FINAL VERIFICATION REPORT "REFORESTATION AND RESTORATION OF DEGRADED MANGROVE LANDS, SUSTAINABLE LIVELIHOOD AND COMMUNITY DEVELOPMENT IN MYANMAR"

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Document Prepared By RINA Services S.p.A. (RINA)

Contact Information (optional)

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Summary:

RINA Services S.p.A. (RINA), commissioned by Worldview International Foundation (WIF) has verified the greenhouse gas emission reductions reported for the project activity "Reforestation and Restoration of degraded mangrove lands, sustainable livelihood and community development in Myanmar, VCS project ID 1764, for the period 15/06/2015 to 14/06/2018. The verification includes confirming the implementation of the monitoring plan of the registered VCS PD (Project ID 1764) and the application of the monitoring methodology as per AR-AM0014, Afforestation and reforestation of degraded mangrove habitats", Version 03.0 dated 04/10/2013

The purpose of the proposed project activity involves restoration of 2146.48 Ha of degraded mangrove habitat of the Magyi, Thabawkan and Thaegone village tracts, located in Northern part of Ayeyarwady Division of Myanmar. From the total 2146.48 Ha, 737.04 Ha covers Magyi region, 887.87 Ha from Thabakwkan region and 521.57 from Thaegone village tract.

The scope of verification is to have an independent evaluation of a project activity by a designated operational entity against the requirements of the VCS Standards, on the basis of the monitoring report and related project documents in order to confirm that the monitoring report as documented, is sound and reasonable and meets the identified criteria.

The validation consisted of the following three phases: (i) document review, (ii) on-site assessment, (iii) the resolution of outstanding issues and the issuance of the final verification report

During the verification 01 Corrective Action Requests (CARs), 03 Clarification Requests (CLs) were identified related to the monitoring, implementation or operations of the proposed VCS project activity in relation to all relevant VCS requirements and the applied baseline and monitoring methodology AR-AM0014, version 03.0. These, findings have been discussed in Appendix 1 of the report.

In conclusion, it is RINA's opinion that the project activity " Reforestation and Restoration of degraded mangrove lands, sustainable livelihood and community development in Myanmar", VCS project ID 1764, meets all relevant requirements for VCS standard and guidelines and correctly applies the baseline and monitoring methodology AR-AM0014 Version 3.0 "Afforestation and reforestation of degraded mangrove habitats", dated 04/10/2013. The monitoring system is in place and the emission

reductions are calculated without material misstatement. Hence, RINA is able to certify that the emission reductions from the project during the monitoring period 15/06/2015 to 14/06/2018 amount to 31,744 tCO_2e.

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1 INTRODUCTION

1.1 Objective

RINA Services S.p.A. (RINA), commissioned by Worldview International Foundation (WIF) has been verifying the greenhouse gas emission reductions reported for the project activity "Reforestation and Restoration of degraded mangrove lands, sustainable livelihood and community development in Myanmar, VCS project ID 1764, for the period 15/06/2015 to 14/06/2018. The verification includes confirming the implementation of the monitoring plan of the registered VCS PD (Project ID 1764) and the application of the monitoring methodology as per AR-AM0014, Afforestation and reforestation of degraded mangrove habitats", Version 03.0 dated 04/10/2013.

The objectives of this verification exercise are, by review of objective evidence, to establish that:

- The project activity has been implemented and operated as per the project description (PD) and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place;
- Monitoring report and other supporting documents are complete;
- The data is recorded and stored as per the monitoring methodology and approved monitoring plan.
- To confirm that the monitoring system is implemented and fully functional to generate Voluntary Emission Reductions (VERs/VCUs) without any double counting, and

To establish that the data reported are accurate, complete, consistent, transparent and free of material error or omission by checking the monitoring records and the emissions reduction calculation.

1.2 Scope and Criteria

The verification scope is:

- to verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan;
- to evaluate the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emission reduction data is free from material misstatement;
- to verify that reported GHG emission data is sufficiently supported by evidence.

The project is assessed against the requirements of VCS version 3.7 and related rules and guidance. RINA has, based on the recommendations in the latest version of CDM Validation and Verification Manual, and employed a rule-based approach (as criteria) in the verification, focusing on the identification of significant reporting rules and the reliability of project monitoring.

Verification is not meant to provide any consultancy towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the monitoring.

1.3 Level of Assurance

The draft final verification report before being submitted to the client were subjected to an independent internal technical review to confirm that all verification activities had been completed according to the pertinent RINA instructions.

The technical review was performed by a technical reviewer(s) qualified in accordance with RINA's qualification scheme for VCS and CDM validation and verification.

The verification team and the technical reviewers consist of the following personnel.

Role	Last Name	First Name	Country
Team Leader, Technical Expert	Menon	Rekha	India
Technical Expert	Nambiar	Dhanya	India
Technical reviewer	Liu	Huifeng	China
Technical Expert supporting Technical reviewer	Maso	Daria	Italy

The verification report concludes with a reasonable level of assurance about the reported net anthropogenic GHG removals data is free from material misstatement.

1.4 Summary Description of the Project

The proposed project involves restoration of 2146.48 Ha of degraded mangrove habitat of the Magyi, Thabawkan and Thaegone village tracts, located in Northern part of Ayeyarwady Division of Myanmar. From the total 2146.48 Ha, 737.04 Ha covers Magyi region, 887.87 Ha from

Thabakwkan region and 521.57 from Thaegone village tract. During the site visit, it was understood that the project is planned to be implemented in phased manner. The project started the initial plantation activity in Magyi region in 2015 and aimed to complete the same by 2017. Further, the other two regions Thabawkan and Thaegon village tracts will start the plantation activities in 2018 and finish the same by 2020.

Apart from the restoration activities of mangroves, the other important objective of the project is poverty reduction with sustainable livelihoods in the coastal communities. Also, emphasising on conservation of bio-diversity and establishment of the first mangrove gene bank in Myanmar.

As discussed above, the project is located at Magyi, Thabawkan and Thaegone village tracts, located in Northern part of Ayeyarwady Division of Myanmar.

Project Participant(s)	World View International Foundation		
Project Title	Reforestation and Restoration of degraded mangrove lands, sustainable livelihoods and community development in Myanmar'		
Location of the project	Project is located at Magyi, Thabawkan and Thaegone village tracts, located in Northern part of Ayeyarwady Division of Myanmar		
Methodology(ies)	Approved large scale CDM methodolgy AR-AM0014 Version 3.0 "Afforestation and reforestation of degraded mangrove habitats", dated 04/10/2013		
Sectoral Scope(s)	14	Technical Area(s)	14.1.
Registered PDD	Registered PDD, version 3.0 of 19/02/2018 /02/		
Starting date of the crediting period	15/05/2015		
Project's crediting period	15/06/2015 to 14/06/2035		
Project documentation link	VCS database: http://vcsprojectdatabase.org/#/project_details/1764		

2 VERIFICATION PROCESS

2.1 Method and Criteria

Verification was conducted using RINA procedures in line with the requirements specified in the VCS Requirements, i.e. VCS Program Guide, VCS Version 3 (v3.7) of 21/06/2017, and VCS Standard, VCS Version 3 (v3.7) of 21/06/2017. The GHG emission reductions are on the basis of the approved large scale CDM methodolgy AR-AM0014 Version 3.0 "Afforestation and reforestation of degraded mangrove habitats", dated 04/10/2013.

The verification consisted of the following three phases

Document review;

On-site assessment including Interviews and Site Inspections;

Resolution of Any Material Discrepancy and the issuance of the final verification report and certification.

The following sections outline each step in more detail.

2.2 Document Review

The monitoring report (MR), version 1.0 of 06/07/2018 and version 2.0 of 22/09/2018 **/71/**, the emission reduction calculations spreadsheet (VCU calculations MM for Verification 2015-2017 V 1.0 WIF.xlsx) version 01 of 06/07/2018 and (VCU calculations MM for Verification 2015-2017 V 2.0 WIF.xlsx) version 2.0 of 22/09/2018 /**03**/, were assessed as part of the verification.

The following table lists the documentation that was reviewed during the verification

/01/	Worldview International Foundation: VCS-PD for the project activity '' Reforestation and Restoration of degraded mangrove lands, sustainable livelihood and community development in Myanmar'' version 3.0 of 01/02/2018
/02/	Worldview International Foundation: ER spread sheets in the form of (VCU calculations MM for Verification 2015-2017 V 1.0 WIF.Xlsx), version 01 of 06/07/2018 ER spread sheets in the form of (VCU calculations MM for Verification 2015-2017 V 1.1 WIF.xlsx), version 02 of 22/09/2018
/03/	CDM Executive Board: Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities" (version 01.0.0), dated 25/11/2011
/04/	WIF: Non permanence risk report, version 2.0 of 15/11/2017
/05/	CDM Executive Board: Demonstration of eligibility of lands for A/R CDM project activities, version 02.0, dated 04/10/2013
/06/	CDM Executive Board: Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" (version 04.2), dated 24/07/2015
/07/	CDM Executive Board: Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities" (version 03.1), dated 24/07/2015
/08/	CDM Executive Board: Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity"(version 02.0), dated 04/10/2013
/09/	CDM Executive Board: Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity' (version 04.0.0_, dated 25/11/2011
/10/	CDM Executive Board: Approved large scale CDM methodolgy AR-AM0014 Version

	3.0 “Afforestation and reforestation of degraded mangrove habitats", dated 04/10/2013
/11/	CDM Executive Board: Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities”, version 01 dated 19/10/2007
/12/	CDM Executive Board: Guidelines for objective demonstration and assessment of barriers, version 01 of 16/10/2009
/13/	CDM Executive Board: sample plot calculation VCS Myanmar mangrove.xlsx
/14/	WIF: 3. Annex 8 VCS Risk Report Calculation Tool, v3.1 submitted on 18/07/2018
/15/	WIF:Landsat Images of 2003 & 2013 for Magyi, Thabakawn and Thaegon regions
/16/	WIF: Google earth files: Project boundary KML files Version 01 submitted on 31/05/2017 WIF: Google earth files: Project boundary KML files Version 02 submitted on 16/11/2017 WIF: Google earth files: Project boundary KML files Version 03 submitted on 01/02/2018
/17/	WIF: Project boundary files with geo-cordinates in excel format, Version01 submitted on 31/05/2017 WIF: Project boundary files with geo-cordinates in excel format, Version02 submitted on 16/11/2017 WIF: Project boundary files with geo-cordinates in excel format, Version03 submitted on 01/02/2018
/18/	WIF: Project boundary Shape files of the region Magyi, Thabakawn and Thaegon Version 1.0 dated 31/05/2017, version 2.0 dated 16/11/2017 and version 3.0 dated 01/02/2018.
/19/	WIF: Land use maps of Magyi, Thabakawn and Thaegon regions
/20/	MoU between University of Pathein and WIF on Development of Mangrove park and Mangrove gene bank for Research & Development in support of Magrove Restoration in Myanmar, dated 15/11/2013
/21/	MoU between University of Pathein and WIF on validation and sale of CO_2 offsets to international buyers, dated 15/07/2016
/22/	Amendment of the MoU between University of Pathein and WIF for the extension of

	contract and increased land area dated 21/05/2017
/23/	Agreement between WIF and Theagon community, dated 21/05/2017 Agreement between WIF and Thabawkan community, dated 21/05/2017
/24/	MoU between WIF and Forest Department for , capacity building, research, Mangrove restoration with community development and biodiversity/rescue of endagered endemic orchids, dated 11/08/2017
/25/	Regional Ministry of Agriculture, Livestock , Natural Resource & Environment: to confirm that the 1100 ha land area have been handed over to the village tract Magrove Conservation commitee, Thabawkan for 30 years and can be extended for 120 years, aslo confirming the forest definition of Myanmar, dated 17/05/2017
/26/	Regional Ministry of Agriculture, Livestock , Natural Resource & Environment: to confirm that the 750 ha land area have been handed over to the village tract Magrove Conservation commitee, Thaegon for 30 years and can be extended for 120 years, aslo confirming no forest in the allocated land dated 17/05/2017
/27/	Regional Ministry of Agriculture, Livestock , Natural Resource & Environment: to confirm that the 728 ha of land handed over to Pathein University doesn't have forest, dated 18/05/2017. Extension of area applied to 785 Ha.
/28/	Letter from Forest Department to support WIF in restorartion and rehabilatate mangrove forests, dated 08/08/2017
/29/	Pathein University: Soil Carbon Measurement for Magyi area, dated 27/04/2015 along with the soil test data sheet, which was performed by University Research centre, Yangon.
/30/	WIF: Soil Carbon calculation (SoilCarbon_Myanmar_LRA2.xlsx) submitted on 15/08/2017
/31/	Article on carbon sequestration on Mangrove forest by Daniel M. Alongi, 04/2014
/32/	Carbon sequestration by mangrove plantation and a natural regeneration stand in the ayeyarwady delta region, Myanmar by Ya Min Thant, dated 30/06/2012
/33/	Mangrove Service Network: Annual growth rate of Mangroves in Ayeryarwady region for Rhizophora and Bruguiera species , dated 05/01/2017
/34/	Preparation of baseline data mangrove ecosystem in Bintan Island by CV Ideas
/35/	WIF: sample plot calculation (sample plot calculation VCS Myanmar mangrove. Xlsx), (2015 planted sample plots.xlsx), (2016 planted sample plots.xlsx) and (2017 planted

	sample plots.xlsx) submitted on 15/08/2017
/36/	RINA: Field note and Interview sheet with stakeholders(Thabawkan village, Thaegon village, Magyi village), WIF , project consultants, Forest Department and Pathein University.
/37/	VCS: AFOLU requirements, V 3.6 of 21/06/2017
/38/	VCS: Standard, V 3.7 of 21/06/2017
/39/	WIF: Height_and_Diameter_measurement_of_2015.xlsx Height_and_Diameter_measurement_of_2017.xlsx Height_and_Diameter_measurement_of_2017.xlsx
/40/	Mangrove plantation in Ayerwady region by forest dept.
/41/	IPCC: Good practice guidance for landuse, land use change and forestry, dated 2003
/42/	FAO Forestry Department: Mangrove forest management guidelines, 1994
/43/	Mangrove action project: 5 steps to successful ecological restoration of mangroves, dated 04/2006
/44/	WIF: employment contract of field assistant, dated 16/03/2015
/45/	WIF: employment contract of techncial assistant, dated 16/03/2015
/46/	Minimum wage proof: https://tradingeconomics.com/myanmar/minimum-wages, English Language, last accessed on 19/12/2017
/47/	RINA : Interview sheets with stakeholders dated 18/07/2018 to 23/07/2018
/48/	WIF: Traning and capacity building for the staff at the mangrove plantation
/49/	WIF: Aerial image of the project location.
/50/	Forestry Master Plan (2001-2030) : http://www.fao.org/forestry/14871-095a15477c1192458cbb5d861551416d6.pdf, English Language, last accessed on 02/01/2018
/51/	Environmental conservation law (2012) : http://www.fao.org/faolex/results/details/en/c/LEX-FAOC139025/, English Language, last accessed on 02/01/2018
/52/	Mangrove plantation in Rakhine area by Mangrove Service Network

/53/	Stakeholders consultation: Meetings held at Thaegon village from 15/01/2016 to 01/09/2016 Meetings held at Thabokkan village from 08/07/2016 to 16/02/2017 Meetings held with forest dept officers , dated 18/12/2016 at WIF office, Magyi.
/54/	Myanmar Agenda 21 : http://www.un.org/esa/agenda21/natlinfo/countr/myanmar/natur.htm, in English Language, last accessed on 15/01/2018
/55/	FREDA: http://fredamyanmar.org/?page_id=174, in English Language , last accessed on 15/01/2018
/56/	Mangrove Research Team, Pathein University: Preliminary Report on Area Survey for Mangrove Park (PUR/01) At MaGyi, Ayeyarwady Division
/57/	WIF: Receipts of Mangrove species seeds from Gwa, dated 20/03/2015 and 04/05/2017
/58/	WIF: Field measurement log sheets.
/59/	J. Boone Kauffman and Donato, D.C. (2012) Protocols for the measurement, monitoring and reporting of structures, biomass and carbon stocks in mangrove forests. CIFOR, Bogor, Indonesia, Working Paper No. (86)
/60/	Howard, J., Hoyt, S., Isensee, K., Telszewski, M., Pidgeon, E. (eds.) (2014). Coastal Blue Carbon: Methods for assessing carbon stocks and emissions factors in mangroves, tidal salt marshes, and seagrasses. Conservation International, Intergovernmental Oceanographic Commission of UNESCO, International Union for Conservation of Nature. Arlington, Virginia, USA.
/61/	Nguyen HT, Yoneda R, Ninomiya I et al. (2004) The effects of stand-age and inundation on carbon accumulation in mangrove plantation soil in Namdinh, Northern Vietnam. TROPICS Vol. 14 (1)
/62/	Allometric equation for biomass estimation proposed by Sukardjo and Yamada (1992)
/63/	Government of the Union of Myanmar, Ministry of Forestry, Forest Department, Forest Research Institute, Yezin : Physical and Chemical Properties of Mangrove Forest Soils by Daw Tin Tin Ohn, B.Ag. (Mdy.), M.S. (U.F) Researcher and U Sein Thet, B.Sc. (For.) (Rgn.), M.Sc. (ANU) Head of Division, Forest Research Institute Leaflet No. 6, 1991
/64/	Ya Min Thant, Mamoru Kanzaki, Seiichi Ohta from Kyoto University and Maung Maung Than (DFID program, British Council): “Carbon sequestration by mangrove plantations and a natural regeneration stand in the Ayeyarwady Delta, Myanmar”, dated 30/06/2012
/65/	WIF: Revised boundary files of Magyi area.
/66/	Regional Ministry of Agriculture, Livestock , Natural Resource & Environment: letter No: 300 / 1-12/ Government (Ayeyarwaddy) (9/2014) dated 12/05/2014 allotting 1815.49 acre (734.7 ha) land to Pathein University.

/67/	WIF: Taking growth measurements of mangrove trees manual book.
/68/	WIF: Oraganizational structure and QA/QC procedure for Mangrove restoration project in Magyi, Thabawkan and Thaegone areas of Myanmar, version 02 of August 2018.
/69/	WIF: Planting inventory and the receipts of buying mangrove seeds.
/70/	WIF: GIS and forest inventory training progaramme.
/71/	WIF: VCS monitroing report for the project "Reforestation and Restoration of degraded mangrove lands, sustainable livelihoods and community development in Myanmar" version 1.0 of 6/07/2018 and version 2.0 of 22/09/2018
/72/	Garmin: Oregon 600 series , owners manual issued 04/2014
/73/	RINA: Project boundary files KML and excel sheet, cross verified with the original shape file/18/ of Magyi area
/74/	RINA: KML file of the 23 sample plots visited during the verification site visit
/75/	RINA: Tree measurement data taken from the 23 permanent sample plots collected during site visit.
/76	Vanniarachchy, S.A., Aung, H., Kontny, J. (2018) Assessment of Soil Carbon of the Mangroves in Shwethaungyan Area of the Ayeyarwady Region in Myanmar. Proceedings of the 2nd International Conference on Climate Change, Colombo, Sri Lanka LINK: http://climatechangeconferences.com/wp-ontent/uploads/2018/06/ICCC-2018-Book-of-Abstracts.pdf
/77/	Photo evidence provided presenting the paper at the 2nd International Conference on Climate Change

2.3 Interviews

The key personnel interviewed and the main topics of the interviews are summarized in the table below.

	Date	Name and Role	Organization	Topic
/a/	23/07/2018	Dr. Arne Fjortoft (Secretary General)	WIF	VCS consideration, funding of the project, Commercial operation date of the project, Land tenure rights, VER revenue sharing, community development and involvement
/b/	23/07/2018	Win Sandar (Finance Manager)	WIF	
/b/	18/07/2018 to 23/07/2018	Bo Ni (Managing Director)	WIF	
/b/	18/07/2018 to 23/07/2018	Mr. Win Maung (Project Manager)	WIF	Project implementation status, Project boundary, area covered, species selected, sample plot selection, planting technique used, survival rate, measurement

				methods, data storage and archiving and QA/QC procedures.
/c/	18/07/2018 to 22/07/2017	Dr. Htay Aung (Professor)	Pathein University	Role of Pathein University, soil carbon studies, land rights, Environmental Socio-Economic Impacts, hydrological data.
/d/	18/07/2018 to 23/07/2018	Mr. Thulasi Varman	GIS&RS specialist	Baseline stratification, aerial and satellite imageries, project boundary, sampled plots and kml files.
/e/	18/07/2018 to 23/07/2018	Suraj A. Vanniarachchy (AFOLU carbon project development specialist)	WIF	Baseline, Data storage and Archiving procedures, Trainings, Site Preparation Activities, Baseline stratification, Sample plot calculation, Emission Reduction calculations, risk assessments and calculations, start date and crediting period
/f/	18/07/2018 to 23/07/2018	Mr. Joacim Kontny (VCS Co-ordinator)	BIO-8	

2.4 Site Inspections

From 18/07/2018 to 23/07/2018, RINA visited the project site located on Magyi, Thabawkan and Thaegon village tracts of the Northern part of Ayeyarwady Division of Myanmar to check the technology employed and monitoring arrangement as part of project activity. During the on-site assessment of the project RINA assessed the implementation and operation of the proposed A/R project activity, reviewed the information flows for generating, aggregating and reporting the monitoring parameters, interviewed key personnel of the forestry department to confirm the operational and data collection procedures, cross-checked between information provided in the monitoring report and field measurement data. The values used in the ER calculations were confirmed by means of checking the records provided by the client. Checked the quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters. There were no hindrances or barriers that were faced by the verification team while carrying out the site visits. All measurement equipment's and processes of the project activity were accessible to the verification team.

2.5 Resolution of Findings

The objective of this phase of the verification is to resolve any outstanding issues which need to be clarified for RINA's positive conclusion on the project description. To guarantee transparency any findings raised during the verification are incorporated in the Appendix B to this report. A corrective action request (CAR) is raised if one of the following occurs:

- The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions.
- The VCS Version 3.7 requirements have not been met.

- There is a risk that the emission reductions cannot be monitored or calculated.

A clarification request (CL) is raised if information is insufficient or not clear enough to determine whether the applicable VCS Version 3.7 requirements have been met.

The No. of CARs/CLs raised by RINA are the following

CAR:01, CL: 03 and FAR: 0

2.5.1 Forward Action Requests

This is the first verification report and based on the review of the validation report , the following FARs, were raised.

FAR 1

As per the methodology, (Equation no.2) change in carbon stock in tree biomass in project in year t, shall be estimated by using the tool, “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”; t CO2-e. and “Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities (Version 01.0.0). The tool states that, for ex ante estimation of aboveground tree biomass in project scenario, any allometric equation can be used. Accordingly, PP has used an allomatric equation given in Sukardjo & Yamada (1992).

However, for ex-post estimation, PP has 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. Further, in Section 3.2 of VCS PD, PP states that for ex-post estimation of project emission, such allometric equation will be developed using the continued research data and research personal and using the permanent sample plots that have been set up within the project.

In view of the above, PP is requested to publish these research findings in peer-reviewed journals in order to ascertain that, the data or parameters used are correct and appropriate for the project circumstances.

FAR 2

For the ex-ante estimation of SOC pool, PP has used site specific value for $dSOC_{t. .}$ derived from field based data. RINA audit team has evaluated all the research work related to soil carbon estimation and found that the value chosen for the project is relevant. PP has provided transparent and verifiable information to justify that the value used is appropriate to the project context. Hence RINA accepted the chosen value for ex-ante estimation of the changes in carbon stocks in soil organic carbon.

However, as per paragraph, 3.2.5 of Validation and Verification manual, ver 3.2, in order to ascertain the validity of the data or parameter provided by PP, it shall be sourced from relevant peer-reviewed journals/literature. Hence PP is requested to use data from such published sources and the same shall be made available during the time of project monitoring and verification.

FAR 3

To address the project management risk, PP has provided MoU signed between WIF and University of Pathein for Magyi area. This MoU specifies WIF's role in managing the project manangement risk. However for Thabawkan and Thaegone area, there are no such agreements in place, though there are MoUs with village tract chairman for using the area for reforestation project.

FAR 4

The area under the Pathein University considered for the VCS project is 737.04 ha. However the document from the Regional Ministry of Agriculture, Livestock , Natural Resource & Environment, confirms that 728 ha of land handed over to Pathein University that doesn't have forest, dated 18/05/2017. During the site visit, PP confirmed that the MoU signed between WIF and Pathein university was for 785 Ha, and they have applied for an extension of areas with the Regional Ministry of Agriculture, Livestock, Natural Resource & Environment . The same was also confirmed by the representatives from Pathein Univesrity. RINA closed the CL based on the ammended MoU ad site visit inteviews. However, PP is requested to provide the ammended document from the Regional Ministry of Agriculture, Livestock , Natural Resource & Environment: to confirm that 785 ha or at least 737.04 ha land was handed over to Pathein University that doesn't have forest, The same needs to be checked during the first verification.

For more details on closure of the FARs, please refer to Appendix-B of this report.

2.6 Eligibility for Validation Activities

RINA is accredited for validating and verifying GHG emission reduction project activities falling under sectoral scope 14, AFOLU. Hence, this section is not applicable.

3 VALIDATION FINDINGS

3.1 Participation under Other GHG Programs

N/A.

3.2 Methodology Deviations

N/A.

3.3 Project Description Deviations

The following table list the project description devaition from the registered VCS-PD

As per the registered VCS-PD	As per the Monitoring Report	Justification/Assessment
The total area of plantation in Magyi area is 737.04 ha.	The total area of plantation in Magyi area is 701.5 ha	As per the discussions during the site visit, the actual land allocated to pathein university from the goverment is only 1815.49 acre (734.7 ha) and there were no further revisions in this land area. The same was checked and confirmed with the letter No: 300 / 1-12/ Government (Ayeyarwaddy) (9/2014) dated 12/05/2014 /66/. It was also noted that there was a further decrease in the area to 701.5 ha due to removal of abandoned shrimp pond /65/. Since the land area has reduced from the original, RINA confirms that the change in the area will not impact the baseline, additonality, scale and emission reductions of the project activity.
The plantation activities will start from 2015 in Magyi area and from 2017 in Thabawkan	The plantation activities in Thabawkan and theagone area will start in 2018	Plantation activities were checked during the site visit and further cross checked with the stock registry /69/. RINA

and theagone area.		confirms that the change in the year of plantation doesnt impact the project activity.
As per the registered VCS-PD , following was the equation used in Emission Reductions calculations i.e tree biomass per hectare. log10 (total biomass) = -0.9036 + 2.9499 log10 DBH (Sukardjo & Yamada, 1992).	Ex-post emission reduction , the following was used for tree biomass calucation. Above ground - $\mathbf{W_{Top} = 0.22\ \rho\ (DBH^2H)^{0.82}}$ Below ground - $\mathbf{W_{Root} = 1.69\ \rho\ (DBH^2H)^{0.40}}$	It is checked that for ex-post estimation, PP has 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. Since the same is allowed by the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; RINA accepted the same.
Prime Carbon Co Ltd involved as one of the entities in AFOLU carbon project development.	Prime Carbon Co Ltd has been removed.	RINA confirms that the role of Prime Carbon Co Ltd is to provide the technical input during project validation hence its removal will not impact the project activity niether the emission reductions.

3.4 Grouped Project

N/A.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

The proposed project involves restoration of 2146.48 Ha of degraded mangrove habitat of the Magyi, Thabawkan and Thaegone village tracts, located in Northern part of Ayeyarwady Division of Myanmar. From the total 2146.48 Ha, 737.04 Ha covers Magyi region, 887.87 Ha from Thabakwkan region and 521.57 from Thaegone village tract. As per the discussions during the site visit, the actual land allocated to pathein university from the goverment is only 1815.49 acre (734.7 ha) and there were no further revisions in this land area. The same was checked and confirmed with the letter No: 300 / 1-12/ Government (Ayeyarwaddy) (9/2014) dated 12/05/2014 /66/. It was also noted that there was a further decrease in the area to 701.5 ha due to removal of abandoned shrimp pond.

According with the *Sampling and surveys for CDM project activities and programmes of activities standard*, for applying acceptance sampling, RINA has followed the steps below:

Determination of the sample. It is checked that the no. of permanent sample plots are calculated based on the tool: "Calculation of the number of sample plots for measurements within A/R CDM project activities" (Version 2.1.0). The samples resulted was 50 for the total project area. However, for the current monitoring the total area considered 701.5 ha and the no. of samples for the same is calculated to be 23 /13/. During the verification site visit RINA team visited all the 23 sample plots to assess the project boundary and cross checked the measurements of the standing trees on a random basis.

During the field visit the measurement procedures adopted by the field staff were assessed against the forest inventory procedures /67/ and RINA team did not find any deviations. Noted that the field staff were trained on the measurement methods /70/ and also they have a forestry background.

Check the acceptability of the data. The sampling design was developed by the PP based on the tool: "Calculation of the number of sample plots for measurements within A/R CDM project activities" (Version 2.1.0). as described in the registered PD; the total permanent sample plots calculated is 50, which is the same as per the sample plot calculation provided during the validation. As discussed above, for the current monitoring the total area considered 701.5 ha and the no. of samples for the same is calculated to be 23. Based on that RINA has carried out cross check of the tree data (DBH & H). The measurements taken at field by RINA were cross-checked with the measurement taken by the PP /58/ /39/ and the ER spread sheets /02/ and found that the values used are conservative.

It is also checked that apart from the restoration activities of mangroves, the other important objective of the project is poverty reduction with sustainable livelihoods in the coastal communities. Also, emphasising on conservation of bio-diversity and establishment of the first mangrove gene bank in Myanmar.

There are no methodology deviations. The deviations with reference to the registered VS-PD has been explained in section 2.2.2 of the MR and the same has been assessed and justified in section 3.3 of the verification report.

RINA team confirms that the project is not part of any emissions trading program or any other mechanism that includes GHG allowance trading. Further, the project has not received or sought

any other form of environmental credit, or has become eligible to do so since validation or previous verification. It is also checked that the project has not participated or been rejected under any other GHG programs since validation or previous verification.

Data parameters fixed ex-ante and available at validation are given below:

DATA/PARAMETER Unit	Source of data	Reported value for the project period	Assessment/Observation
Baseline net GHG removals by sinks in the year t ($\Delta C_{BSL,t}$) in t CO_2-e	Data based on registered PD /02/ and validation report /08/	0	The value is ex-ante fixed for 10 years crediting period as per the registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool **/02/, /08/**.
Carbon fraction of tree biomass CF_{TREE} ; kg CH_4/kg COD	Data based on registered PD /02/ and validation report /08/ i.e 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	0.47	The value is ex-ante fixed for 10 years crediting period as per the registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool **/02/, /08/**.
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 $f_j(x_{1,l},x_{2,l},x_{3,l},\ldots)$	For ex-post: Ya Min Thant et al. (2012) Above ground - $W_{Top} = 0.22\ \rho\ (DBH^2H)^{0.82}$ Below ground - $W_{Root} = 1.69\ \rho\ (DBH^2H)^{0.40}$	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 (km/m^3) /64/	The equation is used in ex-post ER calculations. Since the same is more specific to the tree biomass calculation. This issue was raised as a FAR, based on which the PP has chosen different equation for ex-post ER calculations. The same was accepted by RINA.
The rate of change in SOC stocks within the	Data based on registered PD /02/ and validation report /08/	7.32	The value is ex-ante fixed for 20 years crediting period as per the registered PD, which has been justified and validated by validation

project boundary, in year t, $dSOC_{t\ in}$ t C ha^{-1} yr^{-1}			DOE to follow the applied methodology and tool **/02/, /08/**.

Data and parameters monitored:

Data/Parameter	Assessment
Data Unit	A_i in ha
Description	Area of tree biomass stratum i
Source of data to be used	GPS and GIS
Value of monitored parameter for the monitoring period	701.5 ha /02/ A_1 86.76 ha A_2 105.17 ha A_3 250.79 ha A_7 107.95 ha A_8 24.37 ha A_9 126.48 ha
Monitoring equipment	GPS (Garmin), GPS Smartphones, ArcGIS or QGIS software
Accuracy of the monitoring equipment	Not applicable also checked with the GPS user manual /72/
Measuring/Reading/Recording frequency	Before the start of the project (planting) and adjusted thereafter every two years since the year of the initial verification
Calculation method (if applicable)	N/A.
Calibration	
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	-
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	-
Calibration certificates	-
Does the calibration of metershave be done by an accredited person or institution?	-

Data/Parameter	Assessment
Data Unit	n_i

Description	Number of sample plots in stratum *i*
Source of data to be used	Calculated as per tool "Calculation of the number of sample plots for measurements within A/R CDM project activities" (version 02.1.0)
Value of monitored parameter for the monitoring period	23 /35/
Monitoring equipment	N/A
Accuracy of the monitoring equipment	N/A
Measuring/Reading/Recording frequency	n_i is calculated for each monitoring event, at least every five years
Calculation method (if applicable)	N/A.
Calibration	
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	N/A
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	N/A
Calibration certificates	N/A
Does the calibration of metershave be done by an accredited person or institution?	-

Data/Parameter	Assessment
Data Unit	w_i
Description	Relative weight of the area of stratum i, the area of the stratum i divided by the project area.
Source of data to be used	Calculated, area of the stratum i divided by the project area /02/.
Value of monitored parameter for the monitoring period	w_1 0.20 w_2 0.24 w_3 0.57 w_7 0.42

	w_8 0.09 w_9 0.49
Monitoring equipment	N/A
Accuracy of the monitoring equipment	N/A
Measuring/Reading/Recording frequency	Calculated for each monitoring event, at least every five years
Calculation method (if applicable)	N/A.
Calibration	
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	N/A
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	N/A
Calibration certificates	N/A
Does the calibration of metershave be done by an accredited person or institution?	N/A

Data/Parameter	Assessment
Data Unit	$A_{PLOT,I}$ in ha
Description	Size of sample plot in stratum i
Source of data to be used	Field measurement, GPS and GIS
Value of monitored parameter for the monitoring period	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.
Monitoring equipment	Measuring tape, GPS
Accuracy of the monitoring equipment	N/A
Measuring/Reading/Recording frequency	Annually
Calculation method (if applicable)	N/A.
Calibration	

Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	-
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	-
Calibration certificates	-
Does the calibration of metershave be done by an accredited person or institution?	-

Data/Parameter	Assessment
Data Unit	DBH in cm
Description	Diameter breast height of tree
Source of data to be used	Field measurement
Value of monitored parameter for the monitoring period	Average DBH Values /39/

period	DBH
Year-1	0.6
Year-2	1.4
Year-3	1.4

Monitoring equipment	Vernier Calliper
Accuracy of the monitoring equipment	N/A
Measuring/Reading/Recording frequency	Annually It is checked that Diameter at breast height (DBH) is measured at 1.3 m along the stem using a DBH tape, and for plants below 1.3 m a calliper was used to measure the basal diameter (D_{10}). It is also checked that for the *Rhizophora* species, the measurements were taken from where the 1st prop root is visible. The measurement procedures were checked with forest inventory procedures and is confirmed to be appropriate. "For the initial verification, until the trees reach a height beyond 1.3 m, D30 or the basal diameter is measured and recorded /67/." The same is as per the registered VCS-PD and thus accepted by RINA.

Calculation method (if applicable)	N/A.
Calibration	
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	-
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	-
Calibration certificates	-
Does the calibration of metershave be done by an accredited person or institution?	-

Data/Parameter	Assessment
Data Unit	H in m
Description	Tree height
Source of data to be used	Field measurement
Value of monitored parameter for the monitoring period	Average H Values /39/

period	H
Year-1	0.582
Year-2	0.629
Year-3	0.768

Monitoring equipment	Measuring tape, PVC or bamboo pole
Accuracy of the monitoring equipment	N/A
Measuring/Reading/Recording frequency	Annually
Calculation method (if applicable)	N/A.
Calibration	
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	-

Does the calibration cover the monitoring period? Has the calibration frequency been respected?	-
Calibration certificates	-
Does the calibration of metershave be done by an accredited person or institution?	-

Data/Parameter	Assessment
Data Unit	T in Year
Description	Time period elapsed between two successive estimations of carbon stock in a carbon pool
Source of data to be used	N/A
Value of monitored parameter for the monitoring period	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,
Monitoring equipment	N/A
Accuracy of the monitoring equipment	-
Measuring/Reading/Recording frequency	Annually
Calculation method (if applicable)	N/A
Calibration	
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	N/A
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	N/A
Calibration certificates	N/A
Does the calibration of metershave be done by an accredited person or institution?	-

4.2 Accuracy of GHG Emission Reduction and Removal Calculations

4.2.1 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 shall 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 sinks in year *t*; t CO_2-e
$\Delta C_{TREE\_BSL,t}$	=	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 CO_2-e
$\Delta C_{SHRUB\_BSL,t}$	=	Change in carbon stock in baseline shrub 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 CO_2-e
$\Delta C_{DW\_BSL,t}$	=	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 CO_2-e

However, as demonstrated in Section 3.1 of the registered VCS PD, the carbon stocks and carbon stock changes of trees and shrubs in the baseline is estimated as zero following the conditions outlined in chapter 5 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" Version 04.1. The existence of baseline trees shall be monitored throughout the crediting period of the project activity consistent with the baseline scenario.

During the site visit RINA team has assessed the baseline condition of the project site and confirms that baseline trees are preserved and they are not counted as part of the project trees. Hence, the

baseline net GHG removal by sink ($\Delta C_{BSL,t}$) during this monitoring period is considered as zero (tCo2e), by following a conservative approach.

4.2.2. Project Emissions

The ex-post actual net GHG removals by sinks over the period of 2015-2018 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:

$$\Delta C_{ACTUAL,t} = \Delta C_{P,t} - GHG_{E,t}$$

Where:

$\Delta C_{ACTUAL,t}$	=	Actual net GHG removals by sinks, in year *t*; t CO_2-e
$\Delta C_{P,t}$	=	Change in the carbon stocks in project, occurring in the selected carbon pools, in year *t*; t CO_2-e
$GHG_{E,t}$	=	Increase in non-CO_2 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 of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity"; t CO_2-e

Change in the carbon stocks in project, occurring in the selected carbon pools in year *t* were calculated as follows:

$$\Delta C_{P,t} = \Delta C_{TREE\_PROJ,t} + \Delta C_{SHRUB\_PROJ,t} + \Delta C_{DW\_PROJ,t} + \Delta SOC_{PROJ,t}$$

Where:

$\Delta C_{P,t}$	=	Change in the carbon stocks in project, occurring in the selected carbon pools, in year *t*; t CO_2-e
$\Delta C_{TREE\_PROJ,t}$	=	Change in carbon stock in tree biomass in project in year *t*; t CO_2-e
$\Delta C_{SHRUB\_PROJ,t}$	=	Change in carbon stock in shrub biomass in project in year *t*; t CO_2-e
$\Delta C_{DW\_PROJ,t}$	=	Change in carbon stock in dead wood in project in year *t*; t CO_2-e
$\Delta SOC_{PROJ,t}$	=	Change in carbon stock in the soil organic carbon (SOC) pool within the project boundary, in year *t*; t CO_2-e

According to section 3.2 of the registered VCS PD, carbon pools considered for the project is above ground biomass, below ground biomass and soil organic carbon.

4.2.2.1. Estimation of the changes in carbon stocks in tree biomass: $\Delta C_{TREE\_PROJ,t}$

Section 4.2 of VCS MR describe the method followed for estimation of change in carbon stock in tree biomass by using A/R methodological tool "estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" (Version 04.2). 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. Further, for ex-post calculation, data from the permanent sample plots were used for the estimation of changes in carbon stocks in tree biomass and the mean carbon stock in trees biomass per hectare was estimated by using the below equation:

$$C_{TREE} = \frac{44}{12} \times CF_{TREE} \times B_{TREE}$$

were

$$B_{TREE} = A \times b_{TREE}$$

$$b_{TREE} = \sum_{i=1}^{M} w_i \times b_{TREE,i}$$

Where;

C_{TREE} = Carbon stock in trees in the tree biomass estimation strata; tCO_2e

CF_{TREE} = Carbon fraction of tree biomass; t C (t d.m.)$^{-1}$ A default value of 0.47 was used as per the methodology

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 ($wi = A_i/A$); dimensionless

$b_{TREE,i}$ = Mean tree biomass per hectare in stratum *i;* t d.m. ha^{-1}

For estimating mean tree biomass per hectare in each stratum ($b_{TREE,i}$) PP has used the guidelines from A/R CDM Tool 14, V.4.2 "Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities (Version 01.0.0)". Though VCS PD mentions of developing allometric equation by using the actual field measurements, however, due to lack of enough data generated in this monitoring period, PP has adopted a more project specific equation given in the published literature "Carbon sequestration by mangrove plantations and a natural regeneration stand in the Ayeyarwady Delta, Myanmar" /64/ by Ya Min Thant, Mamoru Kanzaki, Seiichi Ohta from Kyoto University and Maung Maung Than (DFID program, British Council). This study was published in the journal TROPICs by Japan Society of Tropical Ecology. RINA audit team verified the appropriateness of the above published work and found suitable for the project context and hence accepted for ex-post estimation.

Thus by using the method adopted in the above published work, the total aboveground and belowground biomass was calculated by following the below equation:

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

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

Where:

DBH = Diameter at breast height; cm

H = Height (m)

ρ = Wood density (km/m^3)

During site visit RINA team has cross checked DBH and Height of trees present in the permanent sample plots by visiting 23 PSPs and confirmed that the values used for mean carbon stock estimation are applied conservatively. Further all the input values given in the VCU calculation spread sheet are in conformity with the monitored parameters given in section 3 of VCS MR. The table below shows the final value of total carbon stock obtained from tree biomass

		Area planted in year t; ha	**Change in the carbon stock in project, occurring in the selected carbon pools, in year t; tCO2-e**
Year	**t**	$A_{PLANT,t}$	$\Delta C_{P,t}$
2015-2016	1	194.71	5523
2016-2017	2	129.54	9068
2017- 2018	3	377.28	20701

4.2.2.2 Estimation of the changes in carbon stocks in shrub biomass:

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

4.2.2.3. Estimation of the changes in carbon stocks in dead wood:

Deadwood is expected to remain in the project area, which are subjected to tidal influence. They are not removed from the project site. Therefore, carbon stock in this pool is assumed not to increase under a conservative approach.

4.2.2.4. Estimation of the changes in carbon stocks in soil organic carbon (SOC $\Delta SOC_{PROJ,t}$

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

$$\Delta SOC_{PROJ,t} = \frac{44}{12} \times \sum_{t=1}^{t} A_{PLANT,t} \times dSOC_t \times 1\ year$$

Where

$\Delta SOC_{PROJ,t}$	=	Change in SOC stock within the project boundary, in year *t*; t CO_2-e
$A_{PLANT,t}$	=	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 of is used, unless transparent and verifiable information can be provided to justify a different value:

(i) $dSOC_t$= 0.50 t C ha^{-1} 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 t C ha^{-1} yr^{-1} for $t > t_{PLANT}$ +20.

As per the registered VCS PD, estimation of SOC pool is carried out by using a site specific value for $dSOC_{t,}$ which is based on a research work conducted by University of Pathein. There were more than 84 samples analysed as part of this research. 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. Further PP has provided evidences of publishing these information in international journals/76/. RINA evaluated these findings and confirm that the chosen value for SOC estimation is appropriate for the project context and hence accepted. The following table gives the value of change in carbon stock from soil organic carbon obtained from the project activity.

		The rate of change in SOC stocks within the project boundary, in year t; t C ha 1 yr 1	**Area planted in year t; ha**	**Change in SOC stock within the project boundary, in year t; t CO2 e**
Year	**t**	$dSOC_t$	$A_{PLANT,t}$	$\Delta SOC_{PROJ,t}$
2015-2016	1	7.32	194.71	5228
2016-2017	2	7.32	324.24	8706
2017- 2018	3	7.32	701.52	18835

4.2.3. Leakage

As discussed in the registered VCS PD, the emissions due to leakage is considered as zero, since most of the project area belongs to salt marshes, and grazing is not possible to occur in such lands. Hence there are no associated leakage emissions due to the implementation of project activity.

4.2.4. Net GHG Emission Reductions and Removals

As per the registered VCS PD, the net anthropogenic GHG emission reductions and removals were calculated using equation 6 of the methodology AR-AM0014:

$$\Delta C_{AR-CDM,t} = \Delta C_{ACTUAL,t} - \Delta C_{BSL,t} - LK_t$$

Where:

$\Delta C_{AR-CDM,t}$	=	Net anthropogenic GHG removals by sinks, in year *t*; t CO_2-e
$\Delta C_{ACTUAL,t}$	=	Actual net GHG removals by sinks, in year *t*; t CO_2-e
$\Delta C_{BSL,t}$	=	Baseline net GHG removals by sinks, in year *t*; t CO_2-e
LK_t	=	GHG emissions due to leakage, in year *t*; t CO_2-e

RINA audit team has verified the VCU calculation excel sheet and confirm that the input value used are appropriate and are in conformance with the values given in section 3 of VCS MR. There were no manual transposition errors occurred between the data sets and the procedure used for calculation are transparent. Further RINA confirms that Net anthropogenic GHG removals calculated are correct and are in accordance with the registered VCS PD and applied methodology. The following are the values of Net GHG emission reductions or removals (tCO_2e) resulted from the project activity during this verification period.

Year	Baseline net GHG removals by sinks (tCO_2e)	Actual net GHG removals by sinks (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
Year 1	0	5,523	0	5,523
Year 2	0	9,060	0	9,060
Year 3	0	20,688	0	20,688
Total	0	**35,271**	0	**35,271**

4.3 Quality of Evidence to Determine GHG Emission Reductions and Removals

During the verification site visit, all relevant documents were checked to assess the correctness and quality of data submitted by the project participants, which are used to determine emission reductions. DBH and H of the trees were checked during the site visit, which was further cross checked with Field measurement data and Emission Reduction spread sheets. The no. of trees planted were also cross checked with stock registry and the purchase receipts. The provided data was found to be of adequate quality with no errors, moreover the data was found to be conservative.

All records needed for monitoring are archived in line with the requirements of the registered monitoring plan. No significant, lack of evidence and missing data were detected during onsite verification. Hence, the verification team confirms that the monitoring system ensures required quality of the monitored data. All internal data are subjected to QA/QC measures. All the roles and responsibilities for monitoring and reporting have been clearly defined. Based on document review /68/ and interview, it was found that the management and operational structure is in line with that stated in the registered monitoring plan.

It is also confirmed that the measurement instruments used in the verification doesn't require calibration. More information on the calibration requirements are provided in section 3.2 of the MR. The same was checked /71/ and accepted by RINA team.

It was verified through onsite interviews that the field team involved in the monitoring of project activity were well experienced and further trained on the measurement and recording procedures /70/. Hence, the verification team concludes that competent field staff has been employed by the project proponent to carry out the relevant tasks with sufficient accuracy.

RINA is of the opinion that this method of estimation is accurate and results in conservative estimation of emission reduction and is in line with the applicable VCS requirements.

4.4 Non-Permanence Risk Analysis

The proposed 'Reforestation and Restoration of degraded mangrove lands, sustainable livelihoods and community development in Myanmar' utilized the AFOLU Non-Permanence Risk tool: VCS Version 3.2 to assess the risk according to internal risk, external risk, natural risk, and mitigation measures for minimizing risk. At all levels, the Verification team evaluated the rationale, appropriateness, and justifications of risk ratings chosen by project proponents. The audit team confirmed that the non-permanence assessment has been carried out adequately and applying conservative assumptions wherever needed. Each risk factor was thoroughly assessed for conformance.

The Audit Team has carefully evaluated the Risk Assessment Excel sheet provided by the PP and confirmed against each of the risk factors in each category and sub-category of the AFOLU VCS Risk Tool (Ver.3.3) i.e. as set out in Sections 2.2 (internal risks), 2.3 (external risks) and 2.4 (natural risks), and also verified the assigned risk score for each risk factor. The calculation formulas and justification followed by the PP in each table to determine the risk rating for the sub-category and category is hence verified. The risk factor of Internal and external risk for the project activity for this monitoring period represents the zero and four rating respectively while the Natural risk associated with the proposed project instance is 3.5 considering each of the Natural Risk such as Fire, Pest & Disease outbreak, Extreme weather, Geologic Risk and other natural Risk. The audit team also evaluated the significance & mitigation measures proposed by the PP in order to minimize these Natural risks.

The Non-Permanence Risk Report (Version 2.0) which was prepared in November 2017 has been used as the base report to monitor the parameters related to non-permanence risk. There have not been any changes hence the risk rating of 10% is applicable for this monitoring period. In summary, the overall risk rating that was determined for the project, in accordance with the Risk Tool, is 10%. Accordingly, 3,527 buffer credits are needed to be deposited into the AFOLU pooled buffer account. The audit team has concluded that the above risk rating is in conformance with the VCS rules.

5 SAFEGUARDS

5.1 No Net Harm

The proposed project is reforestation and restoration project and there are no negative environmental or socio-economic impacts due to the project activity. This was confirmed by interviewing the local stakeholders, the chairman and the village leaders of the respective village tracts, where the project is implemented /47/. In fact, the project will lead to positive impacts like low income families in the area will get more opportunities to increase their income, new employment opportunities, knowledge in mangrove plantation infrastructure development and change in life style of local villagers.

5.2 Local Stakeholder Consultation

During the site visit, RINA team interacted with local stakeholders and it is checked that the local stakeholders does not have any negative comments on the projects. It was also noted that PP has identified ongoing stakeholders' grievance mechanism throughout the project implementation as well as for the whole crediting period of the project. Section 2.4.2 of the MR confirms that the representatives of the university of Pathein were responsible for handling the complaints on Magyi area and the chief of village tract committee were responsible for handling the complaints of Thabawkan and Thaegone area supported by the staff of World View International Foundation. Rina team cross checked with the stakeholders and it is confirmed that the villagers are aware of the grievance mechanism and contact details of the personnel to handling the complaints.

6 VERIFICATION CONCLUSION

RINA Service Spa (RINA) has performed verification of the emission reductions reported for the project activity "Reforestation and Restoration of degraded mangrove lands, sustainable livelihoods and community development in Myanmar", VCS Registry Project ID 1764, for the period 15/06/2015 to 14/06/2018, with regard to the relevant requirements for VCS activities. The project participants of the "Reforestation and Restoration of degraded mangrove lands, sustainable livelihoods and community development in Myanmar" project are responsible for:

- the preparation of greenhouses gas emissions data and the reported greenhouse gas emission reductions from the project on the basis set out in the monitoring plan contained in the registered VCS PD, version 3.0 of 19/12/2018.

- the development and maintenance of records and reporting procedures in accordance with that plan, including the calculation and determination of greenhouse gas emission reductions of the project.

It is the responsibility of RINA to express an independent verification opinion about the project's conformity with the requirements of VCS Standard version 3.7 and GHG program applied, on the reported greenhouse gas emission reductions from the project.

Based on documented evidence and corroborated by an on-site assessment RINA can confirm that:

- the project has been implemented and operated as per the registered VCS-PD;
- the monitoring report and other supporting documents provided are complete and verifiable and in accordance with the applicable VCS Standard version 3.7 requirements;
- a monitoring plan is in place as per the applied baseline and monitoring methodology;
- the monitoring plan in the registered VCS-PD is as per the applied baseline and monitoring methodology.

It is RINA's opinion that the GHG emission reduction stated in the monitoring report version 2.0 of 22/09/2018 for the "Reforestation and Restoration of degraded mangrove lands, sustainable livelihoods and community development in Myanmar" for the period 15/06/2015 to 14/06/2018 are fairly stated. The GHG emission reductions were calculated correctly on the basis of the approved large scale CDM methodolgy AR-AM0014 Version 3.0 "Afforestation and reforestation of degraded mangrove habitats", dated 04/10/2013 and the monitoring plan contained in the registered VCS-PD.

Hence RINA is able to certify that the emission reduction from the project during the monitoring period 15/06/2015 to 14/06/2018 is amount to.

Verification period: From 15/06/2015 to 14/06/2018.

Verified GHG emission reductions and removals in the above verification period:

Year	Baseline emissions or removals (tCO_2e)	Actual net GHG removals by sinks (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2015-2016	0	5,523	0	5,523
2016-2017	0	9,060	0	9,060
2017- 2018	0	20,688	0	20,688

Total	0	**35,271**	0	**35,271**

The risk rating that was determined for the project, in accordance with the VCS Non-Permanence Risk Tool, is 10%. The audit team has concluded that the above risk rating is in conformance with the VCS rules and the buffer credits foreseen in the proposed project activity are 35,271 x 10% = 3,527 tCO_2e. The yearly break-up of the VCUs (rounded off) after deducting the buffer credits is given in the following table:

Year	Net GHG emission reductions or removals (tCO_2e)	No. of Buffer credit (@10%) (tCO2e) (Rounded off)	No. of VCUs to be issued (tCO2e)
2015-2016	5,523	552	4971
2016-2017	9,060	906	8154
2017- 2018	20,688	2068	18620
Total	**35,271**	3527	31,744

Thus after deducting the buffer credits, the total emission reduction for the monitoring period from 15/06/2015 to 14/06/2018 is 31,744 tCO_2e

APPENDIX A: ABBREVIATIONS

Abbreviations	Full texts
BE	Baseline Emissions
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM M&P	Modalities and Procedures CDM
CER(s)	Certified Emission Reduction(s)
CH4	Methane
CR	Clarification Request
CO2	Carbon dioxide
CO2e	Carbon dioxide equivalent
COD	Chemical Oxygen Demand
CRT	Coordination and Technical Control Staff
DBH	Diameter at Breast Height
DCI	Certification Division of RINA Services Spa
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
EF	Emission Factor
ER	Emission Reductions
FAR	Forward Action Request
GHG(s)	Greenhouse gas(es)
GIS	Geographical Information System
GPS	Geographical Positioning System
GWP	Global Warming Potential
H	Height
IPCC	Intergovernmental Panel on Climate Change
LoA	Letter of Approval
MoV	Means of Verification
MR	Monitoring Report
NGO	Non-governmental Organization
ODA	Official Development Assistance
PDD	Project Design Document
PE	Project Emission
PP(s)	Project Participant(s)
Ref.	Document Reference
RINA	RINA Services Spa

SOC	Soil Organic Carbon
SS(s)	Sectoral Scope(s)
TA(s)	Technical Area(s)
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
VCS PD	Verified Carbon Standard Project Document
VCU	Verified Carbon Unit
VER	Voluntary Emission Reductions
VVS	Validation and Verification Standard

APPENDIX B: CLARIFICATION REQUESTS, CORRECTIVE ACTION REQUESTS AND FORWARD ACTION REQUEST

Table 1. FAR from the previous validation

FAR ID	01	**Section no.**	2.5.1	**Date:** 15/08/2018
Description of FAR				
As per the methodology, (Equation no.2) change in carbon stock in tree biomass in project in year t, shall be estimated by using the tool, “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”; t CO2-e. and “Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities (Version 01.0.0). The tool states that, for ex ante estimation of aboveground tree biomass in project scenario, any allometric equation can be used. Accordingly, PP has used an allometric equation given in Sukardjo & Yamada (1992). However, for ex-post estimation, PP has 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. Further, in Section 3.2 of VCS PD, PP states that for ex-post estimation of project emission, such allometric equation will be developed using the continued research data and research personal and using the permanent sample plots that have been set up within the project. In view of the above, PP is requested to publish these research findings in peer-reviewed journals in order to ascertain that, the data or parameters used are correct and appropriate for the project circumstances.				
Project participant response				**Date:** 22/09/2018

According to Tool 14, V.4.2 the tool "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."

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 allomatric equations will be developed using the continued research data and research personal and using the permanent sample plots that have been set ups.

However it was found that there were not enough data for the 3 year period to develop its own allometric equation. 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.jstage.jst.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 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 - $\mathbf{W_{Top} = 0.22\ \rho\ (DBH^2H)^{0.82}}$

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

Where:

DBH = Diameter at breast height; cm

H = Height (m)

ρ = Wood density (km/m^3)

The above assessment was conducted in Ayeyarwady Delta. The VCS project is also implemented in the Ayeyarwady Delta. Assessment by Ya Min Thant et al. was conducted for 6-7 year old mangroves hence the equation is well fitted for the estimation between 1-7 year old. The mangroves in the project were planted in 2015 hence the equation is well suited within the time period.

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 PP 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. Owing to the reason that Myanmar is a Least Developed Country (LDC) and data availability is always a constraint, PP has used the best available allometric equation to conservatively calculate ex-post reductions.

Documentation provided by project participant	
Document "Ya Min Thant et al. 2012 - Carbon sequestration by mangrove plantations and a natural regeneration stand in the Ayeyarwady Delta, Myanmar"	
DOE assessment	**Date:** 03/10/2018
It is checked that for ex-post estimation, PP has 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. Since the same is allowed by the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; RINA accepted the same. It is checked that as per the VCS PD~~D,~~ the ex-post calculation will use allometric equations based on the data measured from the permanent sample plots. However, since the three year data was not sufficient to develop the ex-post equation, PP referred to the allomteric equations given in the paper "Carbon sequestration by mangrove plantations and a natural regeneration stand in the Ayeyarwady Delta, Myanmar" published by Ya Min Thant, Mamoru Kanzaki, Seiichi Ohta from Kyoto University and Maung Maung Than (DFID program, British Council), which refers to similar mangrove species as that of the project activity and also refers to the Ayeyarwady Delta , same as that of the project location . It is further noted that the above mentioned paper covers 6 species, out of which only two species are specific to the proposed project. Since no other data is available and being a least developed country the assessment carried by Ya Min Thant et al was accepted in the ex-post allometric equations. Based on the above mentioned justification FAR 1 is closed.	

FAR ID	02	**Section no.**	2.5.1	**Date:** 15/08/2018
Description of FAR				
For the ex-ante estimation of SOC pool, PP has used site specific value for $dSOC_{t.}$. derived from field based data. RINA audit team has evaluated all the research work related to soil carbon estimation and found that the value chosen for the project is relevant. PP has provided transparent and verifiable information to justify that the value used is appropriate to the project context. Hence RINA accepted the chosen value for ex-ante estimation of the changes in carbon stocks in soil organic carbon. However, as per paragraph, 3.2.5 of Validation and Verification manual, ver 3.2, in order to ascertain the validity of the data or parameter provided by PP, it shall be sourced from relevant peer-reviewed journals/literature. Hence PP is requested to use data from such published sources and the same shall be made available during the time of project monitoring and verification.				
Project participant response				**Date:** 22/09/2018

The study team have presented the assessment at the 2nd International Conference on Climate Change organized by the International Institute of Knowledge Management (TIIKM) in collaboration with University of Colombo (Sri Lanka) and Colorado State University (USA). The conference was held on 15th–16th February 2018 in Colombo, Sri Lanka. ICCC 2018 was organized under the theme **"Climate change and global sustainability: Action for bridging the gap"** and was chaired by Dr. Erandathie Lokupitiya, Senior Lecturer of Environmental Science, Department of Zoology, University of Colombo, Sri Lanka.
Documentation provided by project participant
Vanniarachchy, S.A., Aung, H., Kontny, J. (2018) Assessment of Soil Carbon of the Mangroves in Shwethaungyan Area of the Ayeyarwady Region in Myanmar. Proceedings of the 2nd International Conference on Climate Change, Colombo, Sri Lanka LINK: http://climatechangeconferences.com/wp-content/uploads/2018/06/ICCC-2018-Book-of-Abstracts.pdf Photo evidence provided presenting the paper at the 2nd International Conference on Climate Change

DOE assessment	**Date:** 03/10/2018
It is checked that the soil carbon assessment results of the project area was presented at the 2nd International Conference on Climate Change organized by the International Institute of Knowledge Management (TIIKM) in collaboration with University of Colombo (Sri Lanka) and Colorado State University (USA). The book of Abstracts of 2nd International Conference on Climate Change, 2018 document is publicly available document. FAR 2 is closed.	

FAR ID	03	**Section no.**	2.5.1	**Date:** 15/08/2018
Description of FAR				
To address the project management risk, PP has provided MoU signed between WIF and University of Pathein for Magyi area. This MoU specifies WIF's role in managing the project manangement risk. However for Thabawkan and Thaegone area, there are no such agreements in place, though there are MoUs with village tract chairman for using the area for reforestation project.				
Project participant response				**Date:** 22/09/2018

The Operational Management structure for all 3 village areas provided as evidence.

The Government of Myanmar provided the Thabhawkan and Thaegone village tracts land areas to restore using the letter No: 500/5-4 (1592)/ Government (Ayeyarwaddy) dated 10th April 2017.

Similar to the MoU between Pathein University and WIF, the MoUs between WIF and 2 village tract committees (Thabawkhan and Thaegone) mention that WIF will support the restoration with the two village tract committees. The Operational Management structure was prepared by the Manging Director of WIF and shall govern the operations of the project.

Documentation provided by project participant

1. 10_April_2017 Thaegone & Thabowkan Land Permission from Gov to each Village tract M-Version
2. 10_April_2017 Thaegone & Thabowkan Land Permission Notarial from Gov to each Village tract
3. Agreement between Thaegon Village tract and WIF
4. Agreement between Thabawkan and WIF
5. "Quality Assurance and Quality Control" document

DOE assessment	**Date:** 03/10/2018

The agreement copies from Government of Myanmar (Ayeyarwaddy), dated 10/04/2017 are in place allocating the land areas to Thabhawkan and Thaegone village tracts. Further there are agreements between village tract and WIF for the proposed VCS project development. Thus, it is WIF's responsibility to manage the project management risk, which is also made transparent in the organizational structure provided separately for Magyi area and the two village tracts.

FAR 3 is closed.

FAR ID	04	**Section no.**	2.5.1	**Date:** 15/08/2018

Description of FAR

The area under the Pathein University considered for the VCS project is 737.04 ha. However the document from the Regional Ministry of Agriculture, Livestock , Natural Resource & Environment, confirms that 728 ha of land handed over to Pathein University that doesn't have forest, dated 18/05/2017. During the site visit, PP confirmed that the MoU signed between WIF and Pathein university was for 785 Ha, and they have applied for an extension of areas with the Regional Ministry of Agriculture, Livestock, Natural Resource & Environment . The same was also confirmed by the representatives from Pathein Univesrity. RINA closed the CL based on the ammended MoU ad site visit inteviews. However, PP is requested to provide the ammended document from the Regional Ministry of Agriculture, Livestock , Natural Resource & Environment: to confirm that 785 ha or at least 737.04 ha land was handed over to Pathein University that doesn't have forest, The same needs to be checked during the first verification.
Project participant response **Date:** 22/09/2018
The Myanmar Government has provided Pathein University (UoP) a land area of 1815.49 acre (734.7 ha) using the letter No: 300 / 1-12/ Government (Ayeyarwaddy) (9/2014) dated 12th May 2014. This is the original land area given by Myanmar Government to Pathein University. Although during later stages of the project, WIF and UoP signed MoUs for extension of project areas in Magyi, the final area recognized by all parties (Government, UoP and WIF) is 1815.49 acre (734.7 ha). Hence the project area for Magyi was revised to have an area lesser (701.5 ha or 1733.44 acres) than the total area given to UoP by the Government. Justification done in the MR Section 2.2.2.
Documentation provided by project participant
12_May_2014 Pathein Land Permission from Gov to Pathein University M-Version 12_May_2014 Pathein Land Permission Notary from Gov to Pathein Univesity
DOE assessment **Date:** 03/10/2018
As per the discussions during the site visit, the actual land allocated to pathein university from the goverment is only 1815.49 acre (734.7 ha) and there were no further revisions in this land area. The same was checked and confirmed with the letter No: 300 / 1-12/ Government (Ayeyarwaddy) (9/2014) dated 12/05/2014. FAR 04 is closed.

Table 2. CL from this verification

CL ID	01	**Section no.**	3.3	**Date:** 15/08/2018
Description of CL				

The following project description deviations has been noticed. PP is requested to clarify and justify the same with evidences. 1. Implementation of the project: Deviation has been noticed in the total area of plantation in the Magyi area. As per the registered PDD , the area is 737.04 ha and as per the MR it is 701.5 ha. Also PP is requested to submit the revised project boundary files. 2. As per the PDD, in Magyi area the plantation activities were supposed to start in the year 2015 and to be completed by 2017. However, as per the MR, the plantation activities in Magyi area was completed only by July 2018. It was also noticed that the other two areas that is Thabawkan and Thaegone , the plantation activities were supposed to start in 2017. However, the same is not yet carried out. 3. Noticed that the equation used for the total biomass tree calculation ex-post is different from the regsitered PD. 4. It is also noticed there is an inconsistency in the project entities discussed in the registered PD and the in the MR. Exclusions needs to be justified. 5. Noticed change in Sustainable development contributions with reference Economic criteria.

Project participant response	**Date:** 22/09/2018

1. Although it was planned to plant 737.04 ha in Magyi, during the planting period it was found that an area of abandoned shrimp pond area was not suitable for mangrove planting. Further PP had to follow the original land area provided by the Government to UoP. Hence the area had to be removed from the original planting area. This area will NOT be planted in the future too. Revised project boundaries submitted.

2. As per the MR, the planting in Magyi was done by 2017 (but in the PDD it was supposed to conduct planting between 2015-2018). However the area planted in each year 2015, 2016 and 2017 differed from the PDD due to plantation differentiations of mobilizing funding, planting material and staff. Further due to factors such as mobilizing funding, planting material, involvement of local communities for planting had an impact in delaying the planting in Thabawkan and Thaegone. Planting in Thabawkan started in 2018.

3. The equation used for the ex-ante calculation was a regional equation. At the time when the project was developed, only estimate diameter at breast height (DBH) values were available. There was a difficulty in finding height estimations. A research done by Sukardjo & Yamada (1992) on mangroves species in Indonesia seems to be most plausible equation. Results on this equation and results from field measurements gave similar results thus proving that this equation is the most plausible for ex-ante estimations. It was decided to use site-specific or at least area-specific equations to estimate biomass for ex-post calculations and was clearly mentioned in the PDD. As explained in FAR 01, it was found that there were not enough data for the 3 year period to develop its own allometric equation. 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.jstage.jst.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 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 - $\mathbf{W_{Top} = 0.22\ \rho\ (DBH^2H)^{0.82}}$

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

Where:

DBH = Diameter at breast height; cm

H = Height (m)

ρ = Wood density (km/m^3)

4. In the PDD, Prime Carbon Co Ltd was mentioned as the AFOLU carbon project development specialist and Suraj A. Vanniarachchy was the contact person. During the monitoring, Suraj joined WIF as the AFOLU carbon project development specialist hence Prime Carbon Co Ltd was removed from the MR.

5. Noticed change in Sustainable development contributions with reference Economic criteria – During the period where the VCS PD was prepared and the Monitoring Report was done, PP identified certain impact drivers of mangrove planting that have links with the UN Sustainable Development Goals (SDGs). Hence they were included in the Monitoring report as an additional section in the Economic criteria.

Documentation provided by project participant	
1. Revised project boundary files “1. Revised boundary for Magyi” 2. Reference for justification of using new equation - Ya Min Thant et al. 2012 - Carbon sequestration by mangrove plantations and a natural regeneration stand in the Ayeyarwady Delta, Myanmar.pdf Evidence for the section linking mangrove restoration and UN SDGs – The paragraph was written after referring number of articles, reports including the following: • Article by IUCN - Can restoring mangroves help achieve the Sustainable Development Goals? https://www.iucn.org/news/forests/201703/can-restoring-mangroves-help-achieve-sustainable-development-goals • MANGROVES – A LIFE-SAVING COASTAL ECOSYSTEM Scaling up protection and restoration for achieving the SDGs – report by BMZ, IUCN, WWF - https://www.bmz.de/de/zentrales_downloadarchiv/themen_und_schwerpunkte/biodiversitaet/Infosheet_BMZ-WWF-Mangroves.pdf • Supporting Monitoring and Implementation of Sustainable Development Goals with Earth Observations (page 22-25) - https://ec.europa.eu/easme/sites/easme-site/files/gepw_plenary_sdgs_plag.pdf	
DOE assessment	**Date:** 03/10/2018

1. As per the discussions during the site visit, the actual land allocated to pathein university from the goverment is only 1815.49 acre (734.7 ha) and there were no further revisions in this land area. The same was checked and confirmed with the letter No: 300 / 1-12/ Government (Ayeyarwaddy) (9/2014) dated 12/05/2014. It was also noted that there was a further decrease in the area to 701.5 ha due to removal of abandoned shrimp pond. Since the land area has reduced from the original, RINA confirms that the change in the area will not impact the baseline, additonality, scale and emission reductions of the project activity. PP has submitted revised project boundary files.

2. it was checked that the plantation activities were not carried out as mentioned in the registered PD due to financial constraints. Since the same does not impact the ER calculations, RINA accepted the deviation.

3. It is checked that for ex-post estimation, PP has 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. Since the same is allowed by the tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”; RINA accepted the same.

4. RINA confirms that the removal of the entity i.e. Prime Carbon Co Ltd will not impact the project activity niether the emission reductions.

5. Economic criteria of the sustainable development conributions were revised based on teh UN SDGs. The same was accepted by RINA.

CL 1 is closed based on the above mentioned justification.

CL ID	02	**Section no.**	4.1	**Date:** 15/08/2018
Description of CL				

1. Accuracy of the instruments used and the calibration methods/requirements for these instruments used in the measurements is not transparent in the MR.

2. Provide the training records of team members trained on GIS, GPS applications and forest inventory procedures, especially with respect to taking measurements of DBH of tree.

3. n_i: Include the sample plots, covered only for this monitoring period. Also submit the KML file showing the location of all the sample plots

4. *DBH*: PP is requested to provide the average values. Further, during the site visit it was noted that the filed measurements carried out differs from the procedures mentioned in the MR. PP is requested to follow the forest inventory procedures for the measurements of DBH and also provide copy of the same to RINA team.

   QA/QC procedures are not transparent on the methods to cross check the field measurements carried out by the field staff.

   During the site visit, calliper was used. However, the MR and registered PD states diameter tape.

5. PP is requested to provide 2 separate O&M structure for Magyi and Thabawkan/Theagone areas.

Project participant response	**Date:** 22/09/2018

1. Instruments used for measurement are the Caliper, Diameter tape for diameter and Measuring Tape, PVC pole or bamboo stick to measure the height. The instructions followed by WIF is attached. Also a list of equipment are provided in a table in Section 3.2.

2. WIF conducted a training for the staff on the application of forest inventory procedures. This included identifying sample plots using GPS, mearing the diameter of trees with different shapes etc. the training was done by Mr. Win Maung who has over 30 years experience in mangroves. The staff are graduates from University of Forestry. This university is the only university in Myanmar specialized in Forestry and offers a 5 year Bachelor of Science degree program. Therefore the staff have also experience in forest mensuration through their intense training received during the university period.

3. Only the sample plots covered for this monitoring period included. KML file showing the locations also provided.

4. Average values of DBH and height provided. The PD states of using the diameter tape. However, 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 (D_{10}). As mentioned in the document "Field Guidance on growth measurements of mangroves" the Diameter of *Rhizophora* spp. was done taking the measurement at the 1st prop root is visible. Page 71 of the PD states that "For the initial verification, until the trees reach a height beyond 1.3 m, D30 or the basal diameter is measured and recorded." Therefore, PP has not deviated from the original method of measuring diameter.

5. Provided. Project Director shall select 50% of the data sheets and cross-check with actual field measurements before sending the data to the Managing Director. Managing Director, upon receiving the data sheets, shall select 25% of the sheets, cross-check with the actual field measurements during his visit to the site before signing the data sheets as true-sheets. This shall minimize the errors during data measurement and entering.

The document titled "Taking Growth Measurements of Mangrove Trees Manual Book" was developed by WIF based on International guidelines and documents.

Documentation provided by project participant

1. Taking Growth Measurements of Mangrove Trees Manual Book V.2.0
2. WIF Training on Forest Management.pdf in Myanmar language
3. WIF Training on Forest Management – English translation
4. Location of 23 Sample plots titled "Sample plot KMZ"
5. Excel file titled "Estimated growth values for sample plots"
6. Organization Management Structure & Quality Assurance and Quality Control V.2.0.pdf

DOE assessment	**Date:** 03/10/2018

1. Accuracy of the instruments and their calibration details are made transparent in section 3.2 of the MR.

2. Training records on the measurement methods and forest management procedure checked along with the list of participants. The records show that field staff was given training on 5/12/2017, which is before the actual field measurements taken for ER calculations. Thus, accepted by RINA.

3. The permanent sample plots revised as per the areas considered in the current monitoring period. Also, the kml files of the sample plot are provided by PP.

4. The revised MR provides average DBH values. Further it is checked that the measurements follow the document titled "Taking Growth Measurements of Mangrove Trees Manual Book" was developed by WIF, which is based on the forest inventory procedures. Since for plants below 1.3 m practically it is difficult to measure diameter using the diameter-tape. A calliper was used to measure the basal diameter (D_{10}) and the Diameter of *Rhizophora* spp. was done taking the measurement at the 1st prop root is visible. Since the same is as per the forest inventory procedures. RINA accepted the justification provided by PP.

5. Organization Management Structure & Quality Assurance and Quality Control V.2.0.pdf for both the areas provided . Checked and accepted.

CL 2 is closed based on the above mentioned justification.

CL ID	03	**Section no.**	4.2	**Date:** 15/08/2018
Description of CL				
The ER spread sheets is not transparent on how the survival rate is taken in to account. PP is requested to provide the stock registry to support the no. of plants planted. Further to cross check the same, PP is requested to provide the invoice receipts or payments receipts.				
Project participant response				**Date:** 22/09/2018
Survival Rate: Based on the survival rate counts in the 23 sample plots, a 95% survival rate have been calculated. Hence a rate of 91% was used in the calculations. Revised ER Spread sheet provided (Refer sheet: Growth Data). Stock registry provided.				
Documentation provided by project participant				

Planting Inventory PDF file Planting_inventory_WIF Excel file Receipt for buying mangrove seeds 20 March 2015 VCU calculations MM for Verification 2015-2017 V 1.1 WIF.xlsx
DOE assessment **Date:** 03/10/2018
ER spread sheets are now made transparent on the survival rates. The same is also accounted in the ER calculations, which was further cross checked with filed measurement data and RINAs cross check at the field. The data used by the PP is found to be conservative and hence accepted. Stock registry provided by WIF was cross checked with the planting inventory and the purchase receipt. The same is found to be in order, hence accepted by RINA. CL 3 is closed based on the above justifications.

Table 3. CAR from this verification

CAR ID	01	**Section no.**	5.2	**Date:** 15/08/2018
Description of CAR				
The MR is not transparent on the ongoing methods to address the local stakeholder's comments. PP is requested to provide the grievance mechanism method and details.				
Project participant response				**Date:** 22/09/2018

Apart from the stakeholder consultation meetings held at the time of the VCS PD was developed and validated, PP has its office in Magyi where any stakeholder could come and make a complaint or suggestion. Prof. Htay Aung from the Pathein University visits the office twice a month to record these comments. As a representative of Pathein University, he is responsible for taking the comments and discussing them with UoP and WIF.

Complaints/ suggestions that are able to handle at local office shall be discussed with the local team led by Mr. Win Maung. For higher decision making, the Rector of Pathein University and Dr. Arne of WIF will be involved. For Thabawkan and Thaegone, the chief of village tract committees will also be responsible for recording the complaints, suggestions regarding the project and report to Mr. Win Maung and Dr Arne from WIF. Telephone numbers of Prof. Aung and Mr. Win Maung have been given to the local communities to be contacted.

Any comments, complaints, grievances in relation to the general implementation of the project shall be as a first stage reported by phone or in writing to the WIF office in Magyi.

Contact person by email: htayaungpathein@gmail.com
Contact person by phone: Prof. Htay Aung
Office phone: +95-9970530946

In the case of grievances reported by phone, a grievance note will be 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, above details will be recorded.

WIF will respond in writing to any claimant within 15 days and take 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 will be 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.

WIF country office:

#70, Yaw Min Gyi Street, Dagon Township, Yangon

This grievances mechanism will be shared during all consultation meetings.

Documentation provided by project participant	
Revised MR.	
DOE assessment	**Date:** 03/10/2018

During the site visit , RINA team interacted with local stakeholders and it is checked that the local stakeholders does not have any negative comments on the projects. It was also noted that PP has identified ongoing stakeholders grievance mechanism throughout the project implementation as well as for the whole crediting period of the project. Section 2.4.2 of the MR confirms that the representatives of the university of Pathein were responsible for handling the complaints on Magyi area and the chief of village tract committee were responsible for handling the complaints of Thabawkan and Thaegone area supported by the staff of World View International Foundation. Rina team cross checked with the stakeholders and it is confirmed that the villagers are aware of the grievance mechanism and contact details of the personnel to handling the complaints.

CAR 1 is closed.

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CERTIFICATO DI QUALIFICA PER GLI SCHEMI VOLONTARI*
*QUALIFICATION CERTIFICATE FOR VOLUNTARY SCHEMES**

Si attesta che il sig./sig.ra:
We declare that Mr/Mrs/Ms: **Rekha Menon**

è qualificato come:
is qualified as: **TEC, VAL, VER, TL, ITRP**

per le seguenti aree tecniche:
for the following technical areas:

AREE TECNICHE *TECHNICAL AREAS*	DESCRIZIONE DELL'AREA TECNICA *TECHNICAL AREA DESCRIPTION*	SCOPO SETTORIALE *SECTORAL SCOPE*
1.2	Renewables	1
2.1	Electricity distribution	2
13.1	Solid waste and wastewater	13
13.2	Manure	13
14.1	Afforestation and reforestation	14

REVISIONE *REVISION*	DATA *DATE*	MOTIVAZIONI PER LA REVISIONE *REASON FOR THE REVISION*
0	19/07/2016	First issue with new template (this certificate is linked to CDM qualification)

Responsabile di schema
Scheme Leader
Rita Valoroso

*SCHEMI VOLONTARI/ VOLUNTARY SCHEMES: ACR American Carbon Registry, CCB The Climate, Community & Biodiversity Alliance, GS Gold Standard, JI Joint Implementation, SCS Social Carbon Standard, VCS Verified Carbon Standard.

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*QUALIFICATION CERTIFICATE FOR VOLUNTARY SCHEMES**

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è qualificato come: / *is qualified as:* **TEC**

per le seguenti aree tecniche:
for the following technical areas:

AREE TECNICHE *TECHNICAL AREAS*	DESCRIZIONE DELL'AREA TECNICA *TECHNICAL AREA DESCRIPTION*	SCOPO SETTORIALE *SECTORAL SCOPE*
1.2	Renewables	1
2.1	Electricity distribution	2
13.1	Solid waste and wastewater	13
13.2	Manure	13
14.1	Afforestation and reforestation	14

REVISIONE *REVISION*	DATA *DATE*	MOTIVAZIONI PER LA REVISIONE *REASON FOR THE REVISION*
0	19/07/2016	First issue with new template

Responsabile di schema
Scheme Leader
Rita Valoroso

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GHG_QUAL_CERT_EN_07_16 Voluntary(Certificate) Page 1 of 1

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*QUALIFICATION CERTIFICATE FOR VOLUNTARY SCHEMES**

Si attesta che il sig./sig.ra: / *We declare that Mr/Mrs/Ms:* **Hui Feng Liu**

è qualificato come: / *is qualified as:* **TEC, VAL, VER, TL, ITRP**

per le seguenti aree tecniche:
for the following technical areas:

AREE TECNICHE *TECHNICAL AREAS*	DESCRIZIONE DELL'AREA TECNICA *TECHNICAL AREA DESCRIPTION*	SCOPO SETTORIALE *SECTORAL SCOPE*
1.1	Thermal energy generation	1
1.2	Renewables	1
8.1	Mining and mineral processes	8
9.2	Iron, steel and Ferro alloy production	9
13.1	Solid waste and wastewater	13

REVISIONE *REVISION*	DATA *DATE*	MOTIVAZIONI PER LA REVISIONE *REASON FOR THE REVISION*
0	19/07/2016	First issue with new template (this certificate is linked to CDM qualification)

Responsabile di schema
Scheme Leader
Rita Valoroso

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*QUALIFICATION CERTIFICATE FOR VOLUNTARY SCHEMES**

Si attesta che il sig./sig.ra:
We declare that Mr/Mrs/Ms: **Daria Maso**

è qualificato come:
is qualified as: **TEC, FIN-EXP**

AREE TECNICHE *TECHNICAL AREAS*	DESCRIZIONE DELL'AREA TECNICA *TECHNICAL AREA DESCRIPTION*	SCOPO SETTORIALE *SECTORAL SCOPE*
14.1	Afforestation and reforestation	14
15.1	Agriculture	15

REVISIONE *REVISION*	DATA *DATE*	MOTIVAZIONI PER LA REVISIONE *REASON FOR THE REVISION*
0	26/01/2017	First issue
1	03/05/2017	Update qualification as financial expert

Responsabile di schema
Scheme Leader

Laura Severino

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