Joint Mangrove Reforestation Activities with Department of Marine and Coastal Resources

Description	
Project title	Mangrove Afforestation Project for Carbon Credit Benefit developed by the Department of Marine and Coastal Resources in collaboration with RATCH Group Public Company Limited
Location	- Pak Nam Weru forest reserve, at Moo 5, Ban Nakung, Bangchan Subdistrict, Khlung District, Chanthaburi Province - Pak Nam Weru forest reserve, at Moo 8, Ban E-Mui, Nong Chim Subdistrict, Laem Sing District, Chanthaburi Province - Mangrove forest area per the Cabinet's resolutions dated 22 August 2000 and 17 October 2000, at Moo 7, Ban Thanon-makok, Takat Ngao Subdistrict, Tha Mai District, Chanthaburi Province
Coordinates	Plot Ratch 01 X174887 Y1389632 Plot Ratch 02 X175005 Y1389629 Plot Ratch 03 X195959 Y1367902 Plot Ratch 04 X195864 Y1367843 Plot Ratch 05 X195977 Y1367855 Plot Ratch 06 X196003 Y1367813 Plot Ratch 07 X196046 Y1367770 Plot Ratch 08 X196080 Y1367718 Plot Ratch 09 X196249 Y1367820 Plot Ratch 10 X196369 Y1367765 Plot Ratch 11 X194005 Y1372898 Plot Ratch 12 X194002 Y1372770 Plot Ratch 13 X194051 Y1372713 Plot Ratch 14 X194152 Y1372937 **(Coordinate reference system: UTM Zone 47N)**
Starting date	24 August 2023
Carbon credit calculation period	10 years from 24 August 2023 to 23 August 2033
Project owner/developer	Department of Marine and Coastal Resources
Joint developer	RATCH Group Public Company Limited

Project description and activities

1) Background

RATCH Group Public Company Limited proposed the Department of Marine and Coastal Resources its reforestation plan and collaboration in a scheme under Thailand Voluntary Emission Reduction Program (T-VER), in order to expand Thailand's green areas and carbon sinks and mitigate climate change. In this endeavor, it asked for the allotment of reforestation areas from the Department.

The Department has approved the Mangrove Afforestation Project for Carbon Credit Benefit in collaboration with RATCH Group Public Company Limited, covering the areas of 113.47 rai in Takat Ngao Subdistrict, Tha Mai District; in Bangchan Subdistrict, Khlung District; and in Nong Chim Subdistrict, Laem Sing District in Chanthaburi Province.

2) Location and boundary

The T-VER project at Pak Nam Weru forest reserve encompasses 14 plots of land, covering a total area of 113.17 rai.

3) Ecological condition

The area was degraded following the encroachment by aquaculture farmers (for shrimp farming). After reclaiming the land and finalizing legal persecution against the encroachers, the Department of Marine and Coastal Resources restored its original condition and prepared it for mangrove reforestation. Original plants in this area cover *Rhizophora apiculate, Excoecaria agallocha, Lumnitzera racemosa, Bruguiera cylindrica, Bruguiera gymnorrhiza, Thespesia populnea, Sonneratia caseolaris, Sonneratia ovata, Avicennia alba, Avicennia officinalis, Avicennia marina.*

4) Land use

The Department of Marine and Coastal Resources approved the Mangrove Afforestation Project for Carbon Credit Benefit on the 113.47-rai area in Takat Ngao Subdistrict, Tha Mai District; Bangchan Subdistrict, Khlung District; and Nong Chim Subdistrict, Laem Sing District in Chanthaburi Province.

The generated carbon credits are shared accordingly to the Department of Marine and Coastal Resources' regulation on the Carbon Credit Trading and Benefit Sharing Obtained from Planting and Maintaining Mangrove Forest for the Community B.E.2565. Under this regulation, the T-VER partner/developer is entitled to 90% of benefit sharing while the Department of Marine and Coastal Resources as land owner is provided the remaining 10% carbon credits.

5) Reduction of greenhouse gases caused by deforestation and degradation and carbon storage enhancement at mangrove forests in Chanthaburi Province

The project's emission reduction activities concentrate on Pak Nam Weru forest reserve in Moo 5, Ban Nakung, Bangchan Subdistrict, Khlung District; Moo 8, Ban E-Mui, Nong Chim Subdistrict, Laem Sing District; and Moo 7, Ban Thanon-makok, Takat Ngao Subdistrict, Tha Mai District, Chanthaburi Province.

Of total 113.47 rai, 92 rai (open area and area with sparse trees) is allocated for reforestation while the 21.47-rai area with high concentration of trees will be maintained through a 10-year period. The project is expected to remove 312 tCO_2e of greenhouse gas per year or a total of 3,120 tCO_2e in the period. The project's carbon sequestration activities involve reforestation, maintenance and appropriate management. While trees are planted in Year 1, maintenance activities along with patrols to prevent encroachment and deforestation are rolled out in all 10 years before the calculation of sequestered carbon.

6) Description of T-VER Scheme

Methodology

The project's activities are aligned with the 3 characteristics of activities identified for T-VER Methodology for Afforestation/Reforestation of lands except wetlands (T-VER-P-METH-13-01) under Sustainable Forestation standard, Version 01, Sector 14 –Afforestation and Reforestation, which concern correct tree planting, forest conservation and management.

T-VER project location

The project's reforestation area, covering 14 plots, is in Pak Nam Weru forest area and mangrove forest area designated by the Cabinet's resolutions dated 22 August 2000 and 17 October 2000. To allow data recording, the plots were surveyed and 16 permanent plots were planned (for long-term data tracking).

Sample plots were arranged in random in accordance with the concentration of native trees, classified in 3 categories: open space where native mangroves do not exist; space with low concentration of mangroves; and space with high concentration of mangroves.

Baseline data

Data collected from the sample plots covered types of trees, width and height. Tree tags were attached to measure and put the trees in 2 groups: full-grown trees with height above 1.30 meters and 4.50 centimeters in diameter or more; and saplings with height below 1.30 meters and less than 4.50 centimeters in diameter. (Saplings were not included in the baseline calculation.)

The calculation for carbon sequestration is based on trees' sequestration capacity and the sample plots for baseline calculation are no less than 1% of the 113.47-rai area. Of 16 sample plots that span 1.5625 rai, 4 cover 20x20 meters each (0.25 rai); 8 cover 10x10 meters each (0.0625 rai); and 4 cover 5x5 meters (0.0156 rai). Poles were erected at the corners of each plot.

Baseline =	**Forest with low tree density** [(carbon stocks of trees in project area at initiation (tons of carbon dioxide equivalent)) x entire area (rai)/sample plot area (rai)] + **Forest with high tree density** [(carbon stocks of trees in project area at initiation (tons of carbon dioxide equivalent)) x entire area (rai)/sample plot area (rai)] = [(2.07) (tCO_2e)] X 14.90/0.3750 (rai) + 12.40 (tCO_2e)] X 21.47/0.3750 (rai) = 82.06 + 710.21 tCO_2e = 792.27 tCO_2e

Expected sequestration capacity throughout project period (10 years)

Year	GHG removal/emission from baseline scenario	GHG removal/emission from project activities	Emissions beyond project boundary	GHG Removal/Reduction
t	1	2=1+(t*2.75)*113.47	3	4=2-1-3
1	792.27	1,104.31	-	312
2	792.27	1,416.35	-	624
3	792.27	1,728.40	-	936
4	792.27	2,040.44	-	1,248
5	792.27	2,352.48	-	1,560
6	792.27	2,664.52	-	1,872
7	792.27	2,976.57	-	2,184
8	792.27	3,288.61	-	2,496
9	792.27	3,600.65	-	2,808
10	792.27	3,912.69		3,120
Total (tCO_2e)				**3,120**
No. of years	10			
Annual average (tCO_2e/y)				**312**

Note: (1) Change in carbon stock in mangrove biomass at 0.75t/rai/year means combined carbon sequestration in mangrove biomass at 2.75 tCO_2/rai/year. (Faculty of Forestry, 2011)

(2) Project area = 113.47 rai

7) Monitoring Procedure

The monitoring of changes in carbon stocks from this project include the methodology and frequency as per TGO requirements. Each of the monitoring parameters shall be conducted by specialists or individuals with training on monitoring tools such as global positioning system (GPS) and dendrometers. The parameters requiring monitoring, monitoring methods and frequency are listed below;

Monitoring Table

Item	Activity	Unit	Method
1	Project location in UTM Zone 48N coordinate reference system	meter	GPS, Mapping
2	Project area	rai	GPS, Mapping
3	Areas of sample plots	rai	GPS, Mapping
4	Tree diameter	centimeter	dendrometers
5	Tree height	meter	Height measuring device
6	Risk monitoring 1) Survival rate 2) Land encroachment 3) Disease and pest	time	Survey

Photos of sample plot arrangement and survey for data collection

8) Co-benefits

List of co-benefits	Description
1. Environmental and natural resource co-benefits	
1.1 Air pollution ☑ Improvement in ambient air quality	A number of 59,212 trees are planted in the 113.47-rai area, able to absorb dust and improve the air quality. Each tree can absorb 1.4 kg of dust and $PM_{2.5}$ particles per year. Chanthaburi Province is located in the areas with medium air quality index (AQI) and $PM_{2.5}$ concentration. (Pollution Control Department, 2024). The project's dust absorption capacity is thus estimated at 82,896.80 kg/year.
1.2 Water pollution ☑ Zero discharge of wastewater	The project's wastewater is not discharged to public waterways (Zero Discharge). Researches show mangroves can add oxygen into water and thus purify wastewater. Mangroves also absorb nutrients and contaminants from wastewater, which aid the functions of bacteria. Mangrove reforestation thus improves the quality of water in the project vicinity.
1.3 Emission reduction/Carbon sink enhancement ☑ Increase in green areas through reforestation, conservation, etc. for additional greenhouse gas removal capacity	The project allocates a 92-rai area for the growing of 59,212 trees by SEAMAN Co., Ltd. which are all in the Rhizophoraceae family. Seedlings are planted in a scientifically-approved manner as per the Department of Marine and Coastal Resources' regulation on mangrove planting and maintenance B.E. 2564, hence increasing green and carbon sink areas by 92 rai or the annualized removal of approximately 312 tCO_2e or a total of 3,120 tCO_2e in the 10-year project period.
1.4 Soil ☑ Soil enrichment	Soil in the project will be enriched due to 59,212 more trees. The trees will shed leaves and attract living beings into the area while the composition of dead wood and animals will further enrich the soil.
1.5 Biodiversity preservation ☑ Increase in native faunas/animals	The 59,212 trees in the Rhizophoraceae family are planted on the 92-rai area which served as shrimp farms. The area was restored for mangrove reforestation in order to increase the variety and abundance of plants and animals. Mangroves are the nurseries for marine life, food sources, the habitats, and

	the refuges of marine life. Extended mangroves consequently enhance the biodiversity.
2. Social co-benefits	
2.1 Community engagement ☑ Dispatch of project officers to periodically sound neighboring communities' opinion on possible impacts of the project, or community relations activities	Plot officers are instructed to communicate with local people, to protect trees in the plantation plots and sound local opinions on possible impacts throughout the project period.
2.2 Health and safety ☑ Work-related safety standards above legal requirements	Officers are required to wear appropriate outfits while performing their tasks, including Ninja boots, trousers, and gloves.
3. Economic co-benefits	
3.1 Job/income creation ☑ Employment of local workers	The project hires community workers for tree plantation and maintenance as well as grass mowing and seedlings. Some seedlings are sourced from the community in project area and nearby communities, thus boosting their income.