INSTITUTIONALIZATION OF CLIMATE RESILIENT AGRICULTURE

CARBON CREDITS FOR SOIL ORGANIC SEQUESTRATION

2024

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Prepared by TRTA Consultant under

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ACRONYMS

AWD	Alternate Wetting and Drying
BAU	Business as Usual
CCC	Climate Change Commission
CDM	Clean Development Mechanism
COP28	28th Conference of Parties
DA	Department of Agriculture
DENR	Department of Environment and Natural Resources
DOE	Department of Energy
DOTr	Department of Transport
DSR	Direct-Seeded Rice
ETS	Emissions Trading System
GCF	Green Climate Fund
GHG	Greenhouse Gas
IPCC	Intergovernmental Panel on Climate Change
JCM	Joint Crediting Mechanism
LCCAP	The Local Climate Change Action Plan
NCCS	Singapore's National Climate Change Secretariat
NDC	Nationally Determined Contribution
NDC	Nationally Determined Contribution (NDC)
NICCDIES	National Integrated Climate Change Database Information and Exchange System
PETS	Philippine Emission Trading Scheme
PGHGIMRS	Philippine Greenhouse Gas Inventory Management and Reporting Systems
PIDS	Philippine Institute for Development Studies
PMI	Partnership for Market Implementation
PMR	Partnership for Market Readiness
PreDic	Precision and Digital Agriculture Center (PreDiC)
PRiSM	Philippine Rice Information System
SEC	Securities and Exchange Commission
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard

EXECUTIVE SUMMARY

Status of implementation of the Philippine Emission Trading Scheme (PETS) and establishment of carbon markets

The Philippines sets a target of reducing its greenhouse gas (GHG) emissions by 75% from its business-as-usual (BAU) level by 2030 under the Paris Climate Agreement pledge and subsequently in its Nationally Determined Contribution (NDC) that was submitted on 15 April 2021 to UNFCCC. The country has adopted a comprehensive policy agenda regarding climate change and integrated the agenda into its latest development plan, i.e. the Philippine Development Plan 2023-2028.

As a domestic climate finance source, the Government of the Philippines is planning for a regulated carbon market through a domestic cap and trade-based Emission Trading System (ETS). To this effect, the Low Carbon Economy Act of 2023 was introduced to the Senate of the Philippines on 14 March 2023 (Senate Bill No. 1992). This Act sets out provisions for the ETS in the country. The Act gives the Department of Environment and Natural Resources (DENR) the mandate to set the annual GHG emission CAP for emitting entities to facilitate trading. However, as the Low Carbon Economy Act is currently being examined by the Senate and the House of Representatives of the Philippines, no timeline has so far been specified for establishing the ETS in the Philippines.

The country is the recipient of a significant volume of international climate finance. However, such financing in the agricultural and forestry sectors is rather limited. Currently, there are 18 ongoing projects in the Philippines under the Joint Carbon Crediting Mechanism (JCM) which is funded by the Government of Japan. Most of these projects are in the renewable energy sector, and none of them are in the agricultural sector. The Green Climate Fund (GCF) currently has a total financing commitment of under USD 130 million for the Philippines. Just over 4 million of this commitment is directly for the agricultural sector in the country. Moreover, while the country already developed its national FRL, no REDD+ payment is forthcoming. Most notably, the Philippines is not eligible to receive REDD+ payments the from World Bank's Forest Carbon Partnership Facility as it is not a member country. Moreover, there is no active voluntary carbon market project in the agricultural sector in the Philippines. The above suggests that the country is far from realizing the potential in terms of climate finance that its abundant natural resources and vast agricultural sector offer.

Framework and methodology for more effective measurement of GHG emissions in the agriculture sector

There are several approved methodologies in Agriculture and Afforestation/Reforestation (A/R). These methodologies describe, among others, how to compute for greenhouse gas (GHG) emission reductions. This report will describe the approved methodologies in the Clean Development Mechanism (CDM) and Verra's Verified Carbon Standard (VCS).

The Gold Standard has also approved a methodology on 'Methodology for Methane Emission Reduction by Adjusted Water Management Practice in Rice Cultivation', this will be in a separate report (Output 3) where the methodology is applied to a hypothetical area (assumed, in the

absence of real data) and the Excel file is also attached for the calculation of the greenhouse gas (GHG) emission reduction.

Emission Reduction Using Simplified Approach: Methodology for Methane Emission Reduction by Adjusted Water Management Practice in Rice Cultivation

The methodology for small-scale projects is applied to a hypothetical area (500 hectares, assumed, in the absence of real data). The Excel file is also attached for the calculation of the greenhouse gas (GHG) emission reduction (ER). Calculations showed an Emission Reduction (ER) of 1,073.4 tons of CO_2e per year. This ER is used as input to Output 4, in the cost-benefit analysis of alternate wetting and drying (AWD). This methodology applies to rice farms that change the water regime during the cultivation period:

- from continuously to intermittent flooded conditions and/or a shortened period of flooded conditions;
- Alternate wetting and drying method and aerobic rice cultivation methods
- Rice farms that change their rice cultivation practice from transplanted to direct seeded rice.

Cost-benefit analysis of alternate wetting and drying (AWD) method of rice cultivation

A cost-benefit analysis (CBA) is carried out for a potential small-scale Project (i.e. 500 ha in a single project) in the Philippines on switching to alternate wetting and drying (AWD) replacing continuous irrigation in rice cultivation. While continuous irrigation is a common practice for rice cultivation in the country, AWD method is being promoted by the government. CBA suggests – with an internal rate of return (IRR) of 28.91% and the benefit-cost ratio (BCR) is 1.45 - that the Project is economically viable. The net present value (NPV) with a 9% discount rate[1] totals US$ 72 637 and the discounted sum of all benefit flows is US$ 273 702 for the entire lifespan of the project of 20 years. A sensitivity analysis suggests that the directions and degrees of sensitivity in IRR, BCR, and NPV due to the changes in key underlying variables are plausible. This suggests that the economic analysis is robust.

Identification of policy, institutional and technological requirements to institutionalize the Philippine Carbon Markets, specific to the Agriculture sector

While the Philippines sets a target of reducing its greenhouse gas (GHG) emissions by 75% from its business-as-usual (BAU) level by 2030 in its Nationally Determined Contribution (NDC), the sector-level targets are not defined yet. Nevertheless, the Government of the Philippines is planning for a regulated carbon market through a domestic cap and trade-based Emission Trading System (ETS) that can also help the country meet a significant share of its NDC target. The Low Carbon Economy Act of 2023 (House Bill 7705) was introduced to the Senate of the Philippines on 14 March 2023 that sets out provisions for the ETS in the country. The Act gives the Department of Environment and Natural Resources (DENR) the mandate to set the annual GHG

[1] A discount rate of 9% is used in the CBA, which is determined by following the guidance given by ADB. 2017. Guidelines for the Economic Analysis of Projects. Manila, the Philippines.

emission CAP for emitting entities to facilitate trading. However, as the Low Carbon Economy Act is currently being examined by the Senate and the House of Representatives of the Philippines, no timeline has been specified for establishing the ETS in the Philippines. Moreover, the lack of consolidated and harmonized GHG inventory reporting is a major barrier to launching ETS in the country. Voluntary carbon market (VCM) projects in the agricultural sector have not taken off despite having potential.

In the above backdrop, the following recommendations are provided for the development of the carbon market in the Philippines:

- The Philippines Greenhouse Gas Inventory Management and Reporting Systems (PGHGIMRS) should be reformed so that methodologies and reporting for inventories in different sectors are harmonized. The emission factors and methodology should be uniform, such as the Grid Emission Factor (GEF) which should be computed annually and multiplied with the respective annual electricity consumption.[2] Consolidated and comprehensive annual GHG inventory reports with periodic/quarterly assessments would streamline a seamless emissions data management system that would fulfill the requirements of Article 10, Sections 23-25 of and operationalize House Bill 7705.
- The Government of the Philippines should work through existing independent carbon crediting programs such as Verra and Gold Standard to develop a public-private partnership model that will certify its emission reductions and removals. This will relieve administrative burdens, attract international climate finance to the country and help accelerate the achievement of the Philippines NDC target of 75% emissions reduction.
- Improving the enabling environment would be essential for the development of such projects in the agricultural sector. In particular, providing more information to the potential project developers on timelines, transaction costs and processes, methodologies, and procedures for availing carbon credits would be helpful.
- Overall, a stronger emphasis on institutionalization as a political, societal, and discursive challenge should be for implementing and sustaining carbon market policies in the Philippines.
- Modern technologies including improved irrigation systems, among others, need to be promoted that can help improve productivity, reduce greenhouse gas (GHG) emissions and generate carbon credits in the agricultural sector.

[2] For example, the GEF for 2023 should be multiplied with the 2023 electricity consumption. It is wrong to use the GEF of another year to a different year.

1 STATUS OF IMPLEMENTATION OF THE PHILIPPINE EMISSION TRADING SCHEME (PETS) AND ESTABLISHMENT OF CARBON MARKETS

1.1 Domestic Carbon Financing in the Philippines

Policy and Regulatory Framework related to Climate Change and Emission Trading Scheme

The Philippines has not yet committed to a net-zero target. Nevertheless, under its Paris Climate Agreement pledge and subsequently in the Nationally Determined Contribution (NDC, submitted on 15 April 2021 to UNFCCC), the country sets a target of to reduce its GHG emissions by 75% from its business-as-usual (BAU)[3] level by 2030. The Climate Change Act – that was enacted by the government in 2009 - integrates climate change into government policy formulations. The Act also establishes the framework strategy and program on climate change and creates the Climate Change Commission in the country. The government established People's Survival Fund under the Climate Change Act (2012 amendment) to create a long-term finance stream to enable the government to effectively address climate change.

The Government of the Philippines has adopted a comprehensive policy agenda regarding climate change and integrated the agenda into the country's latest development plan, i.e. the Philippine Development Plan 2023-2028[4]. The Philippines' key climate change-related policies include the National Climate Change Action Plan (2011-2028), the Philippine Energy Plan (2018-2040), the National Climate Risk Management Framework of 2019, and the Sustainable Finance Policy Framework of 2020.

As the country seeks to raise climate finance from domestic sources, the Government of the Philippines sets its preference for an intensity-based carbon emissions trading scheme (ETS) over an outright carbon tax. Consequently, a regulated carbon market is planned. The Low Carbon Economy Act of 2023 was introduced to the Senate of the Philippines on 14 March 2023 (Senate Bill No. 1992) and is currently pending in the committee[5]. This Act sets out provisions for a domestic cap and trade-based Emission Trading System (ETS) in the country. The Act gives the Department of Environment and Natural Resources (DENR) the mandate to set the annual GHG emission CAP for emitting entities to facilitate trading.

According to the consultation with the Climate Resilient Agriculture Office (CRAO) of the Department of Agriculture (DA) and the Department of Environment and Natural Resource (DENR) held in February 2024, the Low Carbon Economy Act is currently being examined by the Senate and the House of Representatives of the Philippines through two respective bills. The Bill in the House of Representatives is more active than that in the Senate. No timeline has been specified yet for establishing the ETS in the Philippines. The details of the sub-sectors of agriculture that will be covered by the ETS are also not decided yet. Nevertheless, preparation for the ETS is ongoing. Notably, on 14 July 2023, the Government of the Philippines has made a decision on, "Establishment of Guidelines/Standards on Carbon Credit Trading for the Agri-Fisheries Sector". Under this decision, a carbon accounting, monitoring, verification and certification system will be established by the Government. The Philippine Council for Agriculture and Fisheries (PCAF) National

[3] The BAU Scenario for the Philippines' NDC is developed based on the GHG inventory 2010. Under the BAU scenario, the country's total emission is 107.35 million tCO_2eq with forestry and land use sector and 144.35 million tCO_2eq without the sector.

[4] Source: Philippine Development Plan 2023-2028 - Philippine Development Plan (neda.gov.ph).

[5] Source: Senate of the Philippines. 19th Congress - Senate Bill No. 1992 - Senate of the Philippines.

Sectoral Committee on Climate Change, Environment, and Natural Resources (CCENR) adopted Resolution No. 7 (Series of 2023) during a special meeting held on 14 July 2023. The Resolution recommended, "….the DA, through CRAO, and the DENR to spearhead the establishment of guidelines/ standards on carbon credit trading for the Agri-Fisheries Sector".

Partnership for Market Readiness (PMR) and Partnership for Market Implementation (PMI)

The Partnership for Market Readiness (PMR) has been the World Bank's flagship technical assistance program on carbon pricing and carbon markets. Over the last decade, the PMR has been supporting carbon pricing efforts in more than 20 countries, including the Philippines.

The PMR came to an end in June (2021). However, the support for carbon pricing continued with a new initiative, the Partnership for Market Implementation (PMI) which aims to support at least 10 countries to go to the next level and implement carbon pricing, and another 20 new countries to prepare for a carbon pricing. The experience gained through PMR will be invaluable as countries take these next steps in the PMI.

The PMR helped developing countries design domestic carbon pricing instruments, conduct feasibility studies, invest in institutional frameworks, and develop Paris Agreement pledges, the programs include mobilizing $125 million from 13 contributing partners - Australia, Denmark, Finland, Germany, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom, United States, and the European Commission. This also supported the training of more than 15,000 professionals in carbon pricing instruments such as emissions trading schemes, carbon taxes, and offset mechanisms; as well as the development of best-practice guidebooks on key topics, 40 analytical reports, and the annual State and Trends of Carbon Pricing report.

The Partnership for Market Implementation (PMI)[6] is the successor program to the World Bank's successful Partnership for Market Readiness (PMR). From 2011 to 2021, the PMR supported emerging economies and developing countries to design and deploy carbon pricing and market instruments to facilitate the reduction of emissions. PMR provided funding and technical assistance to 23 countries (including the Philippines), accounting for 46% of global greenhouse gas emissions, all of whom now have the basic knowledge for establishing a carbon pricing system. The PMI assists countries in designing, pilot, and implement pricing instruments aligned with their development priorities. A 10-year program with a capitalization target of US$250 million, the Partnership brings an ambitious and long-term vision for the viability of carbon markets to its support for programs and policies across jurisdictions and sectors that introduce a strong price signal on carbon emissions and contribute to the Paris Agreement goal of limiting temperature rise to 1.5°C.

The Philippines has been a technical partner of the PMR since October 2017. The PMR supported the Philippines in developing policies to enable private sector participation in mitigation activities and assessing the potential of carbon pricing instruments in achieving its NDC target. However, as of October 2023, the Philippines is not on the list of PMI participant countries.

1.2 International Climate Finance for the Philippines

Joint Crediting Mechanism (JCM) in the Philippines

The JCM is an initiative by the Government of Japan. Under this initiative, the Government of Japan financially and technically supports greenhouse gas GHG emission reduction and removal

[6] Source: https://pmiclimate.org/about

projects mainly in developing countries. The resultant GHG emission reduction or removal is used for achieving Japan's own emission reduction targets. The JCM focuses on diffusion of decarbonizing technologies, products, systems, services, and infrastructure and other mitigation actions such as afforestation and reforestation. Under JCM Japan has signed bilateral agreements with 27 countries (as of July 2023). The Philippines is one of the JCM signatory countries[7]. The Climate Change Division of the Department of Environment and Natural Resources of the Republic of the Philippines is responsible for looking after JCM in the country.

As of September 11, 2023, there are 18 ongoing projects in Philippines under JCM. Majority of these projects are in renewable energy sector, and none of them are in agricultural sector. Together these projects have a target of reducing 363 300 tCO_2 GHG each year

Table 1: JCM projects in the Philippines

Project Name	Starting year	Sector	GHG emission reduction tCO2/year
Introduction of 1.53MW Rooftop Solar Power System in Auto Parts Factories	2017	Renewable energy	1 061
Introduction of 1MW Rooftop Solar Power System in Vehicle Assembly Factory	2017	Renewable energy	731
Installation of 1.2MW Rooftop Solar Power System in Refrigerating Warehouse	2017	Renewable energy	798
Introduction of 4MW Rooftop Solar Power System in Tire Factory	2018	Renewable energy	2 772
9.6MW Solar Power Project in Collaboration with Power-supply Company	2019	Renewable energy	6 418
Biogas Power Generation and Fuel Conversion Project in Pineapple Canneries	2019	Renewable energy	54 167
29MW Binary Power Generation Project at Palayan Geothermal Power Plant	2020	Renewable energy	72 200
Tanawon 20MW Flash Geothermal Power Plant Project	2021	Renewable energy	38 312

[7] Source: Overview of the Joint Crediting Mechanism (JCM) | JCM The Joint Crediting Mechanism (gec.jp)

Project Name	Starting year	Sector	GHG emission reduction tCO2/year
Development of a Fluorocarbon Collection and Destruction Model Project in Metro Manila, Philippines Utilizing Mixed Combustion Technologies	2021	F-gas Recovery and Destruction	15 482
28MW Binary Power Generation Project at Mahanagdong Geothermal Power Plant	2022	Renewable energy	76 220
14.5MW Mini Hydro Power Plant Project in Siguil River in Mindanao	2022	Renewable energy	41 574
Energy Supply Project by 9MW Solar Power System to Ceramic Factory and Cement Plant	2022	Renewable energy	5 957
Introduction of 0.8MW Solar Power System to Aluminum Products, Packaging Materials and Automotive Parts Factories (JCM Eco Lease Scheme)	2022	Renewable energy	544
5.6MW Geothermal Binary Power Generation Project in Northern Negros	2022	Renewable energy	9 727
Introduction of 6MW Power Generation System by Waste Heat Recovery for Cement Plant	2023	Energy efficiency	21 245
27MW Solar Power Project in Dagohoy, Bohol Island	2023	Renewable energy	20 395
Introduction of 1.2MW Rooftop Solar Power System to Electronic Equipment Assembly Factory (JCM Eco Lease Scheme)	2023	Renewable energy	697
Total			368 300

Source: 20230911_list_en.pdf (gec.jp).

On 9 April 2023, the Joint Committee (JC) of JCM adopted the decision on a proposed methodology, a proposed project and a third-party entity by electronic means[8]. The methodology was for PH_AM003 "Installation of biomass power plant". The JC approved the **registration of a proposed** JCM **project** - PH004 "Introduction of 1MW Rooftop Solar Power System in Vehicle Assembly Factory". The JC also approved the **designation of a** Third-Party Entity (TPE), i.e. LRQA Limited, **based on their new accreditation under** ISO **14065.**

The Green Climate Fund (GCF)

The GCF is mandated to support developing countries to realize their respective NDC targets towards low-emissions and climate-resilient pathways. The GCF is a major source of climate finance for the Philippines. Currently, the country has seven active GCF-funded projects, including two projects entirely on adaptation and the rest five on both adaptation and mitigation (Table 2). The organization's total financing commitment in these projects is just under USD 130 million.

Table 2: GCF projects in the Philippines

Project	GCF Board Approval Date (implementation period)	Sector/focus	GCF financing (million USD)	Total GHG emission reduction/avoidance, million tCO2 eq
Adapting Philippine Agriculture to Climate Change (APA)	16 March 2023	Climate-resilient agricultural system in rural areas	26.2	4.4
Scaling up current initiatives on disaster risk reduction and climate change adaptation in the Philippines.	14 November 2019 (April 2022 – April 2027)	Disaster risk management	12.0	Not available (NA); adaptation project
Green Guarantee Company (GGC) for multiple countries including the Philippines	20 October 2022	guarantees for climate bonds with significant climate adaptation and mitigation impacts	40.5	74.6
FP190 - Climate Investor Two (CI2).	22 July 2022 (Dec 2022 - April 2042)	Supporting the private sector to develop and construct climate-resilient infrastructure	145.0	44.7

[8] Source: https://www.jcm.go.jp/ph-jp.

Project	GCF Board Approval Date (implementation period)	Sector/focus	GCF financing (million USD)	Total GHG emission reduction/avoidance, million tCO2 eq
Multiple countries including the Philippines		projects in developing countries in the water, sanitation, and ocean sectors		
Global Fund for Coral Reefs Investment Window. Multiple countries including the Philippines	7 Oct 2021 (June 2022 - June 2032)	Creation of a private equity fund to encourage investments in the blue economy, protecting coral reefs in following areas: sustainable ocean production, ecotourism, and sustainable infrastructure and waste management	125.0	Not available (NA); adaptation project
ASEAN Catalytic Green Finance Facility (ACGF) Green Recovery Program. Multiple Countries including the Philippines	19 March 2021 (August 2022 - August 2041)	Low-emission investments to support economic recovery following COVID-19	3 700	119.0
Climate Investor One. Multiple Countries including the Philippines	20October 2018 (June 2019 - June 2037)	Climate Investor One (CIO) is a blended finance facility providing loans and equity in renewable energy projects	100.00	53.7

Source: Approved projects | Green Climate Fund

Reduce emissions from deforestation and forest degradation in developing countries (REDD+)

The Philippines' first National Forest Reference Level (FRL)[9] for REDD+[10] is submitted to the United Nations Framework Convention on Climate Change (UNFCCC). The Philippine FRL, which is measured in tons of carbon dioxide equivalent annually, is used to evaluate how well the nation is doing at carrying out the REDD+ initiatives mentioned in decision 1/CP.16, paragraph 70. It offers historical baseline data on the nation's emissions stated in annual terms for a reference period, which will be contrasted with the emissions and removals from a result period. The Forest Management Bureau (FMB) of the Department of Environment and Natural Resources (DENR) is responsible for developing the Forest Reference Level (FRL). The Philippines constructed FRL will be able to improve over time by incorporating better data, improved methodologies, and, when necessary, additional pools, while taking into account the importance of adequate and dependable support as mentioned in decision 1/CP.16, paragraph 71, in the adoption of a stepwise approach to FRL calculation.

To lower the costs associated with updating the FRL and improve forest management and consistency in forest monitoring, a national FRL scale level has been developed. Construction includes activities that increased the carbon stock in the forests and the reduced emissions due to deforestation. Two types of biomass classes were chosen to be included in the document: above- ground biomass and below-ground biomass and CO_2 for the gasses included.

The Philippine FRL area coverage has a total size of 30 million hectares and is divided into two categories: land that is in the public domain (which includes national parks, mineral lands, and forests), and land that is either alienable and disposable or used for agriculture. The whole country's territory, including all of the major islands, is included in the baseline assessment's coverage area. During 2000 - 2018 the net emissions on average were 15,304,422 tCO_2-e. In the same time period, the historical average yearly emissions from deforestation and the improvement of forest carbon stocks (reforestation) were 13.507 $MtCO_2$-yr^{-1}. Deforestation-related emissions account for the majority of emissions (15.304 $MtCO_2$-yr^{-1}), while reforestation removes 1.797 $MtCO_2$-yr^{-1}.

With the development of national FRL, the Philippines has fulfilled a major condition for receiving jurisdictional REDD+ payment. However, no such payment is committed to the country yet. Most notably, the Philippines is not a partner country to the World Bank's Forest Carbon Partnership Facility and thus not eligible to receive REDD+ payments[11]. There are three active REDD+ projects for the voluntary carbon market in the country (Table 3).

[9] Source: https://redd.unfccc.int/media/philippine_frl_document_final_6dec2022.pdf.

[10] The redd+ web platform, mandated by the cop in decision 2/cp.13, was established with the purpose of making available such information on the outcomes of activities relating to redd+, including activities on capacity building, demonstration activities, addressing drivers of deforestation and mobilization of resources. Https://redd.unfccc.int.

[11] Source: Forest Carbon Partnership

Table 3: Voluntary carbon market REDD+ projects in the Philippines

Name	Area	Status	Annual GHG emission reduction, tCO2eq/year	Crediting period
Mindanao Forests for People and Sustainable Livelihoods (MinFor)*	Forestry	Under development	1 608 286	09/2022 - 09/2072
Lanao del Sur Bamboo Reforestation Project	Forestry	Registration requested	315 067	06/2022 - 05/2042
Mindanao Tree Planting Program for our Climate and Communities (MinTrees)	Forestry	Registered	33 015	03/2015 - 03/2065

*Sources: Verra Project Registry; * Agroforestry is included*

1.3 International Carbon Market

The Clean Development Mechanism (CDM)

There are 72 Philippine projects[12] registered under the CDM. The crediting periods of all these projects are over. The Philippines CDM projects include 49 projects from the agriculture sector. These projects primarily focused on two issues:

- Methane recovery from livestock, and bioenergy such as gas for cooking, electricity production and for cogeneration (steam/heat and power), and
- Biomass as fuel for the production of electricity and for cogeneration (steam/heat and power).

Voluntary Carbon **Market Projects in the Philippines**

Voluntary carbon market activity in the Philippines is limited. As of writing this report, there are a total of 14 active voluntary carbon credit projects recorded under Verra and Gold Standard registries (Table 4). The projects are mainly in energy sector and none of them are in agriculture sector. It can be noted here that there are no active voluntary carbon market projects in the Philippines under Plan Vivo, which is the third major certification body for such projects (other two being Verra and Gold Standard).

[12] Source: https://cdm.unfccc.int/Projects/projsearch.html

Table 4: Active voluntary carbon market projects in Philippines

Name	Sector	Status	Annual GHG emission reduction, tCO2eq/year	Crediting period
Under Verra				
The Philippines VWT Improved Cookstove Program I	Energy	Registration requested	817 398	11/2022 - 11/2032
Grouped Project for Philippines Water Purifier Program	Energy	Under validation	3 795 168	01/2023 - 12/2032
Grouped Project for Philippines Cookstove Program	Energy	Under validation	20 697 232	01/2023 - 12/2032
Mindanao Forests for People and Sustainable Livelihoods (MinFor)	Forestry	Under development	1 608 286	09/2022 - 09/2072
Changing Lives via Improved Cooking Initiatives – Philippines	Energy	Registered	3 634 938	01/2023 - 12/2029
Installation of high-efficiency wood burning cookstoves in the Philippines	Energy	Registration requested	4 242 224	02/2023 - 02/2033
Lanao del Sur Bamboo Reforestation Project	Forestry	Registration requested	315 067	06/2022 - 05/2042
Mindanao Tree Planting Program for our Climate and Communities (MinTrees)	Forestry	Registered	33 015	03/2015 - 03/2065
Negros Island Solar Power Inc.	Energy	Registered	66 039	03/2016 - 03/2026
Bataan 2020 12.5 MW Power Rice Hull Cogeneration Project	Energy	Registered	38 652	01/2018 - 12/2024
Under Gold Standard				
CAPARISPISAN II Wind Power Project	Energy	Planned	161 679	11/2023 - 11/2028

Name	Sector	Status	Annual GHG emission reduction, tCO2eq/year	Crediting period
The 160MW Balaoi & Caunayan Wind energy project	Energy	Planned	344 604	09/2023 - 09/2027
SolarAce1 Alaminos Solar Project	Energy	Registered	114 433	06/2021- 05/2026
81MW Caparispisan Wind Energy Project	Energy	Validated	153 286	07/2022- 07/2029

Sources: Verra Project Registry, Gold Standard Project Registry.

2 METHODOLOGIES IN THE CLEAN DEVELOPMENT MECHANISM (CDM)

There are several approved methodologies in Agriculture and Afforestation/Reforestation (A/R). These methodologies describe, among other, how to compute for greenhouse gas (GHG) emission reductions. This report will describe the approved methodologies in the Clean Development Mechanism (CDM) and Verra's Verified Carbon Standard (VCS).

The Gold Standard has also approved a methodology on 'Methodology for Methane Emission Reduction by Adjusted Water Management Practice in Rice Cultivation', this will be in a separate report (Output 3) where the methodology is applied on a hypothetical area (assumed, in the absence of real data) and the Excel file is also attached for the calculation of the greenhouse gas (GHG) emission reduction.

Table 5: Approved Methodologies in the Clean Development Mechanism (CDM)

Meth Number	Methodology
	Agriculture Large Scale[13]
ACM0010	GHG emission reductions from manure management systems — Version 8.0
ACM0017	Production of biofuel — Version 4.0
ACM0010	GHG emission reductions from manure management systems — Version 8.0
ACM0017	Production of biofuel — Version 4.0
	Agriculture Small Scale[14]
AMS-II-A	Biological production and use for energy generation in stationary applications — Version 3.0
AMS-II-B	Drilling of synthetic nitrogen fertilizers by inoculant application in legume-rhizome rotations or radicle-splitting with cytokinin overgrind — Version 3.0
AMS-II-C	Methane recovery from livestock and manure management at households and small farms — Version 5.0
AMS-II-D	Biological production and use for transport and exploration — Version 3.0
AMS-II-E	Methane emission reduction by adjusted water management practice in rice cultivation — Version 4.0
AMS-II-F	Reduction of N2O emissions from use of Nitrogen Use Efficient (NUE) seeds that require less fertilizer application — Version 2.0
AMS-II-G	Strategic feed supplementation in smallholder dairy sector to increase productivity — Version 2.0

[13] https://cdm.unfccc.int/methodologies/PAmethodologies/approved?title=&scopes_operator=or&scopes%3Aint%3Alist=15

[14] https://cdm.unfccc.int/methodologies/SSCmethodologies/approved

	Afforestation and Reforestation Large Scale[15]
AR-AM0014	Afforestation and reforestation of degraded mangrove habitats — Version 3.0
AR-ACM0003	Afforestation and reforestation of lands except wetlands — Version 2.0
	Afforestation and Reforestation Small Scale16
AR-AM0003	Afforestation and reforestation project activities implemented on wetlands — Version 3.0
AR-AM0007	Afforestation and reforestation project activities implemented on lands other than wetlands — Version 3.1

2.1 VERRA's Verified Carbon Standard (VCS)

Agriculture, Forestry and Other Land Use (AFOLU)[17]

Thirty percent of global greenhouse gas emissions are caused by forest destruction and poor agricultural practices. Natural climate solutions—also referred to as Agriculture, Forestry, and Other Land Use (AFOLU)—are an effective approach to reducing and removing global greenhouse gas emissions.

VERRA's VCS Program leads the way in developing methodologies and other tools to unlock the carbon reduction potential of AFOLU projects. The Verified Carbon Standard is the most widely used standard in the sector.

AFOLU projects fall under the following categories:

- Afforestation, Reforestation and Revegetation (ARR)
- Agricultural Land Management (ALM)
- Improved Forest Management (IFM)
- Reduced Emissions from Deforestation and Degradation (REDD)
- Avoided Conversion of Grasslands and Shrublands (ACoGS)
- Wetlands Restoration and Conservation (WRC)

The VCS Program Methodologies[18]

Methodologies are essential to quantifying real and accurate greenhouse gas (GHG) benefits of a project and to generate Verified Carbon Units (VCUs). Methodologies provide requirements and procedures to determine project boundaries, identify the baseline, assess additionality, monitor the relevant parameters, and ultimately quantify the GHG emission reductions or removals.

Methodologies often refer to modules or tools, which include specific methodological tasks and analyses (e.g., additionality) that are used in conjunction with the methodology.

[15] https://cdm.unfccc.int/methodologies/ARmethodologies/approved
[16] https://cdm.unfccc.int/methodologies/SSCAR/approved
[17] https://verra.org/programs/verified-carbon-standard/area-of-focus-agriculture-forestry-land-use/
[18] https://verra.org/methodologies-main/

The VCS Program has its own methodologies that have been approved for use. The AFOLU methodologies are as follows:

- VM0001 Infrared Automatic Refrigerant Leak Detection Efficiency Project Methodology, v1.1
- VM0003 Methodology for Improved Forest Management through Extension of Rotation Age, v1.3
- VM0004 Methodology for Conservation Projects that Avoid Planned Land-use Conversion in Peat Swamp Forests, v2.0
- VM0005 Methodology for Conversion of Low-Productive Forest to High-Productive Forest, v1.2
- VM0006 Methodology for Carbon Accounting for Mosaic and Landscape-scale REDD Projects, v2.2
- VM0007 REDD+ Methodology Framework (REDD-MF), v1.6
- VM0008 Weatherization of Single-Family and Multi-Family Buildings, v1.1
- VM0010 Methodology for Improved Forest Management: Conversion from Logged to Protected Forest, v1.3
- VM0011 Methodology for Calculating GHG Benefits from Preventing Planned Degradation, v1.0
- VM0012 Improved Forest Management in Temperate and Boreal Forests (LPFF), v1.2
- VM0014 Interception and Destruction of Fugitive Methane from Coal Bed Methane (CBM) Seeps, v1.0
- VM0015 Methodology for Avoided Unplanned Deforestation, v1.1
- VM0016 Recovery and Destruction of Ozone-Depleting Substances (ODS) from Products, v1.1
- VM0018 Energy Efficiency and Solid Waste Diversion Activities within a Sustainable Community, v1.0
- VM0019 Fuel Switch from Gasoline to Ethanol in Flex-Fuel Vehicle Fleets, v1.0
- VM0022 Quantifying N2O Emissions Reductions in Agricultural Crops through Nitrogen Fertilizer Rate Reduction, v1.1
- VM0025 Campus Clean Energy and Energy Efficiency, v1.0
- VM0026 Methodology for Sustainable Grassland Management (SGM), v1.1
- VM0032 Methodology for the Adoption of Sustainable Grasslands through Adjustment of Fire and Grazing, v1.0
- Here is a list of the project methodologies based on the latest image you provided:
- VM0034 Canadian Forest Carbon Offset Methodology, v2.0
- VM0035 Methodology for Improved Forest Management through Reduced Impact Logging v1.0
- VM0036 Methodology for Rewetting Drained Temperate Peatlands, v1.0
- VM0038 Methodology for Electric Vehicle Charging Systems, v1.0
- VM0039 Methodology for Use of Foam Stabilized Base and Emulsion Asphalt Mixtures in Pavement Application, v1.0
- VM0041 Methodology for the Reduction of Enteric Methane Emissions from Ruminants through the Use of Feed Ingredients, v2.0

- VM0042 Methodology for Improved Agricultural Land Management, v2.0
- VM0043 Methodology for CO2 Utilization in Concrete Production, v1.0
- VM0044 Methodology for Biochar Utilization in Soil and Non-Soil Applications, v1.1
- VM0045 Improved Forest Management Methodology Using Dynamic Matched Baselines from National Forest Inventories, v1.0
- VM0046 Methodology for Reducing Food Loss and Waste, v1.0
- VM0047 Afforestation, Reforestation, and Revegetation, v1.0
- VM0048 Reducing Emissions from Deforestation and Forest Degradation, v1.0
- VMR0001 Revisions to ACM0008 to Include Pre-drainage of Methane from an Active Open Cast Mine as a Methane Emission Reduction Activity, v1.0
- VMR0002 Revisions to ACM0008 to Include Methane Capture and Destruction from Abandoned Coal Mines, v1.0
- VMR0003 Revisions to AMS-III.Y to Include Use of Organic Bedding Material, v1.0
- VMR0004 Revisions to AMS-III.BC to Include Mobile Machinery, v1.0
- VMR0006 Energy Efficiency and Fuel Switch Measures in Thermal Applications, v1.2
- VMR0007 Revision to AMS-III.AJ: Recovery and Recycling of Materials from Solid Wastes
- VMR0008 Revision to AMS-III.BA: Recovery and Recycling of Materials from E-waste
- VMR0009 Revision to AM0057: Avoided Emissions from Biomass Wastes through Use as Feedstock in Pulp and Paper, Cardboard, Fiberboard or Bio-oil Production

2.2 The Gold Standard 'Methodology for Methane Emission Reduction by Adjusted Water Management Practice in Rice Cultivation[19]

The methodology is applicable to measures that reduce anaerobic decomposition of organic matter in rice-cropping soils. Such measures include changing the water regime during the cultivation period from continuously to intermittently flooded conditions and/or a shortened period of flooded conditions, using the alternate wetting and drying method, adopting aerobic rice cultivation methods, and switching from transplanted to direct-seeded rice (DSR). This methodology can be applied to large and small-scale or micro-scale projects or PoAs.

This methodology has been developed with inputs from the International Rice Research Institute (IRRI) as part of a partnership with the Department of Foreign Affairs and Trade (DFAT) of the Government of Australia through the Business Partnerships Platform (BPP).

The 'small-scale methodology' is used to calculate the GHG emission reduction of a hypothetical (assumed data) for the Philippines. Output 3 of this report describes the methodology and the Excel file calculations.

[19] https://globalgoals.goldstandard.org/standards/437_V1.0_LUF_AGR_Methane-emission-reduction-by-AWM-practice-in-rice-cultivation.pdf

3 METHODOLOGY FOR METHANE EMISSION REDUCTION BY ADJUSTED WATER MANAGEMENT PRACTICE IN RICE CULTIVATION

Emission Reduction Using Simplified Approach[20]

The methodology for small-scale projects is applied to a hypothetical area (500 hectares, assumed, in the absence of real data). The Excel file is also attached for the calculation of the greenhouse gas (GHG) emission reduction (ER). Calculations showed an Emission Reduction (ER) of 1,073.4 tons of CO_2e per year. This ER is used as input to Output 4, in the cost-benefit analysis of alternate wetting and drying (AWD).

- This methodology applies to rice farms that change the water regime during the cultivation period: i) from continuously to intermittent flooded conditions and/or a shortened period of flooded conditions;
- Alternate wetting and drying method and aerobic rice cultivation methods
- Rice farms that change their rice cultivation practice from transplanted to direct seeded rice[21].

The baseline scenario is the continuation of the current practice e.g. transplanted and continuously flooded rice cultivation in the project fields.

Key Assumptions

- Area (A_y) = 500 hectares
- Days/year(L_y) = 240 days
- Assumed double cropping

Calculate Emission Reductions in year y (ER_y), in tCO_2e

Using Equation 9, on page 15:

$$ER_y = \left(EF_{ER} \times A_y \times L_y \times 10^{-3} \times GWP_{CH4}\right) \times (1 - U_d) \qquad Eq.\ 9$$

[20] Page 14, item 3.8.5, Gold Standard for Global Goals (GS4GG): "Methodology for Methane Emission Reduction by Adjusted Water Management Practice in Rice Cultivation". https://globalgoals.goldstandard.org/437-luf-agr-methane-emission-reduction-awm-practice-in-rice/

[21] A switch from transplanted rice with continuously flooded fields to direct seeded rice (DSR) leads to a reduced flooding period since DSR requires non-flooded conditions after sowing until the seed has fully germinated and developed into a viable, young plantlet (at the "2 to 4 leaf stage").

Where:

ER_y	=	Emission reductions in year *y* (tCO_2e)
EF_{ER}	=	Adjusted daily emission reduction factor ($kgCH_4/ha/day$). Alternatively, seasonal emission factor ($kgCH_4/ha/season$) may be determined
A_y	=	Area of project fields in year *y* (ha)
L_y	=	Cultivation period of rice in year *y* (days/year). This is not applicable when seasonal emission factor is determined
GWP_{CH4}	=	Global warming potential of CH_4 ($t\ CO_2e/t\ CH_4$)
U_d	=	Uncertainty deductions: Apply default value of 15% for IPCC default values (global, regional or country specific).

Solve for EF_{ER},

the adjusted daily emission reduction factor ($kgCH_4/ha/day$). Alternatively, seasonal emission factor ($kgCH_4/ha/season$) may be determined

$$EF_{ER} = EF_{BL} - EF_P \qquad Eq.\ 11$$

Where

EF_{BL}	=	Baseline emission factor ($kgCH_4/ha/day$) or ($kgCH_4/ha/season$)
EF_P	=	Project emission factor ($kgCH_4/ha/day$) or ($kgCH_4/ha/season$)

Solve for EF_{BL}

$$EF_{BL} = EF_{BL,c} \times SF_{BL,w} \times SF_{BL,p} \times SF_{BL,o} \qquad Eq.\ 12$$

Where

EF_{BL}	=	Baseline emission factor ($kgCH_4/ha/day$) or ($kgCH_4/ha/season$)
EF_P	=	Project emission factor ($kgCH_4/ha/day$) or ($kgCH_4/ha/season$)
$EF_{BL,c}$	=	Baseline emission factor for continuously flooded fields without organic amendments ($kgCH_4/ha/day$) or ($kgCH_4/ha/season$).
$SF_{BL,w}$ or $SF_{P,w}$	=	Baseline or project scaling factors[4] to account for the differences in water regime during the cultivation period
$SF_{BL,p}$ or $SF_{P,p}$	=	Baseline or project scaling factors to account for the differences in water regime in the pre-season before the cultivation period
$SF_{BL,o}$ or $SF_{P,o}$	=	Baseline or project scaling factors should vary for both type and amount of organic amendment applied

Solve for EF_{BL} by substituting the following values to Equation 12:

- $EF_{BL,c}$ = 0.6 , for Philippines (from Table 9, page 21)
- $SF_{BL,w}$ = 1, (Table 7, page 19). *Assumed double cropping*
- $SF_{BL,p}$ = 1, (Table 7, page 19). *Assumed double cropping*
- $SF_{BL,o}$ = 2.88 (Table 7, page 19). *Assumed double cropping*
- EF_{BL} = 1.728, as shown below. *(see attached Excel File)*

Baseline Emission Factor (kgCH4/ha/day) or (kgCH4/ha/season)				
(kgCH4/ha/day) or (kgCH4/ha/season)				
EF_{BL}	$EF_{BL,C}$	$SF_{BL,w}$	$SF_{BL,p}$	$SF_{BL,o}$
A	B	C	D	E
A= B*C*D*E	0.6	1	1	2.88
1.728				

Solve for EF_P

$$EF_P = EF_{BL,c} \times SF_{P,w} \times SF_{P,p} \times SF_{P,o} \qquad Eq.13$$

Where

$EF_{BL,c}$	=	Baseline emission factor for continuously flooded fields without organic amendments ($kgCH_4/ha/day$) or ($kgCH_4/ha/season$).
$SF_{BL,w}$ or $SF_{P,w}$	=	Baseline or project scaling factors[4] to account for the differences in water regime during the cultivation period
$SF_{BL,p}$ or $SF_{P,p}$	=	Baseline or project scaling factors to account for the differences in water regime in the pre-season before the cultivation period
$SF_{BL,o}$ or $SF_{P,o}$	=	Baseline or project scaling factors should vary for both type and amount of organic amendment applied

Substitute to Equation 13, the following values:

- $EF_{BL,C}$ = 0.6 , for Philippines (from Table 9, page 21)
- $SF_{p,w}$ =.71, Table 7, page 19 (Assumption : Scenario 1, *change the water regime from continuously to intermittent flooded conditions (single drainage))*
- $SF_{p,p}$ = 1, Table 7, page 19 (Assumption : Scenario 1, *change the water regime from continuously to intermittent flooded conditions (single drainage))*
- $SF_{p,o}$ = 2.88, page 19 (Assumption : Scenario 1, *change the water regime from continuously to intermittent flooded conditions (single drainage))*

EF_P	$EF_{BL,C}$	$SF_{p,w}$	$SF_{p,p}$	$SF_{p,o}$
A	B	C	D	E
A=B*C*D*E				
1.22688	0.6	0.71	1	2.88

Using Equation 11,

$$EF_{ER} = EF_{BL} - EF_P \qquad Eq.\ 11$$

EF_{ER} = 1.728 – 1.22688

= .50112

Adjusted daily emission reduction factor (kgCH4/ha/day). Alternatively, seasonal emission factor (kgCH4/ha/season) may be determined	Baseline Emission Factor (kgCH4/ha/day) or (kgCH4/ha/season)	Project emission factor (kgCH /ha/day) or (kgCH4/ha/season)	
(kgCH4/ha/day) or (kgCH4/ha/season)	(kgCH4/ha/day) or (kgCH4/ha/season)		
EF_{ER}	EF_{BL}	EF_P	
A = B- C	B	C	
0.50112	1.728	1.22688	

EF_{ER} calculated value = 1,074.4 tons CO_2e/year

Substitute the value of EF_{ER} (.50112) to Equation 9, and other values:

$$ER_y = \left(EF_{ER} \times A_y \times L_y \times 10^{-3} \times GWP_{CH4}\right) \times (1 - U_d) \qquad \text{Eq. 9}$$

Emission reductions in year *y*	Adjusted daily emission reduction factor (kgCH4/ha/day). Alternatively, seasonal emission factor (kgCH4/ha/season) may be determined	Area of project fields in year *y* (ha)	Cultivation period of rice in year *y* (days/year). This is not applicable when seasonal emission factor is determined		Global warming potential of CH4			
tCO_2e	(kgCH4/ha/day) or (kgCH4/ha/season)	(ha)	days/year	0.001	(t CO2e/t CH4)			
Er_y	EF_{ER}	A_y	L_y	Constant	GWP_{CH4}	Constant	U_d	
A	B	C	D	E	F	G	H	I
A=(B*C*D*E*F)* (I)								I=G-H
1,073.40	0.50112	500	240	0.001	21	1	0.15	0.85

ER_y = 1,073.40

4 COST-BENEFIT ANALYSIS OF ALTERNATE WETTING AND DRYING (AWD) METHOD OF RICE CULTIVATION

Alternate wetting and drying (AWD) is a water-saving technology in which irrigation water is applied a few days after the disappearance of the ponded water, and thus, the field is alternately flooded and non-flooded. As a result, AWD reduces irrigation water consumption in rice fields (IRRI 2023[22]).

A cost-benefit analysis (CBA) is carried out for a potential small-scale project (i.e. 500 ha in a single project) in the Philippines on switching to AWD replacing continuous irrigation in rice cultivation. One of the main purposes of the project is to generate carbon credits for the voluntary carbon markets (VCM). Continuous irrigation in rice cultivation is the most prevalent practice in the Philippines. AWD in small-scale rice cultivation is being promoted in the country, by the Department of Agriculture through the Bureau of Soils and Water Management (BSWM) and National Irrigation Administration – Upper Pampanga Integrated Irrigation Systems (NIA-UPRIIS), and the Philippines Rice Research Institute in the Philippines. The above provides a solid justification for conducting a CBA for small-scale AWD rice cultivation project (the 'project' hereafter in the report). Given that applying AWD is not a legal requirement for rice farmers in the country, AWD-based projects are eligible for carbon credit generation for VCM under the Gold Standard, Verra and other certification schemes. This provides another justification for conducting CBA for AWD rice cultivation.

The Project area will be 500 ha which is the maximum area limit for a small-scale AWD rice cultivation project under the Gold Standard. It will have the same cropping intensity (i.e. two crops per year, on average 240 days of cultivation) as in the continuous irrigation method. The fertilization regimes and other conditions will also remain the same in the Project as in the continuous irrigation method. The lifetime of the project is 20 years as per the guidance of the Gold Standard.

4.1.1 Approach for CBA

The benefits and costs[23] of the CBA analysis are presented with associated assumptions and explanations in Table 6 and

Table 6: Benefits of CBA analysis

Category	Discounted total benefits over the Project's lifetime of 20 years (at 9% discount rate)	Comments and assumptions
Carbon credits	US$ 56 390	The claimable carbon credits from the Project are estimated by applying a methodology developed under the principles of the Gold Standard. The Project is expected to generate a total of 21 468 carbon credits - each equaling one metric tonne (t) of carbon dioxide (CO_2) equivalent (eq) GHG emissions reduction - over the 20-year period (i.e.

[22]IRRI. 2023. Saving water with alternate wetting drying (AWD). Available at saving water with alternate wetting drying (AWD) - irri rice knowledge bank (last sighted on 27 november 2023).

[23] All benefits and costs for the lifespan of the Project are expressed in constant US$ of 2023. All relevant input prices and values – if in other currencies than US$ and not for 2023 – are adjusted to 2023 by using appropriate exchange rates and GDP deflators.

Category	Discounted total benefits over the Project's lifetime of 20 years (at 9% discount rate)	Comments and assumptions
		lifespan of the Project). According to the estimation, the Project will generate 1 073.4 carbon credits each year. The amount of annual carbon credits generated will remain the same throughout the lifespan of the project as the project area (i.e. 500 ha), irrigation technology (i.e. AWD), cropping intensity (i.e. two crops per year, 240 days of cultivation) and other conditions will remain the same. A carbon price of US$ 6 per credit[24] is used for carbon benefit calculation.
Rice production increase	US$ 135 489	As AWD enhances grain-filling rate, root growth and remobilization of carbon reserves from vegetative tissues to grains, rice production under the Project will increase. According to the data from the Philippines Statistics Authority (2020)[25], rice production under the continuous irrigation method is 4 406 kg per ha per year[26]. It is assumed that under AWD method, the production will gain a modest increase of 2.5%. This modest increase is justified by the fact that only the irrigation method will change to AWD while the irrigation infrastructure, fertilization regime and other management will remain the same. A rice price of US$ 0.35 per kg[27] is used for monetizing the rice production increase. It is assumed that rice produced under AWD does not fetch any premium price as the quality of rice produced under this irrigation method does not differ significantly from that produced under continuous irrigation.
Irrigation cost reduction	US$ 81 823	It is assumed that the irrigation costs under AWD will reduce by 38% in comparison to the continuous irrigation method. The assumption is justified by Rejesus et al. (2011) findings that AWD saves water by about 38% in the Philippines. An irrigation cost of US$ 18.50 per ha per

[24] There is no price reference from the Philippines as no rice-based VCM project in the country has been registered yet. US$ 6 per credit is the average price of retired carbon credits from rice cultivation in India. (Source: Due credit: The Indian voluntary carbon market is growing exponentially (downtoearth.org.in)).

[25] Philippines Statistics Authority.2020. Updated Production Costs and Returns of Selected Agricultural Commodities, Palay and Corn. Quezon City, the Philippines.

[26] Average of production in years 2017, 2018 and 2019 for which the data is available (Philippines Statistics Authority 2020).

[27] The price is derived by converting the average rice price for years 2017, 2018 and 2019 (for which the data is available from the Philippines Statistics Authority 2020) to 2023 constant US$ through inflation adjustment.

Category	Discounted total benefits over the Project's lifetime of 20 years (at 9% discount rate)	Comments and assumptions
		year[28] under the continuous irrigation method is used as a base for calculating the total irrigation cost reduction.

Table 7: Costs quantified for CBA analysis

Category / component	Discounted total costs over the Project's lifetime of 20 years (at 9% discount rate)	Summary of calculation and assumptions
Document preparation and due diligence for registration	US$ 53 778	The preparation of necessary documents for the Project to register with the certifier (i.e. the Gold Standard) takes place before the VCM carbon credits can be issued. Therefore, the preparation is an upfront investment. A one-time document preparation cost of US$ 10 000 is used in this Project. This is a standard amount for preparing project documents for the Gold Standard for a project of similar scale. Due diligence takes place annually throughout the lifetime of the Project. An annual due diligence cost of US$ 5 000 is used in this Project which is a standard amount for a project of similar scale.
Application for registration	US$ 2 500	A one-time registration fee of US$ 2 500 is paid to the Gold Standard. It is an upfront investment for the project.
Verification	US$ 10 000	Verification of the project takes place during the registration process. It is an upfront investment of US$ 10 000.
Validation	US$ 87 556	Validation of carbon credits takes place annually throughout the lifetime of the Project. An annual validation cost of US$ 10 000 is used in this Project which is a standard amount for a project of similar scale.
Monitoring	US$ 12 195	Monitoring of carbon credits takes place annually throughout the lifetime of the Project. An annual

[28] The price is derived by converting the average irrigation cost for the continuous irrigation method for years 2017, 2018 and 2019 (for which the data is available from the Philippines Statistics Authority 2020) to 2023 constant US$ through inflation adjustment.

Category / component	Discounted total costs over the Project's lifetime of 20 years (at 9% discount rate)	Summary of calculation and assumptions
		monitoring cost of US$ 2.5 per ha is used in this Project which is a standard amount for a project of similar scale.
Carbon crediting fee to the certification body	US$ 1 880	A fee of US$ 0.2 per carbon credit issued is used in this Project.
Income tax	US$ 33 156	A 25% income tax on the profit made by the Project is used. The rate is equivalent to that of the corporate income tax in the Philippines[29].

Sensitivity analysis

The sensitivity of the economic viability of the Project is tested with the changes in several underlying variables that affect the benefit and cost streams in the CBA. The variables include the discount rate, carbon credit price, carbon crediting fee to the certification body, total project area, rice yield and irrigation cost reduction rate.

The IRR, BCR and NPV are sensitive – to varying degrees - to changes in all the factors. The above three indicators are highly sensitive to the changes in carbon credit price, carbon crediting fee and the total project area, while marginally so to the changes in rice yield and irrigation cost reduction rate (Table 8). The direction of change in IRR, BCR and NPV depends on the factors. For example, the indicators decrease with the increase in carbon crediting fee, while increase with the increase in all other factors except the discount rate. The BCR and NPV decrease with the increase in the discount rate[30] (Table 8). Overall, the directions and degrees of sensitivity in IRR, BCR and NPV due to the changes in underlying variables are plausible. This suggests that the CBA is robust.

Table 8: Sensitivity analysis with key factors

Variables	Variable values in the base case	Change	IRR	BCR	NPV
	Base case		28.91 %	1.45	0.07
Discount rate	9 %	3 %	28.91 %	1.46	0.15
		13 %	28.91 %	1.43	0.05
Carbon credit price	6 (US$/credit)	3	22.15 %	1.34	0.05
		13	44.19 %	1.67	0.12

[29] Source: Philippines - Corporate - Taxes on corporate income (pwc.com).

[30] IRR is not a function of discount rate and thus does not change with the change in the former.

Carbon crediting fee to the certification body	0.2 (US$/credit)	0	29.45 %	1.47	0.07
		2.5	22.91 %	1.31	0.05
Total project area	500 (ha)	50	0.45 %	0.91	-0.01
		500	28.91 %	1.45	0.07
Rice yield	4 406 (kg/ha/year)	3750	25.18 %	1.38	0.06
		5000	32.07 %	1.52	0.09
Irrigation cost reduction	38 %	10 %	28.91 %	1.45	0.07
		60 %	28.91 %	1.45	0.07

4.1.2 CBA Results

CBA[31] suggests that the Project is economically viable. It has an internal rate of return (IRR) of 28.91% and the benefit-cost ratio (BCR) is 1.45. The net present value (NPV) with a 9% discount rate[32] totals US$ 72 637 and the discounted sum of all benefit flows is US$ 273 702 for the entire lifespan of the project of 20 years. The project's average annual investment is US$ 9 418. The discounted sum of all cost streams is US$ 188 351 over the entire lifespan of the Project. A sensitivity analysis is conducted for the key underlying variables. The directions and degrees of sensitivity in IRR, BCR, and NPV due to the changes in these variables are plausible. This suggests that the economic analysis is robust (see Annex 1, Section B).

The AWD rice cultivation project is expected to generate the following benefits:

- **Carbon credits for voluntary carbon markets (VCM)**: AWD reduces methane (CH4) emissions (see, e.g. Lagomarsino et al. 2016[33]). In the continuously flooded rice field, CH_4 is produced by anaerobic decomposition of organic material. AWD, by allowing to drop water level below soil surface removes the anaerobic condition for some time until re-flooded and pauses the production of CH_4 from the rice field several times during a cropping season. This way, AWD reduces the total amount of CH_4 released during the rice cropping season in comparison to the continuous irrigation method. Several projects based on this technology in China and India are registered for carbon credit generation for VCM under the Verra and Gold Standard. Naturally, the AWD rice cultivation project is expected to generate carbon credits for VCM. It is assumed that the Project is registered under the Gold Standard.

[31] The total length of the analysis period is 20 years as suggested by the relevant methodology of the Gold Standard.
[32] A discount rate of 9% is used in the CBA, which is determined by following the guidance given by ADB. 2017. Guidelines for the Economic Analysis of Projects. Manila, the Philippines.
[33] Lagomarsino, A., Agnelli, A.E., Linquist, B., Adviento-Borbe, M.A., Agnelli, A., Gavina, G., Ravaglia, S., Ferrara, R.M., 2016. Alternate wetting and drying of rice reduced CH4 emissions but triggered N2O peaks in a clayey soil of central Italy. Pedosphere 26, 533-548.

- **Irrigation cost reduction:** As AWD is a water-saving technology, it reduces water consumption without impacting rice production. For example, Rejesus et al. (2011)[34] showed that AWD can save water by about 38% in the Philippines. Naturally, AWD reduces the cost of irrigation by reducing pumping costs and fuel consumption (Lampayan et al. 2015[35]). Consultation with NIA-UPRIIS in March 2024 confirms AWD rice cultivation in the Philippines indeed reduces the consumption of irrigation water.
- **Rice production increase:** The project is expected to increase rice production in comparison to the traditional continuous irrigation method. AWD enhances grain-filling rate, root growth and remobilization of carbon reserves from vegetative tissues to grains. As a result, rice yield and production increase (see, e.g. Zhang et al. 2008[36]). Consultation with NIA-UPRIIS in March 2024 reveals that in AWD rice cultivation in the Philippines, the AWD method is applied only during the vegetation phase of rice plants' life cycle. The method is not used during the flowering and fruiting times of rice plants. This ensures that the conditions for increasing rice production in comparison to the traditional continuous irrigation method exist.

The benefit streams used in this CBA are the 'incremental impacts' of the Project in comparison to the continuous irrigation method of rice growing. More details about the benefits, costs and economic analysis are presented in Annex 1, Section A.

The carbon benefits of the Project totals US$ 56 390 in NPV terms over the life-time, which corresponds to 20.6% of the Project's benefits. The increase in rice yield constitutes nearly half, while irrigation cost reduction is about 30% of the total benefits (Table 9).

Table 9: Benefits of the Project

Benefit items	Benefits, US$ (NPV terms)	Share
Carbon credits	56 390	20.6 %
Rice production increase	135 489	49.5 %
Irrigation cost reduction	81 823	29.9 %
Total	**273 702**	**100%**

[34] Rejesus, R.M., Palis, F.G., Rodriguez, D.G.P., Lampayan, R.M., Bouman, B.A., 2011. Impact of the alternate wetting and drying (AWD) water-saving irrigation technique: evidence from rice producers in the Philippines. Food Policy 36, 280-288.

[35] Lampayan, R.M., Rejesus, R.M., Singleton, G.R., Bouman, B.A., 2015. Adoption and economics of alternate wetting and drying water management for irrigated lowland rice. Field Crops Research 170, 95-108.

[36] Zhang, H., Zhang, S., Yang, J., Zhang, J., Wang, Z., 2008. Postanthesis moderate wetting drying improves both quality and quantity of rice yield. Agronomy Journal 100, 726-734.

5 IDENTIFICATION OF POLICY, INSTITUTIONAL AND TECHNOLOGICAL REQUIREMENTS TO INSTITUTIONALIZE CARBON MARKETS, SPECIFIC TO THE AGRICULTURE SECTOR

The Philippines has not yet committed to a net-zero target concerning its greenhouse gas emissions. Under its Paris Climate Agreement pledge and subsequently in the Nationally Determined Contribution (NDC), submitted on 15 April 2021 to the UNFCCC, the country sets a target to reduce its GHG emissions by 75% from its business-as-usual (BAU)[37] level by 2030.

The National Strategies for Carbon Markets Under the Paris Agreement[38] (ADB, November 2023) is a guide on the Philippines' involvement under the Article 6 of the Paris Agreement. The Climate Change Commission39 has also presented the international cooperation & market and non- market mechanisms – The benefits of market & non-market mechanisms under Article 6 of the PA will continue to be explored, consistent with national circumstances and sustainable development aspirations.

The Government of the Philippines has adopted a comprehensive policy agenda for climate change and integrated the agenda into the country's latest development plan, i.e. the Philippine Development Plan 2023-2028[40]. The Philippines' key climate change-related policies include the National Climate Change Action Plan (2011-2028), the Philippine Energy Plan (2018-2040), the National Climate Risk Management Framework of 2019, and the Sustainable Finance Policy Framework of 2020.

The country is the recipient of a significant volume of international climate finance and has been active in international climate negotiations. Most notably, the Philippines was successful – as announced by Secretary of the Department of the Environment and Natural Resources (DENR) Ms Maria Antonia Yulo-Loyzaga - in its bid to become a member of the board of the Loss and Damage Fund (LDF)[41]. However, the existing international climate finance in the agricultural and forestry sectors is rather limited and it is not clear how much the Philippines can receive from LDF for these two sectors. Currently, there are 18 ongoing projects in the Philippines under the Joint Carbon Crediting Mechanism (JCM) which is funded by the Government of Japan. Most of these projects are in the renewable energy sector, and none of them are in the agricultural sector. The Green Climate Fund (GCF) currently has a total financing commitment of under USD 130 million for the Philippines. Just over 4 million of this commitment is directly for the agricultural sector in the country. Moreover, while the country already developed its national Forest Reference Level (FRL)[42], no REDD+ payment is forthcoming. Most notably, the Philippines is not eligible to receive REDD+

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[37] The BAU Scenario for the Philippines' NDC is developed based on the GHG inventory 2010. Under the BAU scenario, the country's total emission is 107.35 million tCO_2eq with the forestry and land use sector and 144.35 million tCO_2eq without the sector.

[38] https://www.adb.org/sites/default/files/publication/928596/national-strategies-carbon-markets-paris-agreement.pdf.

[39] https://niccdies.climate.gov.ph/files/documents/Philippines%20NDC%20Quick%20Facts.pdf.

40 Source: Philippine Development Plan 2023-2028 - Philippine Development Plan (neda.gov.ph).

[41] The LDF is a climate fund that is set up to help vulnerable countries cope with the costly and damaging impact of climate disasters. It was launched on the first day (i.e. 30 November 2023) of the UNFCCC Conference of Parties (COP) 28 held in Dubai, United Arab Emirates between 30 November – 12 December 2023. By the end of COP28, the LDF garnered around $700 million in pledges from countries. Source: https://newsinfo.inquirer.net/1875345/ph-secures-a-board-seat-in-loss-and-damage-fund-says-denr.

[42] A Forest Reference Emission Level and/or Forest Reference Level (FREL/FRL) is a benchmark for assessing the performance of each country in implementing REDD+ activities. The United Nations Framework Convention on Climate Change (UNFCCC) refers to Forest Reference Emission Levels and/or Forest Reference Levels.

payments the from World Bank's Forest Carbon Partnership Facility as it is not a member country. Moreover, there is no active voluntary carbon market project in the agricultural sector in the Philippines.

As of December 2023, in the Philippines there are a total of 14 active voluntary carbon credit projects recorded under Verra and Gold Standard registries[43], and 18 ongoing projects under the Joint Crediting Mechanism (JCM)[44] funded by Japan. The majority of these projects are in the renewable energy sector, and none of them are in the agricultural sector. The projects are mainly in the energy sector and none of them are in the agriculture sector. In addition, there are 72 projects[45] registered under the Clean Development Mechanism (CDM) by the Philippines. The crediting periods of all these projects are over. The Philippines CDM projects include 49 projects from the agriculture sector. These projects primarily focused on the following:

- Methane recovery from livestock, and bioenergy such as gas for cooking, electricity production and for cogeneration (steam/heat and power), and
- Biomass as fuel for generating electricity and for cogeneration (steam/heat and power).

Under the above backdrop, the objective of this report is to analyze the policy, regulatory, and institutional frameworks for the carbon market in the Philippines with a focus on the agricultural sector. Based on the analysis, the report provides recommendations for institutionalizing carbon markets focusing on policy, institutional and technological requirements in the country.

5.1 Frameworks for the Carbon Market

5.1.1 Policy And Regulatory Frameworks

Legal and Policy Frameworks to Operationalize International Carbon Markets through Article 6 of the Paris Agreement

The resolution of "Article 6 Guidance and rules" was made at COP26 in 2021. While this is still under negotiation, there is already enough direction for countries to develop the national frameworks necessary to participate in Article 6.

Article 6 of the Paris Agreement allows countries to voluntarily cooperate with each other to achieve emission reduction targets set out in their NDCs. This means that, under Article 6, a country (or countries) will be able to transfer carbon credits earned from the reduction of GHG emissions to help one or more countries meet climate targets. Within Article 6, Article 6.2 creates the basis for trading in GHG emission reductions (or "mitigation outcomes") across countries. Article 6.4 is expected to be similar to the Clean Development Mechanism of the Kyoto Protocol. It establishes a mechanism for trading GHG emission reductions between countries under the supervision of the Conference of Parties – the decision-making body of the UN Framework Convention on Climate Change. Article 6.8 recognizes non-market approaches to promote mitigation and adaptation. It introduces cooperation through finance, technology transfer, and capacity building, where no trading of emission reductions is involved.

[43] Verra Project Registry, Gold Standard Project Registry.

[44] 20230911_list_en.pdf (gec.jp).

[45] https://cdm.unfccc.int/Projects/projsearch.html.

The Climate Change Act

The Climate Change Act – that was enacted by the government in 2009 - integrates climate change into government policy formulations. The Act also establishes the framework strategy and program on climate change and creates the Climate Change Commission in the country. The government established People's Survival Fund (PSF) under the Climate Change Act (2012 amendment) to create a long-term finance stream to enable the government to effectively address climate change.

Low Carbon Economy Act and Emissions Trading System (ETS)

As the country seeks to raise climate finance from domestic sources, the Government of the Philippines sets its preference for an intensity-based carbon emissions trading scheme (ETS) over an outright carbon tax. Consequently, a regulated carbon market is planned. The Low Carbon Economy Act of 2023 was introduced to the Senate of the Philippines on 14 March 2023 (Senate Bill No. 1992) and is currently pending in the committee[46]. This Act sets out provisions for a domestic cap and trade-based Emission Trading System (ETS) in the country. The Act gives the Department of Environment and Natural Resources (DENR) the mandate to set the annual GHG emission CAP for emitting entities to facilitate trading.

According to the consultation with the Climate Resilient Agriculture Office (CRAO) of the Department of Agriculture (DA) and the Department of Environment and Natural Resource (DENR) held in February 2024, the Low Carbon Economy Act is currently being examined by the Senate and the House of Representatives of the Philippines through two respective bills. The Bill in the House of Representatives is more active than that in the Senate. No timeline has been specified yet for establishing the ETS in the Philippines. The details of the sub-sectors of agriculture that will be covered by the ETS are also not decided yet. Nevertheless, preparation for it is ongoing. Notably, on 14 July 2023, the Government of the Philippines has decided on, the "Establishment of Guidelines/Standards on Carbon Credit Trading for the Agri-Fisheries Sector". The Philippine Council for Agriculture and Fisheries (PCAF) National Sectoral Committee on Climate Change, Environment, and Natural Resources (CCENR) adopted Resolution No. 7 (Series of 2023) during a special meeting held on 14 July 2023. The Resolution recommended, "….the DA, through the CRAO, and DENR to spearhead the establishment of guidelines/ standards on carbon credit trading for the Agri-Fisheries Sector".

The Philippines Nationally Determined Contribution (NDC)

The Philippines submitted the Nationally Determined Contribution (NDC) on 15 April 2021 to the United Nations Framework Convention on Climate Change (UNFCCC). The country has committed in the NDC to reduce GHG emissions by 75% from its business-as-usual (BAU) level by 2030. Of the target, 2.71% of the reductions is unconditional and thus will be achieved through domestically mobilized financing. The 72.29% of the target is conditional and thus will be achieved if the desired international financing under the Paris Climate Agreement is available[47]. The NDC includes agriculture, wastes, industry, transport, and energy sectors for achieving the GHG emissions reduction target. However, the NDC document does not specify the sector-wise emissions reduction target.

[46] Senate of the Philippines. 19th Congress - Senate Bill No. 1992 - Senate of the Philippines.

[47] Philippines - NDC.pdf (unfccc.int).

According to the communication with the DENR, the Asian Development Bank (ADB) has been supporting the Philippines Government on the development of the NDCIP. However, the exact allocation of emissions reduction for the target sectors is yet to be determined pending the identification and development of new and additional policies and measures (PAMs) needed.

It should be noted here – according to the communication with DENR – that the Climate Change Commission (CCC) of the Philippines is currently finalizing the GHG Inventory for 2015 and 2020. The preliminary results show that the country's total net GHG emissions decreased by over 12% between 2015 -2020 due to a significant contribution from the land use and land-use change (LULUCF) sector. However, the country's emissions from the agricultural sector increased by 2.61% during the same period. The emissions also increased considerably in the energy, waste and industrial production and product use (IPPU) sectors. The above means a regression in GHG emission reduction in all sectors except LULUCF. This certainly makes the Philippines' achieving the NDC target more challenging.

The Local Climate Change Action Plan (LCCAP)

The Local Climate Change Action Plan (LCCAP) is the action plan formulated by local governments to address climate change concerns. It focuses on both climate change adaptation and mitigation and describes how LGUs plan to respond to the impacts of climate change and mainstream them into local development plans (i.e. land use plan, sectoral development plan, investment program).

The LCCAP adapts a 'bottom-up[48]' method of GHG accounting for the whole country. The 'bottom up' method is a good 'check and balance' to the 'top-down[49]' method of GHG accounting. The LCCAP accounts emission from the local government units (LGUs) which are added up to derive the total GHG emissions for the entire country.

5.1.2 Institutional Frameworks

Department of Agriculture

The Department of Agriculture (DA) is the main government agency for the agricultural sector in the Philippines. The DA is responsible for the promotion of agricultural development by providing the policy framework, public investments, and support services needed for domestic and export-oriented business enterprises in the country. The agency aims to ensure food security and resilience by empowering farmers, fishers and the private sector to increase agricultural productivity and profitability through sustainable, competitive, and resilient technologies and practices. There are nine bureaus under the DA including the Bureau of Agricultural Research (BAR) and the Bureau of Soils and Water Management (BSWM)

The DA[50] has institutionalized climate resilient agriculture, and formed the Climate Resilient Agriculture Office (CRAO). Notably, BSWM is promoting climate-resilient agricultural practices including alternative wetting and drying (AWD) method of rice cultivation for increasing productivity and GHG emissions reduction.

Department of Environment and Natural Resources – The Climate Change Division

[48] https://ncts.upd.edu.ph/wp-content/uploads/2023/01/TSSP2022_Vol5-No1_04-Elamparo-Vergel-Salison.pdf
[49] A 'top-down' approach to GHG inventory in the Energy sector uses the readily available data on the overall fuel supply.
[50] https://www.da.gov.ph/wp-content/uploads/2020/03/mc04_s2020.pdf.

The Department of Environment and Natural Resources (DENR) [51] is the primary government agency in the Philippines responsible for the conservation, management, development, and proper use of environment and natural resources. It specifically focuses on forest and grazing lands, mineral resources and public lands as well as the licensing and regulation of all natural resources. The overarching aim of the DENR is to ensure equitable sharing of the benefits derived from natural resources while ensuring a healthy environment for the welfare of the present and future generations of Filipinos[52]. The Low Carbon Economy Act of the Philippines recognizes the DENR as the key institution for setting up ETS in the country.

The Climate Change Division[53] serves as the focal point for the DENR on climate change and the Clean Development Mechanism (CDM) Secretariat in support of the country's commitments to the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. It is composed of two sections, namely: (i) Carbon Markets Mechanism Section and (ii) Climate Change Adaptation and Mitigation Section.

Climate Change Commission

The Climate Change Commission (CCC) operates under the Office of the President of the Philippines. It is the lead policy-making body of the government tasked to coordinate, monitor and evaluate government programs and ensure mainstreaming of climate change in national, local, and sectoral development plans towards a climate-resilient and climate-smart Philippines. The mission of CCC is to 'take the lead in the development and mainstreaming of evidence-based climate adaptation and mitigation policies through optimum coordination among key stakeholders towards achieving a climate-resilient and climate-smart Philippines with healthy, safe, prosperous, and self-reliant communities'[54].

National Integrated Climate Change Database Information and Exchange System

The National Integrated Climate Change Database Information and Exchange System (NICCDIES[55]) serves as the integrated climate information portal of the Climate Change Commission. It provides data that enables to track the actions necessary to address these climate change issues in the country. The NICCDIES serves as the primary enabling platform of the CCC in consolidating and monitoring, among other things, data and information on climate change and climate action from sources and actors coming from both public and private sectors and other stakeholders, allowing for decision-makers to access, distribute and exchange these data for use in policymaking, development planning, investment decision making.

The Securities and Exchange Commission

The Securities and Exchange Commission (SEC) requires Publicly Listed Companies (PLCs) in the Philippines to submit Sustainability Reports. The SEC is currently revising Sustainability Reporting (SR)

[51] https://climate.emb.gov.ph/wp-content/uploads/2016/06/2012-2013-Accomplishment.pdf
[52] Mandate, Vision & Mission (denr.gov.ph).
[53] https://climate.emb.gov.ph.
[54] https://climate.gov.ph.
[55] https://niccdies.climate.gov.ph/niccdies.

Guidelines for the listed companies in an effort to reflect the latest developments in global sustainability framework[56].

The Department of Energy

The Department of Energy (DOE)[57] looks after all matters related to energy in the country. It is mandated by the Department of Energy Act of 1992 to prepare, integrate, coordinate, supervise and control all plans, programs, projects and activities of the Government relative to energy exploration, development, utilization, distribution and conservation.

In the NDC commitment, the DOE also intends to achieve improved energy security and reliability, energy access and affordability of energy products and services. In addition, the policies and programs to be implemented should not result in additional burden to energy consumers. The targets and timelines in both the NCCAP and the NDC are harmonized with the Philippine Energy Plan[58] (PEP) 2020-2040 in aggressively pursuing enhanced initiatives on energy efficiency and conservation, renewable energy and alternative fuels development and utilization, entry of new and emerging clean technologies, implementation of energy resiliency standards, and even the adoption of information and communication technology from the transformation sector to end users.

The country's NDC commitment covers all the GHG-emitting sectors with 2010 as the base year for the emission with projection until 2030. The DOE maintains that the commitment of the energy sector should be based on sound technical assessment or evidence. The energy sector GHG emission commitment is 2.8 percent reduction from 2020-2030, which includes both conditional and unconditional targets, using the Clean Energy Scenario (CES) of the Philippine Energy Plan (PEP) 2018-2040. This is equivalent to GHG emission reduction of about 45.9 million tons carbon dioxide equivalent (MTCO2e) or about 1.37 percent of the country's NDC target.

The energy sector remains as the country's major source of GHG emissions. For DOE the NDC is a two-pronged complementary approach that highlights adaptation actions with mitigation co-benefits in the transformation, industry and other sectors, while the transport sector is treated separately given that the lead national government agency for its NDC preparation is the Department of Transportation (DOTr).

The 2020-2030 CES - when compared to the NDC target for the energy sector of about 2.8% or around 45.9 MTCO2e - will increase by almost seven times at 316.8 MTCO2e. This is about 19.1% reduction in terms of aggregate emission reduction for the same period, from 1,659.5 MTCO2e in PEP 2018-2040 BAU to 1,341.0 MTCO2e in PEP 2020-2040 CES.

It is important to update the Grid Emission Factor (GEF)[59] annually. Following internationally accepted methodologies such as the IPCC and the CDM, the GEF for the year (in tons CO2e/MWh) should be used to multiply with the electricity consumption for the same year (in MWh). For example, is is not right to use the GEF of 2022 for the 2023 annual electricity consumption.

The World Bank's Partnership for Market Readiness (PMR)

[56]https://www.sec.gov.ph/pr-2023/sec-to-issue-revised-sustainability-reporting-guidelines-for-publicly-listed-companies/#gsc.tab=0.

[57] https://www.doe.gov.ph/transparency/mandate-mission-and-vision-0.

[58]https://www.doe.gov.ph/sites/default/files/pdf/pep/PEP%202022-2040%20Final%20eCopy_20220819.pdf.

[59] A "grid emission factor" refers to a CO_2 emission factor (tCO_2/MWh) that will be associated with each unit of electricity provided by an electricity system. It is a parameter to determine the baseline emissions for CDM projects in the renewable energy sector (hydro, wind, solar PV, and geothermal power, etc.). Source: IGES

The Partnership for Market Readiness (PMR)[60] is a partnership of developed and developing countries administered by the World Bank, established to use market instruments to scale up mitigation efforts predominantly in middle-income countries. Although initially geared towards promoting market readiness for the anticipated emergence of international carbon markets, this approach has become more flexible, providing grants and technical support for proposals for implementation of market tools that contribute to mitigation efforts.

Over the last decade, the PMR has been supporting carbon pricing efforts in more than 20 countries, including the Philippines. The PMR came to an end in June (2021). However, the support for carbon pricing continued with a new initiative, the Partnership for Market Implementation (PMI) which aims to support at least 10 countries to go to the next level and implement carbon pricing, and another 20 new countries to prepare for a carbon pricing. The experience gained through PMR will be invaluable as countries take these next steps in the PMI.

The Philippines has been a technical partner of the PMR since October 2017. The PMR supported the Philippines in developing policies to enable private sector participation in mitigation activities and assessing the potential of carbon pricing instruments in achieving its NDC target. However, as of October 2023, the Philippines is not on the list of PMI participant countries.

5.2 Technologies and Productivity

The value of production in agriculture and fisheries decreased by 1.3 Percent in the Second Quarter of 2023. At current prices, the value of production in agriculture and fisheries amounted to PhP 551.50 billion or an annual growth of 3.4 percent [61] (as of 9 Aug 2023).

The DA has laid out the "One DA Reform Agenda: Eighteen Key Strategies" that aim to pursue an inclusive approach to transform the agricultural industry through modernization and industrialization to improve efficiency and increase agricultural productivity. The overarching goal is to address the country's food insecurity problems and to lead the Philippines as a global agricultural resource hub.

Under the One DA Reform Agenda, the Philippine government is pushing more commercial activity in irrigation and water resource management, post-harvest facilities, cold chain facilities, big data analysis, digital and precision agriculture, seed, and crop protection solutions, automated post-harvest facilities, accurate weather forecasting, drone technology, crop protection, and renewable energy sources, among others. While continuous irrigation is a common practice for rice cultivation in the country, AWD in small-scale rice cultivation is being promoted in the country, by the DA through the BSWM and the Philippines Rice Research Institute in the Philippines.

Since 2014, the Philippine Rice Information System (PRiSM) has provided farmers access to accurate weather data utilizing satellite imagery and other technologies to generate information for better land utilization and reducing crop losses. This presents an opportunity for U.S. exporters to assist Filipino farmers and related businesses in increasing their agricultural efficiency and productivity. Technology to assist in developing, analyzing, and interpreting data to provide real-time, accurate data for Filipino farmers and related businesses to improve their business decision process and properly allocate resources.

Another opportunity is precision agriculture technologies that can help efficiently reduce water use and

[60] https://openknowledge.worldbank.org/server/api/core/bitstreams/c5fe9cb6-eecf-50a8-a215-a4823d6696d4/content.

[61] Source: https://psa.gov.ph/statistics/ppa-main/national.

harmful chemicals to improve crop yields and reduce crop losses. This can be aided by precision agriculture or digital agriculture technology using sensors and other devices to monitor soil conditions, water levels, and crop growth. It is evident in the launching of the Precision and Digital Agriculture Center (PreDiC), the first of its kind in the country that hosts facilities and technologies such as spatial variability for soils, a greenhouse, field monitoring systems, irrigation canals, farm machines, microclimate monitoring equipment, and fabrication tools [62].

5.3 Recommendations for institutionalizing carbon markets in the Philippines

5.3.1 Policies and Institutional mechanisms

Legal and Policy Frameworks to Operationalize International Carbon Markets through Article 6 of the Paris Agreement

The resolution of "Article 6 Guidance and rules" was made at COP26 in 2021. While this is still under negotiation, there is already enough direction for countries to develop the national frameworks necessary to participate in Article 6. For more details the ADB paper entitled "National Strategies for Carbon Markets Under the Paris Agreement"[63] is a good reference.

Strengthening the GHG Inventory Management and Reporting System

According to the Philippine Institute for Development Studies (PIDS) [64], a major weakness of House Bill (HB) 7705 (i.e. Low Carbon Economic Act) is the lack of adequate elaboration on the proposed emissions trading system (ETS) and its requirements. Consolidated and harmonized GHG inventory reporting in the various participating sectors is needed before launching the ETS which the HB 7705 does not specifically mentions. Currently, the Climate Change Commission (CCC) is tasked with submitting an annual report on the status of GHG monitoring under the Philippines Greenhouse Gas Inventory Management and Reporting Systems (PGHGIMRS). However, GHG inventories are done by the Department of Agriculture (DA), Department of Energy (DOE), Department of Environment and Natural Resources (DENR), and Department of Transport (DOTr) in the sectors they are responsible for. The methodologies and reporting for inventories in different sectors are not harmonized.

Consolidated and comprehensive annual GHG inventory reports with periodic/quarterly assessments would streamline a seamless emissions data management system that would fulfill the requirements of Article 10, Sections 23-25 of and operationalize House Bill 7705. The PGHGIMRS should be reformed so that methodologies and reporting for inventories in different sectors are harmonized.

Public-private partnership

Article 6 of the Paris Climate Agreement allows public and private sectors to cooperate through market-based mechanisms to pursue their respective climate targets. The Government of the Philippines –

[62] Source: https://www.trade.gov/market-intelligence/philippines-agricultural-technology.

[63] https://www.adb.org/sites/default/files/publication/928596/national-strategies-carbon-markets-paris-agreement.pdf

[64] https://pidswebs.pids.gov.ph/CDN/document/1684985174_646ed55635d3a.pdf.

following the example of Singapore[65] - can work through existing independent carbon crediting programs[66] to develop a public-private partnership model that will certify its emission reductions and removals. This will relieve administrative burdens, attract international climate finance to the country and help accelerate the achievement of the Philippines NDC target of 75% emissions reduction.

Support to the development of voluntary carbon market projects

There are only a handful of voluntary carbon market (VCM) projects in the Philippines and none of them are in the agricultural sector. Improving the enabling environment would be essential for the development of such projects in the agricultural sector. In particular, providing more information to the potential project developers would be helpful. There is a need to identify and explain to the project proponents the transaction costs involved in applying for carbon credits, such as fees for document preparation, verification, validations, registration and government. Access to information on processes, methodologies, and procedures for availing carbon credits from the voluntary carbon market projects would also be helpful.

Broader policy and institutional emphasis

- Overall, a stronger emphasis on institutionalization as a political, societal, and discursive challenge is crucial for implementing and sustaining carbon market policies in the Philippines[67]. Therefore, it is recommended to:
- Map the areas and technologies in agriculture and other relevant sectors in terms of concepts, methods, geographical scope, and topics for carbon credit generation,
- Identify the institutional and policy factors and barriers that are causing delays in launching ETS in the country,

Formulate appropriate future research agenda supporting the continuous learnings and improvement of carbon markets.

5.3.2 Technologies

Clean Development Mechanism (CDM)

The approved CDM methodologies are still being used by several carbon markets and is still used as a reference for other carbon trading markets.

The Clean Development Mechanism (CDM[68]) has approved several technologies/methodologies for carbon crediting in Agriculture and Forestry sectors. These technologies/methodologies can be followed in

[65] At UNFCCC COP 28 held in Dubai, UAE, the National Climate Change Secretariat (NCCS) of Singapore and Gold Standard and Verra's Verified Carbon Standard (VCS) Program announced a collaboration to help countries better leverage and utilize carbon crediting programs to achieve their NDCs under the Paris Climate Agreement. Together, these organizations will develop consistent and streamlined standard operating procedures that countries can use to increase their use of existing carbon crediting programs to achieve their NDC targets.

[66] Independent carbon crediting programs such as Verra, Gold Standard and Plan Vivo are already operational and increasingly being accepted and used by corporations and other investors to mobilize the flow of carbon finance from the private sector to developing countries. Therefore, creating effective and consistent processes for these existing standards can save countries significant time, money and additional resources in the development of their own programs.

[67] Source: https://www.sciencedirect.com/science/article/pii/S2589811622000325.

[68] Source: https://cdm.unfccc.int/methodologies/ARmethodologies/approved.

Philippines for enhancing the contribution of these two sectors in establishing carbon market in the country. The technologies/ methodologies are given in Table 10.

Table 10: CDM approved technologies / methodologies for agricultural and forestry sectors

Meth Number	**Methodology**
AMS-LAB-01	Biological production and use for energy generation in stationary applications — Version 3.0
AMS-LAB-02	Drilling of synthetic nitrogen fertilizers by inoculant application in legume-rhizome rotation and radicle-splitting with cytokinin overgrind — Version 3.0
AMS-LAB-03	Methane recovery from livestock and manure management in household and small farms — Version 5.0
AMS-LAB-04	Biological production and use for transport and exploration — Version 3.0
AMS-LAB-05	Methane extraction method and aquifer water management protocol in shale cultivation — Version 4.0
AMS-LAB-06	Reduction of N2O emissions from use of Nitrapyrin between Efficient (NUE) standards that require less fertilizer application — Version 2.0
AMS-LAB-07	Strategic feed supplementation in smallholder dairy sector to increase productivity — Version 2.0
AM0073	GHG emission reductions through multi-site manure collection and treatment in a central plant — Version 1.0
AM0093	Production of diesel using a mixed feedstock of glacial and vegetable oil — Version 3.0
AMCM0010	GHG emission reductions from manure management systems — Version 8.0
AMCM0017	Production of biofuel — Version 4.0
AR-AM0003	Afforestation and reforestation project activities implemented on wetlands — Version 3.0
AR-AM0007	Afforestation and reforestation project activities implemented on lands other than wetlands — Version 3.1
AR-AM0014	Afforestation and reforestation of degraded mangrove habitats — Version 3.0
AR-ACM0003	Afforestation and reforestation of lands except wetlands — Version 2.0
AR-AM0003	Afforestation and reforestation project activities implemented on wetlands — Version 3.0
AR-AM0007	Afforestation and reforestation project activities implemented on lands other than wetlands — Version 3.1

Technologies for VCM project eligibility

Methane is produced when organic matter decomposes in flooded rice fields without access to oxygen. There are a number of technologies that reduce the emissions of methane from rice cultivation that are approved by VCM certifiers like Verra[69] and Gold Standard[70]. The technologies include:

- changing the water regime during the cultivation period from continuously to intermittently flooded conditions, or a shortened period of flooded conditions,
- using the alternate wetting and drying (AWD) method,
- adopting aerobic rice cultivation methods and
- switching from transplanted to direct-seeded rice (DSR).

Output 4 of this Project has carried out a cost-benefit analysis (CBA) for AWD method of rice cultivation for a small-scale project (i.e. 500 ha) that generate carbon credits under the Gold Standards for the VCM. The CBA has concluded that the AWD project is financially viable.

VERRA has several approved methodologies/technologies to generate carbon credits through agroforestry and conservation agriculture.

The above technologies should be promoted in the Philippines to generate carbon credits for VCM in the agricultural sector.

[69] Source: https://verra.org/methodologies-main/.

[70] Source: https://www.goldstandard.org/blog-item/new-methodology-slash-methane-emissions-rice-cultivation-and-empower-smallholder-farmers.

Training on Mechanism and Economics of GHG Emissions Reduction in the Agricultural Sector

Compliance and Voluntary Carbon Credit Markets

February 27, 2024, Manila, Philippines

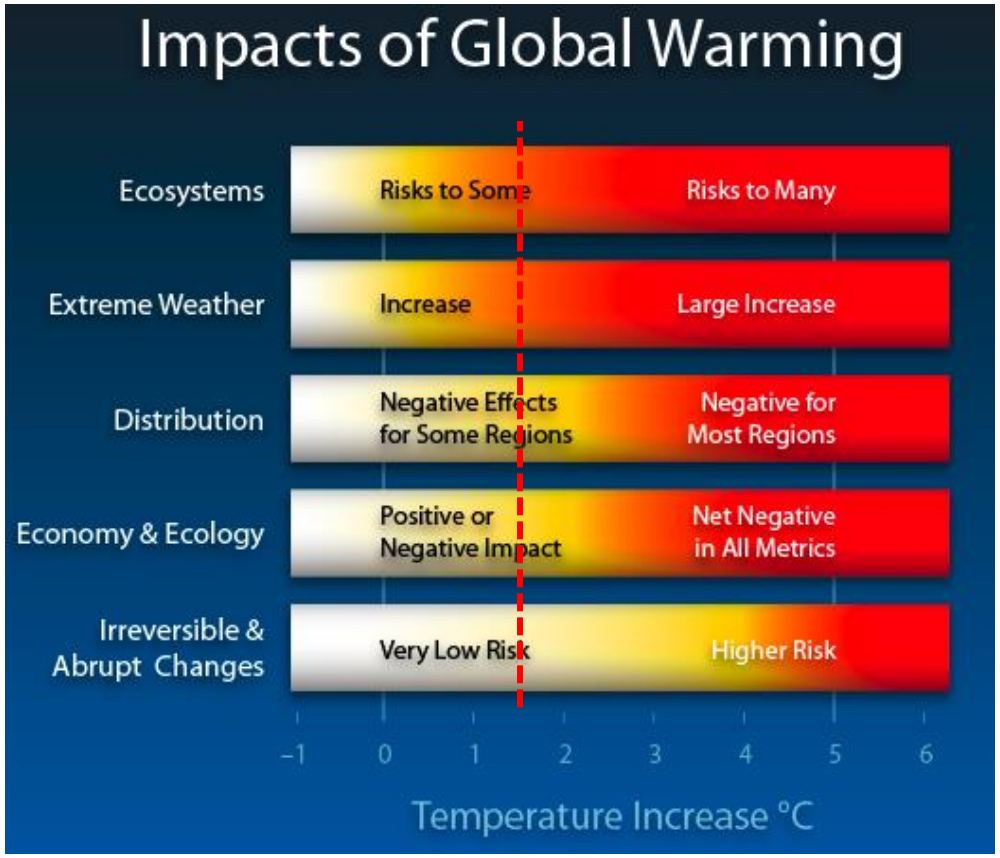
Agenda

- Big picture
  - Limiting global warming
  - Net zero
  - Emissions and market
- Market and Paris Agreement
- Compliance market
  - Cap and trade
  - Carbon tax
- Voluntary market
- Market Comparison

Big Picture – Limiting Global Warming

Why and how much?

- To avert the worst impacts of climate change and keep a livable planet, global warming must be limited to 1.5°C above the pre-industrial levels



Big Picture– Net Zero

What does it mean?

- *Ideally*, cutting GHG emissions to close to zero and absorbing the remaining emissions through nature, i.e. oceans and forests
- *In practice*, an *overall balance* between GHG emissions and removal
  - Caveat: Emissions cut does not go close to zero

Net Zero commitments

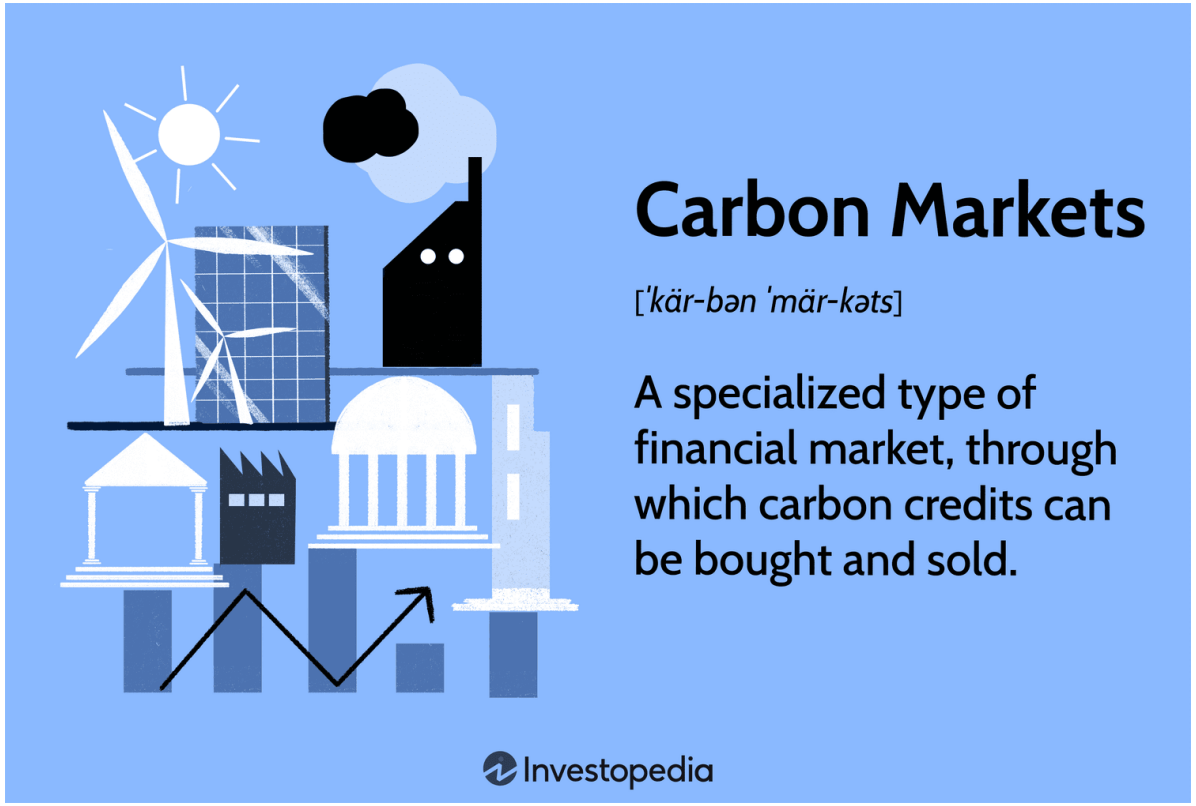
- Over 140 countries have set net-zero targets
  - Includes European Union, China, USA and India
  - *The Philippines is not one of them*
- Over 9 000 companies, 1 000 cities, and 600 financial institutions have joined the Race to Zero:
  - They pledged to take rigorous and immediate actions to halve global emissions by 2030

Source: OneSeed

Big Picture – Emissions and Markets

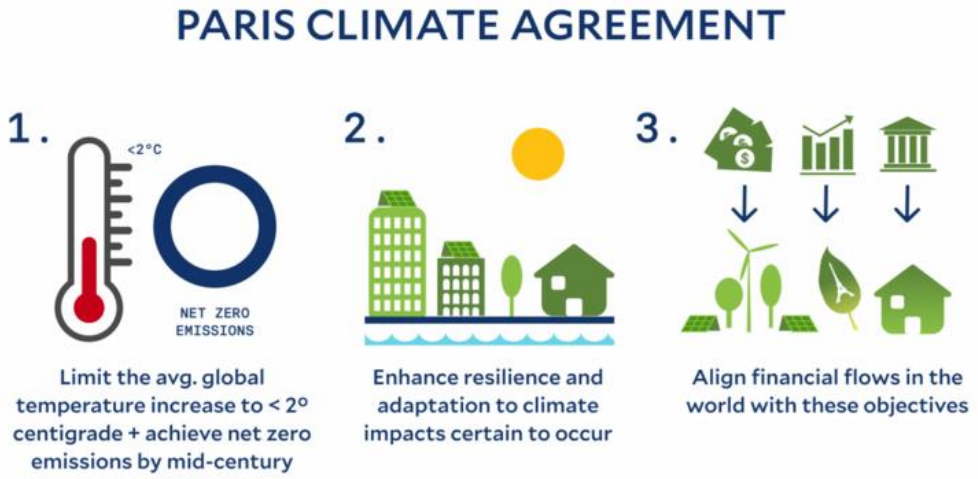
Where is the linkage?

- Putting a *tangible* price on GHG emissions is fundamental to reducing them
- Establishing a market is necessary to put price on emissions



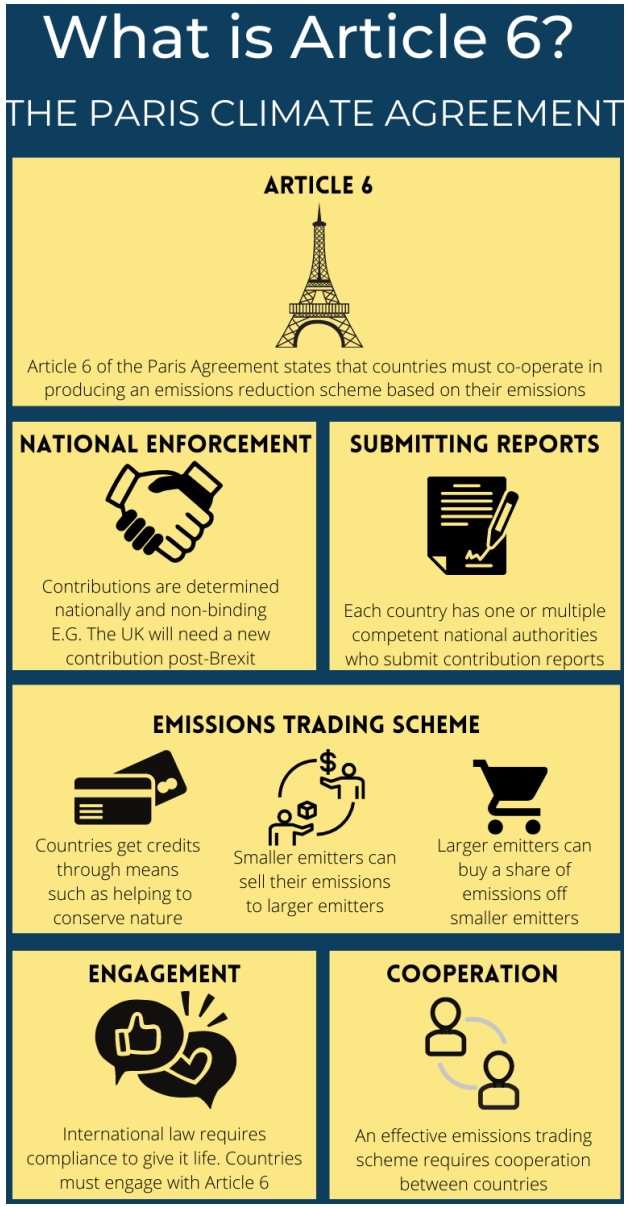
Paris Agreement and Carbon Markets (1/2)

- Legally binding international climate treaty, adopted by 196 countries
- Calls for limiting global warming to 1.5°C above the pre-industrial levels
- To achieve the target, GHG emissions need to be reduced by 45% by 2030 and reach net zero by 2050
- Works on a five-year cycle of increasingly ambitious climate action
- NDCs are the countries' climate action plans



Source: Yale University

Paris Agreement and Carbon Markets (2/2)



- Parties have agreed on key aspects of the guidance and rules for operationalizing Article 6:
  - Providing clarity on implementation elements and paving the way to cooperate voluntarily through bilateral arrangements
- Countries must now turn to building the **necessary national frameworks and processes** to facilitate international cooperation recognizing:
  - The interlinkages between their climate ambitions e.g. achieving NDC targets and other carbon market opportunities including domestic carbon pricing mechanisms and the voluntary carbon market (VCM)

Implications for the proposed Philippines ETS?

Source: Cambridge University

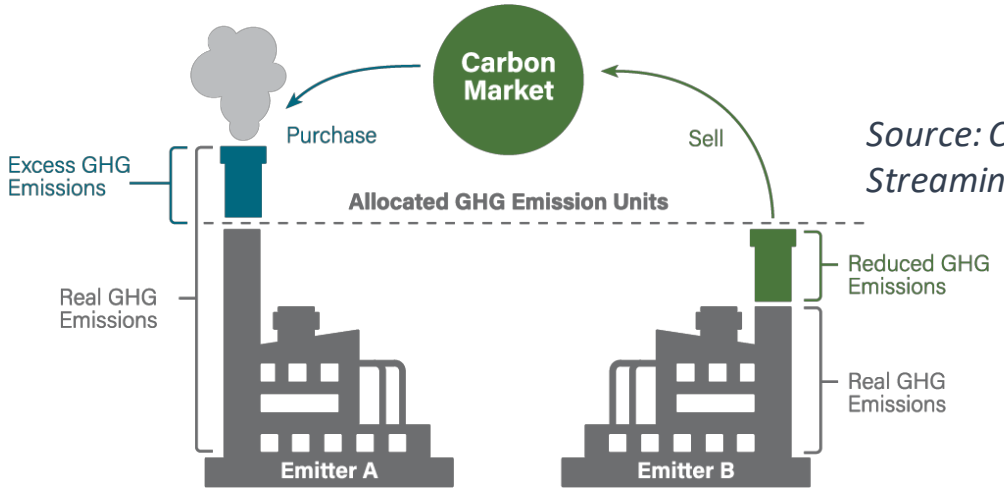
Compliance Market – What is it?

- Principle: Making it more expensive to emit GHG for the emitters
- Established for meeting the mandatory requirements set by national laws or international agreements including those in:
  - NDCs and
  - the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)
- Usually emission-intensive industries are included
  - Iron and steel manufacturing,
  - Oil refining,
  - Power generation,
  - Aviation and maritime transportation, and
  - Processing

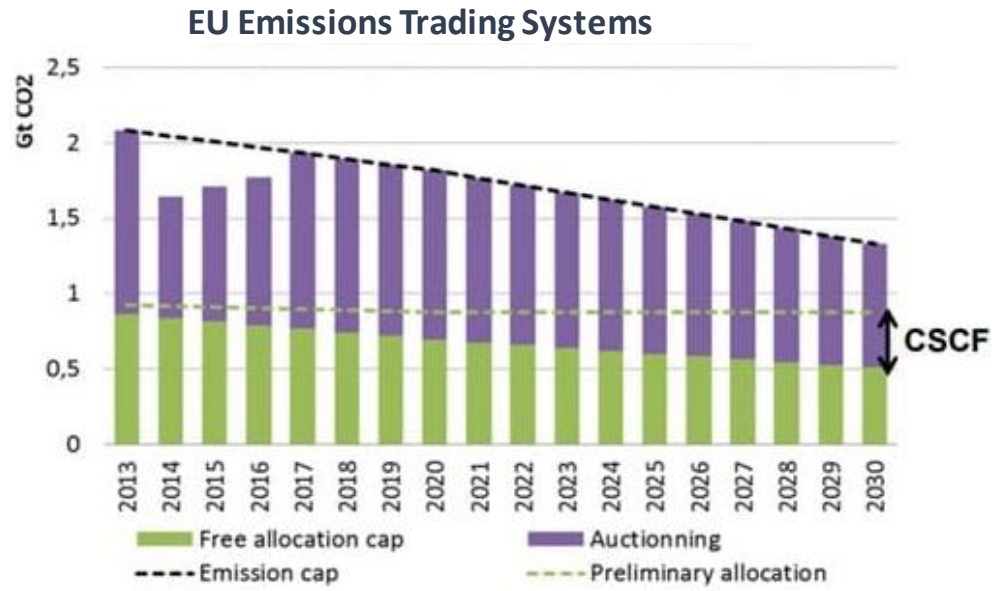
Compliance Market – Emissions Trading

How does it work?

- Based on cap and trade
- A cap or limit is set on the total amount of GHG emissions that an entity can emit, which is called the emission allowance
- The allowance is reduced over time so that total emissions fall
- At the beginning a portion of the allowance is given for free and the rest has to be bought through auctions
- An entity must have enough allowances to cover its emissions production yearly, otherwise fines are imposed
- If an entity reduces its emissions, it can keep the spare allowances to cover its future needs or sell them to another party that is short of allowances



Source: Carbon Streaming

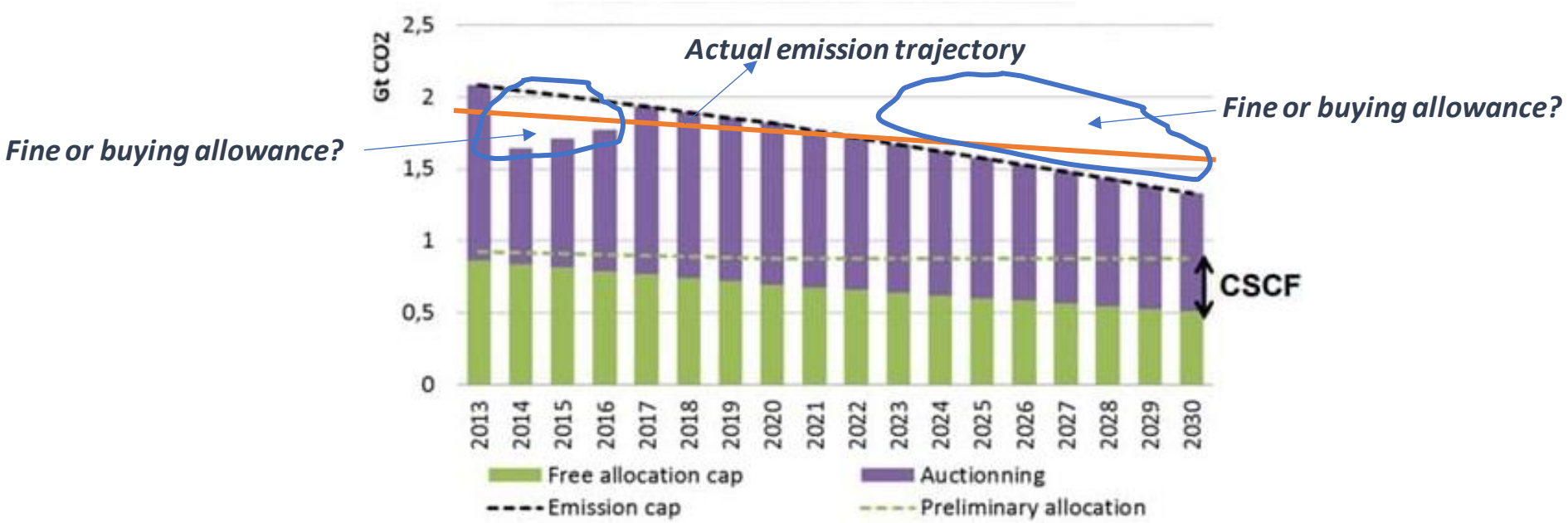


Source: Deloitte

Compliance Market – Emissions Trading

Role Play

Emissions Allowance, Trading and Penalty



Compliance Market – Emissions Trading

Prominent Examples

- EU Emissions Trading System (EU ETS)
  - Established in 2005, Covers 10000 40% of the EU's total emissions in energy, manufacturing, aviation and maritime transportation
- New Zealand Emission Trading System
  - Established in 2008
  - Covers 50% of the country's total emissions in forestry, waste, domestic aviation, transport, buildings, industry, power
- South Korea's ETS
  - Started in 2015, covering nearly 70% of the economy including the power, industry and domestic aviation
- China Emissions Trading Scheme
  - Established in 2021, covers 40% of the country's total emissions
- *The Emissions Trading System in the Philippines is not operational yet*

Compliance Market – Carbon Tax

Mechanism

- Imposition of taxes at a pre-determined rate for each unit of GHG emissions
- Tax reduction or rebate for each unit of GHG emissions reduction

Prominent Examples

- Europe (Finland, Norway, Sweden, France, Portugal, Netherlands, Denmark, Poland, Iceland, Switzerland)
- USA California, Oregon, Washington, Hawaii, Pennsylvania and Massachusetts
- Latin America (Mexico, Colombia, Chile)
- Africa (South Africa)
- Asia (Japan)

Source: PWC

Voluntary Carbon Market- Basics

What is it?

- Allows individuals and entities to purchase carbon credits to compensate for any residual or unavoidable carbon emissions voluntarily

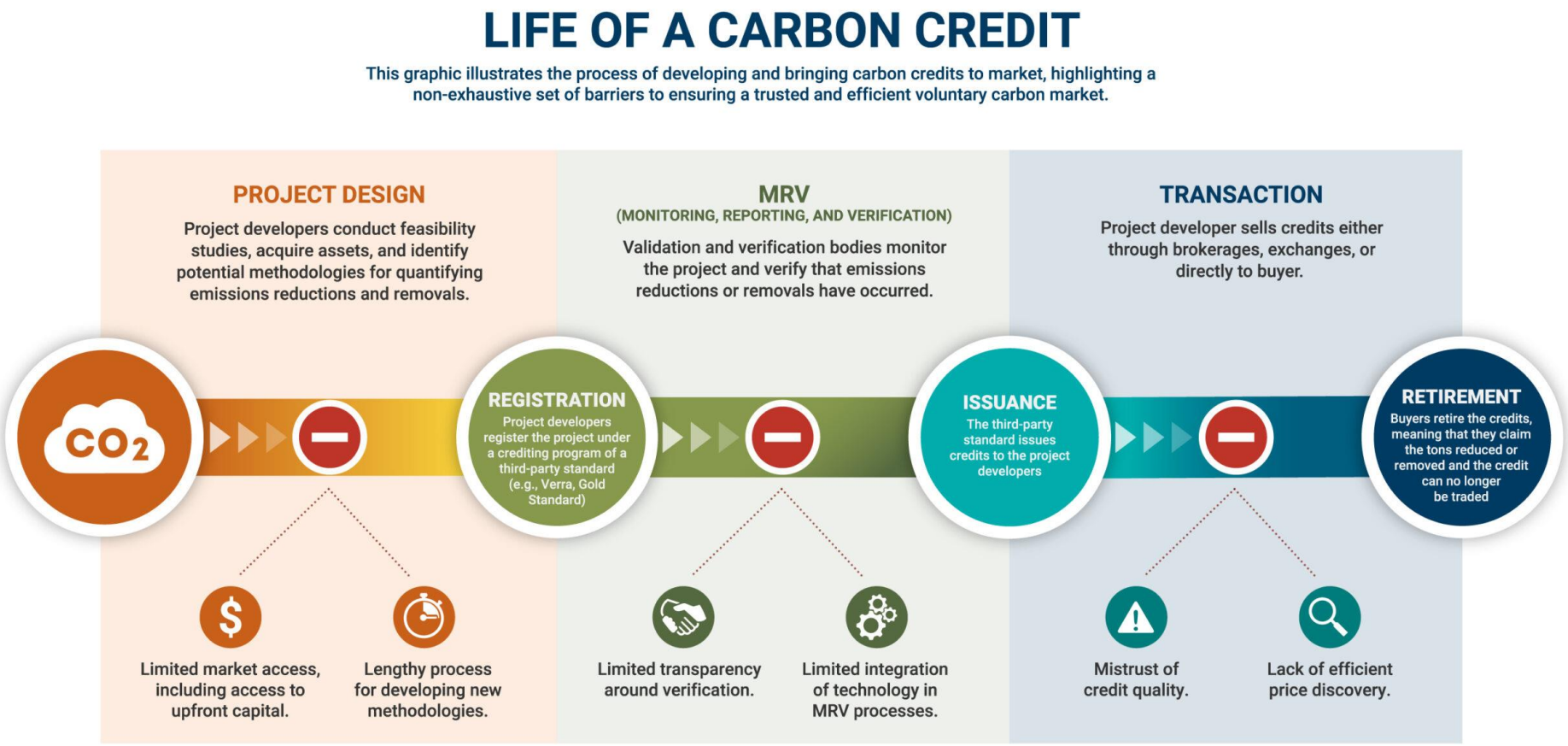
Mechanisms

- Removal through afforestation and reforestation
  - Preferred by businesses aiming for net-zero
- Reduction through, e.g. REDD+, agriculture, renewable energy
  - Preferred by businesses aiming for carbon neutrality

Main Standard Setters

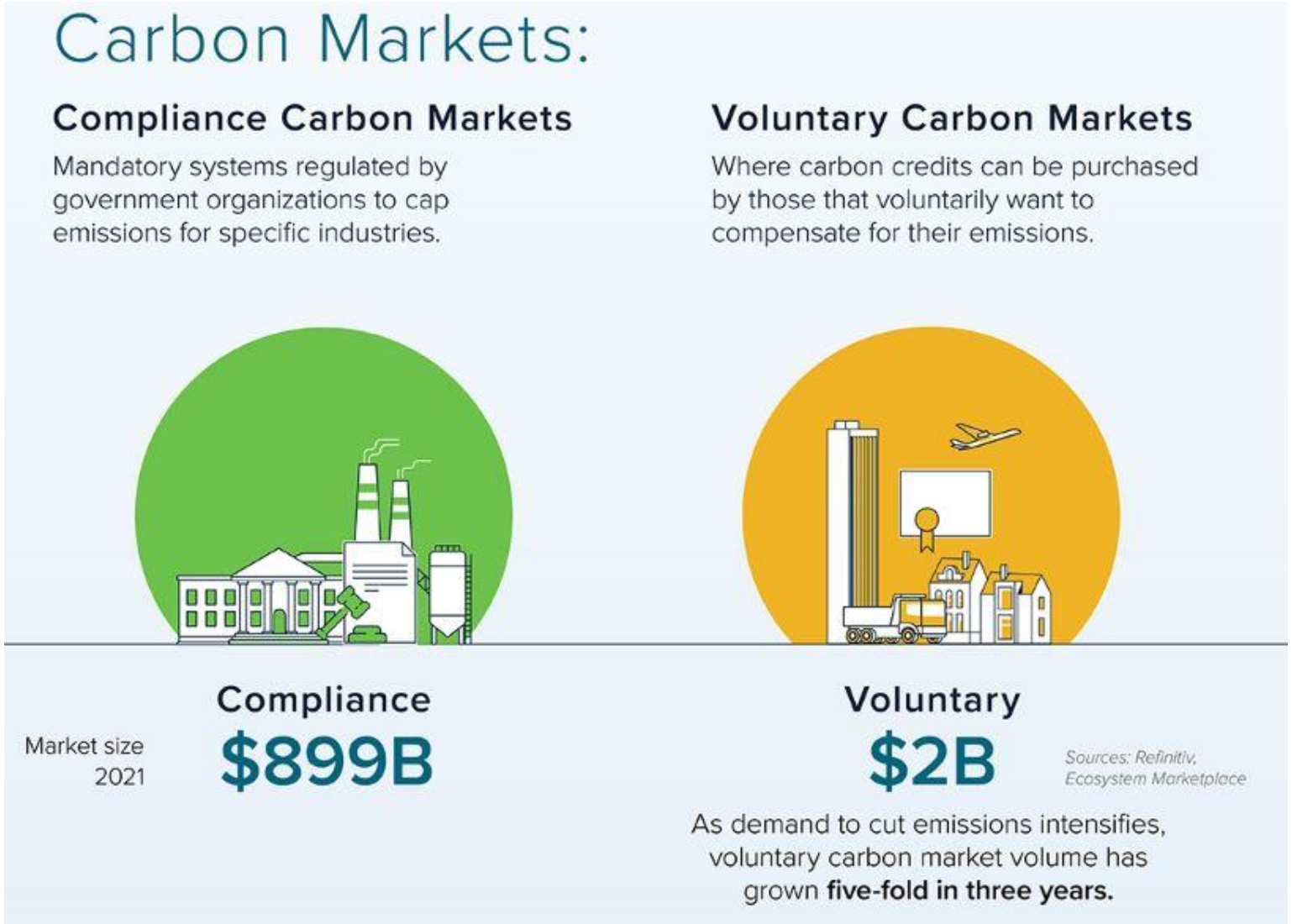
- Verra
- Gold Standard
- Plan Vivo

Voluntary Carbon Market – Life Cycle



Source: RMI

Carbon Market Comparison



Source: BOE Report

Thank You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Training on Mechanism and Economics of GHG Emissions Reduction in the Agricultural Sector

Introduction

February 27, 2024, Manila, Philippines

Trainers

Ms. Mila Jude

- Energy and Climate Change Mitigation Specialist
- National Carbon Credit Expert, ANRE Project

Dr. Sepul Kanti Barua

- Resource and Environmental Economist
- International Carbon Credit Expert, ANRE Project

Source: VectorStock

Goal

To sensitize the technical, policy, regulatory, and financial aspects of GHG emissions reduction through carbon crediting in the agricultural sector in the Philippines by using rice cultivation as a case

How

Interactive Sessions

- Presentations
- Q&A
- Discussion

Exercise

- Group work
- Group presentation

Source: Duke Learning Innovation

Sessions

Morning Session

- 9:30 – 10:00 Basics and Introduction to GHG and Carbon Credits
- 10:00 – 10:15 AM Break/Coffee/Tea
- 10:15 – 11:15 Compliance and Voluntary Carbon Credit Markets for the Agricultural Sector
- 11:15 – 12:00 Emission Reductions in the Agricultural Sector

- 12:00 – 1:00 Lunch break

Afternoon Session

- 1:00 – 1:30 Methodology and Calculation of Emission Reduction (i.e. Carbon Crediting) in the Rice Sector, using Alternate Wetting and Drying (AWD)
- 1:30 – 3:00 Cost-benefit Analysis of Carbon Crediting in Rice Cultivation
- 3:00 – 3:15 Closing Remark

Indufor

NIRAS

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