



Verified Carbon Standard

REFORESTATION AND RESTORATION OF DEGRADED MANGROVE LANDS, SUSTAINABLE LIVELIHOODS AND COMMUNITY DEVELOPMENT IN MYANMAR



WORLDVIEW
INTERNATIONAL FOUNDATION



Document Prepared by Worldview International Foundation

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PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The project's goal is to restore and protect 2,060.72 ha of degraded mangrove forests located in the northern part of the Ayeyarwady Division of Myanmar. The areas of mangrove forests that were restored are in the village tracts of Magyi, Thabawkan, and Thaegone. The project started on 15th May 2015 and have completed the implementation of mangrove restoration by planting mangrove seedlings in 2019. This 6th monitoring report covers the monitoring activities from the period of 15th June 2022 through 31st December 2023. During this time, the project continued and built upon activities conducted during the first five monitoring periods and introduced new activities as appropriate.

The purpose of this project is to establish and maintain a sustainably managed mangrove ecosystem that can help trap carbon, lower the risk of natural disasters, and offer local residents with long-term employment opportunities. To reach this purpose, the project includes strengthening the ability to supply mangrove ecosystem services which can mitigate and adapt the climate change, as well as supporting the economic development while additionally affecting local individuals. In the absence of the project, mangroves in the project area will be disappeared due to various anthropogenic activities. This would result in the release of both above and belowground carbon deposits into the atmosphere.

The species identified for this reforestation project are *Rhizophora mucronata*, *Rhizophora apiculata*, *Bruguiera gymnorrhiza*, *Bruguiera cylindrica*, *Bruguiera sexangula* and *Ceriops tagal*. This combination of mangrove restoration and coastal green belt protection will improve the biodiversity and serve as means of reducing the risk of natural disasters such as waves or tsunamis. In order to create a viable alternative to forest degradation in Myanmar, the project proponent seeks to use the carbon credits generated by the Verified Carbon Standard (VCS) through the Afforestation, Reforestation, and Revegetation (ARR) project category in providing a sustainable revenue stream for project area protection, local community, and infrastructure development.

The project has sequestered 96,225 tCO₂e over this monitoring period from 15 June 2022 to 31 December 2023. In addition to the carbon sequestration the project will also launch:

- Poverty alleviation with sustainable livelihood development activities and wealth creation in rural areas
- Community empowerment through active participation in the planning and development of the project
- Improvement of basic infrastructure for rural communities

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation	15/05/2015 – 26/06/2017	VCS	RINA Services S.p.A (RINA)	2 years and 12 days
1 st Verification	15/06/2015 – 14/06/2018	VCS	RINA Services S.p.A (RINA)	3 years
2 nd Verification	15/06/2018 – 14/06/2019	VCS	TÜV SÜV South Asia Pvt.Ltd	1 year
3 rd Verification	15/06/2019 – 14/06/2020	VCS	4K Earth Science Private Limited	1 year
4 th Verification	15/06/2020 – 14/06/2021	VCS	4K Earth Science Private Limited	1 year
5 th Verification	15/06/2021 – 14/06/2022	VCS	Earthood Services Private Limited	1 year
6 th Verification	15/06/2022 – 31/12/2023	VCS	Ecolance Private Limited	1 year, 6 months, 16 days

1.3 Sectoral Scope and Project Type

Sectoral scope	14
AFOLU project category	ARR + WRC
Project activity type	Restoration of wetlands and vegetation (ARR + RWE)

This project is an Agriculture, Forestry and Other Land Use (AFOLU) project under the Afforestation, Reforestation and Revegetation (ARR) project category.

Project is NOT a grouped project.

As per the Section 3.2.8 of VCS Standard (Version 4.7), all ARR projects that occur on wetlands shall adhere to both the respective project category requirements and the WRC (Wetlands Restoration and Conservation) requirements unless the expected emissions from the Soil Organic Carbon (SOC) pool or change in the SOC pool in the project scenario is deemed below *de minimis* or can be conservatively excluded as set out in the VCS Program document *VCS Methodology Requirements*, in which case the project shall not be subject to the WRC requirements.

For this project, soil organic carbon is an important part of the total amount of the carbon sequestered, hence the project will comply with both ARR requirements and WRC requirements. Upon the requirements, the periodic reassessment of the baseline, at least not more than 10 years, will be

undertaken to capture changes in the drivers and/or behavior of agents that cause the change in land use, hydrology, sediment supply and/or land or water management practices and changes in carbon stocks. At the time of baseline assessment, the latest approved version methodology will be adhered, and the project description will be updated by following both ARR and WRC requirements.

In addition, the Section A1.13 of Appendix 1 of VCS Standard (Version 4.7) also mentions that mangrove is one of the common wetland types. Therefore, according to the VCS Standard (Version 4.7) and relevant methodologies, the project is also eligible for the WRC category.

1. The project is a mangrove restoration project and reduces GHG emissions, hence falls both ARR and WRC categories.
2. The baseline scenario is bare lands, degraded and severely degraded mangrove lands or coastal tidal wetlands.
3. The project reduces carbon emission by restoring mangroves or coastal tidal wetlands.
4. The calculation of GHG emissions were done based on approved methodologies.
5. Project activities neither lower nor raise the water table and remain the tidal range by maintaining the mangrove ecosystems.
6. No modification of hydrology is required, and the original mangroves and its tributaries remain natural, and no significant increase can occur in the GHG emissions outside the project area. Mangrove restoration is carried out on the degraded coastal wetlands, and
7. No burning of organic soil is applied in the project activities.

1.4 Project Proponent

Organization name	Worldview International Foundation (WIF)
Contact person	Dr. Arne Fjortoft
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1.5 Other Entities Involved in the Project

Organization name	Pathein University
Role in the project	Land right holder and research partner
Contact person	Dr. Htay Aung
Title	Research Manager
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Email	htayaungpathein@gmail.com

Organization name	Thabawkan Village Tract Mangrove Conservation Committee
Role in the project	Land right holders and labour force
Contact person	U Chit San
Title	Village tract leader
Address	Thabawkan village, Shwe Thaung Yan township
Telephone	+95-9970292557
Email	N/A

Organization name	Thaegone Village Tract Mangrove Conservation Committee
Role in the project	Land right holders and labour force
Contact person	U Myint Than
Title	Village tract leader
Address	Wet The village, Shwe Thaung Yan township

Telephone	+95-967776366
Email	N/A

Organization name	Forest Department
Role in the project	Land right recommendation and consultation for forest services
Contact person	U Kyaw Htin Latt
Title	Staff officer
Address	Township Forest Department's compound, Pathein Township
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Email	patheintownshipfd@gmail.com

Organization name	Ayeyarwady Regional Government
Role in the project	Landowner and local authority
Contact person	U Myint Sein
Title	Director, Regional Forest Department
Address	Director office's compound, Forest Department, Pathein Township
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Email	fdayerwady3@gmail.com

Organization name	Forest Research Institute
Role in the project	Research partner
Contact person	U Moe Zaw

Title	Director of Forest Research Institute
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Email	fri.yezin@gmail.com

Organization name	University of Forestry and Environmental Science
Role in the project	Research Partner
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Title	Rector
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1.6 Project Start Date

Project start date	15 May 2015
Justification	As per Section 3.8 of VCS Standard Version 4.7, the start date of the project activity is 15 th May 2015, when the land preparation occurred ¹ .

1.7 Project Crediting Period

Crediting period	<input type="checkbox"/> Seven years, twice renewable <input type="checkbox"/> Ten years, fixed
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¹1764 site preparation (RIF)_Project start date

	<input checked="" type="checkbox"/> Other (The duration of the project is 20 years and 00 months, beginning on 15 th June 2015 and ending on 14 th June 2035 with renewable condition up to a maximum of 100 years as per Section 3.9.3 of the VCS Standard Version 4.7 since the proposed project is under the ARR and WRC category of the AFOLU sector. Start date of the crediting period is 15 th June 2015, when the planting started.)
Start and end date of first or fixed crediting period	15 June 2015 to 14 June 2035

1.8 Project Location

The project is implemented in three village tracts namely, Magyi, Thabawkan and Thaegone in Shwe Thaug Yan Township. This is in the Northern part of Ayeyarwady Division of Myanmar.



Figure 1: Location of the project (Source: <https://wif.maps.arcgis.com/>)

The details of each parcel of land are enclosed in the supporting documentation where the location of the planting sites in each village including detailed information for each planting plot is shown on Google Earth image (kml file).

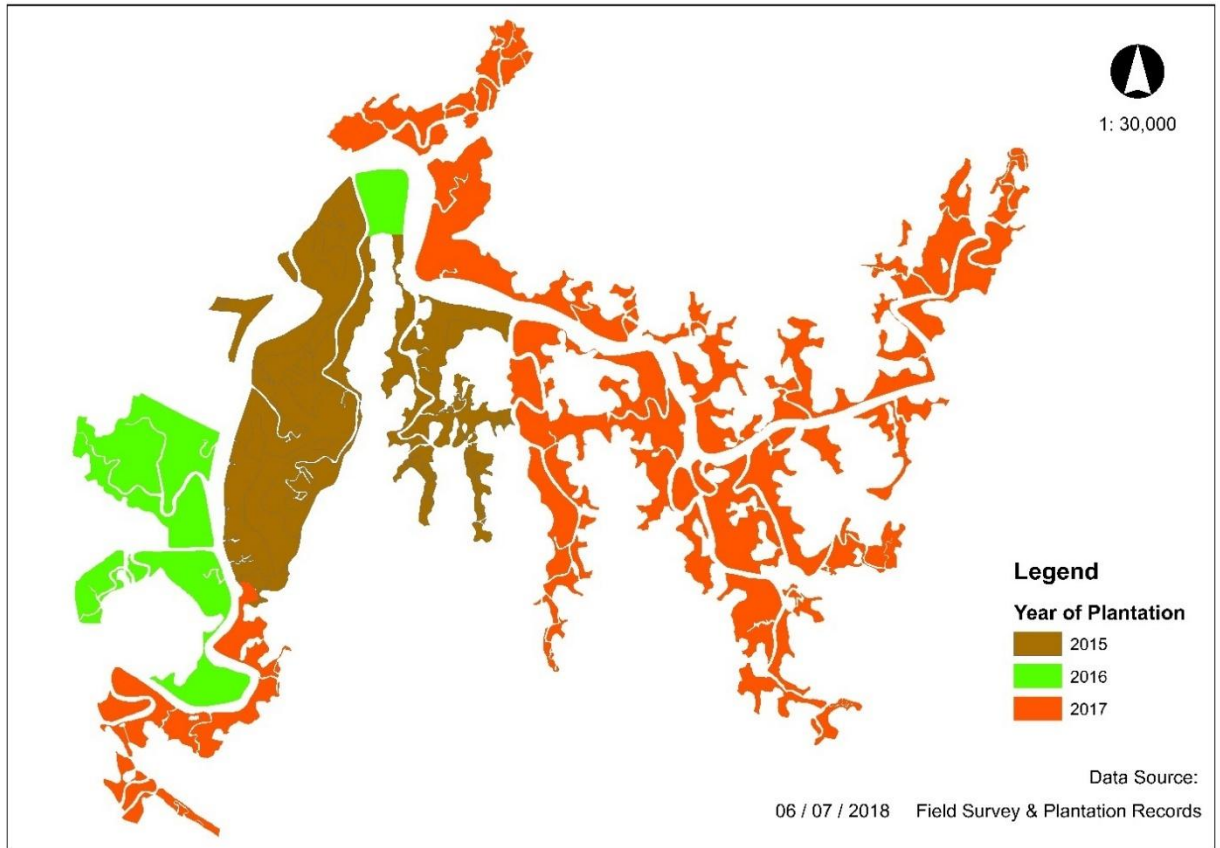


Figure 2: Project Location indicating in Magyi Area including 2015, 2016 and 2017 planting/restoration strata.

Thaegone and Thabawkan 2018 Planting Area

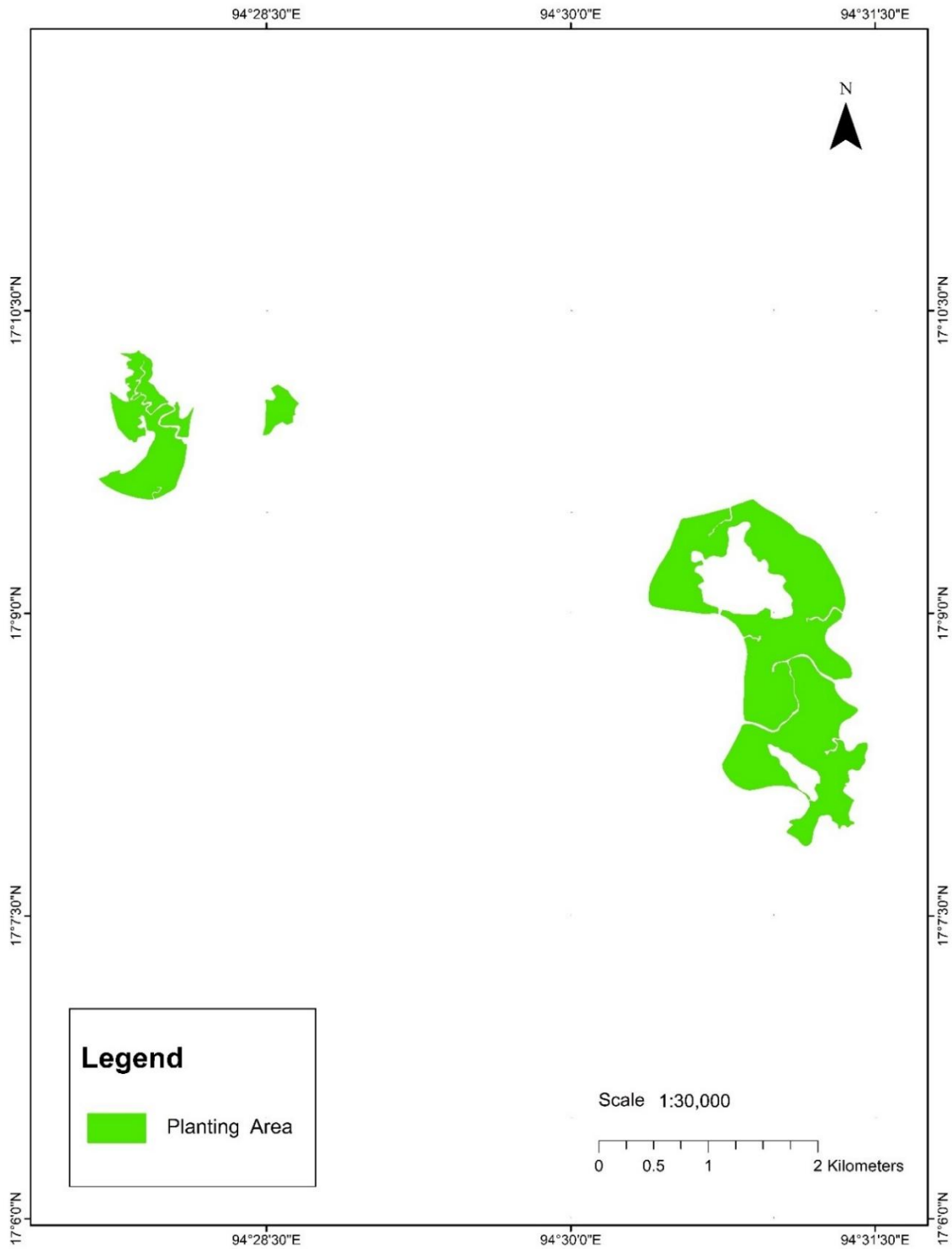


Figure 3: Project Location indicating Thaegone and Thabawkan areas including 2018 planting strata.

Thaegone and Thabawkan 2019 Planting Area

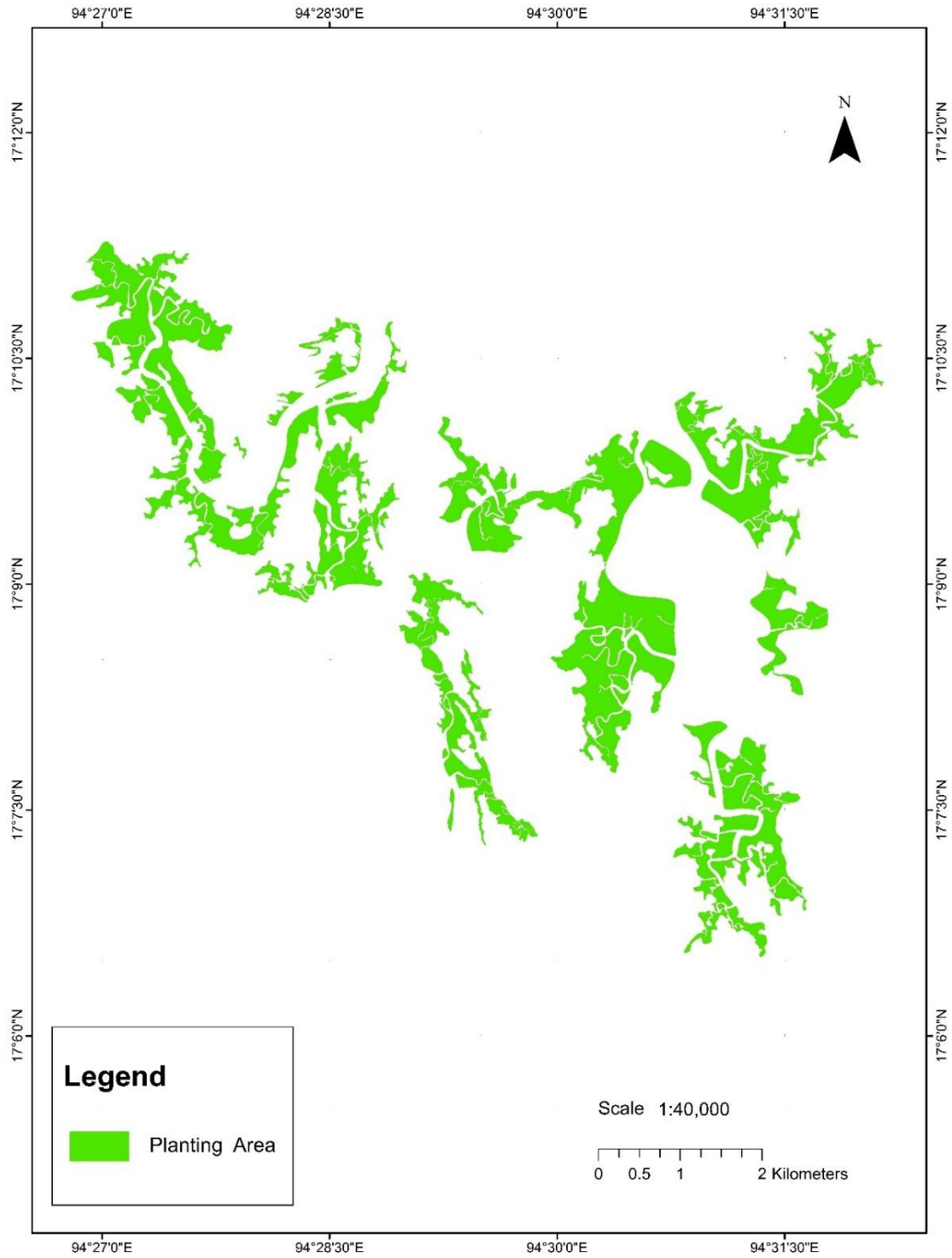


Figure 4: Project Location indicating Thaegone and Thabawkan areas including 2019 planting strata.

1.9 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Tool	AR-Tool 02	(i) “Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities”	01
Tool	AR-Tool 14	(ii) “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”	4.2
Tool	AR-Tool 12	(iii) “Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities”	3.1
Tool	AR-Tool 08	(iv) “Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity”	4.0
Tool	AR-Tool 15	(v) “Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity”	02
Tool	EB 50 Annex 13	(vi) “Guideline for objective demonstration and assessment of barriers”	01
Methodology	AR-AM0014	(vii) Afforestation and reforestation of degraded mangrove habitats	03

1.10 Double Counting and Participation under Other GHG Programs

1.10.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

Yes

No

1.10.2 Registration in Other GHG Programs

Was the project registered or seeking registration under any other GHG programs?

Yes No

1.11 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.11.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit?

Yes No

1.11.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system?

Yes No

1.11.3 Supply Chain (Scope 3) Emissions

Do the project activities affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

Yes No

1.12 Sustainable Development Contributions

During this monitoring period, the project delivers on 11 of the 17 Sustainable Development Goals. The program delivers superior impact in the following 11 core SDGs:

1. SDG 2 – Zero hunger,
2. SDG 3 – Good health and well-being,
3. SDG 4 – Quality education,
4. SDG 5 – Gender equality,
5. SDG 6 – Clear water and sanitation,
6. SDG 7 – Affordable and clean energy,
7. SDG 8 – Decent work and economic growth,
8. SDG 9 – Industry, innovation and infrastructure,
9. SDG 13 – Climate action,

10. SDG 14 – Life below water, and

11. SDG 15 – Life on land

Table 1 gives a detailed explanation of how project activities result in the SD contributions referring to the SDG indicators list².

² <https://unstats.un.org/sdgs/indicators/indicators-list/>

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions (June 2022 – Dec 2023)	Contributions Over Project Lifetime
1)	2.1	Number of households' end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe nutritious and sufficient food all year round.	Implemented activities to increase	The project provided basic food items (rice, cooking oil, onion, potato, egg and beans) to 597 vulnerable households affected by the economic crisis and global pandemic. Provide nutritious food to vulnerable households who is suffered more pressure on the resources due to natural disasters and global pandemic, etc.	The project provided basic food items (rice, cooking oil, onion, potato, egg and beans) to 597 vulnerable households affected by the economic crisis and global pandemic. Provide nutritious food to vulnerable households who is suffered more pressure on the resources due to natural disasters and global pandemic, etc.

2)	2.3	<p>Double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment</p>	<p>Implemented activities to increase</p>	<p>The project aims to increase the number of local people who improved skills, including technical, and vocational skills for employment and entrepreneurship and more production field on agricultural and aquacultural sectors.</p> <p>Until this monitoring period, 88 local people received on organic fertilizer & pesticide making training, farm rat protection and Livestock breeding practices training, mangrove friendly crab rearing training and also received supporting materials and tools as seeds, EM, blue net.</p> <p>Until this monitoring period, 12 vulnerable households received crab traps and fishing net as supporting materials and tools for generating their family income and 52 local people are covered in targeted village.</p>	<p>The project aims to increase the number of local people who improved skills, including technical, and vocational skills for employment and entrepreneurship and more production field on agricultural and aquacultural sectors.</p> <p>Until this monitoring period, 114 local people received on organic fertilizer & pesticide making training, farm rat protection and Livestock breeding practices training, mangrove friendly crab rearing training and also received supporting materials and tools as seeds, EM, blue net.</p> <p>Until this monitoring period, 12 vulnerable households received crab traps and fishing net as supporting materials and tools for generating their family income and 52 local people are covered in targeted village.</p>
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3)	3.8	3.8.1 Coverage of essential health services and facility (defined as the average coverage of essential services based on tracer interventions that include reproductive, maternal, newborn and child health, infectious diseases, non-communicable diseases and service capacity and access, among the general and the most disadvantaged population)	Implemented activities to increase	The project has supported the vacuum machine for child birth and child suction machine 10L/min pressure to Shwe Thaug Yan hospital which covered for 10,834 people in project area which is 100% of population are covered in the project area.	The project has supported the vacuum machine for child birth and child suction machine 10L/min pressure to Shwe Thaug Yan hospital which covered for 10,834 people in project area which is 100% of population are covered in the project area.
4)	3.8	3.8.2 Proportion of people have an access to COVID 19 protective equipment	Implemented activities to increase		The project has supported PPE items which covered for 1,413 people in project area which is 100 % of population are covered in the project area. The project has provided five times the COVID-19 personal protective equipment (PPE) support to people in closely coordination with village development committee and local authorities in Shwe Thaug Yan project area. The provided protected materials are infra-thermometer, face masks, hand gel, gloves, PPE suit, Bacterial Filtration efficiency cap, 16 liters sprayer equipment, Sodium Hypochlorite, medicines.

5)	4.a	4.a.1 Proportion of schools with access to educational facilities	Implemented activities to increase	<p>Increased the access to educational facilities by the school children in 20 school in the project areas</p> <p>100 % of school in project targeted villages are covered.</p> <p>The project supported school multimedia equipment, solar panel & battery set, solar lamps, school items (books and umbrella), raincoats, and teaching materials such as school desks & chairs, and whiteboard to all targeted schools in the project area.</p>	<p>Increased the access to educational facilities by the school children in 20 school in the project areas</p> <p>100 % of school in project targeted villages are covered.</p> <p>The project supported school multimedia equipment, solar panel & battery set, solar lamps, school items (books and umbrella), raincoats, and teaching materials such as school desks & chairs, and whiteboard to all targeted schools in the project area.</p>
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6)	4.b.	4.b.1 Volume of official development assistance flows for scholarships by sector and type of study	Implemented activities to increase	<p>8 teachers were received monthly teacher salary under scholarships program. Total 525 students benefitted by providing 8 teachers in three targeted area schools. In this monitoring period, project supported monthly teacher salary in the targeted schools where there are not enough teachers to teach students under the scholarship program.</p> <p>144 students (KG - Grade 12) and 28 university students have received the scholarship which is covered 80 % of all school in the project area.</p> <p>As the special request from the community, 1 house was rented for 10 students from vulnerable families who needed shelter to study the school lessons in one targeted village under the scholarship program.</p>	<p>8 teachers were received monthly teacher salary under scholarships program. Total 525 students benefitted by providing 8 teachers in three targeted area schools. In this monitoring period, project supported monthly teacher salary in the targeted schools where there are not enough teachers to teach students under the scholarship program.</p> <p>159 students (KG - Grade 12) and 28 university students have received the scholarship.</p> <p>As the special request from the community, 1 house was rented for 10 students from vulnerable families who needed shelter to study the school lessons in one targeted village under the scholarship program.</p>
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7)	4.4	4.4.1 Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill	Implemented activities to increase	The project aims to increase the number of local people who improved skills, including technical, and vocational skills for employment and entrepreneurship. Until this monitoring period, 354 local people received on summer course training program (English & Computer basic training), fuel efficient stove making training, coconut shell value added handicraft training, grievance mechanism and proposal writing training and trash campaign awareness. (3 % of the total population is covered in all targeted villages)	The project aims to increase the number of local people who improved skills, including technical, and vocational skills for employment and entrepreneurship. Until this monitoring period, 555 local people received on summer course training program (English & Computer basic training), fuel efficient stove making training, coconut shell value added handicraft training, grievance mechanism and proposal writing training and trash campaign awareness. (5 % of the total population is covered in all targeted villages)
8)	5.5	5.5.2 Proportion of women in managerial positions	Implemented activities to increase	43% of women are positioned in leading roles in the village development committee in the targeted villages.	Averaged 42.5% of women are positioned in leading roles in the village development committee in the targeted villages.
9)	6.1	6.1.1 Proportion of population using safety managed drinking water services	Implemented activities to increase	With contribution of community, 1 sub-projects supported well excavation and fencing in one targeted village in project area to access safe drinking water. 100% of population in one targeted village is covered.	With contribution of community, 5 sub-projects supported well excavation and fencing and pond renovation in four targeted village in project area to access safe drinking water. 100% of population in four targeted village is covered.

10)	6.2	6.2.1 Proportion of population using (a) safely managed sanitation services and (b) a hand-washing facility with soap and water	Implemented activities to increase	<p>Achieve access to adequate and equitable sanitation and hygiene, to promote using quality drinking water, paying special attention to the needs of women and girls and those in vulnerable situations.</p> <p>198 peoples received four clean hygiene awareness which covered 686 population for promoting their personal hygiene and sanitation in three targeted villages and provided hygiene & sanitation items (soap, tooth paste, tooth brush, bowl, nail clipper and plastic bucket). (21% of the total population is covered in the targeted villages).</p>	<p>Achieve access to adequate and equitable sanitation and hygiene, to promote using quality drinking water, paying special attention to the needs of women and girls and those in vulnerable situations.</p> <p>The project provided fiber clay pots to 66 vulnerable households (251 peoples) in targeted village for using quality drinking water, sanitation and hygiene. (10% of the total population is covered in targeted villages)</p> <p>198 peoples received four clean hygiene awareness which covered 686 population for promoting their personal hygiene and sanitation in three targeted villages and provided hygiene & sanitation items (soap, tooth paste, tooth brush, bowl, nail clipper and plastic bucket). (21% of the total population is covered in the targeted villages).</p>
11)	7.1	7.1.1 Proportion of population with access to electricity	Implemented activities to increase	<p>The project supported the financial to access the electricity within the villages. The total of 3,036 People (100% of population) from three project villages are covered and the people have accessed the electricity for their education and other livelihood sector.</p>	<p>The project supported the financial to access the electricity within the villages. The total of 3036 People (100% of population) from three project villages are covered and the people have accessed the electricity for their education and other livelihood sector.</p>

12)	7.1	7.1.2 Proportion of population with primary reliance on clean fuels and technology	Implemented activities to increase	<p>Fuel efficient cooking stoves are distributed to villagers to save fuelwood consumption.</p> <p>In total 615 number of stoves were distributed to 615 vulnerable households with 2,434 populations in the targeted villages.</p> <p>(34% of the total population is covered in targeted villages.)</p> <p>Small plants were distributed as the monsoon tree plantation activity intended to promote community energy forest.</p> <p>Project provided 9,595 plants to targeted villages as the monsoon tree plantation intended to promote community energy forest.</p> <p>(78% of villages covered in the targeted areas.)</p> <p>Small Home Solar Battery devices to vulnerable households with school going children who really need them and support the education of students in households far away from electricity. Through such distribution, the project was distributed 150 solar battery devices to 150 vulnerable households with</p>	<p>Fuel efficient cooking stoves are distributed to villagers to save fuelwood consumption.</p> <p>In total 1233 number of stoves were distributed to 1233 vulnerable households with 4893 populations in the targeted villages.</p> <p>(51% of the total population is covered in the targeted villages.)</p> <p>Small plants were distributed as the monsoon tree plantation activity intended to promote community energy forest.</p> <p>Project provided 12236 plants to targeted villages as the monsoon tree plantation intended to promote community energy forest.</p> <p>(75% of villages covered in the targeted areas.)</p> <p>Small Home Solar Battery devices to vulnerable households with school going children who really need them and support the education of students in households far away from electricity. Through such distribution, the project was distributed 150 solar battery devices to 150 vulnerable households with</p>
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				<p>701 populations in the targeted eight villages.</p> <p>(24% of the total population is covered in targeted villages.)</p>	<p>701 populations in the targeted eight villages.</p> <p>(24% of the total population is covered in targeted villages.)</p>
13)	8.3	8.3.1 Proportion of informal employment in non-agricultural employment by sex	Implemented activities to increase	<p>221 villagers (167 Males & 54 Females) received income from seasonal livelihood activities and cash for work activities & revolving fund activities.</p> <p>(8% of the total population is covered in seven targeted villages.)</p> <p>During the monitoring period, the project was completely handed over to community business management committee for continuing the whole ice plant business project from September 2022 and created job opportunities for two local people in ice plant factory and the project has a very high social and economic impact on the sea harvesting economy and food security in the area. It was full covered to local people in Shwe Thaug Yan project area.</p>	<p>640 villagers (444 Males & 196 Females) received income from seasonal livelihood activities and cash for work activities & revolving fund activities.</p> <p>(9% of the total population is covered in eleven targeted villages.)</p> <p>During the monitoring period, the project was completely handed over to community business management committee for continuing the whole ice plant business project from September 2022 and created job opportunities for two local people in ice plant factory and the project has a very high social and economic impact on the sea harvesting economy and food security in the area. It was full covered to local people in Shwe Thaug Yan project area.</p>

14)	9.1	9.1.1 Proportion of the rural population who live within 2 km of an all-season road	Implemented activities to increase	With contribution of community, project supported 6 infrastructure projects on promoting the access the smooth transportation, for better drainage and to protect the agricultural land, houses and people from flooding in five targeted villages. The 6 projects are 1 box culvert construction, 2 drainage construction, 2 bridge constructions, 1 school roof repairing and those projects covered 100% of population in five targeted villages.	With contribution of community, project supported 15 infrastructure projects on promoting the access the smooth transportation, for better drainage and to protect the agricultural land, houses and people from flooding in eleven targeted villages. 100% of population in eleven targeted villages are covered. The 15 projects are 1 rural health center fencing, gate & door construction, 1 jetty construction, 1 retaining wall construction, 3 box culvert construction for drainage, 2 drainage Construction, 1 dike renovation, 2 bridge constructions, 1 house building for most vulnerable family, 1 school roof repairing, 1 school overhead tank construction and 1 school cement floor renovation.
15)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	By conserving 2,060.72 ha of the mangrove forest, the project has prevented the release of 96,225 tonnes of VCUs into the atmosphere during the monitoring period.	The project prevented the emission of 340,744 tonnes of carbon into the atmosphere from 2015 to 2023.

16)	13.1	13.1.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	Implemented activities to decrease	Mangrove restoration will reduce the numbers of local people which can be affected from future coastal storms.	2,060.72 ha of mangrove forests in Shwe Thaug Yan Township are restored and replanted by WIF.
17)	13.1	13.1.2 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030	Implemented activities to increase	Myanmar is one of the countries which aims to reduce disaster risks ³ . Mangrove restoration is aligned with the national management of coastal forest and trees to reduce natural disasters.	2,060.72 ha of mangrove forests in Shwe Thaug Yan Township are restored and replanted by WIF.

³ <https://sustainabledevelopment.un.org/content/documents/11803Official-List-of-Proposed-SDG-Indicators.pdf>

18)	13.3	Number of people to Improve education, awareness raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	Implemented activities to increase	<p>2 youths received with 14 days basic knowledge on environmental conservation camping /training program from 2 villages in the targeted project areas. The project has trained to young people and they have communicated the strengthening of individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions.</p> <p>519 students and teachers received basic knowledge on the benefits of mangrove awareness disseminated 3 schools from 3 villages in the targeted project areas</p> <p>Trash Minimization is an approach that aims to reduce the production of waste through education and the adoption of less wasteful practices. WIF has conducted VDC meeting and mobilized about the trash campaign activity through invitation of volunteers and establish the trash management system 2 targeted project village in Shwe Thaug Yan project area.</p>	<p>2 youths received with 14 days basic knowledge on environmental conservation camping /training program from 2 villages in the targeted project areas. The project has trained to young people and they have communicated the strengthening of individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions.</p> <p>519 students and teachers received basic knowledge on the benefits of mangrove awareness disseminated 3 schools from 3 villages in the targeted project areas</p> <p>Trash Minimization is an approach that aims to reduce the production of waste through education and the adoption of less wasteful practices. WIF has conducted VDC meeting and mobilized about the trash campaign activity through invitation of volunteers and establish the trash management system 2 targeted project village in Shwe Thaug Yan project area.</p>
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19)	14.5	14.5.1 Coverage of protected areas in relation to marine areas	Implemented activities to increase	The project areas are protected from cutting trees down with the cooperation of local villages, Forest Department and Pathein University. But villagers are allowed to do catching crabs or other benthic species such as clams, and oysters for their food.	2,060.72 ha of mangrove forests in Shwe Thaug Yan Township are restored and replanted by WIF.
20)	15.2	15.2.1 Progress towards sustainable forest management	Implemented activities to increase	WIF worked together with Forest Department, Pathein University and local communities to prevent the degradation and increase the carbon sequestration of the 2,060.72 ha mangrove forest.	2,060.72 ha of mangrove forests in Shwe Thaug Yan Township are restored and replanted by WIF.
21)	15.b	15.b.1 Official development assistance on the project	Implemented activities to increase	As of the fifth monitoring period, the project has sequestered 60,225 tCO ₂ e over a period of one and half year. The VCS program gave the carbon credits opportunity to successfully restore and protect the forest.	In the previous five years, the project received the carbon credits with VCS program and subsequent finance to continually protect the forest and provide benefits to the local communities.

1.13 Commercially Sensitive Information

There is no commercially sensitive information during this monitoring period.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification	<p>As per section 3.18.1 of VCS Standard v4.7, a thorough assessment of the stakeholders that are impacted by the project activities are conducted, and significance of user populations and how deeply affected they may be by the project activities must be considered in identifying stakeholders.</p> <p>The following procedures are followed by the WIF in stakeholder identification and project initiation:</p> <ul style="list-style-type: none"> - Identify and list all relevant stakeholders, including indigenous peoples, local communities, NGOs, government agencies, and project proponents - Categorize stakeholders based on their interests, influence and potential impact on or from the project - Identify the communities, beneficiaries who may be affected by WIF’s activities - Conduct baseline survey to understand their social, cultural, and political structures, etc. - Conduct introduction meeting with the identified key stakeholders (VT leaders, HH leaders, Elder persons, etc.) - Facilitate participatory mapping exercise, conduct baseline survey, collect village profile data with the affected communities (mapping their lands, resources, culture sites, etc.)
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	<p>Prior to project implementation, RS and GIS technical team with the support of consultants from WIF identified the available land area for the VCS mangrove restoration projects, and forest inventory survey was conducted to ensure the vegetation cover status on the ground.</p> <p>Then, village tracts which are in the vicinity of potential project area were invited to the consultation meeting and about the project activities were introduced. Through a series of consultative processes, the interested communities to involve in mangrove restoration activities as well as their significant impacts on the sustainability of mangroves were identified as the major stakeholders. With the identified village tracts, WIF made legally binding agreements for the 60-year agreement covering over the project longevity.</p> <p>WIF has emphasizes stakeholder consultation from day one of the project, believing that a participatory approach is the only way to success, thus consultation meetings with local stakeholders were held in 3 targeted village tracts (Magyi, Thabawkan and Thaegon) and meeting with other entities such as Forest Department and Pathein University was also held. List of stakeholder consultation meeting during this monitoring period is provided as the supporting documents.</p> <p>As part of project design and implementation, Free Prior Informed Consent (FPIC)⁴ process is implemented while considering the impacts by the project on rights of the identified local stakeholders including indigenous peoples, local communities, and customary rights holders.</p>
<p>Legal or customary tenure/access rights</p>	<p>All land is state-owned as per Constitution of Myanmar (2008)⁵, and local stakeholders have customary rights to use land as per Forest Law (2018)⁶. The project area is classified as Protected Public Forest (PPF)⁷ which is protected by the Forest Law (2018) with the purposes of</p>

⁴ WIF – Operational Guidance of FPIC.pdf

⁵ Constitution of Myanmar_2008

⁶ Forest Law 2018

⁷ 1764_PPF Notifications_ MM and Eng Translation

protecting soil and water, conserving mangroves, environment and biodiversity. Making enquires the rights and privileges of local communities living in the vicinity of the affected areas is one of the main steps of settlement procedures of establishing PPF. The Forest Department comprised a working group including settlement officer, local people and relevant experts to inquire into the public rights to be affected by the prohibitions contained in the declaration of a PPF, and to manage it in the prescribed manners as per Section 6 (c) of the Forest Law (2018) and section 13 (a) of the Forest Rules (1995)⁸.

In addition, as per section 14 (a) (i) of the Forest Rules (1995), if there are customary lands practiced by local communities within the proposed PPF lands, the boundary of proposed PPF is required to determine after excluding land on which land use right was obtained traditionally. As per rule 14 (a) (iv) Forest Rules 1995, the rights to extract and use forest produce, right to use the grazing ground seasonally and other rights are preserved, and number, type, area, boundary, time and season, manner of permissions are recorded. However, apart from the usufruct rights, since the project areas fall in the intertidal zone without any grazing of domestic animals and any land ownership by local communities and stakeholders, if any, which were not considered to demarcate in the project boundary, the local communities are not prohibited from the rights such as catching fish, collecting crabs, use of non-timber products etc., from the project areas.

As the project areas (Magyi, Thabawkan and Thaegon) are under the category of Protected Public Forests (PPFs), they are managed by the Regional Ministry of Natural Resources and Environmental Conservation. These lands have also been protected in accordance with the existing Forest Law, rules and regulations applicable for Republic of Union of Myanmar. In order to strengthen the protection of restored mangrove, the land falls inside the Protected Public Forest (PPF) under the stewardship of the Forest Department of the Ministry of Natural Resources and Environmental

⁸ Forest Rules 1995

Conservation, WIF has been granted land use permissions from the regional government (Regional Forest Department) for the implementation of mangrove conservation and restoration as per the reference permission letters.

As per Section 3 of the Community Forestry Instruction (CFI) (2019)⁹, with the permission of the government, community forests (CF) can be established in protected public forest, and mangrove forests conserved by the local communities in accord with their tradition pursuant to section 7, sub-section (d) of the Forest Law (2018). The duration of land lease for the establishment of CF is initially set for (30) years with renewable option for many times (30 years at a time) upon the performance and the desire of the CF User Group as per Chapter (8), section 13 of the CFI (2019). As regional government permitted WIF to develop community-based mangrove plantations in line with VCS schemes on the degraded mangrove lands by 30-years with the possibility of extending the period up to 120 years, thus, WIF has signed the agreements with identified local stakeholders for 60-year agreement with the option to be renewed.

The agreements valid for the 60-year life span of the project with the options to be renewed as 30-year iterations as appropriate, which aligns with community and customary rights set forth in Section (13) and (14) (a) of the Community Forestry Instructions 2019.

The ultimate goal is aimed to ensure the permanence of carbon stocks required to meet minimal project lifetime as per the VCS standards and rules whilst the project shall be managed as community-based mangrove management and their livelihood development to meet Sustainable Development Goals.

Furthermore, Pathein University has the rights to conduct research in the Magyi area, and hence, PP also signed tripartite legally binding agreement with Pathein University and Magyi communities. Also, PP is signed the separate agreement with Pathein University as a research partner until 2028.

⁹ Community Forestry Instruction 2019

	<p>In addition, as per the results of socio-economic surveys that were carried out at the initial stage of project implementation, most of the local stakeholders in the vicinity of the project areas are fishing communities who can have customary access rights to artisanal fishing practices, crab catching, trespassing without cutting mangroves, and without any conflicting rights as the lands classified under the protected public forests (PPFs) under the administration of Forest Department under the Ministry of Natural Resources and Environmental Conservation (MONREC).</p> <p>As mentioned above, there was no negative impacts on land-use rights and access on customary lands of local stakeholders due to project intervention and classification of PPFs under the protection of the Forest Law (2018).</p>
<p>Stakeholder diversity and changes over time</p>	<p>The majority of local communities, relying predominantly on the goods and services provided by mangrove ecosystems, exhibit a complex tapestry of social, economic, and cultural diversity. To understand the social, economic and cultural diversity and to identify potential risks within local stakeholder groups and to ensure their engagement and participation in the project implementation, comprehensive baseline socio-economic surveys^{10, 11} for all targeted villages were conducted. There are 2,492 households with a 9,694 population in 3 village tracts of Shwe Thaug Yan sub-township and Pathein township under Ayeyarwady Region. Most of the people in the area are casual labor, retailers, farmers, and fisherman. Some villages are located along the seaside, and their main livelihood is fishing, and others inland area people are farmers and gardeners. These local communities are subsistence users and grassroots communities deeply connected to the mangroves for their livelihoods. Additionally, this demographic includes fuelwood collectors and daily wage earners who had odd jobs and are landless, constituting those directly dependent on and benefiting from the mangrove systems. These groups, through their multifaceted reliance on mangrove</p>

¹⁰ Forest Inventory and Survey Report on Shwethaungyan (Magyi)

¹¹ Forest Inventory Report for Thaegone and Thabotkan Area

resources, contribute to the indicate web of interactions that shape the socio-economic dynamics of the region. Unfortunately, the socio-economic challenges faced by these communities, particularly the struggle to secure daily incomes, have resulted in an alarming increase in the degradation of mangrove ecosystems and their associated ecosystems and environment. As the pressure mounts for resources like fuelwood and the expansion of daily wage labour within these ecosystems, the delicate balance between human well-being and environmental sustainability is jeopardized.

There exists another category of local stakeholders who indirectly benefit from the goods and services of mangrove ecosystems. This group comprises small business runners such as retailers, shoppers, brokers, commercial fishing entities, farming, livestock breeders, and microlenders, all of whom play intermediary roles in the economic network surrounding mangrove resources.

Subsistence users, including grassroots communities, marginalized individuals, and vulnerable groups, depend on these intermediaries for employment opportunities that often come with low wages. Moreover, these vulnerable populations rely on loans from microlenders, albeit with high interest rates, to meet their financial needs. The intricate interdependence between these two distinct communities fosters a dynamic relationship, but unfortunately, it also contributes to the accelerated and unsustainable use of mangroves, coastal, and marine resources.

The interactions between small business runners such as retailers, shoppers, brokers, commercial fishing entities, agriculture, livestock breeders, and microlenders, and the vulnerable groups they indirectly support, drive increased pressure on mangrove ecosystems, exacerbating the overall degradation of these critical environments.

To mitigate this degradation, the project has supported diverse activities of sustainable livelihood and community development in collaboration with the village development committee, focusing on the first category of local stakeholders, such as creating job opportunities through

collecting mangrove propagules and seeds near their village and building or rehabilitating community assets to create intermediate income for the villagers. These income-generation activities are part of a comprehensive development approach, combining agriculture, aquaculture, livestock, etc., to improve the economic well-being of the beneficiaries and enhance the economic prospects of the community by utilizing local resources effectively, reduce the risks from natural resources and make them and their communities more resilient to shocks.

The cash for work programme helps meet the immediate basic needs of families while building assets that help them strengthen their livelihoods. WIF consistently offers educational programmes and empowers young individuals by providing essential resources, improving infrastructure, offering scholarships, supporting teacher salaries, providing school materials, and empowering youth with valuable skills.

The village revolving fund was also established to provide cash as capital to the selected beneficiaries through the Village Development Committee and local authorities to improve economic progress and support start-up capital in building micro-enterprises and home industries. The project trained and delivered vocational skill training for the villagers who do not have career skill sets to create regular job opportunities to earn regular income for their families to mitigate the negative impacts of socio-economic hardships on mangrove ecosystems.

As a result of the afore-mentioned interactions between the two major different community stakeholders, mangroves and related coastal and marine resources are under the harvest of short-term benefits, lacking long-term interests. Such status is severely leading to mangrove degradation. In this context of stakeholder interaction, the project ensures that no elite capture of project benefits to the grassroots, marginalized, and vulnerable communities in the project villages through the formation of community organizations such as mangrove conservation and village development

groups to improve relationships, communication, and networking.

In addition to the restoration and protection of mangroves with the participation of local communities in the villages, the village development committee, government agencies such as the Forest Department, and village administration groups are also leading agencies in the patrolling and protection of restored mangroves and law enforcement interventions. However, these agencies face financial shortages and technical difficulties in implementing mangrove restoration and conservation without this project. Therefore, for sustainable livelihood support to the first category of local communities, awareness improvement and capacity building for a diverse array of stakeholders, including the second and third categories of stakeholders, and law enforcement by the active engagement of the third category of stakeholders, the sustainable livelihood team of the project will continue to implement in the long run over the project crediting period with the carbon revenue generated from the restored mangroves.

Additionally, financial literacy programmes and alternative, low-interest financing options will empower vulnerable communities, reducing their dependence on high-interest loans and fostering more sustainable economic practices. Furthermore, raising awareness and fostering community participation in mangrove conservation efforts can empower local stakeholders to take an active role in preserving their natural resources.

In terms of cultural diversity, the majority of people living near the project area are Burmese, Kayin and Rakhine respectively. Myanmar is official language, and all diverse communities can speak and write; therefore, project staff have smooth communication with the local communities.

Local project staff such as forest guards and plantation labors (both male and female) are mostly assigned within the communities and trained as community facilitators in restoring and conserving the mangroves. They are all treated without any discrimination based on race, sex, or education. There has been no gender-sensitive issue

observed in the project areas during the consultations through the community participatory planning tool, as the project complied with the FPIC process.

To understand the stakeholder diversity and economic status of the targeted communities, baseline socio-economic surveys in Magyi VT (18 March 2015), Thaegon VT (25 Dec 2016) and Thabawkan VT (15 Feb 2017) were conducted respectively. According to the survey, most of the people from the community were casual labors. Some of them were fishermen, gardeners, shopkeepers and farmers. Community people are marginalized or vulnerable groups with irregular low income and it does not exist another category except subsistence users. National races were Myanmar, Rakhine and Kayin. The surveys also pointed out that most of the people from the targeted areas used battery and solar for lighting, transportation was difficult and economic growth was very slow. These communities are subsistence users and much rely on both tangible (collecting fuelwoods, food, roofing and fishing) and intangible benefits (ecosystem services) of mangrove forests. This leads to unsustainable management in long term and creates huge livelihood pressure on mangroves. The social, economic hardships and unstable livelihood activities of the communities alerts that mangroves can be gradually degraded if there is no conservation project with sustainable development activities.

During this monitoring period, the project fulfilled the social, economic, environmental and many other sectors of the communities. The project aims to increase the number of local people who improved skills, including technical, and vocational skills for employment and entrepreneurship and more production field on agricultural and aquacultural sectors. Local communities received organic fertilizer & pesticide making training, farm rat protection and Livestock breeding practices training, mangrove friendly crab rearing training and also received supporting materials.

The project takes care of community's health providing related materials and equipment with COVID-19 and communities received four clean hygiene awareness training. In Shwethaungyan (Magyi), the project has

supported the vacuum machine for child birth and child suction machine 10L/min pressure to the hospital.

For educational sector, the project provided teachers with monthly salary to the targeted schools in which there are not enough teachers to teach students. Basic, high and university students received scholarships for higher education and to get brighter opportunities in the future. Local people also received summer course training program (English & Computer basic training), fuel efficient stove making training, coconut shell value added handicraft training, grievance mechanism and proposal writing training and trash campaign awareness for livelihood income generation and personal development.

For community business, the project handed over Village Development Committee for continuing the whole ice plant business project from September 2022 and created job opportunities. The ice plant was very helpful to the community to store fishery products timely and properly.

For transportation sector, the project built new bridges to access smooth transportation between villages. The project also provided box culvert construction, drainage construction and retaining wall construction to be better urban management practices.

The project employs 13 community forest guards/patrolling staff. They patrol regularly the whole project area to protect encroachment and illegal cutting. The project also trained the youth from the project areas on environmental conservation camping /training program. Now they are serving as volunteers in the project areas.

The communities received financial aid to access the electricity within the villages. This is a huge change to the communities. Local people used fuel wood for cooking before. Now they replace electricity for cooking instead of fuel wood. It reduces fuel wood collection pressure from mangroves.

In summary, the project provided not only tangible benefits such as electricity, created smooth transportation, better education and job opportunities with sustainable incomes

	<p>for all subsistence users without any discrimination against sex, race and gender but also intangible benefits like protection from natural disasters and abundance fishery resources including ecosystem services. These above-mentioned activities and implementation actions reduce livelihood pressure on mangroves while supporting job opportunities with sustainable income for the communities.</p> <p>Hence, there are no significant barriers observed in terms of their cultural interactions and differences.</p> <p>In addition, as per above stated activities for sustainable livelihood development, there have positive changes of well-being in local stakeholders and the environment during this monitoring period.</p>
<p>Expected changes in well-being</p>	<p>Stakeholders in the project consist of the villagers living in areas close to the project, the Forest Department, and the local government. In all stages of the project so far, these stakeholders have been involved, and will be involved moving forward to ensure the success of the project. With the intervention of project activities, the mindsets of local stakeholders over time are expected to change from cutting mangroves to conserving mangroves. The local field offices are accommodated and raise awareness trainings to local stakeholders about the role and importance of mangrove ecosystems. With the job opportunities and incomes from generating carbon revenues, the grassroot families will be improved their health, education and economic status.</p> <p>Land use/land cover classes in baseline situation such as degraded mangrove lands, severely degraded mangrove lands and bare lands are identified as project area, and since there was no agricultural land use and grazing activities within the project boundary, there is no displacement due to project intervention. Hence, no significant negative changes and impacts are expected by the project, rather, various positive impacts on livelihood of local stakeholders such as new employment opportunities and increase in income, knowledge and ecosystem services provided by mangrove ecosystem.</p>

	<p>Since the project plants 9.1 million mangroves on 2,146.48 ha of degraded area, the project will increase mangrove forest cover and provide many ecosystem functions, especially a habitat for aquatic fauna and flora. The project activity in turn is beneficial to the villages who depend on the abundance of fish and other species for their livelihoods. In addition, mangroves not only provide coastal protection from natural disasters such as cyclone, but also becomes a potential source of income through sustainable fishing, ecotourism as well as carbon credits. This project supports the restoration of degraded mangrove lands, which directly supports climate change mitigation.</p> <p>In addition, mangroves are a natural defense mechanism for a coastal region and therefore the restoration undertaken by this project provides climate change adaptation.</p>
<p>Location of stakeholders</p>	<p>The location of communities and local stakeholders are not inside the intervention areas for mangrove planting and restoration, and all fall in the vicinity of the project areas. Since the project area is classified under protected public forests, there has not been any type of land use other than mangrove vegetation and there are only degraded mangrove, severely degraded mangrove and bare land within the project boundary. In addition, there is no biomass burning of agricultural practices or grazing. Grazing is not a common practice in the project area as determined from field visits and information gathered from villagers and local governments.</p> <p>Hence, there was no displacement and no negative impacts on local stakeholders due to project implementation during this monitoring period, and local stakeholders still have customary access rights to the resources. Two community's maps – one including Magyi VT and another including Thabawkan and Thaegon VTs are added in the APPENDIX 3 of the updated MR.</p>
<p>Location of resources</p>	<p>The project area is located within Protected Public Forest (PPF) and prior to declaration of the PPF, if there are customary lands practiced by local communities within PPF boundary, such land on which land use right was obtained</p>

traditionally were excluded from the PPF boundary as per rule 14 (a) (i) Forest Rules 1995. In addition, as per rule 14 (a) (iv) of Forest Rules 1995, the rights to extract and use forest produce, right to use the grazing ground seasonally and other rights are preserved within PPF.

Apart from the usufruct rights, since the project areas fall in the intertidal zone without any grazing of domestic animals and any land ownership by local communities and stakeholders, if any, which were not considered to demarcate in the project boundary, the local communities are not prohibited from the rights such as catching fish, collecting crabs, use of non-timber forest products NTFPs including vegetables, medicinal plants, honey, etc., from the project areas. Hence, local stakeholders have still access in the project areas and rights to extract and use forest produce within the project boundary.

2.1.2 Stakeholder Consultation and Ongoing Communication

In communicating with the person from the Forest Department, official letters are used. The requested letters are sent for the date and time appointment for the meeting. For communication with the village tract committees, WIF field offices contact in person or using mobile phone. The minutes of stakeholder consultation and meetings are recorded. If the minutes are in Myanmar language, they are translated into English for the verification process of VCS. Meeting minutes are saved at the WIF cloud service or at the respective persons. Any suggestions or requests during the meeting are followed up by the sustainable development team. WIF office is open at Magyi office and local stakeholders can send complaint letters regarding with the project activities to the WIF offices in the village tract. Complaints are resolved after receiving them. In addition, all stakeholders are aware of the process of VCS Program validation and verification and the validation or verification's site visit.

As the field office is located at Magyi (Shwe Thaug Yan), stakeholder consultations are normally held at the office. Sometimes, meetings are held in religious and community buildings. Technical officer (plantation in charge) and field livelihood officer are majorly responsible for introducing the WIF projects and livelihood activities, and so the officers always keep in touch with the local stakeholders and regularly reports the feedback of the local people who attended the consultation meeting. At each annual review meeting, Program Heads and respective field officers transparently explain about the successful status of the plantations, VCU's issuance, benefit sharing plan and implementation progress of the livelihood activities as well.

The following stakeholder consultations were recorded during this monitoring period 2022-2023.

Ongoing consultation	The current meeting was held at the Monastery of Kyun Chaung village, Shwe Thaug Yan with 49 participants (30 male and 19 female) and 2 WIF staff.
Date(s) of stakeholder consultation	9.2.2023
Communication of monitored results	<p>The purpose of this meeting was wealth ranking in order to prioritize the vulnerable household when livelihood activities are implemented.</p> <p>Firstly, Field Livelihood Assistant explained the objective of meeting and activities conducted by WIF.</p> <ul style="list-style-type: none"> - Discussed about project standardized with 5 wealth ranking stages. - After that, collected wealth ranking of each household according to the agreement of attended villagers were classified.
Consultation records	Consultation records are usually archived in both hard and soft copy versions. A complete meeting record ¹² is provided as a supporting document.
Stakeholder input	Participants actively participated in household wealth ranking process.

Ongoing consultation	The current meeting was held at Magyi office with 14 participants (12 male and 2 female) and 2 WIF staff.
Date(s) of stakeholder consultation	15.2.2023
Communication of monitored results	<p>The purpose was to generate family income from mangrove friendly crab rearing.</p> <p>Field Livelihood Manager met the villagers and introduced about mangrove friendly crab rearing training and also explained that after training session, it was one of the income generation activities.</p>

¹² 1764 Meeting note-Wealth ranking updating, Kyun Chaung village (9.2.23)

Consultation records	Consultation records are usually archived in both hard and soft copy versions. A complete meeting record ¹³ is provided as a supporting document.
Stakeholder input	Villagers were very interested in crab rearing and requested the necessities for this activity.

Ongoing consultation	The current meeting was held at the Church of Hngat Pyaw Chaung village with 36 participants (12 male and 24 female) and 2 WIF staff.
Date(s) of stakeholder consultation	27.3.2023
Communication of monitored results	<p>The purpose was to introduce project activities to the community.</p> <p>Firstly, livelihood manager introduced with WIF and explained about project visions and missions.</p> <p>She continued about sustainable livelihood programs in details.</p> <p>Assistant officer also added that that before the implementation phase, our project will do participatory tool planning meeting to form village development committee (VDC) and to know the current situation of the villages, current problems and how to solve these problems and what kinds of activities need to conduct for village development by the collaboration and agreement of the villagers.</p>
Consultation records	Consultation records are usually archived in both hard and soft copy versions. A complete meeting record ¹⁴ is provided as a supporting document.
Stakeholder input	Villagers were very aware of the objectives of the project and understood that the project implements sustainable livelihood activities while conserving mangroves.

¹³ 1764 Meeting note- Carb Rearing-Shwe Thaug Yan office (15.2.23)

¹⁴ 1764 Meeting Note- Project Introduction at Hngat Pyaw Chaung village (27.3.23)

<p>Ongoing consultation</p>	<p>The current meeting was held at the Monastery of Sin Hnar Hmaung village with 37 participants (14 male and 23 female) and 2 WIF staff.</p>
<p>Date(s) of stakeholder consultation</p>	<p>4.4.2023</p>
<p>Communication of monitored results</p>	<p>The purpose was to develop livelihood management plan using PRA tool.</p> <p>Field Livelihood Manager explained the objective of meeting, project introduction, the conducted activities by WIF.</p> <ul style="list-style-type: none"> ▪ Explained five project activities of our livelihood development program: (1) awareness raising and improving knowledges (2) income generation activities (3) financial support activities (4) cash for work activities and (5) life skill and vocational training. ▪ Explained that before implementing project activities, our project will form village development committee (VDC) and attended participants need to select committee members systematically for village development. ▪ After that, explained the objective and process of participatory tool planning such as social mapping, seasonal calendar, collecting wealth ranking for all household and formulated the problems and difficulties separated by male and female group.
<p>Consultation records</p>	<p>Consultation records are usually archived in both hard and soft copy versions. A complete meeting record¹⁵ is provided as a supporting document.</p>
<p>Stakeholder input</p>	<p>After the meeting, the villagers identified five years' work plan for village development.</p>
<p>Ongoing consultation</p>	<p>The current meeting was held at the Church of Poe Laung village with 39 participants (14 male and 25 female) and 6 WIF staff.</p>

¹⁵ 1764 Meeting note-PRA, Sin Hnar Hmaung village (4.4.23)

Date(s) of stakeholder consultation	11.8.2023
Communication of monitored results	<p>The purpose of the meeting was revolving fund establishment for the community.</p> <p>Field Livelihood Manager explained that five program activities of Livelihood Development project of Worldview International Foundation (WIF).</p> <p>Field Admin and Finance Assistant added about the financial statement of revolving fund group.</p>
Consultation records	<p>Consultation records are usually archived in both hard and soft copy versions. A complete meeting record¹⁶ is provided as a supporting document.</p>
Stakeholder input	<p>After the meeting, village development committee selected beneficiary list to operate the revolving fund.</p>

Ongoing consultation	<p>The current meeting was held at the Thabawkan village with local stakeholders and WIF staff.</p>
Date(s) of stakeholder consultation	10.5.2023
Communication of monitored results	<p>The purpose was (1) to communicate regularly with the locals for the implementation of negotiation, capacity building, and awareness raising, leading to maintain sustainably of old mangrove plantations, and (2) To protect encroachment to the plantation areas.</p> <ul style="list-style-type: none"> ▪ Project Director and members conducted site inspection on sample plot (14/2018) in the Kyauktalone Chaung areas, Thabawkan village, and around the plantation areas, and checked on the survival status of the planted trees from 09:00 AM to 10:15 AM. ▪ Discussion with local stakeholders, who make crab fattening firm in Poelaung village.

¹⁶ 1764 Meeting Note-Revolving Fund-Poe Laung village (11.8.23)

	<ul style="list-style-type: none"> Knowledge sharing on the conserving mangroves and their related benefits including the abundant of aquatic creatures.
Consultation records	Consultation records are usually archived in both hard and soft copy versions. A complete meeting and site visit record ¹⁷ is provided as a supporting document.
Stakeholder input	Local stakeholders explained the challenges and difficulties of crab fattening, and requested informative advice from WIF technicians. They also admitted that as the mangroves are better than before, fish, clam and crab are abundant.

Ongoing consultation	The current meeting was held at the Nwe Nyo Chaung village, Thaegon VT with local stakeholders and patrolling staff.
Date(s) of stakeholder consultation	28.6.2023
Communication of monitored results	<p>The purpose of the meeting was</p> <ol style="list-style-type: none"> (1) To explain the implementation and maintenance process of mangrove plantations in the project areas, (2) To support technical guidance for local stakeholders who are willing to establish CF and conserve mangrove areas that are out of project boundary, (3) To explain the tangible and intangible benefits of conserving mangroves, and (4) To conduct ground checking on the old mangrove plantations whether other factors affected the planted trees. <ul style="list-style-type: none"> Regional Project Coordinator (RPC) and staff conducted site inspection on the mangrove areas of Thaegon VT. <ul style="list-style-type: none"> According to community forest guards' inspection report, the forest conditions were gradually better

¹⁷ Meeting note of PD site visit (10-5-2023)_Thabawkan-1764

	<p>than before, and RPC encouraged the villagers to participate in conservation activities for long term.</p> <ul style="list-style-type: none"> ▪ RPC added the tangible and intangible benefits of conserving mangroves. ▪ Then, RPC continued the implementation and maintenance process of mangrove plantations in the project areas and welcomed stakeholders' participation.
<p>Consultation records</p>	<p>Consultation records are usually archived in both hard and soft copy versions. A complete meeting and site visit record¹⁸ is provided as a supporting document.</p>
<p>Stakeholder input</p>	<p>Local stakeholders showed great interest in the restoration plan of mangrove plantation.. As local stakeholders saw the actual benefits from the project, they were willing to conserve mangroves and establish CF which is adjacent to the project areas. In addition, they also requested technical support from WIF.</p>



Figure 5: Field livelihood manager/officer making consultation with local community.

¹⁸ Meeting note of RPC site visit (28-6-2023)_Thaegone-1764



Figure 6: Project Director and members at site visit, Thabawkan village area (left) and Regional Project Coordinator meeting with local stakeholders at Thaegon VT (right).



Figure 7: Regional Project Coordinator presenting about the project at the annual review meeting, Shwe Thaug Yan (Magyi).

2.1.3 Free, Prior, and Informed Consent

Consent	WIF utilizes Free Prior Informed Consent (FPIC) is a transparent and voluntary decision-making process that
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	<p>occurs before any project activity that may impact a community in order to ensure that the community has complete and accurate information about the project activities and its potential effects, allowing them to either grant or deny permission for the activity.</p> <p>The steps of FPIC processes followed by WIF are as follows:</p> <ol style="list-style-type: none"> 1. Identification, Project Initiation and Mapping 2. Engagement and Communication 3. Information Sharing 4. Community Consultation, Consent Seeking, and Community Participatory Planning process 5. Negotiation and Decision-Making 6. Agreement Drafting/ Ratification 7. Implementation 8. Monitoring and Evaluation 9. Grievance Mechanism 10. Review, Adaptation, Closure <p>Prior to project implementation, initial contact with communities' representatives is established in a respectful manner to ensure trust and relationship between relevant stakeholders and WIF. Then, consultation meetings with the communities are organized to inform procedure of project activities, and discuss about potential impacts, benefits and risks, FPIC process in order to ensure transparency.</p> <p>As per the transparent FPIC process, there was no conflicts and no ongoing conflicts between WIF and relevant stakeholders on project ownership, land use rights, benefit sharing, etc.</p> <p>The operational guidance of FPIC is provided as supporting document.</p>
<p>Outcome of FPIC</p>	<p>As per above-stated procedures of FPIC processes, the outcomes and available evidences for each step are as follows and the evidences can be available to the VVB.</p>

	Steps of FPIC process	Outcomes Data and Available Evidences
	Identification, Project Initiation and Mapping	- Baseline survey report, village profile data, Mapping, etc.
	Community Engagement, and Information Sharing	- IEC materials, etc.
	Community Consultation, Consent Seeking and Community Participatory Planning Process	- Village development action plan book, etc.
	Communities willing to implement VCS project	- Collecting necessary data and documents such as land use plan, etc.
	Negotiation and Decision-Making	-
	Agreement Drafting/ Ratification	- Draft agreement letter, final agreement, etc.
	Implementation	- Community proposals, project agreement letter, payment records, meeting minutes, completion reports, handovers records, etc.
	Monitoring and Evaluation	- Monitoring reports, evaluation reports, success stories, etc.
	Grievances Mechanism	- Letters from communities, register forms, resolution reports, etc.
	Review, Adaptation, Closure	- Annual Review Workshop report, conferences report, etc.

2.1.4 Grievance Redress Procedure

Grievances received	Resolution and outcome
NA	...

Since 2015, and continually thereafter, the project has conducted a series of stakeholder consultations at different levels – national, regional and village. The project has distributed information on the ecosystem restoration concession idea, planned activities, predicted project impacts, management plans, and project boundary establishing processes through this process, and has incorporated stakeholder feedback into agreed-upon plans and legal approval.

During the monitoring period, events with stakeholders were held ranging from workshops, discussion forums, training, and formal planning sessions. Efforts have been taken during all community discussions to ensure that adequate, understandable, honest, and accurate information, including information on costs, risks, and benefits, is supplied as a foundation for any decisions.

Processes to ensure ongoing communication and consultation with local stakeholders, including a grievance redress procedure to resolve any conflicts that may arise between the project proponent and local stakeholders are the following:

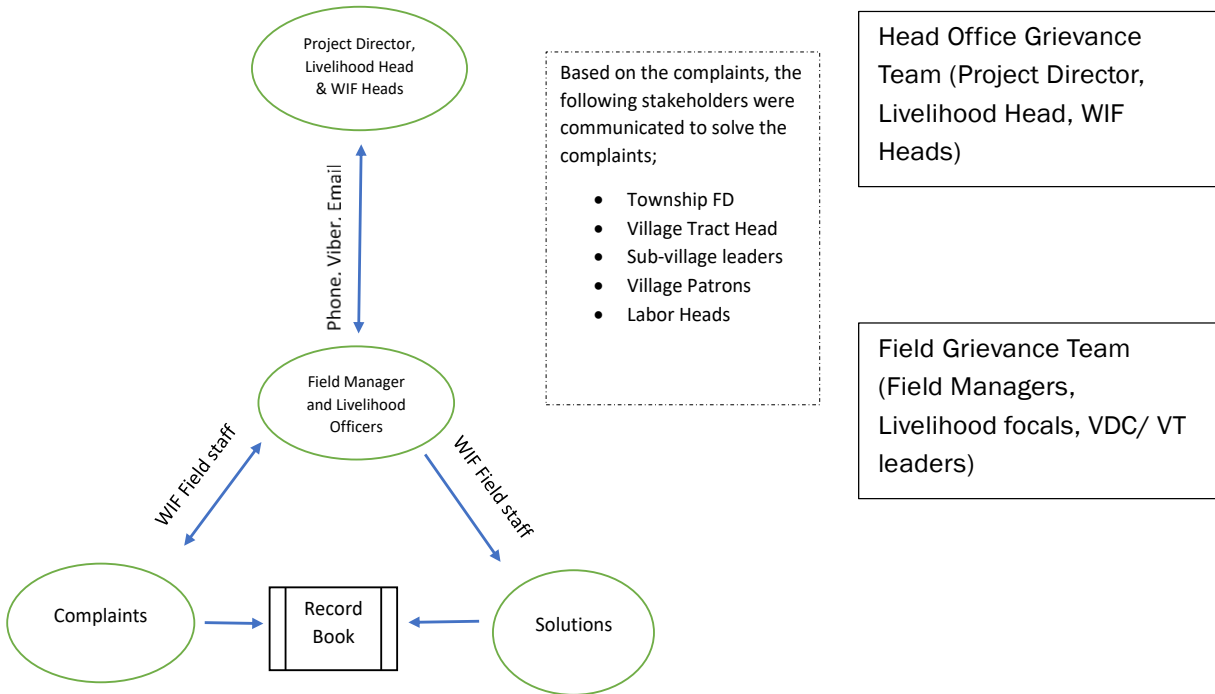
- Complaints/ suggestions that are able to be handled at the local office are discussed with the local team led by Mr. Win Maung. For higher decision making, the Rector of Patheingyi University and Dr. Arne of WIF are involved. For Thabawkan and Thaegone, the chief of village tract committees is also responsible for recording the complaints, suggestions regarding the project and reporting to Mr. Win Maung and Dr. Arne from WIF. Telephone numbers of Mr. Win Maung and Mr. Chit San have been given to the local communities to be contacted.
- Any comments, complaints, grievances in relation to the project are as a first stage reported by phone or in writing to the WIF office in Magyi.

Contact person by phone: Mr. Chit San

Office phone: +95-9970292557

- In the case of grievances reported by phone, a grievance note is filled out including the name, contact details of the claimant, date of complaint and the detailed description of the complaint/ grievance, as well as any comments or suggestions of how to address the complaint. For any grievances submitted by email, the above details are recorded.
- WIF responds in writing to any claimant within 15 days and takes immediate action to address those grievances in consultation with the claimant if any resource restriction has been caused by the project. Claims, responses, and actions taken to address grievances are filed and included in project monitoring.

- If the claimant is not satisfied with the response by the local office, the grievance may be submitted to Worldview International country office in Yangon.



Flow chart of an existing grievance mechanism (Note: VDC is village development committee and VT is village tract). WIF Country Office: #70, Yaw Min Gyi Street, Dagon Township, Yangon.

During the current monitoring period, no letters of grievance/complaint from communities are reported to the field office and Head office (Yangon).



Figure 8: Suggestion box and notice board at Thabawkan village (1764 VCS project site) for grievance/complaint letters.

2.1.5 Public Comments

Summary of comments received	Actions taken
N/A

Implementation of the project has been granted by the Forest Department of the Ministry of Natural Resources and Environmental Conservation, and the Regional Government. The local communities in the project area also have no objection on the project since they all are aware of the project activities and its benefits.

During the current monitoring period, though any letter of comment from communities are not reported to the field office and Head office (Yangon), appreciation and suggestion ones¹⁹ to the project are received.

2.2 Risks to Stakeholders and the Environment

2.2.1 Management Experience

WIF has currently implementing five projects such as three projects in Ayeyarwady region, one project in Yangon, Bago and Mon and one project in Tanintharyi region. Thus, management teams have comprised with senior experiences in implementing VCS project activities including engaging communities. Mr. Bo Ni, the Managing Director is a former Director of the Watershed Management Division of the Forest Department with over 40 years of experience in management and administration. Mr. Win Maung, the Project Director is also a retired Director of the Forest Department. He has over 30 years working experience in mangrove restoration as a government official; researcher and Project Manager of NGO/UN-LIFT projects. Mr. Aung Aung Myint, GIS Expert, is a retired Assistant Director of Forest Department and has over 25-year experience in forest monitoring and mangrove restoration. The scientific advisor is Dr. Htay Aung, a retired professor from Patheingyi University with more than 20 years of experience in marine science and research. Dr. Dhanya M. Nambiar, the Primary Carbon Consultant, contributes her expertise in validation and verification process. She has 20 years of consulting experience in environment and sustainability. She has been involved in more than 100 projects in the area of climate change mitigation and adaptation. Overall supervisory was done by Dr. Arne Fjortoft, Secretary General of WIF. For the management of the project, human resources of the organization and experience of the staff are described in section 4.3 of MR.

2.2.2 Risk assessment

¹⁹ Grievance Registration Book (#1764)

	Risk identified	Mitigation or preventative measure(s) taken
<p>Natural and human-induced risks to stakeholders' wellbeing</p>	<p>No risk identified</p>	<p>There can be no doubt mangroves can protect from natural risks/disasters such as storms and tsunami for coastal communities. The purposes of the projects are to restore the degraded areas and conserve mangroves coupling with local livelihood development.</p> <p>The mangrove restoration and reforestation efforts follow to WIF's guidelines (SOP of Mangrove Restoration, which includes native species selection and site selection to bolster the resilience of planted mangrove trees). Additionally, WIF applies an adaptive management system and regular monitoring practices that enhance overall management effectiveness of mangrove conservation. This approach mitigates natural disasters such as insect infestations, sea-level rise, and temperature increases, thereby improving the mangrove ecosystem's health, which plays critical role for local livelihood development.</p> <p>Local communities heavily depend on fishery resources for their livelihoods. To mitigate human-induced risks, WIF collaborates with government agencies such as the Forest Department and Village Development Committee to strengthen enforcement measures, safeguarding the mangrove project areas. In addition, WIF actively engages with communities, support alternative livelihood programs, and fosters conflict resolution through transparent communication and collaboration among stakeholders.</p>
<p>Risks to stakeholder participation</p>	<p>No risk identified</p>	<p>Stakeholders that have participated in all stages of the project's implementation include the local government, the Forest Department, Pathein University and the residents that live near the project. All the stakeholders remain engaged to ensure the success of the project.</p> <p>One of the objectives of the WIF's sustainable livelihoods and community development project are to provide a helping hand to the disadvantaged</p>

community in overcoming abject poverty as a reward for the people's partnership to take care of the forest for the long-term.

The project restores the degraded mangroves in the protected and proposed protected public forests which are under the management of FD/MONREC. The project activities are supporting the mangrove restoration effort of FD in project regions. It indicates the project implementation has no adverse impact on stakeholders and instead offers environmental benefits.

In addition, awareness of project implementation by the local communities is the crucial component of the entire project cycle. WIF ensures community involvement at all stages of project implementation in a transparent manner. Though communities are living outside PPF, their existing subsistent practices in the PPF are not prohibited. They receive additional benefits from the project in association with the generation of VCU. For this reason, the project does not impact local stakeholder's property rights without the free, prior and informed consent.

The sustainable development team of WIF has been organizing series of local stakeholder meeting to identify the prioritized activities for community development and following key activities are conducted at the targeted village tracts of the project to ensure no-net harm.

- Income Generation Activities: Fuel efficient stove producing, and increased family income by providing crab equipment
- Cash for Work Programme: Improving better transportation, drinking water pond improvement, and rain water harvesting
- Awareness Raising and Improving Knowledge: Health awareness on hygiene and four lean (water clean, latrine clean, food clean, and hand clean)

		<ul style="list-style-type: none"> ▪ Life Skill and Vocational Training: Fuel efficient stove making, mushroom production, and mobile video editing ▪ Financial support activities: Revolving funds <p>Hence, there are no risks to stakeholder participation since there are no negative impacts to local stakeholders due to implementation of the project activities, rather positive impacts are significant delivered.</p>
<p>Working conditions</p>	<p>No risk identified</p>	<p>The project applies Regeneration Improvement Felling technique called RIF for site preparation. RIF is an environmentally friendly silvicultural method, removing the aggressive weeds that are eliminated by handy sharp knives; not by cause of chemical pesticides and herbicides. The weeds and branches from RIF operation are heaped between mangrove anchor roots and dried by direct sunlight, no burning that destroys the ground and kills small microbes. This method makes no destruction to the existing species. WIF technicians give awareness of planting and forestry operation techniques and train them to become skillful labors.</p> <p>In land preparation and planting, safety trainings are given such as working distance from each other when using the weeding knives and grass cutters with close supervision by the managerial and technical in-charges at the sites.</p> <p>During outplanting of the propagules, WIF is honoring it's well-trained and motivated planters with higher salaries they deserve above the official minimum wage (8,000 MMK) and the safety of plantation workers is carefully taken into account during planting in the fields.</p> <p>Site/land preparation and planting operation were done for this project since 2019. But regular patrolling operation still remains. The purpose of patrolling is to maintain a sustainably managed mangrove ecosystem for carbon sequestration, protect illegal cutting from fuel wood collectors and detect any encroachment to the project areas.</p>

		x
Safety of women and girls	No risk identified	<p>The WIF team works with different actors to ensure that gender aspects, including gender-based violence, are taken into account in the design and implementation of the projects.</p> <p>All activities demonstrate how they integrate participation and leadership of women and girls in project design and implementation, addressing the different needs of women and girls within planned activities and ensuring access of women and girls to various services.</p> <p>WIF emphasizes the safety of women and girls and are protected by Panel Code (1861)²⁰ and Social Security Law (2012)²¹ to prevent various forms of violence including sexual violence, trafficking and exploitation. In addition, the project is designed and implemented in compliance with Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) as Myanmar acceded to the Convention on CEDAW in 1997.</p>
Safety of minority and marginalized groups, including children	No risk identified	<p>One of the cross-cutting components of the project is to contribute to the secured livelihoods and poverty reduction of marginalized and vulnerable communities.</p> <p>Activities for the vulnerable and marginalized groups are identified on a case-by-case basis, in consultation with community development committees and communities, with careful attention paid to gender equality in decision-making and participation. Therefore, the proposed project activities are carefully designed to ensure generating positive impacts with no net harm on the socio-economic status of local communities without leaving vulnerable, marginalized, and minority groups.</p>
Pollutants (air, noise, discharges to water, generation of waste,	No risk identified	<p>Mangrove degradation is a global issue and there is no exception for Myanmar. According to the reports, mangroves in Myanmar area as part of the most</p>

²⁰ Myanmar Penal Code_1861

²¹ Social Security Law_pyidaungsu_hluttaw_law_no._15_2012 (MMR_ENG)

<p>and release of hazardous materials and chemical pesticides and fertilizers)</p>		<p>degraded mangrove ecosystem in the Indo-Pacific region²². This project restores degraded mangrove forests by planting 9.1 million mangrove plants which increase the mangrove forest cover and create vibrant and diverse natural habitats for a variety of fauna and flora.</p> <p>Greenhouse gases, particularly carbon dioxide, are the principal cause of climate change. For the faster removal of these gases from the atmosphere, it needs to establish more forests that can capture and use carbon dioxide during photosynthesis. Mangroves can significantly mitigate up to 5 times more CO₂ than terrestrial trees. A high proportion of mangrove carbon is found in sediments and the below-ground biomass of the forests. In addition, mangroves serve as natural barriers protecting the lives and properties of coastal communities from catastrophic storms and tsunamis. Furthermore, to address the issue of sea-level rise and global warming, the capture of sediments by mangrove plays an important role in land forming processes. For these reasons, the mangrove restoration activities of the project contribute to climate change mitigation and adaptation.</p> <p>Mangroves also filter organic wastes from the water which benefits its associated coastal ecosystems. The project is aiming to restore the degraded mangroves to their original status with rich marine biodiversity on which the local communities depend for their living.</p> <p>The mangrove root system reduces the velocity of tidal waves and creates a less turbulent environment favorable for sedimentation which in term stabilizes the shorelines and promotes the accumulation of organic matter in the soil. Without the project, the surface soil in the depleted</p>
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²² Giesen W, Wulffraat S, Zieren M, Scholten L (2006) *Mangrove guidebook for Southeast Asia*. (F. R. International., Ed.) Bangkok, Thailand: RAP Publication

		mangrove areas will be eroded in the long run resulting in poor soil quality.
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2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

	Risks identified ²³	Mitigation or preventative measure(s) taken
Discrimination	No risk identified	<p>Since the project design is aimed to restore mangrove ecosystems that are coupled with the sustainable livelihood development of local communities, neither gender discrimination nor sexual harassment is formed. In addition, project activities including sustainable livelihood development is implemented with fair treatment and equal opportunity (both male and female) within the communities without any discrimination of race, sex and education.</p> <p>Local project staff such as forest guards, and plantation labours (both male and female) with equal payment (e.g., 8,000 MMK per day for plantation labour) are mostly assigned within the communities and trained as community facilitators in restoring and conserving the mangroves.</p> <p>Hence, since the local communities are all treated without any discrimination based on race, sex, or education, there has been no gender-sensitive issue observed in the project area.</p>
Sexual harassment	No risk identified	<p>WIF not only value diversity and inclusion, and discrimination but also prohibition of sexual harassment, and any other legally or ethically protected characteristic. WIF takes the responsibility to prevent sexual harassment and respect in the work environment.</p>

²³ The identified risks and commensurate mitigation or preventative measure(s) for forced labor, child labor, and human trafficking, must be inclusive of staff and contracted workers employed by third parties.

		<p>Myanmar became a party to CEDAW (Convention on the Elimination of All Forms of Discrimination Against Women) in 1997. CEDAW requires States Parties to take comprehensive measures to address women’s equality rights in civil, political, economic, social and cultural spheres. As part of its obligations, Myanmar has committed to ensuring that its laws protect and promote women’s rights and advance women’s equality, taking into account both direct and indirect discrimination and ensuring that the laws, in their effect, enhance women’s substantive equality.</p> <p>In addition, as per Section 1.6 Non-harassment of ‘WIF Employee Handbook’, it is clearly stated that ‘WIF is committed to provide a work environment which is free of unlawful harassment. This includes sexual harassment as well as harassment based on factors such as race, color, religion, national origin, age, gender identity, medical condition, marital status, physical or mental disability, sexual orientation, or any other basis protected by local law’. This proves that WIF shows no sexual harassment in working conditions.</p>
<p>Gender equity in labor and work</p>	<p>No risk identified</p>	<p>The WIF team works with different actors to ensure that gender aspects, including zero-tolerance of gender-based violence, are taken into account in the design and implementation of the projects. All activities demonstrate how they integrate participation and leadership of women and girls in project design and implementation, addressing the different needs of women and girls within planned activities and ensuring access of women and girls to various services²⁴. As a core responsibility, WIF and its staff and committees ensure that project is designed and implemented in ways that contribute to the safety, dignity and integrity of all persons with respect for people’s needs, rights and capacities.</p>

²⁴ VDC Members (gender ratio of women participation)

		Throughout the project cycles, WIF ensures that informed decisions are made for selecting the project activities and identifying the participants and takes initiatives to promote gender equality in terms of joint decision-making and equal representation for both men and women in the projects.
Forced labor	No risk identified	The project does not aim to act and did not do any threat, use of force, abduction, fraud, deception, abuse of power or of position taking advantage of the vulnerability of a person to local stakeholders to participate in the project activities. Since the local communities actively participate in the project activities such as site preparation, tree planting, etc., there are no forced labors.
Child labor	No risk identified	As per Cash For Work project agreement, it mentions 'Employers do not hire children under the age of eighteen'. Therefore, WIF does not apply any child labor in livelihood development activities and plantation operations as well.
Human trafficking	No risk identified	WIF does not and will not violate any regulations stated in The Anti Trafficking in Persons Law 2005 ²⁵ .

2.3.2 Human Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	<p>Since 1948, Myanmar joined the ILO (International Labour Organization), and 25 ILO Conventions had been ratified. Myanmar voted in favor of the United Nations Declaration on the Rights of Indigenous Peoples in 2007²⁶, however, ILO Convention 169 on Indigenous and Tribal Peoples has not yet been ratified.</p> <p>As per socio-economic survey in each Region of project area, the majority of people living in the vicinity of the project area are Burmese, Kayin and Rakhine tribes with other minor ethnic groups. Since WIF is</p>

²⁵ https://asean.org/wp-content/uploads/2016/08/MY7_The-Anti-Trafficking-in-Persons-Law-Title-n-My-uncopyable-2005.pdf

²⁶ UN Declaration on the Rights of Indigenous Peoples

an international non-government organization (non-profit) since 1979 and have been involved in various issues such as communication, health, agriculture and food security, environment, education, democracy and human rights and has worked in close cooperation with UN Agencies and other international and national partners, WIF well recognizes to fully follow the international laws regarding human rights.

WIF follows below rights of indigenous peoples in line with UN Declaration on the Rights of Indigenous Peoples.

As of Article 10 of the UNDRIP, indigenous peoples shall not be forcibly removed from their lands or territories. No relocation shall take place without FPIC.

As of Article 11 of the UNDRIP, the project offers a range of options for grievance mechanisms to respect the cultural, intellectual, religious, and spiritual property taken without FPIC or in violation of their laws, traditions, and customs.

As of Article 19 of the UNDRIP, the project consults and cooperates with local communities concerned through their representative institutions to obtain their FPIC before adopting and implementing legislative or administrative measures that may affect them.

As of Article 28 of the UNDRIP, PP provides the right for local communities to redress for whose traditional lands have been confiscated, taken, occupied, used or damaged without their FPIC.

In addition, WIF does not violate any regulations of existing national laws (e.g., The Anti Trafficking in Persons Law 2005) and always respects the rights of IPs, LCs and customary land right holders within the project areas.

During FPIC process prior to project implementation, a series of consultation sessions were organized to gather community feedback on intended project activities and address concerns about their rights and property, and to provide information on the legal and ethical consideration and any legal obligations.

2.3.3 Indigenous Peoples and Cultural Heritage

Risks identified	Mitigation(s) or preventative measure taken
No risk identified	<p>Though there is no famous cultural heritage site in the project areas, WIF implements the project activities with the collaboration of local communities including indigenous peoples in a culturally appropriate manner since there are indigenous peoples such as Kayin and Rakhine living in the vicinity of the project areas, and fully follows the international regulations to preserve and respect the rights and culture of local communities such as religion, traditional festivals, etc.</p> <p>Since local project staff such as forest guards, and plantation labours (both male and female) with equal payment are mostly assigned within the communities and trained as community facilitators in restoring and conserving the mangroves, there is off-days for some local religious holidays such as Kayin New Year, and WIF has also attention on religious and cultural activities.</p> <p>WIF and its staff and committees shall ensure that project is designed and implemented in ways that contribute to the safety, dignity and integrity of all persons with respect for people’s needs, rights and capacities.</p>

2.3.4 Property Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	<p>Legal or customary tenure/access rights to territories, property and resources by stakeholders are covered by the Constitution of Myanmar (2008). The Union shall permit citizens right of private property, right of inheritance, right of private initiative and patent in accord with the law as per Chapter I, Clause 37 (c).</p> <p>Since land in the project area is classified within the Protected Public Forest (PPF), rights of use and access to land, territories, property and resources have been already clarified and defined during the settlement procedures of PPF declaration and are well documented. In addition, WIF and Forest Department worked with the collaboration of local communities to clarify and demarcate the project boundary and all property and property rights, project ownership and land use/access rights are clearly recognized within the project area. As per transparently recognized property and property rights with local communities, there are no any disputes over this.</p>

The Union shall protect the privacy and security of home, property, correspondence and other communications of citizens under the law subject to this Constitution (Chapter VIII, Clause 357).

The project maps and boundary demarcation allow the relevant stakeholders including local communities to understand their spatial positions in relation to the project area, and participatory mapping is facilitated to map their property in order to avoid any disputes over other village territories. The project does not cause any relocation of communities or any activities important for their livelihood and culture.

Awareness of project implementation by the local communities is the crucial component of the entire project cycle. WIF ensures community involvement at all stages of project implementation in a transparent manner. Though communities are living outside PPF, their existing subsistent practices in the PPF are not prohibited.

In addition, the permanence of carbon stocks will ensure till the end of the project lifetime whilst the project areas are managed as community-based mangrove forests to develop the livelihood of the local community in line with the UN Sustainable Development Goals. In the village tract agreements, it mentioned that WIF will scout for and develop opportunities internationally to market the “blue carbon” project. 50% of the net proceeds from the sale of carbon credits will be used to support agreed livelihood/sustainable development activities in the identified village tract communities, as proposed by the Community Development Committee and agreed by WIF’s Sustainable Development Unit.

For this reason, the project does not impact local stakeholder’s property rights without the free, prior and informed consent.

2.3.5 Benefit Sharing

<p>Summary of the benefit sharing plan</p>	<p>Benefit-sharing agreement is prepared for each village tract affected by the project activities. In the benefit-sharing agreement, the following information are included:</p> <ul style="list-style-type: none"> ▪ Restoration area in hectares ▪ Benefit-sharing plan ▪ Organizing Village Development Committee and assign village track leader to work in close cooperation with WIF
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	<ul style="list-style-type: none"> ▪ Validation and Verification process and their timelines ▪ Protection and monitoring of mangroves from local communities. <p>As a benefit-sharing plan, the benefit sharing is stated that “50% of the carbon credit will be paid back to investors, and 50% of net proceeds to be used in support of agreed livelihood/sustainable development activities in the community, as proposed by the Community Development Committee to be agreed by WIF’s Livelihoods Unit in line with internationally accepted rules for the trading of blue carbon”.</p>
<p>Benefit sharing during the monitoring period</p>	<p>As stated above in the process used to develop benefit-sharing agreement, benefit-sharing agreement is developed based on a series of consultations with affected stakeholder groups such as village tracts and finally approved with the agree up on by the stakeholder groups. The same two original agreements are signed by WIF and each stakeholder group, and since one is given to the stakeholders and one is documented in WIF’s archives, the agreement is readily accessible by local stakeholders who wish to review the agreement.</p> <p>As the technical officer (plantation in charge) and field livelihood officer are majorly responsible for introducing the WIF projects and livelihood activities, the officers always keep in touch with the local stakeholders and regularly reports the feedback of the local people who attended the consultation meeting. At each annual review meeting, Program Heads and respective field officers transparently explain about the successful status of the plantations, VCUs issuance, benefit sharing plan and implementation progress of the livelihood activities as well. Benefits from carbon revenue are currently applied in community development activities. List of livelihood activities during this monitoring period is already mentioned detail in MR Section 1.12 and are also attached as supporting documents.</p>

2.4 Ecosystem Health

	Risk identified	Mitigation or preventative measure(s) taken during the monitoring period
Impacts on biodiversity and ecosystems	No risk identified	<p>This project restores degraded mangrove forests by planting 9.1 million mangrove plants which increase the mangrove forest cover and create vibrant and diverse natural habitats for a variety of fauna and flora.</p> <p>Since mangroves are feeding, spawning, hatching and nursing ground for aquatic species and important hotspots for migratory birds, this project is aiming to restore the degraded mangroves to their original status with rich marine biodiversity on which the local communities depend on their living.</p>
Soil degradation and soil erosion	No risk identified	<p>The mangrove root system reduces the velocity of tidal waves and creates a less turbulent environment favorable for sedimentation which in terms stabilizes the shorelines and promotes the accumulation of organic matter in the soil. Without the project, the surface soil in the depleted mangrove areas will be eroded in the long run resulting in poor soil quality.</p> <p>In addition, the project activity can reduce the erosion of soil by rainwater and waves. The roots of the mangroves in the ground while the prop roots, stilt roots and knee roots near the surface both bind the soil and keep it from being washed out by heavy rains and waves.</p>
Water consumption and stress	No risk identified	<p>The mangrove restoration and planting activities are undertaken in the tidal inundation areas, and the plants rely on natural hydrological patterns for their growth, without any additional inputs of water and stress.</p>

2.4.1 Rare, Threatened, and Endangered species

Species or habitat	<p>It is demonstrated that the project has not adversely impacted habitats for rare, threatened, or endangered species found with the project area during this monitoring period.</p>
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<p><i>Bruguiera hainessii</i> C.G.Rogers</p>	<p><i>B. hainessii</i> is critically endangered (CR) mangrove species in the IUCN red list. Some trees of <i>B. hainessii</i> are found within the project area. One of the prominent characteristics of the species is that there has a sprouting ability from the knee roots. Local communities are aware of this species and totally protect them with bamboo fence and notification sign boards.</p>
<p><i>Sonneratia griffithii</i> Kurz.</p>	<p><i>S. griffithii</i> is critically endangered (CR) mangrove species in the IUCN red list. Some trees of <i>S. griffithii</i> are found within the project area. They are totally protected by the local stakeholders and patrolling staff.</p>
<p><i>Heritiera fomes</i> Buch. Ham.</p>	<p><i>H. fomes</i> is endangered (EN) mangrove species in the IUCN red list. Some trees of <i>H. fomes</i> are found within the project area. Communities and patrolling staff take special care on this specie in order to protect from fuel wood and post collectors.</p>
<p><i>Elephas maximus</i></p>	<p>Asian Elephant <i>Elephas maximus</i> is endangered (EN) mammal species in the IUCN red list. As the project boundaries touch Rakhine Yoma mountain range, elephants often go through and can be found within the project area. Restoring activities of the project creates elephant habitats and seeing wildlife back such as Elephant is a good indicator of successful plantation.</p>
<p>Areas needed for habitat connectivity</p>	<p>The project areas are degraded mangroves and ecologically damaged areas before. The abovementioned endangered mangroves were found since forest inventories were conducted at the beginning of the project. These species are fully protected within the project areas. In addition, some wildlife species such as obviously elephants come back from other habitats to the project areas because restoration and conservation activities make a good forest condition that is essential for habitat connectivity. Therefore, the project supports the needed areas for mangrove species and wildlife without causing adverse impacts during this monitoring period.</p>

<p>Risks identified</p>	<p>Mitigation or preventative measure(s) taken</p>
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<p>Habitats for rare, threatened, and endangered species</p>	<p>No risk identified</p>	<p>The project enriches mangrove ecosystem and helps to be a healthy habitat for the above rare, threatened and endangered species. Hence, it is demonstrated that the project has not adversely impacted habitats for rare, threatened, or endangered species during the monitoring period.</p>
<p>Areas for habitat connectivity</p>	<p>No risk identified</p>	<p>As the project focuses on restoration and conservation of mangroves, it does not induce adverse impacts on areas for endangered (EN) and critically endangered (CR) mangrove species found within the project areas. The mangrove species are fully protected by community forest guards and have a chance to survive well. Moreover, it is not possible to see Asian Elephants before in the project areas. They live in Rakhine Yoma habitat which is adjacent to the project areas. Currently, it is found that elephants come to the project areas frequently. The project becomes an important area itself now for species habitat connectivity. Therefore, the project does not impact adversely for any wildlife species and fosters needed areas for habitat connectivity during this monitoring period.</p>

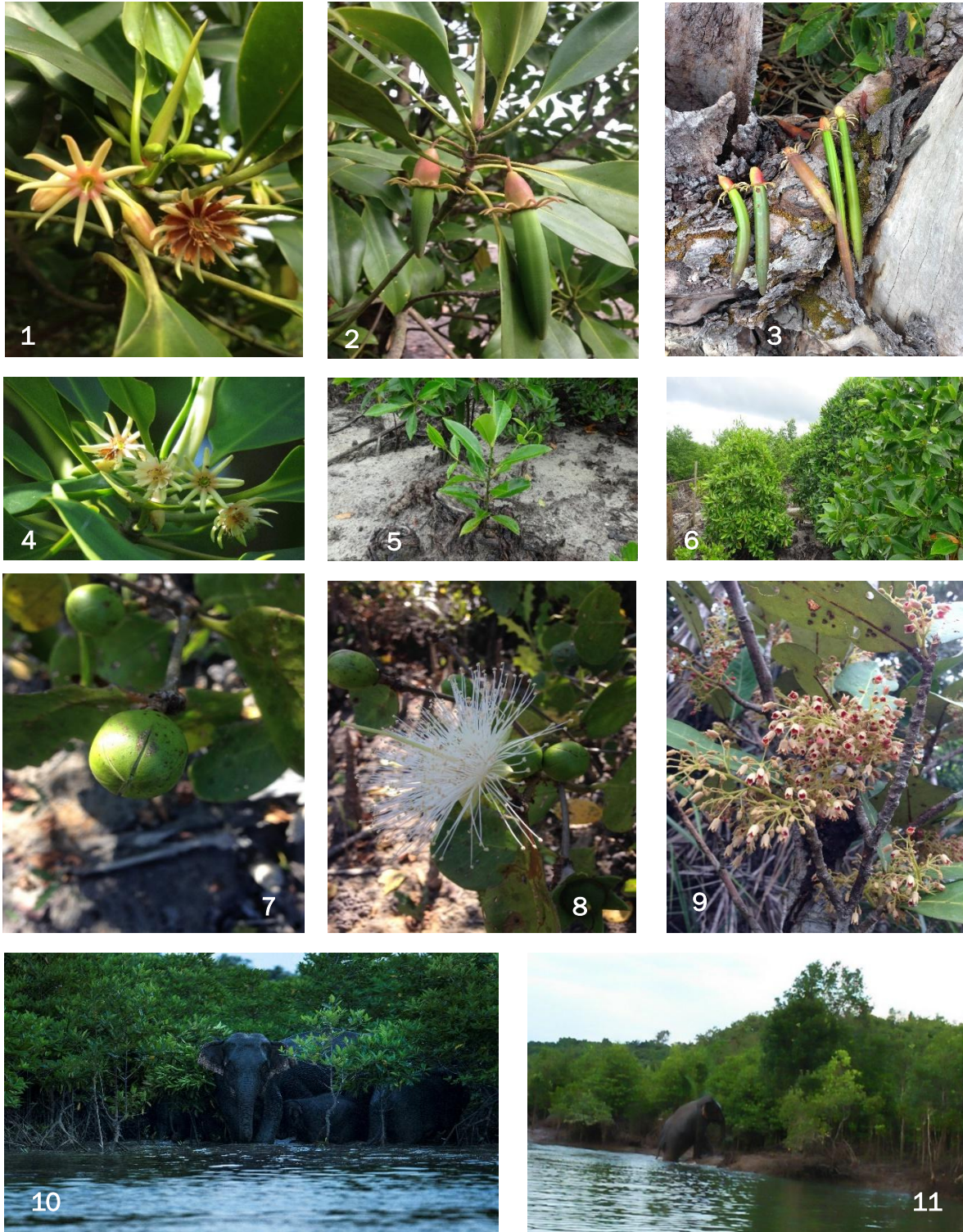


Figure 9: *B. hainessii* (1-6) (second row photos by Sayar U Win Maung), *S. griffithii* (7-8), *H. fomes* (9) and *Elephas maximus* (10-11) (photos by Ashima Narain) found within the project area.

Mangrove forests are part of the coastal ecosystem that typically includes mud flats, seagrass meadows, tidal marshes, salt barrens and even coastal upland forests and freshwater wetlands (i.e., peatlands), freshwater streams and rivers.

Establishing mangrove forests on degraded, and underutilised lands sequester significant amount of GHGs compared to the baseline. The project was implemented by WIF in cooperation with the government and universities that are committed to environmental sustainability and social responsibility.

Under the project, sediments, heavy metals, and other pollutants are trapped within the dense roots network. This retains sediments flowing from upstream and prevents contamination of downstream waterways and protects other marine ecosystems like coral reefs and seagrass beds below. The soil organic contents and mineral contents are improved due to proper land management. The restoration support fisheries and contribute to biodiversity by serving as nursery grounds for numerous coastal and marine species. This protects coastal towns from extreme weather like hurricanes, stabilize coasts, and prevent or stop soil erosion. Protecting endangered flora and fauna is another environmental benefit of the project. Recent mangrove plantations have brought back elephants and other wildlife that were previously not visible.

It is a wonderful sight to see the wildlife returning to the mangrove lands ensuring that their habitats have been reinstated due to the project activities. Biodiversities such as elephants, king fishers, mud skippers, are inhabiting and relying on mangrove plants for food and nesting. Apart from the birds, a variety of brackish fish such as the Blue-spotted mud hoppers have shown an abundant growth since the implementation of the project activities.

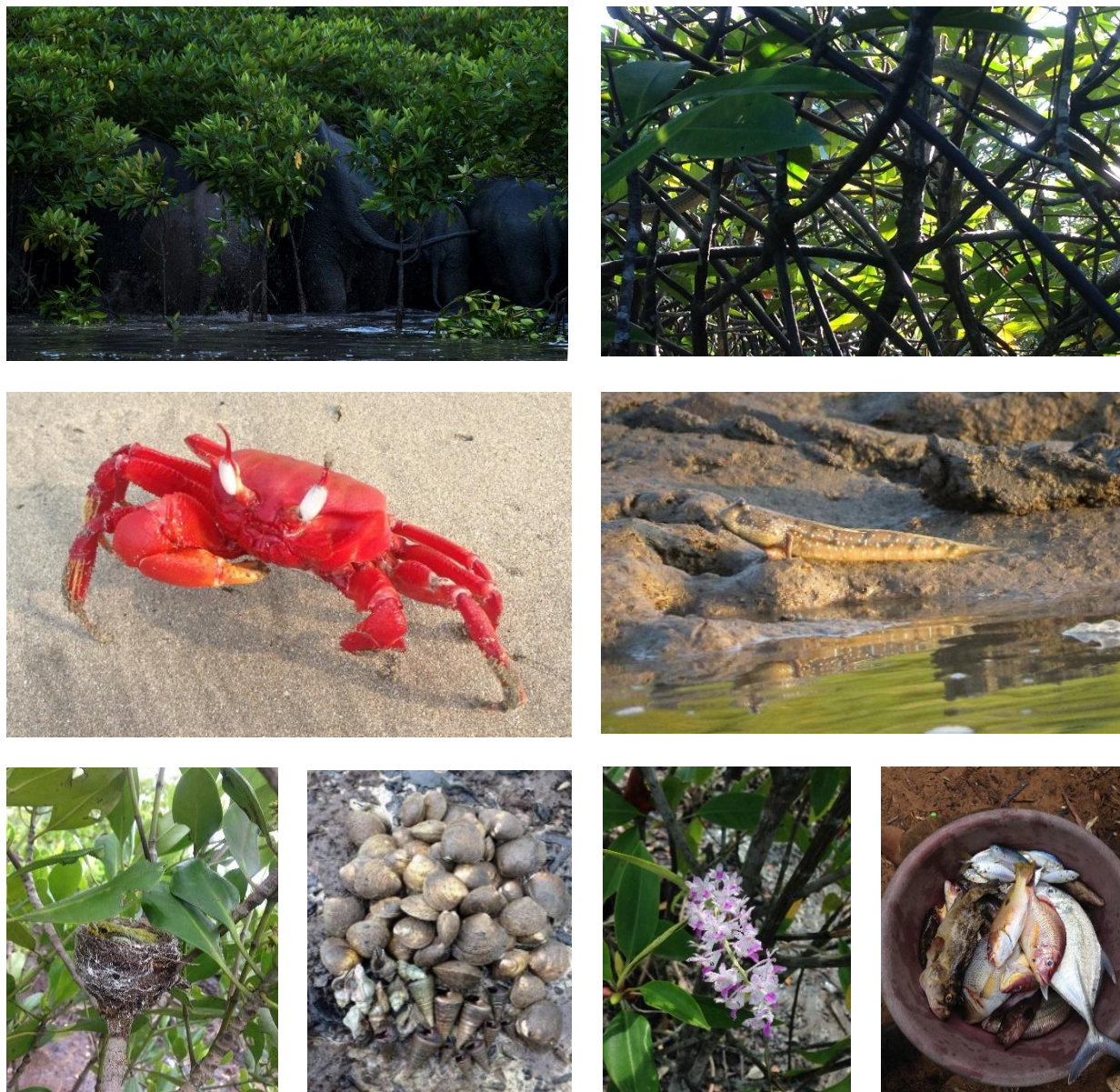


Figure 10: Biodiversity at the project sites (elephant photos by Ashima Narain)

2.4.2 Introduction of species

Species introduced	Classification	Justification for use	Adverse effects and mitigation
<i>Rhizophora mucronata</i>	Native	Common species in the project area (i.e., not a new species to the area)	No adverse effects are found since the introduced species is native mangrove (already mentioned in section 1.8 of the PD).

<i>Rhizophora apiculata</i>	Native	Common species in the project area (i.e., not a new species to the area)	No adverse effects are found since the introduced species is native mangrove (already mentioned in section 1.8 of the PD).
<i>Ceriops tagal</i>	Native	Common species in the project area (i.e., not a new species to the area)	No adverse effects are found since the introduced species is native mangrove (already mentioned in section 1.8 of the PD).
<i>Bruguiera gymnorhiza</i>	Native	Common species in the project area (i.e., not a new species to the area)	No adverse effects are found since the introduced species is native mangrove (already mentioned in section 1.8 of the PD).
<i>Bruguiera cylindrica</i>	Native	Common species in the project area (i.e., not a new species to the area)	No adverse effects are found since the introduced species is native mangrove (already mentioned in section 1.8 of the PD).
<i>Bruguiera sexangula</i>	Native	Common species in the project area (i.e., not a new species to the area)	No adverse effects are found since the introduced species is native mangrove (already mentioned in section 1.8 of the PD).

Existing invasive species	Mitigation measures to prevent the spread or continued existence of invasive species
N/A	N/A

Risks identified		Mitigation or preventative measure(s) taken
Invasive species	No risk identified	Any mitigation measure(s) cannot be available as there were no invasive species.

2.4.3 Ecosystem conversion

Risks identified	Mitigation or preventative measure(s) taken
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<p>Ecosystem conversion</p>	<p>No risk identified</p>	<p>As per explanation in Section 1.10 Conditions Prior to Project Initiation of the PD, the project areas were mangrove forests comprised of different mangrove species that have been subjected to heavy destruction due to charcoal production, agricultural practices, aquaculture, shrimp and fishponds since 2000. This affected the characteristics of secondary habitats that have been cleared of the mangrove forests. Most of these lands were bare lands or degraded mangrove lands. When analyzing the history of mangrove restoration in the project area, there have been neither any restoration activities implemented either by the Government nor any other NGO.</p> <p>Before the project starts, forest inventories were conducted in prior and names of floral species found in the area are presented in the Baseline Study^{27,28}. There was no clearance of the existing ecosystem in the project areas. Still, there were some clearances of the dominant undesirable land cover under Regeneration Improvement Felling (RIF) operation before planting operation, such as unwanted weeds, for example, <i>Acanthus</i> species (Khayar), <i>Acrostichum</i> species (Nget Gyi Taung), <i>Derris trifoliata</i> (Kabyoke Nwe), <i>Derris Scandans</i> (Mi Chaung Nwe), <i>Finlaysonia maritima</i> (Byauk Nwe), etc. Moreover, with field verification the degraded project areas were classified into five land use classes;</p> <ol style="list-style-type: none"> 1. severely degraded mangrove areas, 2. Degraded mangrove areas, 3. bare lands, 4. shallow water areas where planting is possible, and
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²⁷ Forest Inventory and Survey Report on Shwethaungyan (Magyi)

²⁸ Forest Inventory Report for Thaegone and Thabotkan Area

		<p>5. abandoned shrimp pond areas respectively.</p>
		<p>During this project implementation, it did not apply any activities of fertilization or burning of pre-existing vegetation, therefore, the project does not lead to GHG emissions by sources. Additionally, replanted mangrove species are <i>Rhizophora mucronata</i>, <i>Rhizophora apiculata</i>, <i>Bruguiera gymnorrhiza</i>, <i>Bruguiera cylindrica</i>, <i>Bruguiera sexangula</i> and <i>Ceriops tagal</i> that are true and native species commonly found in Myanmar²⁹.</p>

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project activity started in May 2015 and planting started in June 2015. As of July 2021, a total of 2,060.72 hectares have been planted. The project’s activities continue to successfully conserve a vast ecosystem of mangrove forest which would have otherwise been degraded. All project activities are implemented within the context of the national forest policy, forest resource management and the VCS standard by monitoring the project boundary, planted plots, tree growth and community development. No unexpected negative impacts on biodiversity or community occurred as a result of the project’s activities during this monitoring period.

1. Avoided degradation and deforestation

The project has planted and restored 2,060.72 ha of mangroves since 2015. Field office in charge and 13 community forest guards are mainly appointed for the management and protection purposes in the VCS project areas. Regular patrolling activities around the project area are frequently conducted by community forest guards under the guidance of regional project coordinator. The surveillance findings are monthly reported to the Regional Coordinator who is closely working in cooperation with the Forest Department (FD) and other governmental agencies regarding the supervision of both management and patrolling actions and addressing any illegal activities observed.

²⁹ Toe2 Aung 2022_Mangroves in Myanmar

The project areas (Magyi, Thabawkan and Thaegon) are under the category of Protected Public Forests (PPFs) attached as references and have been protected in accordance with the existing Forest Law, rules and regulations applicable for Republic of Union of Myanmar.

The Section 41 (e) of the Forest Law (2018) states; - “41. Whoever commits any of the following acts shall, on conviction, be punished with imprisonment for a term not exceeding two years or with a fine from a minimum of three hundred thousand kyats to a maximum of five hundred thousand kyats or with both: (e) destroying or damaging the forest plantation established by the Ministry or by any person or organization under permission of the Director General.”

As per Section 5 of Forest Rules (1995), the encroachment activities such as construction of new buildings, cutting trees, extraction of forest products, clearing lands, establishment of agriculture practices, fire and grazing lands are not allowed to undertake in the proposed protected public forests.

In the INTERNAL RISK Section 1.1 Project Management b. of AFOLU Non-Permanence Risk Tool v4.2, it describes that “Ongoing enforcement to prevent encroachment by outside actors is required to protect more than 50 percent of stocks on which GHG credits have previously been issued.”

WIF gets the support of the Forest Department officials for the regular monitoring of the area in order to prevent further encroachment. The agreement with the village tracts also ensures sufficient staff be able to take care the plants. However, risk factor of NPRT was conservatively scored as 2 for this monitoring period.

2. Monitoring and maintenance

While protection activities seek to prevent illegal exploitation of the project area, including illegal logging, encroachment, and forest clearance with fire, monitoring and maintenance of permanent sample plots are implemented with the assigned WIF’s staff in the field such as community forest guards and local communities. This is achieved through a combination of activities, all of which were conducted during the current monitoring period and the previous monitoring activities, including:

- Mobilization of trained forest rangers and patrol teams targeted on main access points,
- Replacing the damaged or lost number tags of the trees in permanent sample plots with new ones so that trees can be easily identified for the patrolling teams, and
- Measuring the growth of the trees in permanent sample plots

The previous project boundary has 2,065.87 ha but the current updated boundary during this monitoring period remains tiny changed to 2,060.72 ha. It is found that minor insignificant project areas are not intentionally extended areas (e.g., accidental or careless landfilling by the outsiders), and where are due to limited physical boundary demarcation of the project areas on the ground such as visible and sufficient boundary pillars, resulting of with being less aware of the exact project boundary in the fields by the communities or outsiders.

Furthermore, in order to prevent such future potential unexpected impacts and avoid mistaking of the project boundary, clear and durable boundary markers were developed such as installation of 40 concrete boundary pillars along the impacted areas and regularly maintaining and inspecting of boundary markers by the community forest guards. Besides, WIF also set up notification sign boards between the project boundary and community areas.

The restored mangrove forest is protected by WIF in collaboration with Forest Department and local communities. This project creates job opportunities for local communities by appointing community forest guards. The appointment of local community forest guards ensures efficient protection and prevent loss of carbon as they monitor the project areas on a regular basis. Thus, any activities that may lead to loss of carbon such as illegal cutting/logging of mangroves and encroachment on the project areas, did not happen during this monitoring period.

Furthermore, the project is in coastal area and covered with water and subjected to low tide and high tide. Therefore, burning is not practiced because of the wet condition and being not needed of such practice. Any debris during the site visits is left onsite since it will also provide nutrition to the new plants. Additionally, according to the study by Unnikrishnan and Reddy (2020)³⁰, fire is also not a practice in the coastal areas due to tidal conditions, and no clearance actions with fire occurred during this monitoring period.



³⁰ Unnikrishnan, A. and Reddy, C.S., 2020. Characterizing distribution of forest fires in Myanmar using earth observations and spatial statistics tool. *Journal of the Indian Society of Remote Sensing*, 48(2), pp.227-234.

Figure 11: Replacing new number tags of the trees in permanent sample plots.



Figure 12: Measuring growth of the trees (DBH and height) in permanent sample plots.

3. Community and livelihood development

Community livelihood development is a core priority of the project. The goal is to bring substantial benefits to the project-zone communities through sustainable economic development and land use, through support for activities identified during the participatory planning process. A range of activities were supported during the current monitoring time and a selection of these are summarized below.

- Provision of educational facilities to schools and students
- Local economic development (e.g., ice plant installation)
- Development of village infrastructure such as construction of timber bridge, drainage, box culverts and dykes
- Seasonal job opportunities such as mangrove seeds collection
- Vocational training such as seaweed culture, mobile video production, and computer trainings
- Reducing fuel consumption with fuel efficient stoves and creating community energy forest by planting

3.1 Social criteria

Low-income households in the area will benefit from the project because they will have more possibilities to enhance their income and thus be less likely to engage in unsustainable behaviors

that would increase CO₂ emissions, damage the ecosystem, and further deplete mangrove populations.

The project created direct employment at agreed wages for the local communities involved in the project and provides all the necessary training as well. The project promoted a working family model where both men and women actively participate in the project.

Improvements to the infrastructure in the area were done to provide economic accessibility of the project area and also facilitate farmers' access and strengthen the competitiveness of the farmers when it comes to taking their food crops to the market.

Throughout the project implementation, village communities have shown a keen interest in the employment opportunities delivered through the project. During this monitoring period, all environmental awareness trainings, livelihood and income generating trainings for the local communities implemented are (1) organic fertilizer and pesticide making training, (2) farm rat protection training, (3) livestock breeding practices training, (4) mangrove friendly crab rearing training, (5) fuel-efficient stove making training, (6) coconut shell value added handicraft training, (7) grievance mechanism and proposal writing training, (8) trash campaign awareness, (9) basic computer trainings, (10) basic English program, (11) waste management training, (12) health education trainings, (13) basic knowledge on environmental conservation camping/training program, and (14) environmental awareness session respectively. More activities photos can be seen in Appendix 1 and details are already mentioned in Section 1.12 of MR.



Figure 13: A. coconut value added training, and B. organic fertilizer and pesticide making training at Shwe Thaug Yan

Furthermore, the project provided (1) basic food items (rice, cooking oil, onion, potato, egg and beans), crab traps, fishing nets and small home solar battery devices to vulnerable households, (2) vacuum machine for child birth and child suction machine 10L/min pressure to Shwe Thaug Yan hospital, (3) school multimedia equipment, school items (books and umbrella) and teaching materials such as school desks & chairs, and whiteboard to all targeted schools in the project area, (4) teacher salary, renting hostel and scholarship for students, (5) hygiene & sanitation items (soap,

tooth paste, tooth brush, bowl, nail clipper and plastic bucket), (6) financial support to access for the electricity supply, (7) stoves and plants for community energy forest for the village communities respectively. More activities photos can be seen in Appendix 1 and details are already mentioned in Section 1.12 of MR.



Figure 14: A. providing scholarship at Thabaw Kan village, and B. providing books & umbrellas to school children at Nwe Nyo Chang village.

Additionally, some community development activities by the project are well excavation and fencing in one targeted village (Ma Tha village) to access safe drinking water, construction of box culvert and drainage at Ward 3 Shwe Thaug Yan, construction of drainage at Thae Kyin village, repairment of old timber bridge at Ma Tha village, repairment of old timber bridge at Phone Soe village, and repairment of school roof at Nwe Nyo Chang village respectively. More activities photos can be seen in Appendix 1 and details are already mentioned in Section 1.12 of MR.



Figure 15: A. well digging and fencing construction at Ma Tha, B. box culvert and drainage construction at Ward 3 Shwe Thaug Yan, and C. bridge construction at Phone Soe village.

3.2 Economic criteria

The labour requirement for the project was fulfilled through local employment. Therefore, the major portion of the budget on labour was retained within the region and the local community. The project paid its workers above normal wages with additional support in solving problems such as supporting

construction of community dike, pond renovation to secure fresh water supplies in the dry season, repairing broken floors and roofs of school buildings, distributing solar lamps to families with school children, distribution of school bags and raincoats etc. in addition to creating new livelihoods.

In 2021, with the support of WIF, an ice plant was completely installed in Magyi community. The land was contributed by the village. The goal was inspired by an urgent request from fishermen who have long struggled to obtain ice to secure their catch, as 40 percent of it spoils on the way to market due to a lack of ice. Many households rely heavily on fishing for subsistence and income generation. The project has a significant social and economic impact on the local harvesting of seafood and food security. The Magyi community was willing to establish an ice plant for the creation of livelihoods opportunities of the local people and sustainable income generation.

During this monitoring period, the project was completely handed over to community business management committee for continuing the whole ice plant business project from September 2022 and ice plant is well being operated now in the community. More activities photos can be seen in Appendix 1 and details are already mentioned in Section 1.12 of MR.



Figure 16: Ice plant building.

Moreover, both the monitoring report and the Non-Permanence Risk Assessment Report have also been prepared, assuring congruence among the different documents. The Non-Permanence Risk Report (Version 2.0) that was prepared in November 2017 was revised based on the activities during the 6th monitoring period and has been used as the base report to monitor the parameters related to non-permanence risk.

The leakage for the project has been proven to be assumed zero as per the tool “Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity” (Version 02).

3.2 Deviations

3.2.1 Methodology Deviations

No methodology deviations, were made during this monitoring period.

3.2.2 Project Description Deviations

Project Longevity

With the identified village tracts, WIF made legally binding agreements for the 60-year agreement with the option to be renewed covering over the project longevity to be in line with the Core Carbon Principles (CCPs) and latest Verra NPR tool. Ayeyarwady Regional Government letter accordingly, project lands have been given for a period of 30 years with the possibility of extending the period up to 120 years. It also aligns with Section 13 and 14, Chapter 8 of the Community Forestry Instruction (CFI) 2019 which means Community Forest is initially set for 30 years and can be extended as many times as appropriate. In addition, the project falls within the Protected Public Forest (PPF) following the rules and regulations set forth in the Forest Law (2018) and Forest Rules (1995), and hence the longevity of PPF for conservation purposes is unlimited beyond 100 years. Therefore, the project claims 100 years of longevity for this monitoring period.

Geographic boundaries deviation

The current status of the project boundaries and the extent of the encroachment have been thoroughly checked using satellite imaginaries by GIS Team and field survey conducted by Field team with the lead of Regional Coordinator in collaboration with community forest guards on the ground. It is found that most of the areas are not intentionally extended areas, and such kinds of issues are due to limited physical boundary demarcation of the project areas on the ground such as visible and sufficient boundary pillars, resulting of with being less aware of the exact project boundary in the fields by the communities or outsiders. Some areas are careless landfill areas by the outsiders, and some are hydrologically waterlogged areas with poor drainage system due to the natural occurrence of hydrological changes in which the growth of restored and replanted mangrove vegetation are required to be tended more.

As per explanation in Section 3.1 Baseline Emissions of the PD, project areas were classified into five land use classes; 1. severely degraded mangrove areas, 2. degraded mangrove areas, 3. bare lands, 4. shallow water areas where planting is possible, and 5. abandoned shrimp pond areas respectively.

Some shallow water areas are naturally and periodically waterlogged areas with poor drainage system. The mangrove restoration and planting activities were undertaken in the tidal inundation areas, and the plants rely on natural hydrological patterns for their growth, without any additional inputs of water and stress. Any other special silvicultural activities which lead to any alteration of hydrology have not done.

Additionally, to meet the Section 3.11.4 (5) and Section 3.11.5 of VCS Standard v4.7, hydrological modelling expert from WIF researched regarding hydrological connectivity to adjacent (non-project) areas

and negative impact on the hydrology within the project area using Planet-NICFI monthly imagery (4.7m res); SRTM DEM (30m res); Sentinel-1 & Sentinel-2 Imagery (10m res); HydroSHEDS for basin and river data; CHIRPS Daily for precipitation data; MODIS MCD12Q1 for IGBP land cover data (500m res); and OpenLandMap for soil texture data (30m res) in Google Earth Engine and ESRI ArcGIS. It aims to provide a quick and preliminary understanding of how a project might affect the hydrological system, including water availability, water quality, and water flow dynamics.

In conclusion, it showed that the project does not seem to disrupt or impede the natural flow of water or alter the connectivity between different water sources within the region, and related technical report is herewith attached to be more comprehensive understanding for the analysis.

At the moment, therefore, the project team has carried out required tending operations such as gap planting of mangrove vegetation on the landfill areas, improving better hydrology and drainage system in the waterlogged areas while considering the suitable species to be with gap planting. The photos of improving hydrological drainage are provided as the evidence.

The previous project boundary has 2,065.87 ha but the current updated boundary during this monitoring period remains tiny changed to 2,060.72 ha. Though the mangrove vegetation with additional gap planting in such insignificant affected and waterlogged areas are still included within project boundary, such impacted areas are not conservatively considered in the VCU accounting of this monitoring period. Thus, the total VCU accounting area during this monitoring period is 2,049.96 ha. Though implementing the above activities in the waterlogged areas, these areas 10.76 ha will not be accounted for VCUs calculation in future but just be kept within project boundary for conservation. On the other hand, only minor ineligible ones about 15.91 ha, although those are insignificant, are conservatively excluded. Additionally, such kind of ambiguous areas will be reconsidered and updated in the next year reassessment period since the upcoming verification falls under the 10-year reassessment period and the GIS and RS team starts preparing the comprehensive ground truth surveys with reassessing each and every project polygon in details.

As per the definitions provided by Verra in VCS Program Definitions Version 4.5, a Loss Event is defined as “In an AFOLU project, any event or group of events that results in a cumulative loss of more than five percent of previously verified emissions and removals. An event qualifies as a loss when it affects carbon stocks in pools included in the project boundary and that are expected to be sequestered and/or maintained under the project scenario”.

A total of 15.91 ha was identified as ineligible area during the current monitoring period, resulting in a carbon stock loss of 2,400 tCO₂e—approximately 1.13% of the total Emission Reduction Removals (ERRs). Based on assessments conducted by the field and GIS teams, the annual carbon stock loss across the monitoring periods from 2018 to 2023 is as follows: 2018 – 1.17%, 2019 – 0.86%, 2020 – 0.77%, 2021 – 0.77%, 2022 – 0.77%, and 2023 – 0.78%. Since the cumulative loss remains below the 5% threshold, it is considered de minimis and is not deemed to have significantly impacted the project’s carbon stock.

The total ERRs issued from the 1st to 5th verification periods amount to 1,780 tCO₂e. In accordance with Section 3.2.18 of the VCS Standard v4.7, these ERRs have been appropriately discounted in the current verification period. Section 5.4 of the Monitoring Report has been updated accordingly.

Furthermore, in order to prevent such future potential unexpected impacts and avoid mistaking of the project boundary, clear and durable boundary markers such as currently 40 concrete boundary pillars are already installed (kindly see the photos of boundary pillars) and regularly maintaining and inspecting boundary markers will be conducted by the project team. Such project boundary pillars are extremely important for the project areas which are connected with communities as well as hotel and tourism development. However, to install such pillars to cover the project areas are expensive and impossible. Therefore, WIF has currently implemented the prioritized and potential conflict areas, and then once the carbon revenues are generated more by this monitoring period, more boundary pillars will be posted to ensure the boundary lines with the adjacent communities and secure the physical project boundary on the ground. Besides, WIF also set up notification sign boards between the project boundary and community areas. Furthermore, the corresponding regional coordinator and both field teams of plantation and SDG components are encouraged to make plans of more awareness raising of project areas for the relevant stakeholders.

To sum up, the project boundaries are updated by excluding minor insignificant ineligible areas. Furthermore, non-permanence risk report is also updated with addressing these actions for this monitoring period and provided. Updated kml file showing updated project area with relevant photographic evidence including replanted areas and boundary pillars are provided as well.

3.3 Grouped Projects

This is NOT a grouped project.

3.4 Baseline Reassessment

Did the project undergo baseline reassessment during the monitoring period?

- Yes No

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	$\Delta C_{BSL,t}$
Data unit	t CO ₂ -e
Description	Baseline net GHG removals by sinks in year t

Source of data	N/A
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	<p>Applying the conditions of the applied methodology AR-AM0014, carbon stock in trees in the baseline is accounted as zero since the following three conditions were met;</p> <ul style="list-style-type: none"> (a) The pre-project trees are neither harvested, nor cleared, nor removed throughout the crediting period of the project activity; (b) The pre-project trees do not suffer mortality because of competition from trees planted in the project, or damage because of implementation of the project activity, at any time during the crediting period of the project activity; (c) The pre-project trees are not inventoried along with the project trees in monitoring of carbon stocks but their continued existence, consistent with the baseline scenario, is monitored throughout the crediting period of the project activity
Purpose of Data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	CF_{TREE}
Data unit	t C (t d.m.) ⁻¹
Description	Carbon fraction of tree biomass
Source of data	Default value of AR CDM tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities” Version 04.2
Value applied	0.47
Justification of choice of data or description of measurement methods and procedures applied	Default value of AR-TOOL14 is used unless transparent and verifiable information can be provided to justify a different value
Purpose of Data	Calculation of project emissions
Comments	N/A

Data / Parameter	$fj(X_{1,l}, X_{2,l}, X_{3,l}, \dots)$
Data unit	t d.m.

Description	Total biomass of the tree returned by the allometric equation for species <i>j</i> relating the measurements of tree <i>l</i> to the total biomass of the tree
Source of data	For ex-ante: Sukardjo & Yamada (1992) For ex-post: more project specific equations will be used
Value applied	$\log_{10}(\text{total biomass}) = -0.9036 + 2.9499 \log_{10} \text{DBH}$ Where, <i>DBH</i> = Diameter at breast height
Justification of choice of data or description of measurement methods and procedures applied	Most appropriate allometric equation identified to determine the total biomass of the tree based on DBH
Purpose of Data	Calculation of project emissions
Comments	N/A

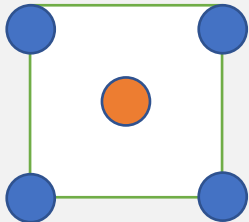
Data / Parameter	<i>dSOC_t</i>
Data unit	t C ha ⁻¹ yr ⁻¹
Description	The rate of change in SOC stocks within the project boundary, in year <i>t</i>
Source of data	Estimated (Research done by the University of Pathein)
Value applied	7.32
Justification of choice of data or description of measurement methods and procedures applied	University of Pathein carried out an in-depth soil analysis. The average carbon stock stored was estimated as 732.26 tC/ha for a mean soil depth of around 1 meter. Applying a conservative estimate of 100 years accumulation, this would result in 7.32 tC/ha/year for soil depth around 1 m.
Purpose of Data	Calculation of project emissions
Comments	N/A

4.2 Data and Parameters Monitored

Data / Parameter	<i>A_i</i>
Data unit	ha
Description	Area of tree biomass stratum <i>i</i>

Source of data	GPS and GIS																				
Description of measurement methods and procedures to be applied	<p>Areas in project area will be tracked in the field using the GPS.</p> <p>Each plot which will be subject to planting is tracked - a standard procedure of the baseline and monitoring inventory</p>																				
Frequency of monitoring/recording	Before the start of the project (planting) and adjusted thereafter every two years since the year of the initial verification																				
Value monitored	<table border="1"> <thead> <tr> <th>Strata</th> <th>Area (ha)</th> </tr> </thead> <tbody> <tr> <td>A₁ (2015 planting)</td> <td>93.92</td> </tr> <tr> <td>A₂ (2016 planting)</td> <td>68.86</td> </tr> <tr> <td>A₃ (2017 planting)</td> <td>244.54</td> </tr> <tr> <td>A₄ (2018 planting)</td> <td>297.88</td> </tr> <tr> <td>A₅ (2019 planting)</td> <td>1,100.57</td> </tr> <tr> <td>A₇ (2015 restoring)</td> <td>107.97</td> </tr> <tr> <td>A₈ (2016 restoring)</td> <td>21.88</td> </tr> <tr> <td>A₉ (2017 restoring)</td> <td>114.34</td> </tr> <tr> <td>Total</td> <td>2,049.96</td> </tr> </tbody> </table>	Strata	Area (ha)	A ₁ (2015 planting)	93.92	A ₂ (2016 planting)	68.86	A ₃ (2017 planting)	244.54	A ₄ (2018 planting)	297.88	A ₅ (2019 planting)	1,100.57	A ₇ (2015 restoring)	107.97	A ₈ (2016 restoring)	21.88	A ₉ (2017 restoring)	114.34	Total	2,049.96
Strata	Area (ha)																				
A ₁ (2015 planting)	93.92																				
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A ₇ (2015 restoring)	107.97																				
A ₈ (2016 restoring)	21.88																				
A ₉ (2017 restoring)	114.34																				
Total	2,049.96																				
Monitoring equipment	GPS (Garmin), GPS Smartphones, ArcGIS or QGIS software																				
QA/QC procedures to be applied	Field-team members are fully aware of all procedures and the importance of collecting data as accurately as possible; all field team members are trained in GPS/GIS application																				
Purpose of the data	Calculation of project emissions																				
Calculation method	Using the GPS to measure the boundary of planting of each year																				
Comments	N/A																				

Data / Parameter	n_i
Data unit	Dimensionless
Description	Number of sample plots in stratum i
Source of data	Calculated
Description of measurement methods and procedures to be applied	Based on the CDM tool, the total number of sample plots were 54. Each plot is 10 m x 10 m giving a value of 0.01 ha (100 m ²). GPS coordinates of each plot is marked and kept for future monitoring. For the 2018 planting 3 extra plots were added and for the 2019 planting 1 extra plot was added, raising the number of sample plots from 17 to 18 for 2019.

Frequency of monitoring/recording	n_i is calculated for each monitoring event, at least every five years																				
Value monitored	<p>2015 planting – 8 plots, 2016 planting – 7 plots, 2017 planting – 8 plots, 2018 planting – 13 plots, 2019 planting – 18 plots</p> <table border="1"> <thead> <tr> <th>Stratum</th> <th>No of sample plots</th> </tr> </thead> <tbody> <tr> <td>n_1 (2015 planting)</td> <td>4</td> </tr> <tr> <td>n_2 (2016 planting)</td> <td>4</td> </tr> <tr> <td>n_3 (2017 planting)</td> <td>6</td> </tr> <tr> <td>n_4 (2018 planting)</td> <td>13</td> </tr> <tr> <td>n_5 (2019 planting)</td> <td>18</td> </tr> <tr> <td>n_7 (2015 restoring)</td> <td>4</td> </tr> <tr> <td>n_8 (2016 restoring)</td> <td>3</td> </tr> <tr> <td>n_9 (2017 restoring)</td> <td>2</td> </tr> <tr> <td>Total</td> <td>54</td> </tr> </tbody> </table>	Stratum	No of sample plots	n_1 (2015 planting)	4	n_2 (2016 planting)	4	n_3 (2017 planting)	6	n_4 (2018 planting)	13	n_5 (2019 planting)	18	n_7 (2015 restoring)	4	n_8 (2016 restoring)	3	n_9 (2017 restoring)	2	Total	54
Stratum	No of sample plots																				
n_1 (2015 planting)	4																				
n_2 (2016 planting)	4																				
n_3 (2017 planting)	6																				
n_4 (2018 planting)	13																				
n_5 (2019 planting)	18																				
n_7 (2015 restoring)	4																				
n_8 (2016 restoring)	3																				
n_9 (2017 restoring)	2																				
Total	54																				
Monitoring equipment	GPS is used to locate the sample plots																				
QA/QC procedures to be applied	<p>Corners of the plot are marked with 4 wooden poles and GPS coordinates are recorded. A solid concrete pole is fixed at the centre of each plot to ensure plot is identifiable in the future. GPS point of the centre is also recorded.</p> 																				
Purpose of the data	Calculation of project emissions																				
Calculation method	The calculation method is described in the tool “Calculation of the number of sample plots for measurements within A/R CDM project activities” (version 02.1.0)																				
Comments	N/A																				
Data / Parameter	w_i																				
Data unit	Dimensionless																				

Description	Relative weight of the area of stratum i, the area of the stratum i divided by the project area.																	
Source of data	Calculated																	
Description of measurement methods and procedures to be applied	N/A																	
Frequency of monitoring/recording	Calculated for each monitoring event, at least every five years																	
Value monitored	<table border="1"> <tr> <td>w₁ (2015 planting)</td> <td>0.23</td> </tr> <tr> <td>w₂ (2016 planting)</td> <td>0.17</td> </tr> <tr> <td>w₃ (2017 planting)</td> <td>0.60</td> </tr> <tr> <td>w₄ (2018 planting)</td> <td>1.00</td> </tr> <tr> <td>w₅ (2019 planting)</td> <td>1.00</td> </tr> <tr> <td>w₇ (2015 restoring)</td> <td>0.44</td> </tr> <tr> <td>w₈ (2016 restoring)</td> <td>0.09</td> </tr> <tr> <td>w₉ (2017 restoring)</td> <td>0.47</td> </tr> </table>	w ₁ (2015 planting)	0.23	w ₂ (2016 planting)	0.17	w ₃ (2017 planting)	0.60	w ₄ (2018 planting)	1.00	w ₅ (2019 planting)	1.00	w ₇ (2015 restoring)	0.44	w ₈ (2016 restoring)	0.09	w ₉ (2017 restoring)	0.47	
w ₁ (2015 planting)	0.23																	
w ₂ (2016 planting)	0.17																	
w ₃ (2017 planting)	0.60																	
w ₄ (2018 planting)	1.00																	
w ₅ (2019 planting)	1.00																	
w ₇ (2015 restoring)	0.44																	
w ₈ (2016 restoring)	0.09																	
w ₉ (2017 restoring)	0.47																	
Monitoring equipment	N/A																	
QA/QC procedures to be applied	N/A																	
Purpose of the data	Calculation of project emissions																	
Calculation method	Area of the stratum i divided by the project area																	
Comments	N/A																	

Data / Parameter	$A_{PLOT,i}$
Data unit	ha
Description	Size of sample plot in stratum i
Source of data	Field measurement, GPS and GIS
Description of measurement methods and procedures to be applied	<p>Areas in the project area are tracked in the field using the GPS. Each planting area is tracked as a standard procedure of the baseline and monitoring inventory.</p> <p>Each plot represents a 0.01 ha of area covering the trees within the plot. 10 m x 10 m plots are laid using random sampling in the project area after calculating the number of sample plots needed for each stratum.</p>

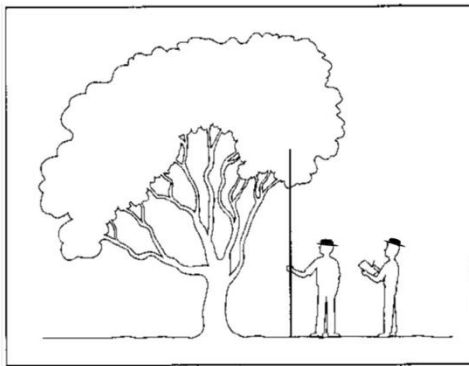
Frequency of monitoring/recording	Annually
Value monitored	0.01 ha
Monitoring equipment	Measuring tape, GPS
QA/QC procedures to be applied	Field teams are trained in all inventory procedures including layout of plots. Field-team members are fully aware of all procedures and the importance of collecting data as accurately as possible.
Purpose of the data	Calculation of project emissions
Calculation method	The GPS coordinates of the plots are collected and recorded at the establishment of these plots. Annually the growth measurements needed to be recorded hence the staff visit the plots using the pre-recorded coordinates and then check the plot area using a tape.
Comments	N/A

Data / Parameter	DBH
Data unit	cm
Description	Diameter at breast height of tree
Source of data	Field measurement
Description of measurement methods and procedures to be applied	<p>Diameter at Breast Height (DBH) is measured at 1.3 m along the stem using a DBH tape or calliper.</p> <p>For plants below 1.3 m practically it is difficult to measure diameter using the diameter-tape. Therefore, a calliper was used to measure the basal diameter. As mentioned in the updated document “1764_Quality Assurance and Quality Control V.4.0,” each individual tree from the plots was measured as the following criteria.</p> <p>For Rhizophora species such as <i>R. apiculata</i> and <i>R. mucronata</i>,</p> <p>Height (H) ≤ 1 m: D₁₀</p> <p>H > 1 m and ≤ 1.3 m: D₃₀</p> <p>H > 1.3 m and DBH < 2.5 cm: D_{AR} (above prop roots/similar prop roots/buttress roots/visible roots)</p> <p>H > 1.3 m and DBH ≥ 2.5 cm: D_{1.3}</p> <p>For <i>C. tagal</i>, <i>B. gymnorrhiza</i> and <i>B. cylindrica</i>,</p> <p>H ≤ 1.3 m: D₁₀</p> <p>H > 1.3 m and DBH < 2.5 cm: D_{AR} (above prop roots/similar prop</p>

	<p>roots/buttress roots/visible roots) $H > 1.3 \text{ m}$ and $DBH \geq 2.5 \text{ cm}$: $D_{1.3}$</p>
Frequency of monitoring/recording	Annually measured and recorded
Value monitored	<p>Mean diameter for trees planted in 2015 – 3.61 cm Mean diameter for trees planted in 2016 – 3.87 cm Mean diameter for trees planted in 2017 – 2.73 cm Mean diameter for trees planted in 2018 – 3.84 cm Mean diameter for trees planted in 2019 – 2.55 cm</p>
Monitoring equipment	Diameter Tape/ Calliper
QA/QC procedures to be applied	<p>Field teams are trained in all inventory procedures including correct measurement. Field-team members are fully aware of all procedures and the importance of collecting data as accurately as possible. Two people take measurements each time. One person measures and reads it loudly to the person who records. He then confirms the value by reading it loud to the measurer. This way recording errors are minimised.</p> <p>A pole with a mark at 1.3 m length is used to determine the 1.3 m from the bottom. This way if anyone takes the measurement, DBH is measured at 1.3 m from the ground.</p> <p>For plants below 1.3 m practically it is difficult to measure diameter using the diameter-tape. Therefore, a calliper was used to measure the basal diameter. As mentioned in the updated document “1764_Quality Assurance and Quality Control V.4.0,” each individual tree from the plots was measured as the following criteria.</p> <p>For <i>Rhizophora</i> species such as <i>R. apiculata</i> and <i>R. mucronata</i>,</p> <p>Height (H) $\leq 1 \text{ m}$: D_{10}</p> <p>$H > 1 \text{ m}$ and $\leq 1.3 \text{ m}$: D_{30}</p> <p>$H > 1.3 \text{ m}$ and $DBH < 2.5 \text{ cm}$: D_{AR} (above prop roots/similar prop roots/buttress roots/visible roots)</p> <p>$H > 1.3 \text{ m}$ and $DBH \geq 2.5 \text{ cm}$: $D_{1.3}$</p> <p>For <i>C. tagal</i>, <i>B. gymnorrhiza</i> and <i>B. cylindrica</i>,</p> <p>$H \leq 1.3 \text{ m}$: D_{10}</p> <p>$H > 1.3 \text{ m}$ and $DBH < 2.5 \text{ cm}$: D_{AR} (above prop roots/similar prop roots/buttress roots/visible roots)</p> <p>$H > 1.3 \text{ m}$ and $DBH \geq 2.5 \text{ cm}$: $D_{1.3}$</p> <p>Project Director selected 100% of the data sheets and cross-checked with actual field measurements before sending the data to the Managing Director. This helped minimise the errors during data measurement and entering.</p>

Purpose of the data	Calculation of project emissions
Calculation method	N/A
Comments	For the initial verification, until the trees reach a height beyond 1.3 m, D ₃₀ or the basal diameter (D ₁₀) is measured and recorded.

Data / Parameter	H
Data unit	m
Description	Tree height
Source of data	Field measurement
Description of measurement methods and procedures to be applied	First the trunk is determined by selecting the start of the second strongest/thickest branch from top. In case there are two equally thick branches the second one is determined as the start of the trunk. The height of the tree is then measured using a PVC or bamboo pole.
Frequency of monitoring/recording	Annually measured and recorded
Value monitored	<p>Mean height for trees planted in 2015 –205.05cm</p> <p>Mean height for trees planted in 2016 –135.95cm</p> <p>Mean height for trees planted in 2017 –156.02cm</p> <p>Mean height for trees planted in 2018 –158.98cm</p> <p>Mean height for trees planted in 2019 – 100.87 cm</p>
Monitoring equipment	Measuring tape, PVC or bamboo pole
QA/QC procedures to be applied	<p>Field teams are trained in all inventory procedures including correct measurement. Field-team members are fully aware of all procedures and the importance of collecting data as accurately as possible. Two people take measurements each time. One person measures and reads it loudly to the person who records. He then confirms the value by reading it loud to the measurer. This way recording errors are minimised. To measure the height of each mangrove tree:</p> <ul style="list-style-type: none"> • Stand the height pole up directly below the highest point of the tree as shown in the figure. • Measure the height of the tree to the nearest 10 cm, based on the known length of the pole. • Record the result. <p>Note: As this can be very difficult and if the tree canopy is higher than 10 m, the use of a clinometer is recommended in such situations.</p>



Once the trees each are than 2-meter height, the pole is divided into 1-meter intervals and marked each point in red masking tape.

Then using yellow colour tape each 0.5 m is marked. Once the pole is kept near the tree, the top of trunk is determined, and measurement is taken. Once the pole is on the ground, a measuring tape is used to calculate the exact tree height.

The Project Director selected 100% of the data sheets and cross-checked with actual field measurements before sending the data to the Managing Director. This helped minimise the errors during measurement and entering of data.

Purpose of the data	Calculation of project emissions
Calculation method	Direct measurement
Comments	

Data / Parameter	T
Data unit	Year
Description	Time period elapsed between two successive estimations of carbon stock in a carbon pool
Source of data	N/A
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	N/A
Value monitored	N/A
Monitoring equipment	N/A

QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of project emissions
Calculation method	If the two successive estimations of carbon stock in a carbon pool are carried out at different points of time in year t_2 and t_1 , (e.g., in the month of June in year t_1 and in the month of February in year t_2), then a fractional value will be assigned to T
Comments	

Data / Parameter	$f_j(X_{1,l}, X_{2,l}, X_{3,l}, \dots)$
Data unit	t d.m.
Description	Total biomass of the tree returned by the allometric equation for species j relating the measurements of tree l to the total biomass of the tree
Source of data	For ex-post: Ya Min Thant et al. (2012) Above ground - $W_{Top} = 0.22 \rho (DBH^2H)^{0.82}$ Below ground - $W_{Root} = 1.69 \rho (DBH^2H)^{0.40}$
Description of measurement methods and procedures to be applied	Above ground - $W_{Top} = 0.22 \rho (DBH^2H)^{0.82}$ Below ground - $W_{Root} = 1.69 \rho (DBH^2H)^{0.40}$ Where: DBH = Diameter at breast height (cm) H = Height (m) ρ = Wood density (kg/m ³)
Frequency of monitoring/recording	Annually calculated for each monitoring period
Value monitored	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

Measuring equipment	Model	Purpose	Calibration method
GPS	Garmin Oregon 650	To collect coordinates of sample plots and mark the project boundaries	The GPS is calibrated at the factory. No calibration needed. The Garmin manual is attached for reference.
Diameter tape	No special model	To measure diameter	No calibration needed
Caliper	Several calipers are used. No special mode	To measure diameter	No calibration needed
Bamboo stick	No special model	To measure height	No calibration needed
PVC pole	No special model	To measure height	No calibration needed
Measuring tape	No special model	To measure height	No calibration needed

4.3 Monitoring Plan

1. The methods used for generating/measuring, recording, storing, aggregating, collating and reporting the data on monitored parameters.

Monitoring was organised according to Section 06 of AR-AM0014 and as mentioned in the VCS PD version 3.0³¹. All the data that are mentioned in this section were to be collected and archived electronically and kept for 2 years after the end of last crediting period.

- Project Boundary

Keeping records of the project boundary is one of the most important activities during monitoring. The geographic coordinates of the project boundary and all stratifications within the project have been established and were recorded. Field surveys using GPS, satellite images and land use maps were used in this activity. WIF has GIS experts who has been coordinating this section. There were two staff members who worked with them in recording proper boundaries.

- Existing plants

Existing plants are not accounted for the carbon stocks but will be left to grow and are monitored throughout the crediting period of the project activity. During the baseline studies, the area has been visited by the survey team. Existing plants are recorded. Therefore, there are records of existing plants in each sample plot. These plants will not be removed and will be monitored throughout the project period. Every existing mangrove tree in each sample plot is marked with color paint at breast height, 130 cm

³¹ https://cdm.unfccc.int/Panels/ar/038/meeting/ARWG38_Annex_04_AR-AM0014_v_er03.0.pdf

from the ground, to quickly distinguish them among planted trees. Furthermore, patrolling staff regularly check and monitor the existing mangrove trees to make sure they are not being cut down.

- Supervision of project activities

The Project Director has full responsibilities for all activities and has trained all staff members regarding mangrove forest management, mangrove nursery techniques, natural resource management and community forestry activities. Technical Assistants and Field Assistant shall supervise all field operations.

2. The organizational structure, responsibilities and competencies of the personnel that carried out the monitoring activities.

- Organisational Structure

The overall management of the carbon component is done by WIF including setting up the sample plots and taking annual recordings up to 2020. After 2020, the management of carbon project has undertaken by 3 VTCs (Magyi, Thabawkan and Thaegone) under the supervision and technical support of WIF. This is to make sure the project will reach a self-reliance status in the future.

The following figure presents the overall organisational structure of the project.

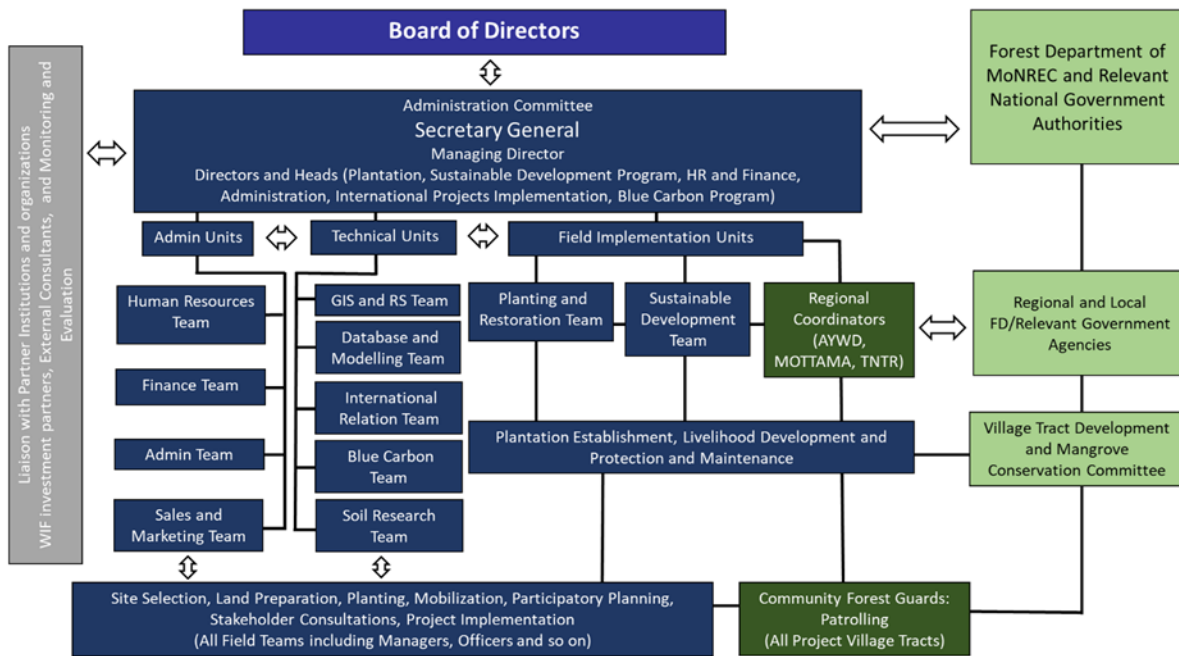


Figure 17: Overall organizational structure of project.

The project proponent is responsible for implementation of this ARR project activity together with the local communities. WIF has more than 130 professional staff at the Administrative Unit, Field Units and in Pathein University Park with backgrounds on forestry, marine science, economic and social Science, remote sensing & GIS. The project employs workers for the reforestation and restoration activities.

The following professionals have been identified to comprise of the administrative team and supervise the monitoring activities.

- Dr. Arne Fjortoft, Secretary General, specialty in development communication, public education, sustainable development project implementation and climate change/environmental conservation
- Dr. (Ms.) Sandii Lwin, Chairperson, Founder and Managing Director of Myanmar Health and Development Consortium, and a public health and development specialist with over 20 years of experience and has worked in more than 30 countries across 6 regions
- Bo Ni, Managing Director, former Director of Watershed Management Division of Forest Department, over 30 years of experience in forestry
- Win Maung, International Mangrove Director, former Director of Forestry Department, 30-year working experience in mangrove restoration as government official, researcher and Project Manager of NGO/UN-LIFT project
- Aung Aung Myint, GIS Expert, over 25 years of experience in forestry and mangrove restoration with experience in GIS and mapping
- Win Sandar Htay, International Finance Director, Lawyer and Accountant in charge of administration and financial management, public relation, database, procurement and sub-contracts
- Dr. Htay Aung, Science Advisor and Field Controller in charge of liaison with Patheingyi University and local communities, over 20 years of experience in marine science research in the project area
- Dr. Dhanya Nambiar, Director of Center for Environment Education and Development (CEED), a carbon consultancy and advisory firm, 15+ years' experience in carbon project development, Carbon Consultant WIF
- Kavitha Pillai, Senior Project Analyst at Center for Environment Education and Development (CEED), having strong technical knowledge in methodological aspects of carbon project development, and until now, experiences with more than 25 AFOLU projects
- Dr. Aung Myat San, Director of International Projects Implementation, 20 years of experience in planning, management, monitoring of the mangrove conservation, restoration and rehabilitation projects, as well as National Forest Inventory
- Dr. Toh Aung @ Toe Toe Aung, Director of Climate Change and Blue Carbon Program, 20 years of experiences in mangrove conservation, management and restoration, implementation of climate change and disaster prevention projects, integrated water resources and watershed management
- Naw Grace Boni, Head of Livelihood Program, 12-year experience as a Program Policy Officer at UN World Food Program in different humanitarian assistance, relief and recovery organizations, and a proven excellent capacity in social mobilization and community engagement

The following personnel with different competencies will coordinate to carry out monitoring activities in different sectors.

- Tun Tun Thein, Database & Geospatial Information Manager, 16+ years of experience in Remote Sensing and Geographic Information System including land cover analysis, forest cover assessment, Participatory resource mapping, Mobile or Web App development, River Basin Information System & Database Engineering, Hydrological Modelling, Flood, Drought and Disaster Management, PD development on Avoided Emissions from Deforestation Project
- Tun Tun Aung, Communication specialist in charge of social mobilization, Former commercial content manager at the Myanmar Times particularly in creating contents related to the Myanmar Times brand in English and Myanmar such as video scripts, advertorials, translation, articles, etc), Former content lead at Wall Street English Myanmar, generated the innovative company's social media channels and website, Former News Editor at Internal Journal, majorly wrote news, communicated with people from various sector and as a moderator in panel discussion and speaker in events
- Aung Ko Thet, Manager of Climate Change and Blue Carbon Program, over 15 years of professional expertise in forests and biodiversity conservation, project management and program development of nature conservation, reforestation, community-based forest management and mangrove rehabilitation, working experience in various organization such as governmental bodies, Local Non-Government Organizations, the United Nations Development Programme, Wildlife Conservation Society, and The Nature Conservancy
- Dr. Kay Khaing Lwin, Manager of Climate Change and Blue Carbon Program, 10-year experience in developing activity data and emission factors for national level FREL, REDD+ MRV activities under UNREDD Programme, spatial mapping and image interpretation, evaluation of District Forest Management Plan
- San San Htay, Officer of Climate Change and Blue Carbon Program, 7+ year experience in Remote Sensing & GIS field, land use and land cover mapping, geospatial analysis, Forest Resource Assessment (FRA), Monitoring, Reporting, and Verification (MRV) for REDD+, mangrove restoration and afforestation projects
- Htet Wai Oo, Senior Program Coordinator, Sustainable Development Program, 12+ years of working experience in the development field, involved in and participated in emergency response, rehabilitation, and sustainable development projects, especially the livelihood enhancement program, and is still participating as a trainer in knowledge sharing sessions such as leadership, dynamic facilitation, proposal writing, and basic gender instruments
- Khattar Soe, Program Coordinator, Sustainable Development Program, 3+ years of working experience in data analysis, monitoring and reporting on the findings and lessons learnt from project innovations, technical support to humanitarian aid program and sustainable development program, etc.

- Phone Pyai Tun, Database & Geospatial Technical Officer, nearly 7+ years of experience in GIS and RS, especially in the realm of Land Use Land Cover Change Analysis, Hydrological Modelling, Multi-criteria Analysis, Flooding, Participatory Resource Mapping, Survey Form Creation, Web Platform Development, Drone Mapping, and various other forms of geospatial analysis
 - Hein Htet Aung, RS & GIS Analyst, 5+ years of experience in RS and GIS field especially in land use/land cover assessment, geospatial analysis, map visualization and reporting, and socio-economic survey and assessment
 - Ye Lin Kyaw, Field Manager, served as a technical assistant with over 3-year experience of mangrove plantation and community development activities at WIF
 - Kyaw Myo Lwin, Officer of Climate Change and Blue Carbon Program, allometric model formulation and biomass measurement for mangrove species, mangrove plantation establishment, and carbon monitoring
3. The implementation of sampling approaches, including target precision levels, sample sizes, sample site locations, stratification, frequency of measurement and QA/QC procedures.

The project implementation is based on the local presence of WIF staff in project area. The main role of the field manager and officers are to manage the reforestation/restoration activity in close cooperation with WIF science and technical programme coordinators. Followings are some of their responsibilities:

- Randomly select and verify GPS locations of at least 10% of the plots planted during a particular planting season.
- Conduct comparisons between the trees actually planted and the trees recorded in the management plan.
- Assess the survival rate of the mangrove seedlings and prepare reports with the findings.
- Area verification. Project parcels are verified using GPS in the field as well as through drone images and Google Earth imagery analysis.
- Identification and monitoring of strata. Baseline stratification was done based on the land use type. Most of the planting sites are severely degraded mangrove areas. Ex-ante stratification is done based on the year of replanting and year of restoration. Even though plot types are similar in the same land use type, there is variation in soil composition, water salinity and water availability.

Certain manmade activities such as replanting and protection also have influence on growth and survival. Therefore, a stratification implemented today may not be realistic in the future once the local community starts managing these lands. Hence the final factors considered for the stratification will be the differences in the estimated carbon sinks for each mangrove species as the project evolves. Due to this reason, strata will be monitored periodically. If a change in number and area of the project strata occurs, the sampling framework will be adjusted accordingly. There were no differences observed in strata. Strata were determined per the year of planting and this continues for this monitoring period as well.

Sampling Design

This ARR VCS project is designed as to the planting and restoration occurred during 2015-2019. Therefore, the database will be updated periodically capturing the following:

- Unpredicted disturbance occurring during the crediting period
- Unpredicted disturbances occurring during the crediting period (changes in hydrology, sedimentation, disease, and/or human factors), affecting differently different parts of an originally homogeneous stratum or stand
- Mangrove forest establishment (planting, re-planting) may be implemented at different intensities, dates and spatial locations than mentioned in the PD;

There were no disturbances observed. However, the changes in mangrove forest establishment than mentioned in the PD and has been recorded as a permanent change. These changes are mentioned in Section 3.2.2 as Project Description Deviations.

- Sampling plan and stratification: As mentioned above, the ex-ante stratification of the project was done by year of planting. Such stratification was selected to increase the measuring precision without increasing unnecessary costs.

For ex-post stratification the strata are as follows:

Strata 1: 2015 planting – applicable for this monitoring period 2022-2023

Strata 2: 2016 planting – applicable for this monitoring period 2022-2023

Strata 3: 2017 planting – applicable for this monitoring period 2022-2023

Strata 4: 2018 planting – applicable for this monitoring period 2022-2023

Strata 5: 2019 planting – applicable for this monitoring period 2022-2023

Strata 7: 2015 restoration - applicable for this monitoring period 2022-2023

Strata 8: 2016 restoration - applicable for this monitoring period 2022-2023

Strata 9: 2017 restoration - applicable for this monitoring period 2022-2023

The project has adopted to the following sampling framework.

- Sampling sizes

The number of samples and sample size was determined using “Calculation of the number of sample plots for measurements within A/R CDM project activities (Version 02.1.0)”.

Initial estimate of number of plots is done with targeted precision level for biomass estimation within each stratum at +/- 10% of the mean at a 90% confidence level. The number of required plots (n) was calculated using the following equation:

$$n = \frac{N * t_{VAL}^2 * \left(\sum_i w_i * s_i \right)^2}{N * E^2 + t_{VAL}^2 * \sum_i w_i * s_i^2}$$

Where;

- n Number of sample plots required for estimation of biomass stocks within the project boundary; dimensionless
- N Total number of possible sample plots within the project boundary (i.e., the sampling space or population); dimensionless
- t_{VAL} Two-sided Student's t-value, at infinite degrees of freedom with 90% confidence level; dimensionless
- w_i Relative weight of the area of stratum i (i.e., the area of stratum i divided by project area); dimensionless
- s_i Estimated standard deviation of biomass stock in stratum i; t d.m. (or t d.m. ha⁻¹)
- E Acceptable margin of error in estimation of biomass stock within the project boundary; t d.m. (or t d.m. ha⁻¹), i.e., in the units used for s_i
- i 1,2,3,..... Biomass stock estimation strata within the project boundary

The number of plots allocated to each stratum was calculated as follows:

$$n_i = n * \frac{w_i * s_i}{\sum_i w_i * s_i}$$

Where;

- n_i Number of sample plots allocated to stratum i; dimensionless
- n Number of sample plots required for estimation of biomass stocks within the project boundary; dimensionless
- w_i Relative weight of the area of stratum i (i.e. the area of stratum i divided by project area); dimensionless
- s_i Estimated standard deviation of biomass stock in stratum i; t d.m. (or t d.m. ha⁻¹)
- i 1,2,3,..... Biomass stock estimation strata within the project boundary

- Types of plots

In order to monitor the project through time, permanent sampling plots were established and maintained.

- Number of Plots

The number of samples and sample size was determined using “Calculation of the number of sample plots for measurements within A/R CDM project activities (Version 02.1.0)” as explained above 23 sample plots are needed for the planting done in 2015, 2016 and 2017. For 2015, planting 8 sample plots were set up while for 2016, planting 7 plots were set up. Another 8 plots were set up for the trees planted in 2017. 13 plots were set up for the trees planted in 2018 and 18 for 2019 planting.

- Location of sample plots

In order to avoid bias with regard to plot locations, permanent sample plots were located systematically with a random start. The geographical position (GPS coordinate), location, stratum and sub-stratum series number of each plot were recorded and archived. It is to be ensured that the sampling plots are distributed randomly.

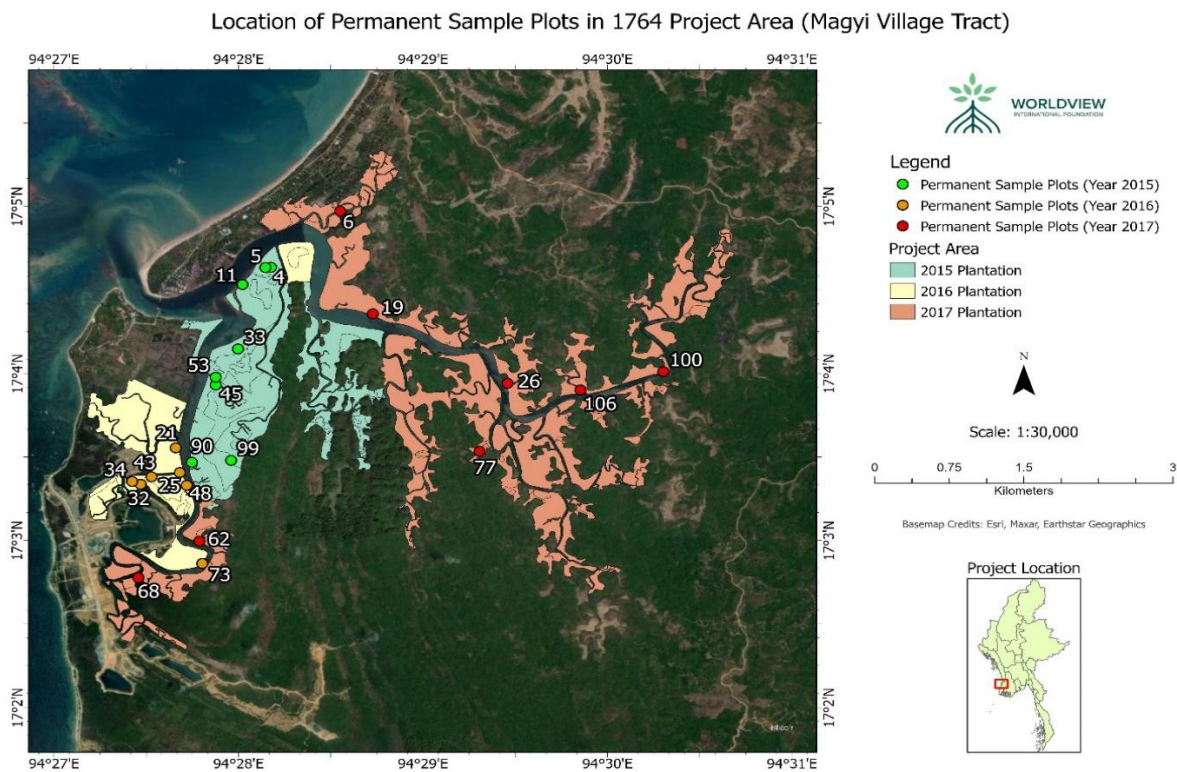


Figure 18: Location of sample plots for each planting stratum planted in 2015, 2016, 2017.

Location of Permanent Sample Plots in 1764 Project Area (Thabawkan Village Tract)

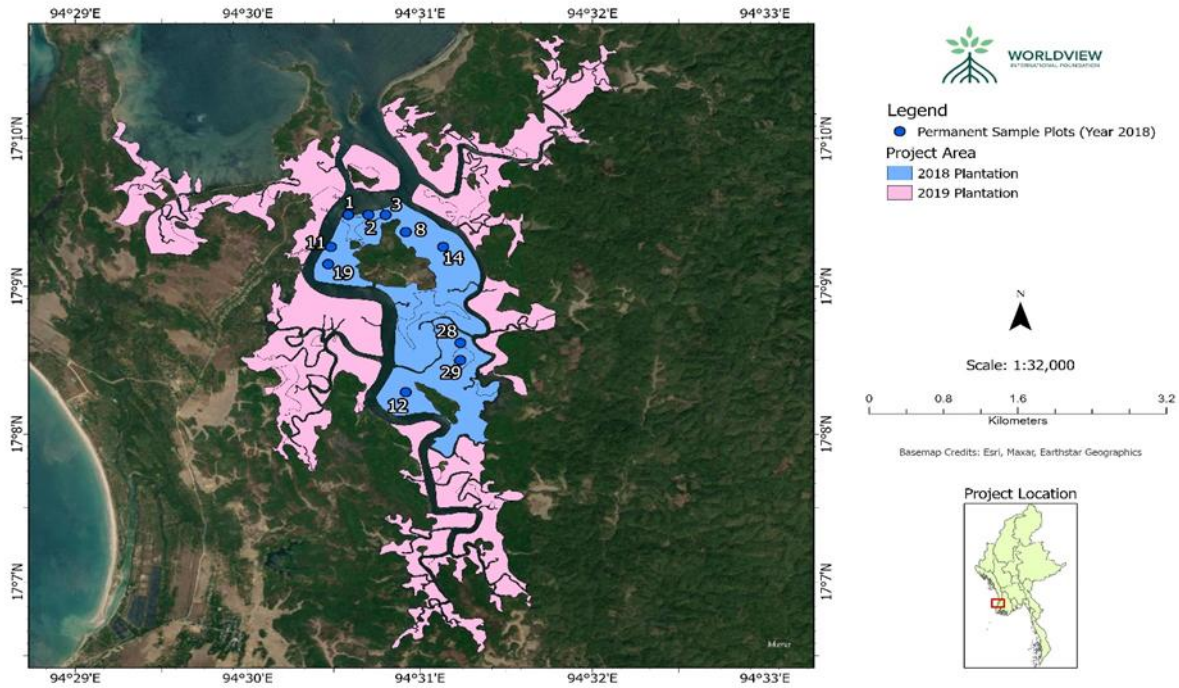


Figure 19: Location of sample plots for each planting stratum planted in 2018.

Location of Permanent Sample Plots in 1764 Project Area (Thaegone Village Tract)

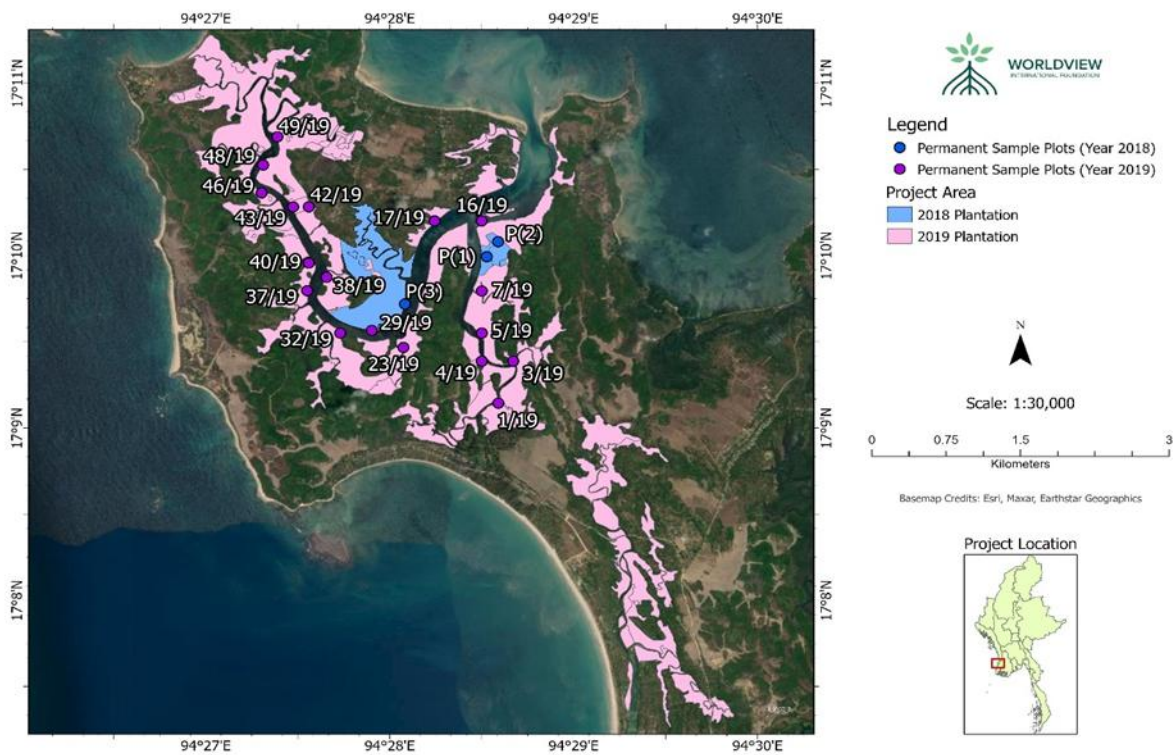


Figure 20: Location of sample plots for each planting stratum planted in 2019.

- Monitoring frequency

Plantation established from 2015 to 2019 are applicable for this monitoring period. Permanent plots were monitored annually to assess actual above and below ground biomass accumulation.

- Measuring and estimating carbon stock changes over time

Carbon stock changes in above- and below-ground biomass on each plot were estimated using the diameter as a parameter. Soil organic carbon was also calculated.

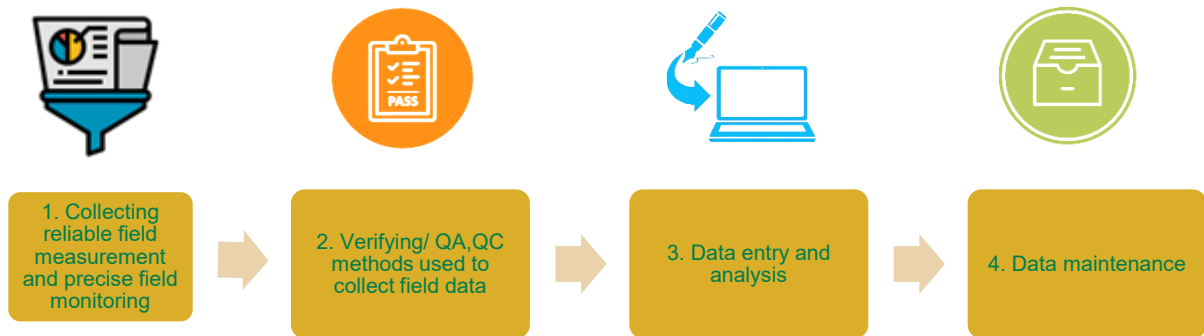
- Stratification and sample size

Sample plots of 0.01 ha (100m²) with 10 m x 10 m were established systematically with a random start for each stratum based on the year of planting.

- Monitoring GHG emissions by sources as the results of the ARR VCS project activity GHG emissions from the project are monitored annually.

QA/QC procedures

The QC and QA procedures under the project aim at implementing standard and methodical procedures for monitoring and collection of precise field measurements. Quality control (QC) and quality assurance (QA) procedures that are applied to monitor actual GHG removals by sinks include -



(1) Collecting reliable field measurements and precise field monitoring

A team consisting of members representing the entire project area was formed. This team involved in field monitoring were trained in data collection and analysis. Each team member has been assigned in duties related to monitoring actual GHG removal. Data collection was conducted by a well-trained team. Those responsible for the measurement work were trained in all aspects of the field data collection and data analyses. The project uses the IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry (2003) as the main reference document for all monitoring activities.

In order to ensure the collection and maintenance of reliable field data:

- a) Field-team members were made fully aware of all procedures and the importance of collecting data as accurately as possible;
- b) Field teams established sample plots in the field and measured all pertinent components;
- c) The document has listed all names of the field team and the project manager certifies that the team is trained;
- d) New staff were adequately trained.

(2) Verifying the methods used to collect field data

The data collected by the team were verified by taking random checks from stands, including their re-measurement by a senior member of the monitoring team. In case of errors, they are corrected and recorded for each stratum.

(3) Verifying data entry and analysis techniques

Reliable carbon estimates require proper entry of data into the emission reduction calculation spreadsheets. Possible errors in this process were minimised by cross checking these entries. In order to ensure more precise output, internal tests were incorporated into the spreadsheets to ensure that the data are realistic. Calculations were based on the methodologies for A/R CDM project activities. After the calculation is done, it is reported in the monitoring report.

Quantifying data is an important procedure and were done accordingly.

(4) Data maintenance and archiving

Because of the relatively long-term nature of these project activities, data archiving (maintenance and storage) is an important component of the work. Data archiving takes several forms and copies (electronic and paper) of all field data, calculations, and models; estimates of the changes in carbon stocks and corresponding calculations and models used; any GIS products; and copies of the measuring and monitoring reports are stored in WIF's Yangon office. These monitored data will be achieved for 2 years following the end of the crediting period as well (Note that this project has a renewable crediting period).

4. The procedures used for handling any internal auditing performed and any non-conformities identified.

Internal auditing and non-conformities are addressed through the formats that incorporate multiple quality assurance and quality control (QA/QC) measures. All data collected, recorded, stored and reported are subject to review and approval by team leaders and/or project managers with reference to data covering each level of data management. In order to ensure the security and traceability of data entry

and QA/QC procedures, all users are allocated unique user IDs and passwords in order to access the database, and in turn their access and roles can be restricted as appropriate.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Under the applicability conditions of the applied methodology AR-AM0014 “Afforestation and reforestation of degraded mangrove habitats” (Version 03.0), it is expected that the baseline carbon stocks in litter and soil organic carbon pools will not show a permanent net increase. The baseline net GHG removals by sinks should be calculated using Equation 1 of the methodology:

$$\Delta C_{(BSL,t)} = \Delta C_{(TREE_BSL,t)} + \Delta C_{(SHRUB_BSL,t)} + \Delta C_{(DW_BSL,t)} \quad \text{Equation (1)}$$

Where,

$\Delta C_{(BSL,t)}$ = Baseline net GHG removals by sink in year t ; t CO₂e

$\Delta C_{(TREE_BSL,t)}$ = Change in carbon stock in baseline tree biomass within the project boundary in year t , as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO₂e

$\Delta C_{(SHRUB_BSL,t)}$ = Change in carbon stock in baseline shrub biomass within the project boundary in year t , as estimated in the "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO₂e

$\Delta C_{(DW_BSL,t)}$ = Change in carbon stock in baseline dead wood biomass within the project boundary in year t , as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO₂e

However, Section 5 of the methodological tool AR-Tool 14 (Version 04.2) explains 3 conditions under which carbon stock and change in carbon stock may be estimated as zero. According to the tool the carbon stock in trees in the baseline can be accounted as zero if all of the following conditions are met:

- (a) The pre-project trees are neither harvested, nor cleared, nor removed throughout the crediting period of the project activity;
- (b) The pre-project trees do not suffer mortality because of competition from trees planted in the project, or damage because of implementation of the project activity, at any time during the crediting period of the project activity;

- (c) The pre-project trees are not inventoried along with the project trees in monitoring of carbon stocks but their continued existence, consistent with the baseline scenario, is monitored throughout the crediting period of the project activity.

To differentiate between project and pre-project trees within permanent sample plots, the methods of; 1. tree tagging to the planted trees, and 2. painting to the existing trees at breast height are practically applied. Tree tags on planted trees are easily identified, and if they are damaged or lost, patrolling staff immediately replace with the new ones. Based on measurement variables, DBH and height of planted trees, ERRs estimations are finally calculated for the respective monitoring period.

LandSat images and Worldview 2 images from the year 2013 were used to conduct a satellite image analysis. Field verification was also conducted to identify the baseline land use types of the area. According to the analysis the following categories were identified.

- a. Severely degraded mangrove areas
- b. Degraded mangrove areas
- c. Bare lands
- d. Shallow water areas where planting is possible
- e. Abandoned shrimp pond areas

For the trees planted in 2015, 2016 and 2017, severely degraded mangrove areas, bare lands and shallow water areas were replanted with a density of 5,000 plants per hectare. Considering leaving enough space to existing trees to grow freely, degraded mangrove areas were restored using approximately 3,000 plants per hectare since there are mangrove plants that fall below the forest threshold but still remain as plants. For trees planted in 2018, a density of 4,000 trees were applied based on the land condition and trees planted in 2019 a density of 2,040 trees per hectare was applied. There is no timber harvesting in this project and there will be monitoring to protect the existing and newly planted plants. Furthermore, these existing mangrove plants are not removed or allowed to suffer mortality. The condition of these lands will be improved with the restoration program. These existing plants are not accounted for the carbon stocks but will be left to grow and are monitored throughout the crediting period of the project activity.

Hence, all applicability conditions (a), (b) and (c) are met.

Paragraph 12 of the same tool states that the changes in carbon stocks in trees and shrubs in the baseline may be accounted as zero for those lands that have met above (a), (b) and (c) conditions.

Hence the Baseline net GHG removals by sinks are conservatively accounted as zero throughout the project period.

5.2 Project Emissions

The following steps are applied to fulfil the calculation of Section 5.5 already described in AR-AM0014 methodology (version 03).

The ex-post actual net GHG removals by sinks over the period of 2015-2019 were estimated using the equation 2 described in Section 5.5 of the methodology AR-AM0014 A/R Methodology: Afforestation and reforestation of degraded mangrove habitats Version 03.0:

$$\Delta C_{ACTUAL,t} = \Delta C_{P,t} - GHG_{E,t} \quad \text{Equation (2)}$$

Where,

- $\Delta C_{ACTUAL,t}$ = Actual net GHG removals by sinks, in year t ; t CO₂e
- $\Delta C_{P,t}$ = Change in the carbon stocks in project, occurring in the selected carbon pools, in year t ; t CO₂e
- $GHG_{E,t}$ = Increase in non-CO₂ GHG emissions within the project boundary as a result of the implementation of the A/R CDM project activity, in year t , as estimated in the tool “Estimation on non-CO₂ GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity”; t CO₂e

Summary of Actual Net GHG Removals by sinks in all planting/restoration strata within the project boundary for the current monitoring period³²

Period	Change in the carbon stocks in project, occurring in the selected carbon pools (t CO ₂ e)	Increase in non-CO ₂ GHG emissions within the project boundary (t CO ₂ e)	Actual net GHG removals by sinks (t CO ₂ e)
15.06.2022-31.12.2022	34,061.83	0	34,061.83
01.01.2023-31.12.2023	62,162.84	0	62,162.84
Total ER for the monitoring period of 15.06.2022 – 31.12.2023			96,224.67

Change in the carbon stocks in project, occurring in the selected carbon pools in year t were calculated using equation 3 described in Section 5.5 of the methodology AR-AM0014 A/R Methodology: Afforestation and reforestation of degraded mangrove habitats Version 03.0:

$$\Delta C_{P,t} = \Delta C_{TREE_PROJ,t} + \Delta C_{SHRUB_PROJ,t} + \Delta C_{DW_PROJ,t} + \Delta SOC_{PROJ,t} \quad \text{Equation (3)}$$

Where,

- $\Delta C_{P,t}$ = Change in the carbon stocks in project, occurring in the selected carbon pools, in year t ; t CO₂e

³² “**Uncertainty Calc and Final VCUs**” Tab in 6th MR_2023_VCUs-Consolidated Calcs Data.xlsx

- $\Delta C_{TREE_PROJ,t}$ = Change in carbon stock in tree biomass in project in year t , as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO₂e
- $\Delta C_{SHRUB_PROJ,t}$ = Change in carbon stock in shrub biomass in project in year t , as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO₂e
- $\Delta C_{DW_PROJ,t}$ = Change in carbon stock in dead wood in project in year t , as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO₂e
- $\Delta SOC_{PROJ,t}$ = Change in carbon stock of the soil organic carbon (SOC) pool within the project boundary, in year t ; t CO₂e

Change in the carbon stocks in project, occurring in the selected carbon pools of planting/restoration strata 2015, 2016 and 2017 ($i_1, i_2, i_3, i_7, i_8, \text{ and } i_9$)³³

Period	Change in carbon stock in tree biomass in project in year t (t CO ₂ -e)	Change in carbon stock in shrub biomass in project in year t (t CO ₂ -e)	Change in carbon stock in dead wood in project in year t (t CO ₂ -e)	Change in carbon stock in the soil organic carbon (SOC) pool within the project boundary, in year t (t CO ₂ -e)	Change in the carbon stocks in project, occurring in the selected carbon pools, in year t (t CO ₂ -e)
15.06.2022-31.12.2023	5,638.06	0.00	0.00	27,068.19	32,706.25
Total ER for the monitoring period of 15.06.2022 – 31.12.2023					32,706.25

Change in the carbon stocks in project, occurring in the selected carbon pools of planting/restoration strata 2018 (i_4)³⁴

³³ "Change in Carbon stk" tab in 6th MR_2023_VCU_2015-17 plantations.xlsx

³⁴ "Change in Carbon stk" Tab in 6th MR_2023_VCU_2018 plantations.xlsx

Period	Change in carbon stock in tree biomass in project in year t (t CO2-e)	Change in carbon stock in shrub biomass in project in year t (t CO2-e)	Change in carbon stock in dead wood in project in year t (t CO2-e)	Change in carbon stock in the soil organic carbon (SOC) pool within the project boundary, in year t (t CO2-e)	Change in the carbon stocks in project, occurring in the selected carbon pools, in year t (t CO2-e)
15.06.2022-31.12.2023	4,948.66	0.00	0.00	12,375.98	17,324.64
Total ER for the monitoring period of 15.06.2022 – 31.12.2023					17,324.64

Change in the carbon stocks in project, occurring in the selected carbon pools of planting/restoration strata 2019 (i5)³⁵

Period	Change in carbon stock in tree biomass in project in year t (t CO2-e)	Change in carbon stock in shrub biomass in project in year t (t CO2-e)	Change in carbon stock in dead wood in project in year t (t CO2-e)	Change in carbon stock in the soil organic carbon (SOC) pool within the project boundary, in year t (t CO2-e)	Change in the carbon stocks in project, occurring in the selected carbon pools, in year t (t CO2-e)
15.06.2022-31.12.2023	4,153.66	0.00	0.00	45,725.22	49,878.88
Total ER for the monitoring period of 15.06.2022 – 31.12.2023					49,878.88

³⁵ "Change in Carbon stk" Tab in 6th MR_2023_VCU_2019 plantations.xlsx

Summary of change in the carbon stocks in project, occurring in the selected carbon pools of planting/restoration of all strata within project boundary

Year of Planting/Restoration Stratum	Change in Carbon Stock (t CO2e)	Total (t CO2e)
2015-2017	32,706.25	99,909.77
2018	17,324.64	
2019	49,878.88	

Estimation of changes in carbon stock in tree biomass: $\Delta C_{TREE_PROJ,t}$

The change in carbon stocks in the tree biomass was estimated using the methodological tool AR-TOOL-14 Version 04.2 [“Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”].

Based on the tool the stock difference method was applied and the ex-ante tree biomass was estimated using the method of “Estimation by modelling of tree growth and stand development”, presented in section 8 of the tool. For the estimation of the changes in carbon stocks in tree biomass ex-post, field measurements in permanent sample plot at two points of time were taken, and the calculations were done following the “difference of two independent stock estimations” method, available in section 6 of the tool. Under this method, method b, “Direct estimation of change by re-measurement of sample plots” was used. Actual field measurements were used in combination with tree growth models to estimate the growth of trees and the development of the tree stand over time.

Mean carbon stock in trees within the tree biomass per hectare was estimated using equation 12, 13, and 14 stated in Ar-Tool14 Version 04.2 [“Estimation of carbon stocks and change in carbon stocks and shrubs in A/R CDM project activities”]:

$$C_{TREE} = \frac{44}{12} \times CF_{TREE} \times B_{TREE} \quad \text{Equation (12)}$$

$$B_{TREE} = A \times b_{TREE} \quad \text{Equation (13)}$$

$$b_{TREE} = \sum_{i=1}^M w_i \times b_{TREE,i} \quad \text{Equation (14)}$$

Where,

C_{TREE} = Carbon stock in tree in the tree biomass estimation strata; t CO₂e

CF_{TREE} = Carbon fraction of tree biomass; t C (t d.m.)⁻¹
 A default value of 0.47 is used unless transparent and verifiable information can be provided to justify a different value

- B_{TREE} = Tree biomass in the tree biomass estimation strata; t d.m.
- A = Sum of areas of the tree biomass estimation strata; ha
- b_{TREE} = Mean tree biomass per hectare in the tree biomass estimation strata; t d.m. ha⁻¹
- w_i = Ratio of the area of stratum i to the sum of areas of tree biomass estimation strata (i.e. $w_i = A_i/A$); dimensionless
- $b_{TREE,i}$ = Mean tree biomass per hectare in stratum i ; t d.m. ha⁻¹

Carbon stock in trees in the tree biomass estimation of planting strata 2015, 2016 and 2017 ($i_1, i_2,$ and i_3)³⁶

Period	Mean tree biomass per hectare within the biomass estimation strata (b_{TREE}) (t d.m. ha ⁻¹)	Sum of areas of the biomass estimation strata (A) (ha)	Tree biomass in the tree biomass estimation strata (B_{TREE}) (t.d.m)	Carbon fraction of tree biomass (CF_{TREE}) (t C (t.d.m.) ⁻¹)	Carbon stock in trees in the tree biomass estimation strata (C_{TREE}) (t CO2e)
15.06.2022-31.12.2023	5.61	407.32	2,285.07	0.47	3,937.94

Carbon stock in trees in the tree biomass estimation of restoration strata 2015, 2016 and 2017 ($i_7, i_8,$ and i_9)³⁷

Period	Mean tree biomass per hectare within the biomass estimation strata (b_{TREE}) (t d.m. ha ⁻¹)	Sum of areas of the biomass estimation strata (A) (ha)	Tree biomass in the tree biomass estimation strata (B_{TREE}) (t.d.m)	Carbon fraction of tree biomass (CF_{TREE}) (t C (t.d.m.) ⁻¹)	Carbon stock in trees in the tree biomass estimation strata (C_{TREE}) (t CO2e)
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³⁶ “ABG & BGB refores” tab in 6th MR_2023_VCU_2015-17 plantations.xlsx

³⁷ “ABG & BGB restoration” tab in 6th MR_2023_VCU_2015-17 plantations.xlsx

15.06.2022-31.12.2023	4.04	244.19	986.53	0.47	1,700.12
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Carbon stock in trees in the tree biomass estimation of planting strata 2018 (i₄)³⁸

Period	Mean tree biomass per hectare within the biomass estimation strata (b _{TREE}) (t d.m. ha-1)	Sum of areas of the biomass estimation strata (A) (ha)	Tree biomass in the tree biomass estimation strata (B _{TREE}) (t.d.m)	Carbon fraction of tree biomass (CF _{TREE}) (t C (t.d.m.)-1)	Carbon stock in trees in the tree biomass estimation strata (C _{TREE}) (t CO ₂ e)
15.06.2022-31.12.2023	9.64	297.88	2,871.56	0.47	4,948.66

Carbon stock in trees in the tree biomass estimation of planting strata 2019 (i₅)³⁹

Period	Mean tree biomass per hectare within the biomass estimation strata (b _{TREE}) (t d.m. ha-1)	Sum of areas of the biomass estimation strata (A) (ha)	Tree biomass in the tree biomass estimation strata (B _{TREE}) (t.d.m)	Carbon fraction of tree biomass (CF _{TREE}) (t C (t.d.m.)-1)	Carbon stock in trees in the tree biomass estimation strata (C _{TREE}) (t CO ₂ e)
15.06.2022-31.12.2023	2.19	1,100.57	2,410.25	0.47	4,153.66

Summary of carbon stock in trees in the tree biomass estimation of all planting/restoration strata in 2015-17, 2018 and 2019

Year of Planting/Restoration Stratum	Change in Carbon Stock (t CO ₂ e)	Total (t CO ₂ e)
2015-2017	5,638.06	14,740.38

³⁸ "ABG & BGB refores" Tab in 6th MR_2023_VCU_2018 plantations.xlsx

³⁹ "ABG & BGB refores" Tab in 6th MR_2023_VCU_2019 plantation.xlsx

2018	4,948.66	
2019	4,153.66	

Estimating mean tree biomass per hectare in each stratum ($b_{TREE,I}$)

According to Tool 17, V.01 “Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities (Version 01.0.0)” was applied. The tool states “For ex ante estimation of aboveground tree biomass in project scenario any allometric equation can be used.” For ex post estimation, the project adopted the method described in Section II, paragraph 6 of the same tool, which specify to use a species-specific or group-of-species-specific allometric equation derived from trees growing in edapho-climatic conditions similar to those in the project area.

A thorough literature review was conducted to identify most suitable allometric equation for ex-ante estimations since there are no equations developed in the project area. It was mentioned in the VCS PD (Version 3.0) that for ex-post estimation allometric equations will be developed using the continued research data and research personal and using the permanent sample plots that have been set ups.

However, the oldest 2015 project plantation at 8 years old showed 3.61 cm diameter and 2.05 m height; the adjacent 2016 project plantation at 7 years old revealed 3.87 cm diameter and 1.36 m height and therefore, diameter ranges of project trees are still small and not enough yet to build own equations in this monitoring period.

A detailed assessment by Ya Min Thant, Mamoru Kanzaki, Seiichi Ohta from Kyoto University and Maung Maung Than (DFID program, British Council) have developed five common allometric equations for stem, branch, leaf, above ground and below ground for six mangrove species based on specific gravity of stem.

Their study was published in the journal TROPICS published by Japan Society of Tropical Ecology (Link: https://www.istage.ist.go.jp/article/tropics/21/1/21_1/article/-char/en). Title of the paper is “Carbon sequestration by mangrove plantations and a natural regeneration stand in the Ayeyarwady Delta, Myanmar”. The study was conducted in Ayeyarwady region. Similarly, the VCS project is also implemented in the Ayeyarwady region. Therefore, Thant’s allometric equations were well suited for the project trees which are growing in similar edapho-climatic conditions and also meet the above criteria of the Tool 17.

Moreover, regarding paragraph 6(c) of the AR-Tool 17, the models were derived from a dataset exceeding 30 trees, with five 9×9 m and five 5×5 m plots sampled across both plantation and natural regeneration stands. Although destructive sampling for regression purposes was conducted on nine individuals, this meets the Tool’s minimum threshold. Also, Thant’s equations showed a significant coefficient of determination value: $R^2 = 0.99$ for aboveground biomass and $R^2 = 0.98$ for belowground biomass, indicating excellent model performance.

The equations to estimate above ground and below ground biomass seem to be most plausible equations. Results on this equation and results from field measurements gave similar results thus proving that this equation is the most plausible for ex-post estimations.

Total aboveground and belowground biomass was estimated using –

Above ground - $W_{\text{Top}} = 0.22 \rho (DBH^2H)^{0.82}$

Below ground - $W_{\text{Root}} = 1.69 \rho (DBH^2H)^{0.40}$

Where:

DBH = Diameter at Breast Height (cm)

H = Height (m)

ρ = Wood density (kg/m³)

Wood density of mangrove species

Species	Density (g/cm ³)
<i>Bruguiera cylindrica</i>	0.763
<i>Bruguiera gymnorrhiza</i>	0.73
<i>Ceriops tagal</i>	0.884
<i>Rhizophora apiculata</i>	0.855
<i>Rhizophora mucronata</i>	0.792
<i>Bruguiera sexangula</i>	0.763
Average	0.80

The applied wood density values for each species shown in above table were taken from page (66) of the published combined report: [Preparation of Baseline Data Mangrove Ecosystem Management in Bintan Island] of ITTO project RED-PD 064/11 Rev.2 (F)⁴⁰.

Ya Min Thant studied the following species: *Avicenia marina* (Am), *Avicenia officinalis* (Ao) and *Sonneratia apetala* (Sa) and a naturally regenerated stand under regeneration improving felling operation (NR: consists of *Ceriops decandra*, *Bruguiera sexangula*, and *Aegicerus corniculatum*) protected for seven years since 2000. The total carbon stock in biomass was 73 tC ha⁻¹ in NR, 43 tC ha⁻¹ in Sa, 21 tC ha⁻¹ in Am and 18 tC ha⁻¹ in Ao for 6-year-old plantations.

Using the same equation, the VCS project gives a 2.6 tC ha⁻¹ for a 3-year-old stand. Hence WIF has taken a very conservative approach and the most suitable and available equation for the project ex-post estimations. Therefore, using the equation provided by Ya Min Thant et al. provides conservative ex-post estimates for the group of mangrove species used in this VCS project. And Myanmar being a Least Developed Country (LDC), WIF have used the best available allometric equation to conservatively calculate ex-post reductions.

⁴⁰ *Baseline Data of Mangrove Ecosystem Management in Bintan Island_Combined report*

Estimation of mean tree biomass in all planting/restoration strata 2015, 2016, 2017, 2018, and 2019^{41 42 43}

Yearly Stratum	Period	DBH	Height	Aboveground weight (kg)	Below ground weight (kg)	Total Biomass per tree	Number of trees per ha	Total Biomass (t/ha)	Mean tree biomass per hectare in stratum i ($b_{TREE,i}$)	Ratio of the area of stratum i to the sum of areas of tree biomass estimation strata (w1)	Mean tree biomass per hectare in the tree biomass estimation strata
		cm	m	W_{top}	W_{root}	kg/tree	n	t/ha	t d.m. ha ⁻¹	dimensionless	t d.m. ha ⁻¹
2015 (i1)	2022-23	3.61	2.05	2.60	5.03	7.63	4,297	32.79	10.51	0.23	2.42
2016 (i2)	2022-23	3.87	1.36	2.08	4.51	6.59	4,438	29.25	9.16	0.17	1.56
2017 (i3)	2022-23	2.73	1.56	1.32	3.61	4.93	3,311	16.32	2.71	0.60	1.63
2015 (i7)	2022-23	3.61	2.05	2.60	5.03	7.63	2,577	19.66	6.30	0.44	2.77
2016 (i8)	2022-23	3.87	1.36	2.08	4.51	6.59	2,663	17.55	5.50	0.09	0.50
2017 (i9)	2022-23	2.73	1.56	1.32	3.61	4.93	1,986	9.79	1.63	0.47	0.77
2018 (i4)	2022-23	3.84	1.59	2.34	4.78	7.12	3,741	26.64	9.64	1.00	9.64

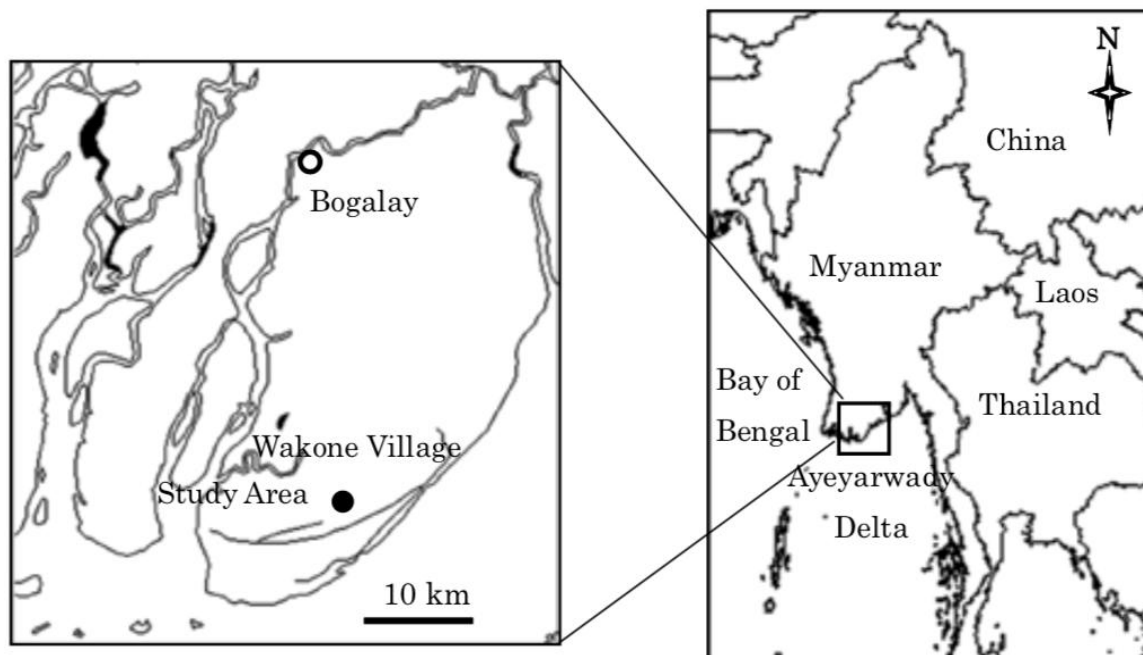
⁴¹ "I1, I2, I3, I7 restore, I8 restore, I9 restore" Tab in 6th MR_2023_VCU_2015-17 plantations.xlsx

⁴² "I4" Tab in 6th MR_2023_VCU_2018 plantations.xlsx

⁴³ "I5" Tab in 6th MR_2023_VCU_2019 plantations.xlsx

2019 (i5)	2022-23	2.55	1.01	0.82	2.87	3.69	1,495	5.52	2.19	1.00	2.19
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The following map shows the study area of Ya Min Thant et al and the VCS project area both located in the Ayeyarwady Delta area.



The DBH and Height values of monitoring data were obtained from the permanent sample plots as the following table.

Plot No.	Year 3		Year 4		Year 5		Year 6		Year 7		Year 8	
	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)
Restoration and Planting Strata in 2015												
2015 Plot 4											3.06	259.38
2015 Plot 5											2.84	279.80
2015 Plot 11											3.16	191.78
2015 Plot 33											5.25	120.00
2015 Plot 45											2.67	239.69
2015 Plot 53											4.37	167.93
2015 Plot 90											3.23	130.35
2015 Plot 99											4.32	251.50
Average											3.61	205.05
Restoration and Planting Strata in 2016												
2016 Plot 21									3.36	117.22		
2016 Plot 25									2.99	225.52		
2016 Plot 32									3.45	90.17		

Plot No.	Year 3		Year 4		Year 5		Year 6		Year 7		Year 8	
	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)
2016 Plot 34									4.38	97.41		
2016 Plot 43									3.99	121.14		
2016 Plot 48									4.54	138.31		
2016 Plot 73									4.38	161.91		
Average									3.87	135.95		
Restoration and Planting Strata in 2017												
2017 Plot 6							2.48	152.28				
2017 Plot 19							2.86	146.34				
2017 Plot 26							2.31	144.69				
2017 Plot 62							3.78	145.15				
2017 Plot 68							2.40	106.05				
2017 Plot 77							2.53	150.74				
2017 Plot 100							2.81	208.97				
2017 Plot 106							2.70	193.93				
Average							2.73	156.02				

Plot No.	Year 3		Year 4		Year 5		Year 6		Year 7		Year 8	
	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)
Restoration and Planting Strata in 2018												
2018 Plot 1					3.21	258.47						
2018 Plot 2					3.47	319.16						
2018 Plot 3					3.57	141.95						
2018 Plot 5					4.31	143.80						
2018 Plot 11					3.66	95.30						
2018 Plot 12					6.03	126.80						
2018 Plot 14					3.91	209.03						
2018 Plot 19					4.07	115.41						
2018 Plot 28					2.97	176.51						
2018 Plot 29					4.04	97.95						
2018 1 (P)					3.01	77.85						
2018 2 (P)					3.50	146.34						
2018 3 (P)					4.14	158.21						
Average					3.84	158.98						

Plot No.	Year 3		Year 4		Year 5		Year 6		Year 7		Year 8	
	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)
Restoration and Planting Strata in 2019												
2019 Plot 1			2.06	91.19								
2019 Plot 3			2.28	94.29								
2019 Plot 4			1.95	94.42								
2019 Plot 5			2.54	92.06								
2019 Plot 7			2.00	86.25								
2019 Plot 16			1.84	83.21								
2019 Plot 17			2.36	78.83								
2019 Plot 23			2.53	84.15								
2019 Plot 29			2.05	118.36								
2019 Plot 32			2.00	93.00								
2019 Plot 37			2.06	92.88								
2019 Plot 38			2.59	94.59								
2019 Plot 40			3.06	224.06								
2019 Plot 42			4.13	108.74								

Plot No.	Year 3		Year 4		Year 5		Year 6		Year 7		Year 8	
	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)	DBH (cm)	Height (cm)
2019 Plot 43			2.61	99.14								
2019 Plot 46			3.13	77.45								
2019 Plot 48			3.86	100.11								
2019 Plot 49			2.77	102.87								
Average			2.55	100.87								

The equations were applied for each year and then the tool AR-Tool 14 (Version 04.2) was used to develop the calculations in Microsoft Excel sheets. Default carbon fraction: 0.47 as per A/R methodological tool.

Out of the strata, only 6 Strata i_1, i_2, i_3 were areas reforesting from 2015 to 2017 and i_7, i_8, i_9 are areas that were restored using mangrove plants. The strata i_4 was planted in 2018 and i_5 was planted in 2019. Calculations for i_4 and i_5 were done separately since they are newly planted areas.

Strata	Year of planting	Area planted (ha)
i_1	2015	93.92
i_2	2016	68.86
i_3	2017	244.54
i_4	2018	297.88
i_5	2019	1,100.57
Total area (ha)		1,805.77

Strata	Year of planting	Area restored (ha)
i_7	2015	107.97
i_8	2016	21.88
i_9	2017	114.34
Total area (ha)		244.19

Thus, using the above information and equations, the above-ground and the below-ground biomass were calculated to be as indicated in the table below.

	2015-2017 Planting tCO ₂ e	2018 Planting tCO ₂ e	2019 Planting tCO ₂ e
Above-ground and Below-ground Biomass	5,638.06	4,948.66	4,153.66

Survival Rate

Based on the survival rate counts in the 54 sample plots covering all planted areas in 2015-2019, an average 99.26 % survival rate has been acquired and applied in which 2015-17 areas represent 99.34%, 2018 areas represent 99.72% and 2019 areas represent 98.71%.

Estimation of changes in carbon stock in shrub biomass: $\Delta C_{SHRUB_PROJ,t}$

As no shrubs are planted as part of this project this carbon stock accounts as zero for the ex-ante and ex-post estimations.

Estimation of changes in carbon stock in dead wood: $\Delta C_{DW_PROJ,t}$

Deadwood is expected to remain in the project area and will not be removed. Therefore, carbon stock in this pool is assumed not to increase under a conservative approach.

Calculation of uncertainty

This was done following the guidance of Appendix 2 of the A/R Methodological Tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”. The values are presented in the table below:⁴⁴

Stratum	Mean t d.m. ha ⁻¹	s _i t d.m. ha ⁻¹	n _i	Standard error of mean (SEM)	SEM expanded at 90% confidence level	Uncertainty
2015 planted	29.62	6.58	8	2.33	4.41	14.88
2016 planted	25.89	5.14	7	1.94	3.78	14.59
2017 planted	19.68	4.10	8	1.45	2.75	13.97
2018 planted	27.71	7.09	13	1.97	3.51	12.65
2019 planted	7.55	2.52	18	0.59	1.03	13.71
Total			54	Average		13.96

Stratum	Change in Carbon Stock	Total	Balance VCUs (at 25% discount due to uncertainty)
2015-2017 planted	5,638.06	14,740.38	11,055.28
2018 planted	4,948.66		
2019 planted	4,153.66		

⁴⁴ “Uncertainty Calc and Final VCUs” Tab in 6th MR_2023_VCUs-Consolidated Calcs Data.xlsx

Estimation of changes in carbon stocks in Soil Organic Carbon: $\Delta SOC_{PROJ,t}$

As explained in the VCS PD (version 3.0) the changes in carbon stocks in the SOC pool were calculated as indicate in the equation (3) of the Methodology AR-AM0014 (03.0):

$$\Delta SOC_{PROJ,t} = \frac{44}{12} \times \sum_{t=1}^t A_{PLANT,t} \times dSOC_t \times 1 \text{ year} \quad \text{Equation (4)}$$

Where,

$\Delta SOC_{PROJ,t}$ = Change in carbon stock of the soil organic carbon (SOC) pool within the project boundary, in year t ; t CO₂e

$A_{PLANT,t}$ = Area planted in year t ; ha

$dSOC_t$ = The rate of change in SOC stocks within the project boundary, in year t ; t C ha⁻¹ yr⁻¹

The following default value is used, unless transparent and verifiable information can be provided to justify a different value:

- (i) $dSOC_t = 0.5 \text{ t C ha}^{-1} \text{ yr}^{-1}$ for $t = t_{PLANT}$ to $t = t_{PLANT} + 20$ years, where t_{PLANT} is the year in which planting takes place;
- (ii) $dSOC_t = 0 \text{ t C ha}^{-1} \text{ yr}^{-1}$ for $t > t_{PLANT} + 20$ years

The IPCC published in its “2013 Supplement to the 2006 IPCC Guideline for National Greenhouse Gas Inventories: Wetlands”, a default value of 1.62 tC/ha/year for mangrove ecosystems with a range of 0.10-10.2 tC/ha/year. Regarding the default accumulation timeframe of this value, the same guidelines state on page 4.27 “Craft et al (2003) found that (a) soil carbon accumulation, developed almost instantaneously with the establishment of vegetation along a chronosequence 1- to 28-year old constructed marshes and (b) a similar soil carbon accumulation rate over 10 years in a natural and created marsh (Craft et al., 2002) and over 20 years in a created mangrove (Osland et al., 2012)”.

This IPCC value is mainly based on the study conducted by Breithaupt et al. (2012) which estimated a geometric mean global organic carbon burial rate of 163 (+39.2; -32) g OC m⁻² yr⁻¹ resulting 1.63 tC/ha/year. This comparative study included 19 studies from Brazil, Columbia, Malaysia, Indonesia, China, Japan, Vietnam, Thailand, Mexico and the United States.

For the proposed VCS ARR project in Myanmar, the University of Pathein carried out an in-depth soil analysis. The samples collected were analysed at the Universities’ Research Centre of the University of Yangon. According to this analysis, average carbon stock stored was estimated as 732.26 tC/ha for a mean soil depth of around 1 meter.

Applying a conservative estimate of 100 years accumulation, this would result in 7.32 tC/ha/year for soil depth around 1 m. The $dSoC_t$ value of 7.32 tC/ha/year has already been fixed since the initial verification.

Hence, for this monitoring period, conservatively, the same SoC parameter 7.32 tC/ha/year determined at validation throughout the project crediting period remains fixed.

Change in SOC stock occurring in the selected carbon pools of planting/restoration strata 2015, 2016 and 2017 ($i_1, i_2, i_3, i_7, i_8,$ and i_9)⁴⁵

Period	The rate of change in SOC stocks within the project boundary, in year t; tC/ha ¹ /yr ¹ ($d\text{SOC}_t$)	Area planted in year t; ha ($A_{\text{PLANT}, t}$)	Change in SOC stock within the project boundary, in year t; tCO ₂ e ($\Delta\text{SOC}_{\text{Proj},t}$)
15.06.2022-31.12.2023	7.32	651.51	27,068.19

Change in SOC stock occurring in the selected carbon pools of planting/restoration strata 2018 (i_4)⁴⁶

Period	The rate of change in SOC stocks within the project boundary, in year t; tC/ha ¹ /yr ¹	Area planted in year t; ha	Change in SOC stock within the project boundary, in year t; tCO ₂ e
15.06.2022-31.12.2023	7.32	297.88	12,375.98

Change in SOC stock occurring in the selected carbon pools of planting/restoration strata 2019 (i_5)⁴⁷

Period	The rate of change in SOC stocks within the project boundary, in year t; tC/ha ¹ /yr ¹	Area planted in year t; ha	Change in SOC stock within the project boundary, in year t; tCO ₂ e
15.06.2022-31.12.2023	7.32	1,100.57	45,725.22

Summary of change in SOC stock occurring in all planting/restoration strata 2015, 2016, 2017, 2018 and 2019

⁴⁵ "SOC" Tab in 6th MR_2023_VCU_2015-17 plantations.xlsx

⁴⁶ "SOC" Tab in 6th MR_2023_VCU_2018 plantations.xlsx

⁴⁷ "SOC" Tab in 6th MR_2023_VCU_2019 plantations.xlsx

Carbon Pool	2015-2017 Planting tCO ₂ e	2018 Planting tCO ₂ e	2019 Planting tCO ₂ e	Total tCO ₂ e
SOC	27,068.19	12,375.98	45,725.22	85,169.39

5.3 Leakage Emissions

According to the methodology AR-AM0014 (Version 03.0), the leakage emission has to be assessed with the tool “Estimation of the increase in GHG emissions attributable to the displacement of pre-project agricultural activities in A/R CDM project activity” (Version 02). This tool evaluates the displacement of crop cultivation and grazing activities. Section 6 of this tool indicates that leakage emissions can be considered insignificant if they meet the following requirements:

1. Leakage emission attributable to the displacement of agricultural activities due to implementation of an A/R CDM project activity is estimated as the decrease in carbon stocks in the affected carbon pools of the land receiving the displaced activity.
2. Leakage emission attributable to the displacement of grazing activities under the following conditions is considered insignificant and hence accounted as zero:
 - (a) Animals are displaced to existing grazing land and the total number of animals in the receiving grazing land (displaced and existing) does not exceed the carrying capacity of the grazing land;
 - (b) Animals are displaced to existing non-grazing grassland and the total number of animals displaced does not exceed the carrying capacity of the receiving grassland;
 - (c) Animals are displaced to cropland that has been abandoned within the last five years;
 - (d) Animals are displaced to forested lands, and no clearance of trees, or decrease in crown cover of trees and shrubs, occurs due to the displaced animals;
 - (e) Animals are displaced to zero-grazing system.

Most of the project areas are emerged salty mudflats, on bare lands or with a few mangrove plants. Grazing is not a common practice in the area. The protection from any future illegal grazing on mangrove sites is part of the project activities. Therefore, leakage in the whole project area can be assumed as zero for the duration of the project.

Prior to the project, some of the local communities have been involved in charcoal production. With the lands being degraded and abandoned, these charcoal producers had to abandon the charcoal production.

One might argue that with the mangrove reforestation program, these charcoal producers may start the charcoal production again thus lead to deforestation. To prevent those in the community living nearby mangrove forest depending on cutting mangrove to make charcoal and get income for their livelihood, Worldview International Foundation (WIF) employ them, paying daily wages of Kyats 8000/-, in planting mangrove in the belief that their participation in planting process would create a feeling of ownership and that they would not readily cut mangrove as they had done so before.

In addition, WIF, in consultation with them, look for an alternative income generation project that might interest them to take care of their livelihood. These people have been made aware that in order to receive an income via carbon credits they need to protect these mangroves. They have also agreed on the alternative livelihood opportunities proposed by WIF for them. This way WIF ensures that the mangrove trees planted by the project will not be cut for the charcoal production. This is in line with Section 3.6.2 of the AFOLU Requirements (version 3.6).

Regular patrolling in the project area is done and any illegal cutting is to be reported to the project office and strict measures are taken for offenders with the support of the forest department officials.

5.4 GHG Emission Reductions and Carbon Dioxide Removals

The ex-ante net anthropogenic GHG emission reductions and removals are calculated using the equation 6 described in the methodology AR-AM0014:

$$\Delta C_{ARR-CDM,t} = \Delta C_{ACTUAL,t} - \Delta C_{BSL,t} - LK_t \quad \text{Equation (6)}$$

Where,

$\Delta C_{ARR-CDM,t}$ = Net anthropogenic GHG removals by sinks, in year t ; t CO_{2e}

$\Delta C_{ACTUAL,t}$ = Actual net GHG removals by sinks, in year t ; t CO_{2e}

$\Delta C_{BSL,t}$ = Baseline net GHG removals by sink in year t ; t CO_{2e}

LK_t = GHG emissions due to leakage, in year t ; t CO_{2e}

The AFOLU Non-Permanence Risk Tool, V4.2 was used to calculate the non-permanence risk for the project. The total internal risk that accounts for project management, financial viability, opportunity cost and project longevity was assessed as 7. Similarly, the total external risk that accounts for land tenure and resource access, community engagement, political risk was assessed as 4. Then, the total natural risk that accounts for fire, pest and disease outbreaks, extreme weather, geological risk, future climate impact and SLR risk was assessed as 5.01. In summary, the overall risk rating for all three risk categories was assessed as 17 %.

In order to demonstrate the in-depth assessment of risk rating and scores counted and ensure the buffer pool to be allocated, the “Non-Permanence Risk Report” for the project has been produced. Accordingly,

16,056 tCO_{2e} buffer credits are needed to be deposited into the AFOLU pooled buffer account. After reducing, the balance credits are 78,389 tCO_{2e}.⁴⁸

State the non-permanence risk rating (%)	17
Has the non-permanence risk report been attached as either an appendix or a separate document?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
For ARR and IFM projects with harvesting, state, in tCO _{2e} , the Long-term Average (LTA).	
Has the LTA been updated based on monitored data, if applicable?	<input type="checkbox"/> Yes <input type="checkbox"/> No If no, provide justification.
State, in tCO _{2e} , the expected total GHG benefit to date.	340,744
If a loss occurred (including a loss event or reversal), state the amount of tCO _{2e} lost:	1,780

Vintage period	Baseline emissions (tCO _{2e})	Project emissions (tCO _{2e})	Leakage emissions (tCO _{2e})	Buffer pool allocation (tCO _{2e})	Reductions VCU (tCO _{2e})	Removals VCU (tCO _{2e})	Total VCU issuance (tCO _{2e})
15.06.20 22- 31.12.20 22	0	33,431.74	0	5,683.40		33,431.74	27,748.34
01.01.20 23- 31.12.20 23	0	61,012.93	0	10,372.20		61,012.93	50,640.73
Total	0	94,444.67	0	16,055.60		94,444.67	78,389.07

The percent difference between ex-ante emissions reductions/removals and achieved emissions reductions/removals is also calculated.

⁴⁸ "Uncertainty Calc and Final VCUs" Tab in 6th MR_2023_Consolidated Calcs Data.xlsx

Vintage period	Ex-ante estimated reductions/removals	Achieved reductions/removals	Percent difference	Explanation for the difference
15.06.2022-31.12.2022	94,490	34,062	- 64%	<p>The ERRs achieved during this monitoring period are not beyond the estimated Ex-ante ERRs. A couple of major reasons observed are below;</p> <ul style="list-style-type: none"> - The parameter values of biomass accounting such as DBH between the ex-ante and ex-post ERR calculations are different. - The allometric equations used for ex-ante and ex-post ERR calculations are different in which the former was applied by Sukardjo & Yamada (1992) in Indonesia and the latter was applied by Ya Min Than et al. (2012) in Myanmar. - Environmental parameters such as temperature, rainfall, topography, salinity and soil conditions can influence the growth rate of mangroves, and as a result, actual field data from the project are smaller than the ex-ante ones.
01.01.2023-31.12.2023	195,841	62,163	- 68%	
Total	290,331	96,225	- 67%	

APPENDIX 1: ACTIVITY PHOTOS



Photo 1: Organic fertilizer and pesticide making training at Shwe Thaug Yan



Photo 2: Coconut value added training



Photo 3: Basic computer training



Photo 4: Basic English program



Photo 5: Environmental awareness raising session



Photo 6: Running ice plant



Photo 7: Box culvert and drainage construction at Shwe Thaug Yan Ward 3



Photo 8: Drainage construction at Thae Kyin village



Photo 9: Bridge construction at Ma Tha village



Photo 10: School roof repairing at BEPS, New Nyo Chaung village

APPENDIX 2: PLANTATION PHOTOS

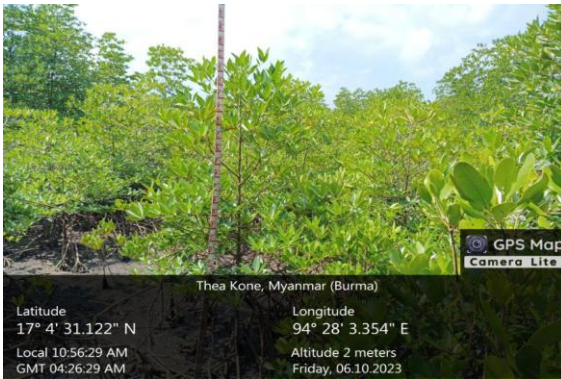


Photo 11: 2015 plantation_Shwe Thaung Yan



Photo 12: 2016 plantation_Shwe Thaung Yan

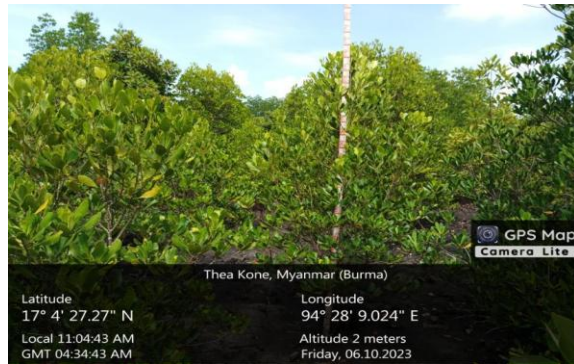


Photo 13: 2017 plantation_Shwe Thaung Yan



Photo 14: 2018 plantation_Thabawkan



Photo 15: 2019 plantation_Thaegon

APPENDIX 3: COMMUNITY MAPS

Map of 1764 Project indicating Magyi Village Tract, Ayeyarwaddy Region



Photo 16: Magyi community map

Map of 1764 Project indicating Thabawkan and Thaegone Village Tracts, Ayeyarwaddy Region

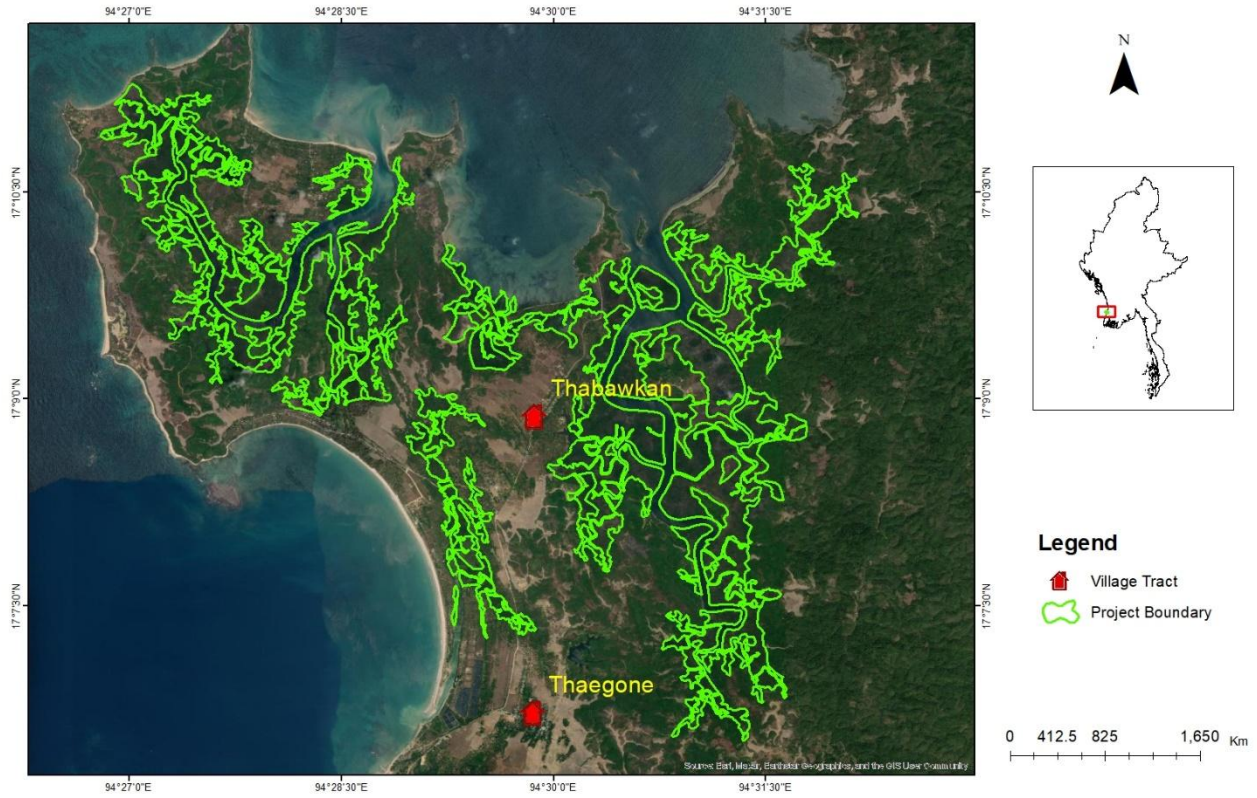


Photo 17: Thabawkan and Thaegone community map