.

Under the successive governments, there were challenges and issues in mangroves conservation tasks. They were the government policy of promoting self-sufficiency in food production, low capacity at local level of government, lack of full understanding of mangrove processes, lack of research capacity on sustainability of mangroves, lack of alternative employment, inadequate funding for implementation of the task and lack of public awareness of environmental issues, insufficient number of the FD staff to manage mangrove, weakness in integration of local community, weakness in coordination with other relative departments, and weakness in law enforcement to control illegal encroachment.

It is suggested that to be successful in mangrove conservation, all the mangrove rehabilitation partners should consider individual species, the community ecology of the naturally occurring mangrove species at the site, paying particular attention to reproducing, distribution and successful seedling establishment, and the normal hydrology. The EMR method should be utilized in mangrove rehabilitation due to the advantages of natural vegetation through tide, low cost, higher survival rate, allowing the regeneration of multiple species, and faster growth rate. Patrolling, monitoring, and allocating of enough staff, enough funds and logistic supports were needed to conserve the mangroves. To raise awareness of the value of mangroves, environmental education and community awareness are essential. Moreover, Myanmar government needed more to invite the local community, NGOs and IGOs/INGOs to cooperate in implementing these to achieve the targets not only in the Ayeyarwady Delta but also in other regions. In addition, IGOs and INGOs have already been technologies and experiences that Myanmar can draw on. Consequently, international cooperation was very crucial for formulating long-term strategies. Myanmar government welcomed and appreciated efforts of International Organizations including UNDP, FAO, JICA, WIF, and ACTMANG for their technical and financial assistance in developing policies, strategy and master plan for the conservation of valuable mangroves in country.

References

(2000). ***Community Development of Ayeyarwady Mangroves,*** FO: DP/MYA/93/026, Terminal Report, Rome, FAO, Myanmar.

(2016). ***Community Forestry Instructions (CFIs) 2016,*** Yangon, Ministry of Environmental Conservation and Forestry (MOECAF), Forest Department (FD), Naypyidaw.

(2001). ***Environmentally Sustainable Food Security and Micro-Income opportunities in the Ayeyarwady Delta,*** FO: DP/96/008 Terminal Report, Rome, FAO, Myanmar.

(1994). ***Feasibility Study on Mangrove Reforestation,*** FO: DP/MYA/90/003, Terminal Report, Rome, FAO, Myanmar.

(1992). ***Forest Law,*** The State Law and Order Restoration Council, Myanmar.

(2015). ***Forest Resource Environment Development and Conservation Association (FREDA) office***, NGO, Yangon.

(2019). ***Forest Resource Environment Development and Conservation Association (FREDA) office***, NGO, Yangon.

Khin Maung Lwin, U., (2012), Field Project Manager, Assistant Director, Myaung Mya District, ***The Integrated Mangrove Rehabilitation and Management Project through Community Participation in the Ayeyarwady Delta***, JICA and Forest Department (FD), MOECF, the Republic of the Union of Myanmar.

(2019). ***Mangrove Data (Abstract),*** Ministry of MONREC, FD, Naypyidaw.

Natural Environment Conservation, *available at* http://fredamyanmar.com/partnership%20 development.html

Ohn, U., Kogo Motohiko, Maung Maung Than, Kyaw Nyein, Nyi Nyi Kyaw, Kyaw Aye. (2012), ***Ten years in Pyindaye, Restoration of Mangrove Ecosystems and Community Development, Ayeyaewaddy Delta, Myanmar, 1999-2008***, FREDA and ACTMANG, Yangon.

One out of local people from Kan Su Village (Myo Gyi), (2018), Ayeyarwady Delta, ***Interview by Author***.

(2006). ***Progress Report on Ecological Mangrove Restoration Project in the Ayeyarwady Delta***, *Mangrove Service Network (MSN), Yangon.*

San Maung, U., (2013), Field Project Manager, Mangrove Service Network (MSN), Yangon, ***Interview by Author***.

(2000). ***Sustainable Forest Guidelines***, Forest Department (FD), Yangon.

(2018). ***The Global New Light of Myanmar***, News and Periodical Enterprise, Yangon, 9, October.

(2019). ***The Global New Light of Myanmar***, News and Periodical Enterprise, Yangon, 1, February.

Three years research project Mangrove restoration Myanmar July 2012-June 2015, https://media-openideo-rwd.oiengine.com/attachments/dc012e47-203d-41cf-bd56-cf5e43e79c9c.pdf

Win Sein Naing, U., (2018), Chairman, Mangrove Service Network (MSN), Yangon, ***Interview by Author***.

Appendix –I

Reserved Forests (RFs) in the Ayeyarwady Delta

No	District	Townships	Reserved Forest	Area (acres)
1	**Myaung Mya**	Myaung Mya	Lae Pyauk Kyauk Kone	26,413 1,355
Total				**27,768**
	Myaung Mya	Laputta	Ka Ka Yan Kyakankwinpauk Pyinalan	72,642 70,926 107,534
Total				**251,102**
	Myaung Mya	Mawkyun	Laputkwe Kalayike Nyi Naung	13,319 23,654 17,259
Total				**54,232**
2	**Pyapon**	Bogalay	Kadonkani Pyindaye Meinmahla	149,511 189,876 33,779
Total				**373,166**
Grand Total				**706,268**

Source: *Forest Department (FD), Ayeyarwady Region*