VNV Advisory

Restoration of degraded mangroves as a climate change mitigation and adaptation strategy in Asia

The problem

The coastline of Myanmar is particularly climate vulnerable and has been severely impacted in recent years by a number of natural disasters, including the 2004 Indian Ocean tsunami as well as subsequent cyclones and storms, most significantly Cyclone Nargis in 2008. Cyclone Nargis caused devastating damage to the environment of the Ayeyarwady and Yangon Divisions, destroying 38,000 hectares (ha) of natural and replanted mangroves, submerging over 63% of paddy fields and damaging 43% of freshwater ponds.

High population pressure in coastal areas has led to the conversion of many mangrove areas to other uses including infrastructure, aquaculture, rice and salt production. A study on drivers of mangrove loss showed that the main drivers of mangrove loss from 1975 to 2005 were the overharvesting of mangrove forests for fuelwood and charcoal production, illegal logging encroachment, and paddy cultivation. It was estimated that the majority of mangrove loss in this period (around 98%) was due to agricultural expansion.

However, mangrove loss does have a significant impact on the decline in coastal fisheries resources. Mangrove habitat conversion has likely contributed to declines in coastal fisheries resources as mangroves play a crucial ecological role as nursery habitat. This mangrove loss is likely to have affected the potential for shrimp aquaculture in Myanmar, which is largely dependent on naturally occurring shrimp post-larvae from estuarine and mangrove environments.

The rate of mangrove loss is significantly higher than the loss of any other types of forests. Asia suffered the largest net loss of mangroves since 1980, with more than 1.9 million ha destroyed, mainly due to changes in land use. In the coastal zone, mangroves are threatened by deforestation, with more than 58% of mangroves lost since 1980. Before the logging ban in April 2016, illegal logging had been rampant further upstream which affects siltation in the major rivers, leading to increased sedimentation. A report by the FAO shows that Myanmar was one of five countries with the largest net loss of mangrove area during the period 2000–2010. A study by NASA shows that mangrove habitats in the region are degrading rapidly

Out of the forest areas only 4% comprise of mangrove forests in Myanmar. Although the mangroves in Myanmar including those in Ayarwaddy area and Rakhine State are being destroyed at an alarming rate, no systematic planting or restoration efforts are underway that will ensure creation of mangrove forests. There are presently no registered A/R CDM projects in Myanmar. Mangroves are not established as a commercial plantation or as any industry in the country and also have to overcome many issues that hinder the development of the forestry sector.

The country saw a loss of 48,500 (ha) in the period 1980 to 2005. From 2000 to 2014, Myanmar had a net mangrove loss of 191,122 (ha). Since 2000, Myanmar has been losing mangrove forest cover at an alarming rate of 2.2% per year (14,619 ha). Government policies have supported self-sufficiency in food production, which saw conversion of mangroves to rice paddies. From 2000 to 2012, 88% of this mangrove loss was due to conversion to rice agriculture.

In 2015, studies for the third consecutive year, Myanmar was ranked globally as the second most vulnerable country in the world to extreme weather events over the last 20 years. Myanmar was ranked second out of 187 countries in the 2017 Global Climate Risk Index. Mangrove ecosystems act as a green wall or barrier to protect the coastline and the communities from bearing the full impact of storms and storm surges.

In addition, mangrove ecosystems act as large carbon sinks. Carbon-dioxide will be removed from the atmosphere and stored in carbon pools within the project boundary through the photosynthesis of the planted trees and captured in soil.

As an LDC, which is particularly climate vulnerable, Myanmar needs sufficient and sustained financial assistance across its climate change agenda. The impacts of changing climate will be felt strongly by the vulnerable coastal community, impacting lives and livelihoods. The PoA seeks to increase the climate resilience of these communities through mangrove plantation, which reduces impacts of storms as well as positively impacts livelihoods of the coastal communities.

The image below shows that the coastline of Myanmar, the PoA region, is degraded and has been subject to loss of mangrove cover.

Image of Map showing Area of Loss of Mangroves
Source: https://maps.coastalresilience.org/mangrove-restoration/

About the project

The programme is expected to significantly increase the area under mangroves through a combination of afforestation and reforestation.

Afforest grassy land accretions within degraded mangrove habitats:

Land accretions are formed as a natural phenomenon as a counter to erosion. These lands have accreted as a result of excessive siltation at river mouths which occur as a result of excessive soil erosion upstream in the river or due to post tsunami/cyclone landscape changes, or a combination of both. In the case of land accretions, the CPA (Generic component project activity) implementer chooses lands only if the land meets certain criteria that show the lands are suitable for mangrove establishment and do not result in a conversion of ecosystems. The lands selected have grasses established on them as well as dispersed mangrove plants. The establishment of grass is used as an indicator that shows that the lands are suitable for mangrove establishment. Studies have shown that once grasses establish, the next natural ecological succession will be mangroves.

The lands selected under this PoA activity are new lands created as a result of a combination of siltation and landscape changes due to the 2004 tsunami and subsequent storms. The land has not been classified as forest as per the host country definition of forest and is not expected to convert to a forest without direct human intervention.

The establishment of mangrove systems will further bind the soil and allow for further capture of silt and prevent excess silt from being washed away. This will help in further land accretion and reduces negative impacts of silt on seagrass, meadows and corals.

Coastal protection function and benefits from Yangon mangroves

Coastal Protection Function

- Protect from Cyclone Nargis
- Protect from strong wind and wave
- Protect from serious erosion (before 2004 serious condition)
- Protect from salt intrusion

Benefits

- Edible Vegetable (A. aureum, P. paludosa, Nypa, Sarcolobus, Sonneratia)
- Medicinal plants (Acanthus, Premna, Stachytarpheta, Merop)
- Fuel wood, Honey
- Key area for Food chain and life cycle of fish, prawn and crab ect
- Income from Fish, Clam, Snail, Prawn, Crab (Villagers from five villages get 300,000 mmk every day from their mangrove forest by catching crab)

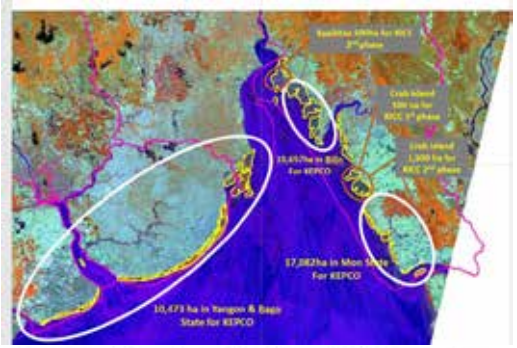
Natural regeneration in Yangon area Sonneratia apetala 13.8.2018

The PoA will be managed by the CME EcoEye Co. Ltd hereinafter referred to as EcoEye. An implementation partner, Worldview International Foundation , hereinafter referred to as WIF, in coordination and cooperation with the local community, will implement the programme as CPA implementer.

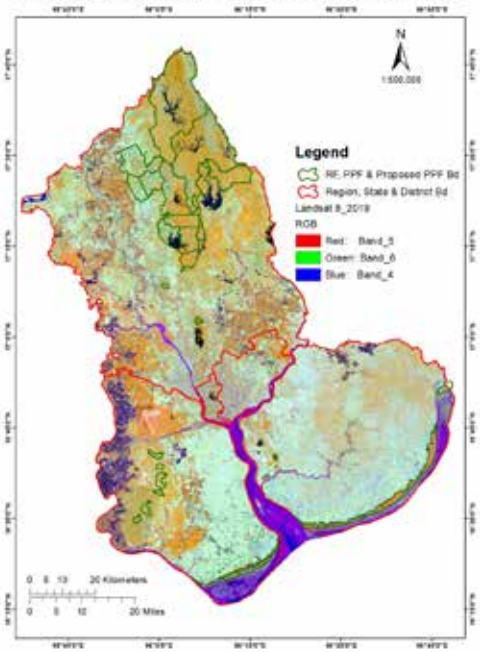
The CME, ECOEYE Co., LTD is a leading CDM project developer and trader that assists for-profit and not-for-profit organizations to implement climate mitigation projects. With over fifteen years of experience, CME has a team of experienced professionals who are highly skilled in CDM project identification and development, renewable energy technologies, rural markets and sampling techniques. Over the past fifteen years, CME has developed many carbon offset projects in a number of sectoral scopes.

WIF has specialized in communication development and project implementation since 1979 . From 2012, WIF has been working in cooperation with the Ministry of Environmental Conservation and Forestry, and various universities in the research and development of effective methods for mangrove restoration. These institutions have professionals with valuable knowledge and capacity, but lack resources and infrastructure. It has been a win-win partnership with the aim of building up national capacity on mangrove restoration at a time with urgent need for action to meet national challenges of climate change

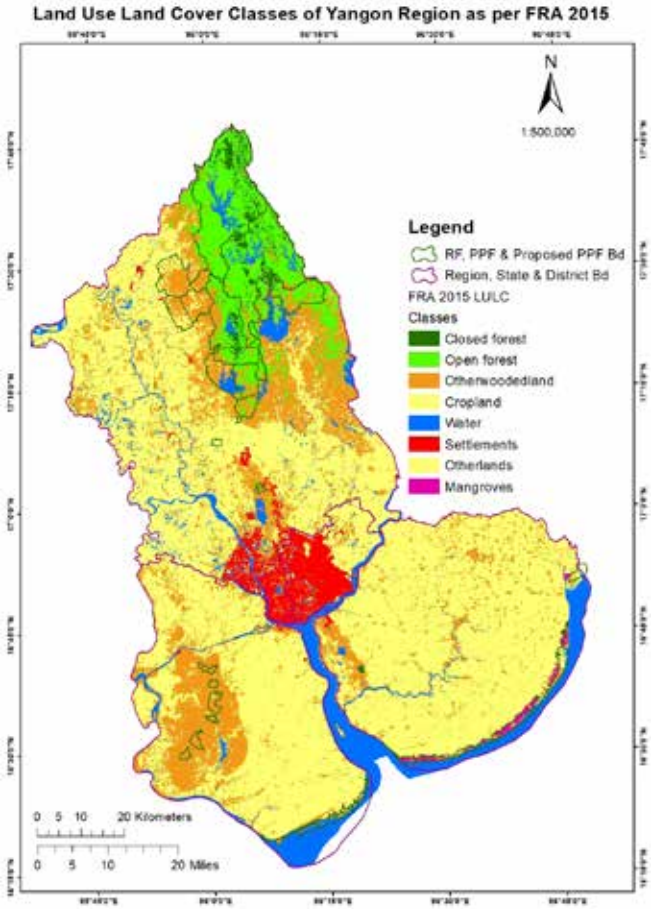
Project Implementation



Location Map of Reserved Forest, PPF and Proposed PPF in Yangon Region



LULC map of Yangon Region



Map of RF & PPF in Yan Region

Country - Republic of the Union of Myanmar
Regions - Yangon and Mon

Estimated emission reductions for 20 years:
1,40,72,351 tCO_2

Implementation Partner:
Worldview International Foundation

WORLDVIEW
INTERNATIONAL FOUNDATION

Methodologies and standardized baselines:
CDM methodology AR-AM0014 version 3

Large Scale A/R Methodology

Duration of the Project:

60 years

Area in Hectares:
4550 ha of the upcoming CPA (component project activities) area

Estimated emission reductions in tons for 20 years

Year	Cumulative net GHG removals by sinks in tCo2
1 year	1 31,036
2 years	60,515
3 years	97,575
4 years	2,02,877
5 years	3,69,102
6 years	7,35,462
7 years	13,23,023
8 years	20,91,296
9 years	27,94,961
10 years	40,41,668
11 years	46,31,315
12 years	57,48,885
13 years	63,73,302
14 years	73,16,449
15 years	85,00,909
16 years	91,42,118
17 years	98,14,153
18 years	1,10,60,279
19 years	1,30,12,004
20 years	1,40,72,351

Purpose and general description of PoA (Programme of Activities)

Mangroves are salt-tolerant evergreen forests commonly found along sheltered coastlines in the tropics and subtropics where they fulfil important socio-economic and environmental functions. These include the provision of a large variety of wood and Non-timber forest products (NTFPs) coastal protection against the effects of wind, waves and water currents; conservation of biological diversity; protection of coral reefs, seagrass beds and shipping lanes against siltation; and provision of spawning grounds and nutrients for a variety of fish and shellfish, including many commercial species. Mangroves are important ecosystems providing wood, food, fodder, medicine and honey. They are also habitats for many organisms.

The purpose of the PoA is to

1. *Reforest/restore degraded or severely degraded mangrove habitats*
2. *Afforest grassy land accretions within degraded mangrove habitats*

The proposed A/R CDM PoA plans to establish mangrove plantations in suitable locations within currently degraded coastal/ intertidal mangrove habitats in Myanmar.

Reforest/restore degraded or severely degraded mangrove habitats: The Purpose of the PoA activity is to reforest degraded mangrove habitats. These include lands that were previously mangrove habitats and that were subjected to impacts resulting in decrease of forest cover below that of the definition of forest as defined by the host country. The host country defines a forest as a land with tree crown cover of more than 10 % and an area of more than 0.5 hectares (ha). The trees should be able to reach a minimum height of 5 meters (m) at maturity in situ.

Species of interest

Sonneratia apetala

Sonneratia caseolaris

Avicennia officinalis

Bruguiera gymnorhiza

Bruguiera sexengula

Rhizophora apiculata

Ceriops tagal

Preparation of nursery (2018)

Potted seedlings	300,000
Bare root	150,000
Seedlings from Magyi and Direct seed sowing	10,000

Establishment of nursery

Nursery management

Mangrove nurseries are established at least one year ahead of planting because of shortage of mangrove seeds and fruiting time. Mangrove species can be established by direct seed sowing method but at least 50% of target plants must be established in the nursery one year ahead. Nursery system is a pound nursery system and water flow is controlled by a sluice gate.

Construction of Nursery: Criteria of setting a Nursery site are as follows,

- Boats should be able to enter every low tide and high tide
- Ground level should be low ground or medium ground
- It should be easy to monitor

An area of 1 meter depth will be dug and an embankment will be made. The depth of the pond is around 1 meter and even during a low tide day in the dry season water should be able to flow into the nursery area. Sluice gate is the best to control the tide inundation. Natural mangrove soil is the best to put in plastic bags. Mangrove seeds are collected during February to May and are grown in these plastic bags.

For direct seed sowing, a 40ft x 20ft seed storage building is required for the capacity to store about 150,000 seedlings.

Storage of Mangrove seeds (propagule)

Most of the mangrove species seeds are viviparous and mature during the dry season (February to April). Seeds should be stored under the shade during February to May. Watering should be done once in every 3 days and change the position once in 2 weeks.

Land preparation and planting

Seedlings are carried out to the planting site from the nursery. Both direct seed sowing and planting seedlings is applied for this project activity.

- Direct seed sowing
- Planting seedlings

Plantation maintenance and Replanting

- Weeding
- Patching - Damaged seedlings need to be replanted.
- Protection - From Natural Disasters or man made disasters

Expected plant survival rates - Based on previous planting by the CPA implementer, a survival rate of 80% is expected.

Local stakeholder meetings

In addition to planting activities, the CPA implementer will undertake other activities with the local communities in order to address the issues of sustainable development, livelihoods and community ownership. These interventions include facilitating sustainable crabbing and shrimp farms, production of mangrove dyes and others.

The project is implemented with a high level of community involvement and members of the local community are employed and trained for the purpose of implementation of project activities.The project team will organise village committees who will be responsible and committed to project these mangroves and report to the team in case of such activities.

Impact Benefits

Improved livelihoods and reduced poverty -
The programme seeks to improve livelihoods and reduce poverty among the country's vulnerable coastal communities by introducing a number of livelihood interventions such as sustainable crabbing and shrimp farms as well as income generating activities such as production of natural dyes from mangroves and other income generating activities.

Improvement in food security -
The programme seeks to improve food security in the region. Mangrove habitats are known to act as safe nurseries for fisheries and other marine organisms such as shrimp and crabs. This improves seafood productivity. In addition, mangroves act as a barrier for tidal surges and reduce the salination of agricultural lands thereby improving agricultural productivity as well.

Protection against climate change -
Mangroves act as a green wall, or a barrier, and protect coastlines and coastal communities from the impacts of tsunamis, storms and tidal surges. In addition, as detailed above, it leads to better food security and food diversity and therefore, good health.

Socio-economic development of local communities -
The programme seeks to improve livelihoods in the coastal communities through a number of interventions such as sustainable crabbing and shrimp farms, IGAs for the women SHGs etc. In addition, the programme will employ members of the local communities for implementation of programme activities and monitoring.

Increased carbon sinks -
Mangrove habitats act as a carbon sink, and have been shown to sequester more carbon than an equivalent area of terrestrial forests. Carbon is sequestered in mangrove trees as well as in the soil. An estimated of 12,371,298 tCO2 in 20 years.

Environmental benefits -
Mangrove habitats are biodiverse habitats of great ecological significance. Mangrove ecosystems act as nurseries for fish and other aquatic organisms such as shrimp. Mangrove roots act as a filtration system and capture silt, thereby preventing siltation in seagrass meadows and on coral reefs.

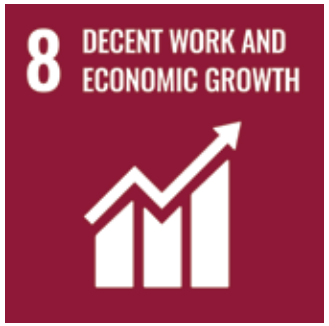
Improved agriculture efficiency -
A healthy mangrove ecosystem helps reduce soil and river bed erosion. It also decreases sediment intrusion from the sea and reduces salinity of the soils inland. This ensures improved agriculture efficiencies and a reduced need to convert more lands to agriculture lands.

Training and knowledge building -
Programme specific training and capacity building will be carried out to enable efficient implementation of programme activities and monitoring. These will contribute to the improvement of knowledge of the local people in areas of environmental conservation, mangrove restoration, and resource management.

Protection to biodiversity -
The programme addresses issues of biodiversity conservation, natural forest management, community forestry, water resource management etc. which will help the community directly and indirectly. Mangrove habitats are known to sustain a diversity of organisms and are biodiversity hotspots. The mangrove ecosystem helps sustain nurseries for various aquatic organisms.

Promote use of traditional medicine -
A number of mangrove species have been known to be used in traditional medicine.

SDGs addressed by the project



The PoA impacts and how they contribute to the SDGs is also in line with the Myanmar Sustainable Development Plan (2018 – 2030).

VNV ADVISORY

VNV Advisory Services has been at the forefront of working with climate change and livelihoods. Our decade-long experience has seen us develop low-carbon projects that support these communities in getting their basic needs while adapting to and mitigating the harsh impacts of climate change. We work in areas of clean cooking, social forestry, sustainable agriculture, rural energy access and many other related community based technologies. With support from over 40 NGOs and implementation partners, our work encompasses over 4 million rural households and 50,000 hectares of forest areas under management across the South Asian (India, Bangladesh, Nepal, Laos, Myanmar and Sri Lanka) region. We have also been able to engage with businesses to address issues of Social Responsibility, Environmental Sustainability and Carbon Neutrality.

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