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UNLOCKING CARBON VALUE

A PLAYBOOK FOR AGRI-FOOD BUSINESSES

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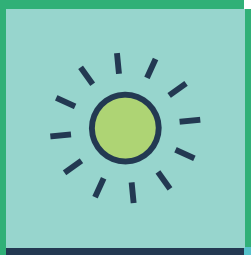



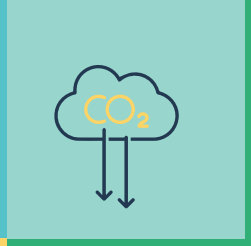


LIST OF ABBREVIATIONS

ACR	American Carbon Registry
AWD	Alternate Wetting and Drying
BEE	Bureau of Energy Efficiency
BUR	Biennial Update Report
CAR	Climate Action Reserve
CCP	Core Carbon Principles
CDM	Clean Development Mechanism
CO2e	Carbon Dioxide Equivalent
CSA	Carbon-Smart Agriculture
CSR	Corporate Social Responsibility
DSR	Direct Seeded Rice
ESG	Environmental Social and Governance
ETS	Emission Trading System
EU	European Union
EV	Electric Vehicle
FMCG	Fast Moving Consumer Goods
FPOs	Farmers Producer Organization
GCC	Global Carbon Council
GORD	Gulf Organization for Research and Development
GHG	Green House Gases
GIS	Geographic Information System
GS	Gold Standards
IALM	Improved Agricultural Land Management
ICM	Indian Carbon Market
ICVCM	Integrity Council for the Voluntary Carbon Market

IoT	Internet of Things
IPCC	Intergovernmental Panel on Climate Change
IRRI	International Rice Research Institute
ITMOs	Internationally Transferred Mitigation Outcomes
KVKs	Krishi Vigyan Kendras
KYC	Know Your Customer
LCA	Life Cycle Assessments
LULUCF	Land Use, Land-Use Change, and Forestry
MRV	Measuring, Reporting and Verification
NDCs	Nationally Determined Contributions
NGOs	Non-Governmental Organization
NSCICM	National Steering Committee for Indian Carbon Market
OMGE	Overall Mitigation of Global Emissions
PACM	Paris Agreement Crediting Mechanism
SOCs	Soil Organic Carbon
SDGs	Sustainable Development Goals
UN	United Nations
UNFCCC	United Nation Framework Convention on Climate Change
USDA	United States Department of Agriculture
VVB	Validation and Verification Body
VCM	Voluntary Carbon Market
VCMI	Voluntary Carbon Markets Integrity Initiative
VCS	Verified Carbon Standards
WWF	Worldwide Fund for Nature

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EXECUTIVE SUMMARY

The Indian agri-food sector stands at a crossroad. Climate change is already disrupting food systems. Rising temperatures, erratic rainfall, floods, and prolonged droughts are reducing crop yields, stressing livestock systems, and threatening rural livelihoods. According to India's Fourth Biennial Update Report, wheat yields fell by up to 34% during the 2022 heatwaves, while vegetable crops like tomatoes and cucumbers saw losses as high as 50% (BUR–4, 2024). Meanwhile, the sector itself contributes over 13% of India's total greenhouse gas (GHG) emissions, primarily from rice cultivation, fertilizer use, and enteric fermentation.

Amid these dual pressure of rising climate risk and growing climate responsibility, agribusinesses are uniquely positioned to lead the transition toward sustainable, low-carbon food systems. This playbook serves as a practical guide for agri-food companies ready to embark on or accelerate their sustainability journey by integrating decarbonization strategies and tapping into the voluntary carbon market (VCM).

The first part of the playbook outlines how agribusinesses can begin reducing their Scope 1 (direct), Scope 2 (energy-related), and Scope 3 (supply chain) emissions. It walks businesses through mapping their GHG hotspots, selecting appropriate mitigation strategies, and leveraging interventions such as fuel switching, renewable energy adoption, and promoting regenerative agriculture practices like alternate wetting and drying (AWD) in rice, composting, and agroforestry. These interventions not only reduce emissions but also create opportunities for carbon credit generation.

The second part of the playbook explains the evolving carbon market landscape. It demystifies the differences between the compliance carbon market and the voluntary carbon market. The playbook introduces key voluntary carbon market actors such as standards bodies like Verra and Gold Standard, registries, project developers, third-party verifiers, and buyers, and maps out the step-by-step process of developing, registering, verifying, and trading carbon credits.

India's voluntary carbon market, especially in agriculture, is projected to grow at nearly 38% annually and could unlock over USD 7 billion by 2035 (PIB, 2024) through nature-based and farm-based mitigation projects. The playbook highlights promising carbon project types relevant for agri-businesses, including soil carbon enhancement, low-emission rice cultivation, improved livestock and manure management, agroforestry, and biochar application. It details applicable methodologies, co-benefits, and the role of digital MRV technologies in ensuring transparency and integrity.

Recognizing that most of Indian agriculture is driven by smallholders, the playbook goes beyond technical guidance to address real-world

challenges: how to overcome the high upfront cost of practice change, and how to aggregate small farmers effectively. It provides recommendations such as blended finance models, results-based payment structures, carbon revenue recycling, and benefit-sharing mechanism.

Several case studies are woven throughout the playbook such as Bayer's Rice Carbon Program, Carbon Mint's digital traceability approach and Grow Indigo's farmer's awareness programme, illustrating how businesses are using technology, partnerships, and farmer engagement to build high integrity and scalable carbon projects.

Finally, the playbook lays out strategic considerations for agribusinesses to operationalize their carbon strategy: aligning with evolving standards, de-risking investments through insurance or pre-purchase agreements, and building capacity among farmers through digital literacy and advisory support. It emphasizes the importance of long-term design, farmer trust, and program durability.

At its core, this playbook is a roadmap for agribusinesses to move from intent to action. It encourages companies to embed climate action in their business models, not just to meet ESG mandates or regulatory compliance, but to build more resilient supply chains, foster rural prosperity, and future-proof India's food system. The voluntary carbon market, when approached with integrity and equity, offers a meaningful lever to finance this transition.

1. INTRODUCTION

Indian agriculture faces growing risks from climate change and climate variability, as unseasonal heatwaves, floods, and extreme weather events increasingly reduce crop and livestock productivity across the country. India's Fourth Biennial Update Report, 2024 submitted to the United Nations Framework Convention on Climate Change (UNFCCC) stated that prolonged heatwaves in 2022 severely impacted major agricultural states such as Punjab, Rajasthan, Uttar Pradesh and Madhya Pradesh. Wheat yields dropped by up to 34 %, maize by 18 %, chickpea by 19 %, cowpea by up to 11 % and mustard by 18 %. Horticultural crops were also hard hit. Farmers reported widespread flower and fruit drop, and yield losses reached as high as 50 % in tomatoes, cucumbers, bitter gourd and okra due to intense heat stress.

Livestock production declined sharply, as milch animals produced up to 15% less milk, egg production fell by up to 10%, and broiler mortality rose to 8%. Water scarcity and rising temperatures also hampered inland fish farming.

Heavy rainfall events caused large-scale flooding in regions like Balrampur, Uttar Pradesh, submerging over hectares of crops such as paddy, maize, and potatoes. In Assam, recurring floods disrupted rice transplanting, forcing delays and increasing production risks. In addition to these, other extreme events such as lightning strikes, glacier bursts, and landslides damaged crops and infrastructure and led to the loss of lives. Glacier bursts triggered flash floods in hilly regions like Uttarakhand, while lightning incidents surged across multiple states during the early monsoon phase (BUR-4, 2024).

While being significantly impacted by climate change, India's agriculture sector is also a notable contributor to greenhouse gas (GHG) emissions. The Fourth Biennial Update Report (BUR-4), 2024, submitted to the UNFCCC also states that India's total GHG emissions in 2020 were 2,959 million tonnes of CO_2e (excluding LULUCF), with net emissions at 2,437 million tonnes of CO_2e after accounting for LULUCF. Of this, the agriculture sector accounted for 13.72%, amounting to approximately 406 million tonnes of CO_2e.

For stakeholders across the agri-food value chain, particularly input providers, food processors, and distributors, climate change has emerged not just as an environmental issue but as a significant business risk. However, agribusinesses are uniquely positioned to be part of the solution. By integrating climate action into their core operations, they can become powerful enablers of sustainable transformation across the sector.

There is a clear opportunity for agribusinesses to reduce greenhouse gas emissions across their value chain, by enhancing on-site energy efficiency and fuel management (Scope 1), transitioning to renewable energy sources (Scope 2), and collaborating with farmers and supply chain partners to adopt climate-smart practices (Scope 3). In addition to direct mitigation efforts, agribusinesses can also participate in the **voluntary carbon market (VCM)** either by developing their own projects (such as regenerative agriculture, agroforestry, or improved manure management) or by purchasing high-quality carbon credits to offset unavoidable emissions.

The evolving global framework under the Paris Agreement, particularly Article 6, which governs international cooperation on carbon markets, presents an opportunity for countries to participate in carbon markets. Article 6.2 facilitates

bilateral cooperation between countries through Internationally Transferred Mitigation Outcomes (ITMOs), allowing India to engage in climate cooperation aligned with its national interests and Nationally Determined Contributions (NDCs). Article 6.4, on the other hand, establishes a centralized crediting mechanism, and the United Nations Framework Convention on Climate Change (UNFCCC) oversees it to ensure environmental integrity, transparency, and real climate benefits.

In the Indian context, these developments are highly relevant as the country begins to operationalize its compliance carbon market under the Bureau of Energy Efficiency (BEE) and the Indian Carbon Market (ICM) framework. The compliance market will initially target hard-to-abate sectors, and the government expects it to evolve into a broader national system that may eventually include agriculture, especially as the country moves toward net-zero targets. Simultaneously, carbon-smart agriculture (CSA) which includes practices such as reduced tillage, improved crop rotations, agroforestry, and enhanced carbon sequestration offers a promising frontier for generating high-integrity voluntary carbon credits.

This is a timely opportunity for agribusinesses to take the lead in climate action. By addressing the GHG emission from their processes and supporting regenerative agricultural practices they can unlock new revenue streams, strengthen supply chain resilience, and enhance their ESG credentials. Most importantly, they contribute directly to climate goals while creating a positive impact for rural communities.

This playbook is designed to guide agribusinesses in identifying actionable opportunities to reduce their Scope 1, 2, and 3 emissions, while also unlocking the potential of the voluntary carbon market (VCM). It breaks down the practical steps required to engage with these pathways, enabling businesses to make informed decisions and actively contribute to India's broader climate transition.

2. STARTING THE SUSTAINABILITY JOURNEY

Starting the sustainability journey for businesses involves several key steps. This chapter outlines how one can begin exploring this path by understanding the broader sustainability landscape and identifying initial areas of focus.

2.1 Understanding the Scope 1, Scope 2 and Scope 3 Emissions

A typical agricultural supply chain involves various actors. Emissions can be classified according to the step in the supply chain where they occur: these are known as Scope 1, 2 and 3 emissions.

The Greenhouse Gas (GHG) Protocol, defines these scope as follows:

SCOPE 1

These are direct emissions from sources that a company owns or controls—for example, a tractor owned by the company that is used to plow fields.

SCOPE 2

These are indirect emissions from the energy a company buys, such as electricity, heating, or cooling. For instance, power used in cold storage rooms for fresh produce.

SCOPE 3

These include all other indirect emissions that come from activities the company doesn't own or control but are still linked to its operations. This includes emissions from the production and transport of inputs like agricultural machinery, fertilizers, and pesticides used on farms. These can occur either before (upstream) or after (downstream) the company's direct activities.

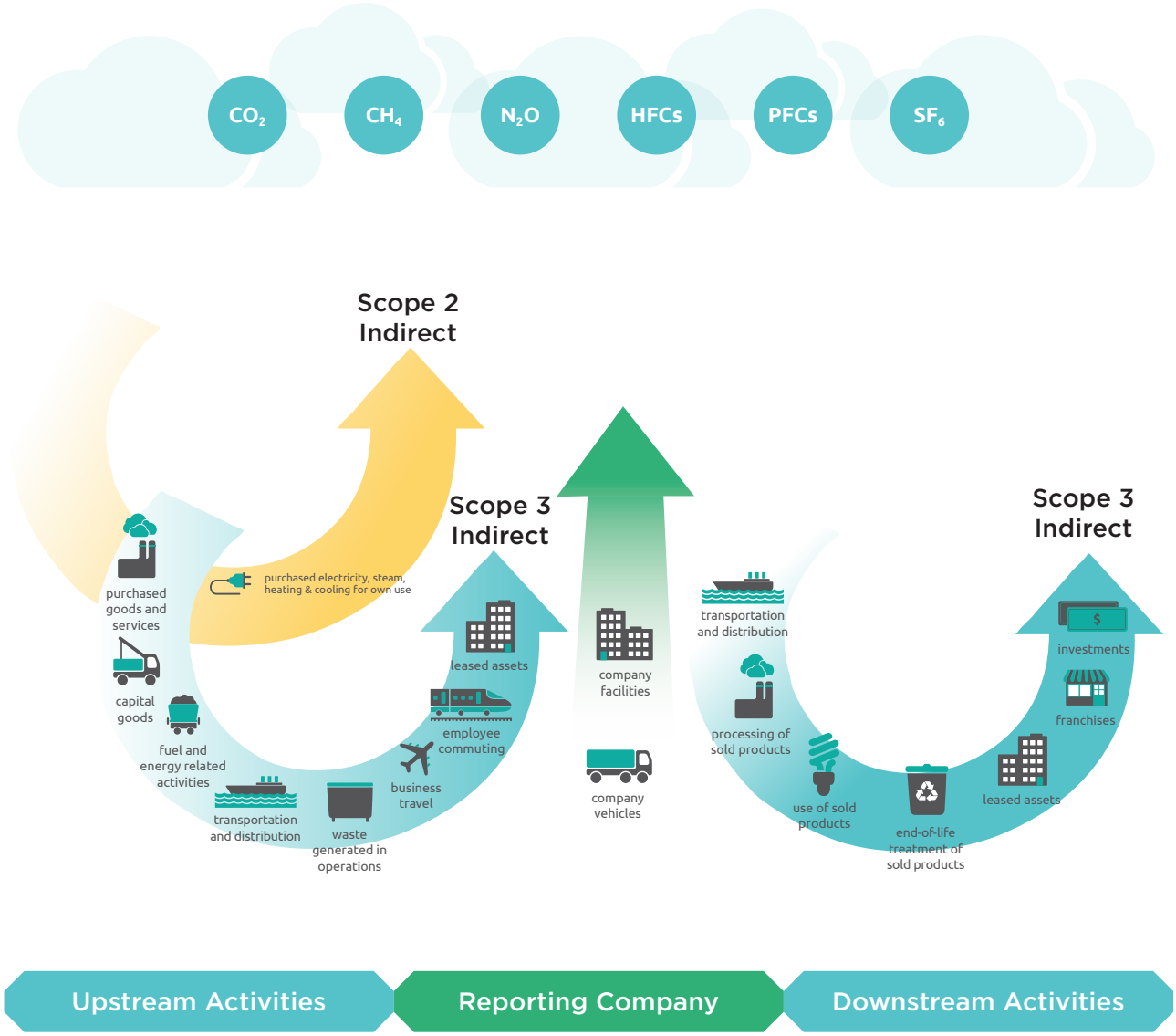


Figure 1 *Illustration of Scope 1, Scope 2 and Scope 3*

It is important to note that, the Scope 1, 2, and 3 emissions of one entity often contribute to the Scope 3 emissions of another. For example, in the agri-food sector, the emissions generated at the farm level—whether from direct activities (Scope 1), purchased energy (Scope 2), or upstream inputs (Scope 3)—are accounted for as Scope 3 emissions by agri-food companies that source and process these raw materials

2.2 Evaluating and Quantifying GHG Hotspots

Effective quantification of emissions requires a clear understanding of both the sources of emissions and the emissions category that they fall under—Scope 1, 2, or 3, so they can be accurately measured and strategically managed. The following table provides an overview of how these emission scopes typically manifest for actors within the agri-supply chain. For this report, the actors in the value chain would be considered up to distributors.

Table 1 *Overview of activities falling under Scope 1, 2 and 3 for the agri-supply chain*

Actor	Scope 1 (Direct Emissions)	Scope 2 (Indirect – Energy)	Scope 3 (Other Indirect Emissions)
 **Input Suppliers**	Fuel used in manufacturing/ agrochemical production units.	Electricity used in production and operations.	Raw material extraction, packaging, logistics, and product use by farmers.
 **Farmers/ Producers**	On-farm fuel use (tractors, diesel pumps), enteric fermentation (if livestock), residue burning.	Electricity for irrigation, cold storage, etc.	Emissions from seed, fertilizer, and agrochemical production, machinery manufacture, transportation.
 **Post-Harvest Actors**	Fuel for local transport, on-site drying or cleaning using diesel burners.	Electricity for storage, drying, and cleaning units.	Packaging materials, upstream farm emissions, and transport to processors.
 **Processors/ Millers**	Fuel in boilers, generators, and on-site transport.	Electricity for milling, processing machinery, lighting.	Upstream farm-level emissions (raw produce), packaging, logistics, and employee travel.
 **Distributors/ Wholesalers**	Fuel for logistics fleet (trucks, vans), cold chain operations.	Electricity in warehouses, logistics hubs.	Emissions from packaging, refrigeration gases, third-party transport, and upstream product emissions.

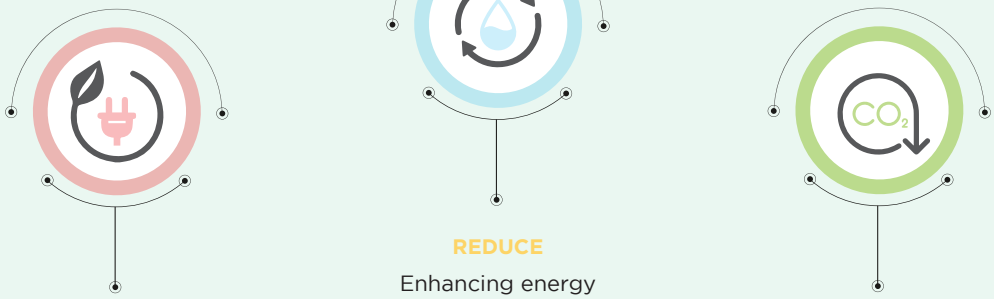
Once emission sources are identified, the next step is to calculate the carbon footprint using emission factors (EF), which may come from public databases or be developed in-house. Using supply chain-specific EFs enhances the accuracy and credibility of these calculations. This requires improved traceability, robust MRV systems, and reliable data from decarbonization projects or pilots, enabling companies to take targeted and effective climate action.

2.3 Setting Emission Reduction Targets and Identifying Mitigation Interventions

Reducing GHG emissions in agribusiness requires a comprehensive approach across Scope 1, 2, and 3 emissions. For cereals and pulses actors—such as seed companies, input manufacturers, grain processors, and distributors—Scope 1 interventions may include fuel switching in milling units, optimizing diesel use, and electrifying internal logistics. Scope 2 strategies focus on transitioning to renewable energy and improving energy efficiency in facilities, such as solar installations at processing units and energy audits to reduce electricity consumption.

Scope 3 emissions, often the most significant and complex, stem from upstream activities like paddy cultivation, fertilizer use, and downstream logistics. Agribusinesses can play a catalytic role by promoting sustainable farming practices such as alternate wetting and drying (AWD) in rice, reducing synthetic fertilizer use and engaging suppliers on emissions-linked sourcing. These efforts not only reduce the overall footprint but also open opportunities for carbon credit generation and align with evolving buyer and regulatory expectations.

The following are examples of mitigation actions that agribusinesses can adopt across Scope 1, 2, and 3 emissions, categorized by strategies that aim to avoid, reduce, or remove GHG emissions:



While mitigating emissions within the value chain is essential, agribusinesses can further strengthen their climate strategy by leveraging carbon markets. The upcoming chapters provide guidance on how to access and utilize these opportunities.

3. CARBON MARKETS

Carbon markets are a form of carbon pricing mechanism that allows companies or individuals to compensate for their GHG emissions by purchasing carbon credits from entities that remove or reduce GHG emissions. One tradable carbon credit is equal to one tonne of carbon dioxide, or the equivalent amount of different GHG reduced, sequestered, or avoided.

These markets aim to achieve climate goals and cost-effectively implement mitigation actions. It is different from carbon taxes, which impose a direct tax on each unit of GHG emitted.

3.1 Paris Agreement and Article 6: Framework for Carbon Markets

Article 6 of the Paris Agreement provides a mechanism for international carbon markets functioning, allowing countries to cooperate in meeting their climate goals. It establishes rules for the trading of carbon credits through bilateral or multilateral agreements and a centralized UN-supervised system.

ARTICLE 6.2

Facilitates the trading of Article 6.2 credits or Internationally Transferred Mitigation Outcomes (ITMOs) between countries. Countries exceeding their Nationally Determined Contributions (NDCs) can sell ITMOs to nations that need additional credits to meet their targets, enabling climate finance and technology transfer.

ARTICLE 6.4

Establishes the Paris Agreement Crediting Mechanism (PACM), which builds on the lessons from the Clean Development Mechanism (CDM). It allows for the centralized registration of projects, approval of methodologies, and management of credit transactions. A percentage of proceeds from these credits contributes to the Adaptation Fund and ensures overall mitigation of global emissions (OMGE).

ARTICLE 6.8

Focuses on non-market- based approaches like technology transfer, capacity building, and policy support without direct emissions trading.

There are two main types of carbon markets operating globally: **compliance and voluntary.** This chapter provides an in-depth overview of how compliance markets are evolving both globally and within India, while the following chapter delves into the voluntary carbon market in detail.

3.2. Compliance Carbon Market

Compliance carbon markets, established by regulatory bodies, operate under mandatory emissions trading schemes (ETS) at national or regional levels. Participants in these markets are obligated to comply with set emission caps and can trade allowances to meet their targets.

3.2.1 How Does the Compliance Market Work?

Compliance carbon markets are designed to help countries and companies meet legally binding climate targets, such as those outlined in the Kyoto Protocol (1997) and the Paris Agreement (2015). These markets typically operate through cap-and-trade systems, also known as Emission Trading Systems (ETS).

In a cap-and-trade system, the government sets a limit (or cap) on the total GHG emissions allowed. This cap is divided into permits or allowances, which are distributed to companies. Each company must hold enough permits to cover its emissions. If a company emits less than its allocated limit, it can sell the extra permits to others. If it exceeds its limit, it must buy additional permits. This creates a financial incentive for companies to reduce their emissions.

Over time, the overall emissions cap is gradually reduced, pushing companies to adopt cleaner and more efficient technologies. These markets are strictly regulated and include robust monitoring and verification processes to ensure accurate reporting of emissions and trades.

3.2.2 Implementing a Compliance Carbon Market

Key Steps in a Typical Compliance Carbon Market Process

Engage Stakeholders and Prepare the System

Authorities design the emissions trading system (ETS) framework, engage key stakeholders—including government agencies, industries, and the public—and build institutional capacity for implementation and compliance monitoring.

Define the Scope

Government/Authorities, identify and define the sectors, greenhouse gases, and entities that the ETS will cover, determining which industries and emission sources fall under regulation.

Set the Emissions Cap

Policymakers establish a total emissions cap for all covered entities.
This cap, based on national or regional emission reduction targets, typically declines over time to drive continuous emissions reductions.

Distribute Allowances

Authorities allocate emission allowances to regulated entities, either for free or through auctions. These allowances grant the right to emit a specific amount of greenhouse gases.

Maintain Market Integrity

Regulatory bodies oversee the market to ensure transparency, liquidity, and fair trading. They also implement safeguards against manipulation and fraud.

Implement Monitoring, Reporting, and Verification (MRV)

Regulated entities monitor and report their emissions according to standardized protocols, while independent third parties verify the reported data to ensure accuracy and integrity.

Allow Use of Offsets (if applicable)

Some systems permit limited use of carbon offsets from approved mitigation projects. These offsets help entities meet compliance obligations, provided they meet strict environmental integrity criteria.

Enable Trading

The market allows participants to buy and sell allowances. Entities with surplus allowances can sell them, while those exceeding their emissions limits must purchase additional allowances to remain compliant.

Link and Integrate Markets

Where feasible, authorities link the ETS with other national or regional carbon markets. This enhances market liquidity, broadens coverage, and reduces overall compliance costs.

Enforce Compliance and Surrender

At the end of each compliance period, entities surrender a number of allowances equal to their verified emissions. Authorities impose penalties or fines on those that fail to surrender sufficient allowances.

Implement, Review, and Improve

At the end of each compliance period, entities surrender a number of allowances equal to their verified emissions. Authorities impose penalties or fines on those that fail to surrender sufficient allowances.

3.2.3 Major Global Compliance Carbon Markets

Currently, there are three major Emission Trading Systems (ETS) around the world.

- European Union's Emissions Trading System (EU)
- The California Global Warming Solutions Act (USA)
- The Chinese National Emission Trading System (China)

Table 2 *Major Global Emission Trading Systems*

European Union ETS	**The California Global Warming Solutions Act**	**The Chinese National Emission Trading System**
First ETS created in the world, operating since 2005	Operating since 2012	Began its operation in 2021
EU ETS jurisdiction covers the 27 EU states and 3 European Free Trade Association states – Iceland, Liechtenstein, and Norway.	Its jurisdiction covers California only.	Has jurisdiction all over China
The total GHG emissions in this jurisdiction amounts to 3,893 million tonnes (Mt) per year	The overall GHG emissions in this jurisdiction amount to 425 million tonnes (Mt) per year	The overall GHG emissions in this jurisdiction amounts to 12,301 million tonnes (Mt) per year
Sectors regulated • Power stations and other combustion installations with >20MW thermal rated input • Industries Including oil refineries, coke ovens and iron/steel plants • Operations that produce cement, glass, lime bricks, ceramics, pulp, paper and cardboard. • Aviation • Carbon capture and storage installations • Production of petrochemicals, ammonia, non-ferrous and ferrous metals, gypsum, aluminium as well as nitric, adipic and glyoxylic.	**Sectors regulated** • Large industries facilities (cement, glass, hydrogen, iron and steel, lead, lime manufacturing, nitric acid, petroleum and natural gas systems, petroleum refining and pulp and paper manufacturing) • Electricity generation • Electricity imports • Other stationary combustion • CO_2 suppliers • Suppliers of natural gas • Suppliers of certain distillate fuel oils • Suppliers of liquid petroleum gas • Suppliers of liquefied natural gas	**Sectors regulated** Currently the sector regulated is Power sector, however the sectors such as petrochemical, chemical, building materials, steel, non-ferrous, metals, paper and domestic aviation may be added in coming phase

Source: carboncredits.com

Other compliance Other compliance carbon markets that exists are are: Korean ETS, the Kazakhstan ETS, the New Zealand ETS, the Japan ETS, the Canada ETS and the Mexico ETS.

3.2.4 Indian Compliance Carbon Market

India began its carbon market journey with schemes like the **Perform, Achieve and Trade (PAT)** program under the **Energy Conservation Act, 2001,** which promoted energy efficiency in select sectors. However, these mechanisms were limited in scope, as they did not cover economy-wide GHG emissions or support carbon credit trading.

Recognizing the need for a comprehensive framework, the government came up with the **Energy Conservation (Amendment) Bill 2022.** This paves the way for a compliance carbon market, with the potential to encompass the agricultural sector, a significant emitter. Furthering this initiative, the Bureau of Energy Efficiency (BEE), published the detailed procedure for the compliance mechanism under Carbon Credit Trading Scheme (CCTS) in July 2024, which they revised in March 2025.

3.2.5 Key Stakeholders in India's Carbon Credit Trading Scheme (CCTS)

The **Carbon Credit Trading Scheme (CCTS)** in India involves a wide range of stakeholders, including central ministries, statutory authorities, independent verification agencies, and obligated industry players. Each plays a crucial role in ensuring the scheme's effective design, governance, implementation, and compliance.

Ministry of Power, Government of India

The MoP leads the development and governance of the CCTS framework, providing policy direction and ensuring alignment with India's national climate and energy goals.

Bureau of Energy Efficiency (BEE)

As the implementing agency, BEE manages core functions such as project and entity registration, emissions monitoring, credit issuance, and overall scheme operations in line with regulatory guidelines.

National Steering Committee for Indian Carbon Market (NSC-ICM)

This committee provides strategic oversight for the carbon market. It approves sector-specific emission targets and ensures market transparency, credibility, and alignment with broader policy objectives.

Accredited Carbon Verification Agencies (ACVAs)

These are independent, third-party agencies responsible for verifying emissions reductions. They conduct audits, data reviews, and site inspections to certify actual performance, thereby ensuring the environmental integrity of the system.

Obligated Entities

Large industrial sectors such as steel, cement, power, and oil refining fall under the category of obligated entities. These entities are required to meet emission reduction targets either through internal improvements or by purchasing carbon credits under the CCTS.

3.2.6 Carbon Pricing in India

India is now actively developing a rate-based Emissions Trading System (ETS) and associated voluntary carbon crediting mechanisms. Rate-based ETS refers to a system where total emissions are not capped but individual entities are allocated a performance benchmark that serves as a limit on their net emissions. Rate-based ETSs offer additional flexibility in managing future growth uncertainty as well as international competitiveness concerns. The CCTS, focuses on emissions intensity, not absolute emissions caps. Credit certificates will be issued to facilities that outperform benchmark emissions intensity levels. (PIB)

3.2.7 Sectors Involved in the CCTS Registration

The CCTS compliance mechanism is divided into two segments – the **compliance mechanism** and the **offset mechanism,** and accordingly, the sectors are also divided by stakeholders:

Under the compliance mechanism (Application Phase 1), the scheme targets high-emission industries. A total of nine sectors have been identified as obligated entities, including **Petrochemicals, Textiles, Chlor-Alkali, Cement, Fertilizers, Iron and Steel, Pulp and Paper, and Petroleum Refineries**. These sectors are required to meet defined emission reduction targets over time.

For the voluntary offset mechanism, Phase 1 covers sectors such as *Waste Handling and Disposal, Industry, Agriculture, Energy, Forestry, and Transport*. In Phase 2, the scheme expands to include *Solvent Use, Construction, Fugitive Emissions, and Carbon Capture.* While participation in these sectors is currently not mandatory and targets have not been formally established, the government is actively encouraging their inclusion in the carbon market to broaden its reach and impact.

As per Bureau of Energy Efficiency (BEE) guidelines, each sector receives specific emission benchmarks under the CCTS registration process. These benchmarks define standardized emission reduction levels. For example, sectors like Aluminium and Cement are expected to reduce emissions by 2–3%, indicating a performance-based approach to emissions management within the scheme.

3.2.8 Step-by-Step Guide on How to Participate in CCTS

The CCTS registration and application process is set up by the BEE it involves multiple steps that goes through multiple agencies spanning government portals to independent Govt. accredited agencies.

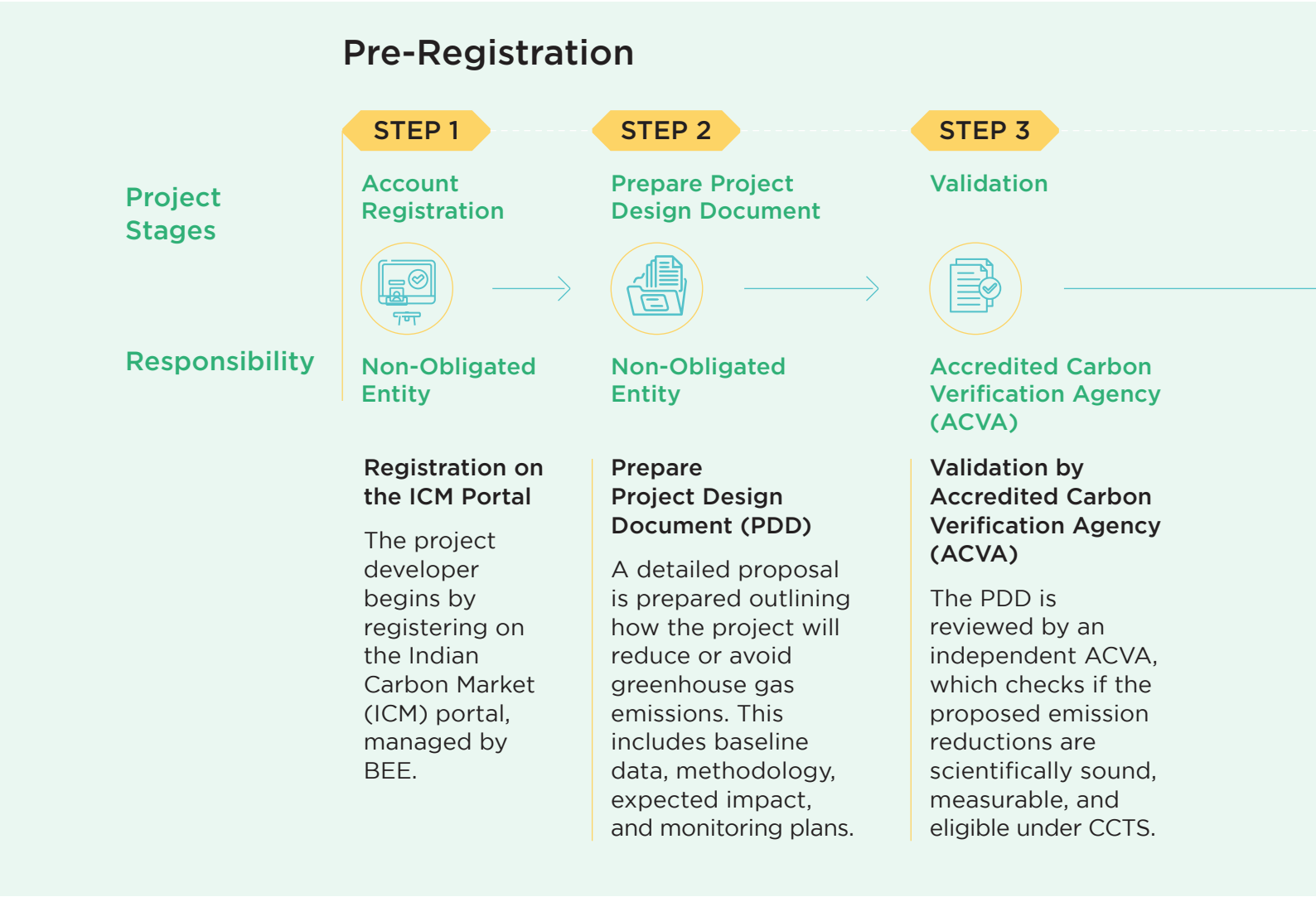


Figure 2 *Steps for participating in CCTS, Adopted from: Detailed Procedure for Offset Mechanism Under CCTS*

3.2.9 Trading of the Compliance Carbon Credits

Under the Indian Carbon Market (ICM), both obligated and non-obligated entities must register on the ICM Registry by submitting the required details and paying the prescribed fees, as per the procedures laid out by the Central Electricity Regulatory Commission (CERC) in its 'Terms and Conditions' for CCC trading. Upon successful registration, the ICM Registry will issue a Certificate of Registration to the entity. Once registered, entities can participate in the trading of Compliance Carbon Credits (CCC) through power exchanges that are registered with the Commission for this purpose. All CCC trading activities will be conducted as per the procedures and guidelines defined by CERC to ensure compliance and transparency within the ICM framework.

STEP 4

Project Registration

ICM Administrator

Official project registration

Once validated, the project is officially registered under the Carbon Credit Trading Scheme by BEE.

STEP 5

Monitoring

Non-Obligated Entity

Monitoring

After the project is implemented, the developer must monitor the activities and collect data to track the actual greenhouse gas reductions over a specified period.

STEP 6

Verification

Accredited Carbon Verification Agency (ACVA)

Verification

The monitoring data is submitted to the ACVA for verification to confirm how much CO_2 (or equivalent) was reduced.

STEP 7

Issuance

ICM Administrator

Issuance of Carbon Credits

Based on verified emission reductions, BEE issues Carbon Credit Certificates (CCCs) to the project developer.

3.2.10 Banking of Carbon Credit Certificates

At the end of a compliance year, any remaining Carbon Credit Certificates (CCCs) may be banked by the obligated entity for use in subsequent compliance years. These banked CCCs can either be used to meet future compliance obligations or be traded within the Indian Carbon Market, offering flexibility in managing emissions and creating opportunities for market-based compliance.

4. THE EVOLVING LANDSCAPE OF VOLUNTARY CARBON MARKETS

India's voluntary carbon market (VCM) is rapidly evolving as a pivotal mechanism to incentivize sustainable practices and drive climate action, especially in the agriculture sector. Various players actively drive the market, while evolving frameworks and standards guide the selection of the best possible methodologies to ensure transparency and credibility. This chapter highlights the main players and the emerging standards that are defining India's VCM landscape.

4.1 Key Participants Actively Involved in VCM Project Development

Project developers design and implement carbon projects, including reforestation, afforestation, carbon sequestration, and renewable energy initiatives.

Farmers and FPOs contribute vital data and serve as the primary beneficiaries of these projects.

Financiers/Investors provide upfront capital for project development in exchange for future carbon credit revenues or impact returns.

Technology Providers offer digital MRV tools, remote sensing, blockchain, or AI-based platforms to enhance accuracy and transparency.

Project Consultants/Advisors – support in feasibility studies, methodology selection, documentation, and stakeholder engagement.

Third-party verifiers, assess whether projects meet their stated objectives and accurately quantify emission reductions.

Intermediaries, such as brokers and exchanges, connect buyers and sellers, enabling transactions and providing market access and liquidity.

End buyers including corporations, governments, and individuals - purchase carbon credits to voluntarily offset their emissions.

Standards bodies establish the validation and verification criteria, ensuring the credibility and quality of issued carbon credits.

4.2 Standards for Verification

There are several standards that use different methodologies for measuring and verifying carbon emission reduction. The most widely used standards include

Table 3 *Major Operational Voluntary Carbon Market Registries*

VCM Registry	Nature-Based Solutions	Agriculture Projects	Energy-Related Projects	Geographic Coverage
Verified Carbon Standard (VCS) by Verra	Afforestation/ reforestation, REDD+, improved forest management	Climate-smart ag, soil carbon, rice cultivation, agroforestry	Renewable energy (solar, wind, hydro), waste-to-energy, cookstoves	**Global**
Gold Standard	Ecosystem restoration, mangrove restoration	Sustainable ag practices, enteric methane reduction	Energy efficiency, biogas, clean cooking, solar/wind energy	**Global**
American Carbon Registry (ACR)	Reforestation, improved forest management, avoided conversion	Nitrogen management, rice methane reduction, livestock waste mgmt	Renewable energy, landfill gas capture, industrial fuel switch	**Primarily U.S.**
Climate Action Reserve (CAR)	Urban forestry, forest carbon projects	Organic waste composting, manure management	Energy efficiency, methane capture, clean tech	**U.S. with limited international expansion**
Plan Vivo	Community forestry, agroforestry	Low-input sustainable ag, land restoration	Small-scale biogas and energy-efficient stoves	**Global (focus on Global South)**
Global Carbon Council (GCC)	Limited support (afforestation in certain geographies)	Precision ag, limited soil carbon	Renewable energy (especially in developing countries), energy efficiency	**Global (focus on developing countries)**
Puro.earth	Biochar from biomass, carbonated building materials	Bio-based construction, regenerative biomass sourcing	BECCS, waste biomass-to-energy	**Global (Europe-led)**

4.3 Current Trends and Emerging Dynamics

The voluntary carbon market (VCM) is evolving rapidly with initiatives focused on enhancing integrity and aligning with global climate goals

1. Agriculture as a Rising Star in Voluntary Carbon Markets

Agriculture has emerged as one of the fastest growing and most promising sectors within the voluntary carbon market (VCM), primarily due to its dual capacity to act as both a source and a sink of greenhouse gas (GHG) emissions. As of 2023, agriculture-related credits covering interventions such as improved soil management, methane abatement, and agroforestry accounted for roughly 15-20% of all carbon credits issued on leading registries like Verra and Gold Standard (Ecosystem Marketplace, 2023). The expansion is underpinned by growing demand from corporates seeking nature-based, high-integrity offsets aligned with their net-zero commitments. Credits from agriculture often fall under categories like Improved Agricultural Land Management (IALM) or Sustainable Rice Cultivation, with methodologies such as VM0042 (Verra) and Gold Standard's Soil Organic Carbon Framework gaining adoption.

2. Corporate Demand Driven by Net-Zero and In setting Strategies

Corporations with aggressive net-zero targets are increasingly turning to agriculture-based credits not just for offsetting residual emissions, but also for in-setting within their supply chains. This is particularly true for agrifood, retail, and FMCG companies that depend heavily on agricultural commodities. Firms like Nestlé, Danone, PepsiCo, and Unilever have made agriculture a focal point of their climate strategy, investing in regenerative practices that simultaneously enhance soil carbon and supply chain resilience. A 2023 survey by South Pole reported that over 57% of companies with supply-chain emissions exposure are exploring in setting solutions, most of which revolve around agricultural practices. This is complemented by the rise of scope 3 disclosure regulations (e.g., in the EU and California), which make it increasingly imperative for companies to act in agriculture-heavy emission categories.

3. Technology-Enabled MRV Systems Driving Scale and Trust

A persistent barrier in agri-carbon has been the challenge of measuring, reporting, and verifying (MRV) outcomes reliably and affordably, especially across fragmented and diverse smallholder landscapes. Recent years have seen a dramatic shift in this space with the introduction of digital MRV platforms that use a combination of remote sensing, AI-based modeling, satellite imagery, and ground truthing. Startups like Boomitra, Regrow Ag, CIBO Technologies, and Comet Farm are pioneering scalable MRV systems validated by major registries. Boomitra, for instance, issued the first-ever remote-sensing based soil carbon credits under Verra in 2022, covering millions of acres across India, Kenya, and Latin America. These innovations significantly reduce the cost and duration of verification, making it possible to include smallholder farmers, particularly in developing countries, in the VCM.

4. Transition Towards High-Integrity and Co-Benefit Credits

VCM buyers are increasingly demanding "high integrity" credits, with a focus on additionality, permanence, and leakage control. Agriculture, which often involves non-permanent carbon sinks, is being pushed to adopt stricter standards and robust methodologies. Organizations such as the Integrity Council for the Voluntary

Carbon Market (ICVCM) and the Voluntary Carbon Markets Integrity Initiative (VCMI) are working to certify only those credits that meet rigorous Core Carbon Principles (CCPs). Simultaneously, there is growing market preference for credits that deliver multiple co-benefits, such as biodiversity conservation, climate adaptation, and rural livelihood improvement. Registries like Plan Vivo, Gold Standard, and Climate Action Reserve are embedding socio-environmental performance indicators into crediting mechanisms. This trend is encouraging more smallholder- centric and gender-sensitive agri-carbon projects that align with SDGs, attracting both philanthropic capital and impact investors.

5. Aggregation Models and Farmer-Centric Platforms

Given the high transaction costs of registering and managing individual farms in the VCM, aggregator-based models have become central to scaling agri-carbon. Aggregators, whether FPOs, NGOs, agri-tech firms, or cooperatives play a critical role in standardizing practices, managing data, ensuring compliance, and sharing revenues equitably. India has seen the rise of several such platforms:

- Grow Indigo is rolling out regenerative farming practices in cotton and cereal belts, linking them with VCM crediting.
- Nurture.farm has tested large-scale alternate wetting and drying (AWD) for rice, claiming methane reduction credits.
- Social Alpha and WRI India are incubating farmer-first carbon projects with bundled livelihood benefits. Globally, platforms like Soil Capital (EU) and Agreena have similarly enabled farmers to transition to carbon-friendly practices while generating verified credits.

Driving Factors Behind the Rise of Agriculture in VCM

1. Net-Zero and Scope 3 Mandates

More than 5,000 companies globally have made net-zero pledges (SBTi, 2024), most of which require scope 3 reductions. Agriculture, as a dominant source of scope 3 emissions (especially for food, textiles, and bioenergy), is emerging as a priority area for insetting and offsetting through VCM.

2. MRV Innovation Reducing Entry Barriers

Technology has dramatically reduced the cost of carbon monitoring. With MRV costs falling by nearly 60% between 2018 and 2023 (Climate Focus, 2023), smallholder-dense geographies like India, Kenya, and Indonesia are now active players in VCM.

3. Credibility Push from Buyers and Standards

Recent controversies around “phantom credits” have prompted buyers to demand traceability, durability, and transparency factors now being integrated through satellite MRV, blockchain-based registries, and standardized methodologies.

4. High ROI and Co-Benefit Potential

Agri-carbon credits often cost $5-15/ton CO_2e, significantly lower than forestry or engineered removal solutions, yet come with biodiversity, water, and livelihood co-benefits making them highly attractive for impact-oriented funds and development finance institutions (DFIs).

5. Inclusive Development Narrative

Agri-carbon is increasingly viewed not just as a climate tool, but as a lever for just transition, climate resilience, and rural income diversification, especially in the Global South. This framing is enabling large-scale philanthropic and blended finance entry into space.

5. OPPORTUNITIES FOR AGRIBUSINESSES IN VCM

By participating in or creating VCM projects, agribusinesses can:

- Pave a reliable path to achieve their sustainability goals.
- Strengthen their climate and sustainability credentials.
- Inset emissions within their own supply chains while directly supporting farmers.

5.1 Types of Eligible Projects

In the VCM, agricultural projects play a crucial role by implementing practices that reduce GHG emissions or enhance carbon sequestration. These initiatives not only contribute to climate change mitigation but also offer farmer, additional revenue streams through the sale of carbon credits. This section also covers the projects that are part of addressing scope 1, scope 2, which also can be registered as VCM project. The table below showcases the list of projects which are not exhaustive but provide an idea of types of projects, that can be built.

Table 4 *Types of projects eligible for voluntary carbon markets*

Project Type	Description	Applicable Methodologies	Co-benefits
Soil Carbon Sequestration	Adopting practices such as reduced tillage, cover cropping, and crop rotation can enhance the organic carbon content of soils. These methods improve soil health and increase its capacity to store carbon, thereby reducing atmospheric CO_2 levels.	• Verra VM0042: Improved Agricultural Land Management (IALM) • Gold Standard: Soil Organic Carbon (SOC) Framework Methodology	Improved water retention, reduced erosion, higher yields.
Methane Emission Reduction in Rice Cultivation	Traditional flooded rice paddies emit significant amounts of methane, a potent GHG. Implementing water management techniques like Alternate Wetting and Drying (AWD) or Direct Seeded Rice (DSR) can substantially reduce methane emissions.	• AMS-III.AU (CDM): Methane emission reductions from rice. • Verra VCS: VMD0054 for low-emissions rice • Verra VCS: VM0051 Improved Management in Paddy Rice Production Systems	Water conservation, increased yields, and reduced energy cost.

Project Type	Description	Applicable Methodologies	Co-benefits
 **Enhanced Livestock and Manure Management**	Improving livestock diets and manure handling can lead to reductions in methane and nitrous oxide emissions. Techniques include optimized feeding strategies and the use of anaerobic digesters for manure treatment.	• AMS-III.F.: Avoidance of methane emissions through controlled biological treatment of biomass • AMS-III.D.: Methane recovery in animal manure management systems • CDM AMS-I.E: Improved cookstoves and biogas • Verra VCS: Verra VM0041 for the Reduction of Enteric Methane Emissions from Ruminants using Feed Ingredients.	Nutrient-rich organic fertilizer; reduced odour and flies. Health improvement, reduced fuel expenses.
 **Agroforestry Practices**	Integrating trees into agricultural landscapes through agroforestry can sequester carbon both above and below ground. This approach not only captures carbon but also enhances biodiversity and soil fertility.	• Verra VCS: Verra VM0047 for Afforestation, Reforestation, and Revegetation • CDM AR-ACM0003, Afforestation and reforestation of lands except wetlands • Plan Vivo: PM001 Agriculture and Forestry Carbon Benefit Assessment Methodology V1.0 • Gold Standard: Methodology for Afforestation/Reforestation (A/R) GHGs Emission Reduction & Sequestration Afforestation/Reforestation (A/R)	Improved soil health, fodder, water conservation, and income diversification.

Project Type	Description	Applicable Methodologies	Co-benefits
 **Biochar Application**	Applying biochar, a form of charcoal produced from organic materials to soils can enhance carbon storage and improve soil fertility. Biochar projects are recognized in the VCM and can generate carbon credits upon proper validation.	• Verra VCS: Verra VM0044 Methodology for Biochar Utilization in Soil and Non-Soil Applications	Improved Soil Health, Enhanced Water Retention, Increased Crop Productivity
 **Renewable Energy (Avoidance)** **(Scope 2 emissions)**	These projects focus on generating electricity or heat from renewable sources such as wind, solar, hydro, or biomass. By replacing fossil fuel-based energy generation with clean alternatives like solar PV, wind turbines, or biogas systems, they help avoid associated carbon emissions.	• CDM methodology ACM0002 : Grid-connected electricity generation from renewable sources. • CDM Methodology ACM0006: Electricity and heat generation from biomass.	Enhance energy security and resilience, Long term reduction in energy costs
 **Energy Efficiency Projects** **(Scope 1 and 2 emissions)**	Energy efficiency projects are designed to lower energy consumption through interventions like upgrading buildings, modernizing appliances, and improving industrial processes. By reducing overall energy demand, these projects contribute to a decrease in associated greenhouse gas emissions.	• CDM Methodology ACM0009: Fuel switching from coal or petroleum fuel to natural gas • Global Carbon Council GCCM001: Methodology for Grid-Connected Renewable Energy Generation Projects	Reduction in GHG emissions, Increased asset value and lifespan (e.g buildings, machinery)

Project Type	Description	Applicable Methodologies	Co-benefits
 **Fuel Switch (industrial energy efficiency)** **(Scope 1)**	Replacing high-emission fuels (coal, oil) with lower-carbon alternatives like natural gas, biomass, or biogas; can include cogeneration.	• AMS-III.B.: Switching fossil fuels • CDM Methodology ACM0009: Fuel switching from coal or petroleum fuel to natural gas • AM0036: Use of biomass in heat generation equipment	Improved energy efficiency and cost savings, lower carbon intensity of production
 **Carbon capture & storage** **(Scope 1)**	Activities involving the capture and storage of carbon.	• Verra (VCS): VM0049 Carbon Capture and Storage	Supports decarbonization of hard-to abate sectors, helps in removal of CO2 from atmosphere
 **Waste Energy Recovery** **(Scope 1)**	This includes activities that generate energy, such as electricity or heat, from waste energy sources like waste heat, gas, or pressure.	• ACM0012 – Waste Energy Recovery	Enhance process efficiency, cuts operational costs, reduces overall consumption and emissions.
 **Energy efficiency and fuel switching measures for industrial facilities**	This includes activities that reduce energy consumption through improved efficiency or fuel switching within industrial operations.	• AMS-II.D – Energy efficiency and fuel switching measures for industrial facilities	Energy cost savings, reduction in fuel use and emissions, improved operational performance.

Project Type	Description	Applicable Methodologies	Co-benefits
 **Energy efficiency in thermal systems.**	This covers activities that reduce energy consumption through efficiency improvements in thermal systems, such as HVAC upgrades, boiler retrofits, and building insulation.	• Verra VCS: VM0018 Energy Efficiency and Solid Waste Diversion Activities within a Sustainable Community	Reduced fossil fuel and GHG emissions, lower operational costs for users.
 **Grid-connected renewable electricity generation.**	This includes project activities that generate electricity from renewable sources such as solar, wind, hydro, geothermal, tidal/ wave, and renewable biomass and supply it to a national or regional grid.	• CDM AMS-I.D – Grid-connected renewable electricity generation.	Reduced fossil fuel use and GHG emissions, improved energy security
 **Thermal energy for the user with or without electricity using renewable biomass.**	This covers small-scale projects that produce thermal energy (and optionally electricity) using renewable sources like biomass, solar thermal, or geothermal systems.	• AMS-I.C The methodology includes setups that produce both heat and electricity (cogeneration) or heat, electricity, and cooling (trigeneration), provided they stay within the small-scale capacity limits.	Reduction in indoor pollution from traditional biomass burning, Employment in biomass supply chain.
 **Methane recovery in wastewater treatment.**	Applies when recovered methane (biogas) is used for energy generation such as electricity, heat, or fuel displacing fossil-based energy sources.	• AMS-III.H – Methane Recovery in Wastewater Treatment Methodolohy	Reduction of methane, a potent GHG, Renewable energy from biogas, Improved sanitation and water quality

Source: Adapted from the Framework for Voluntary Carbon Markets in the Agriculture Sector (MoA&FW, 2024), and resources from Gold Standard, Verra, Plan Vivo, and the UNFCCC website

SRC Natura Sure's Project Terre Boost: Biochar for a Better Tomorrow

Agriculture sector in India generates a huge amount of crop residue and other residues with conventional waste disposal methods such as open field burning being prevalent. This contributes significantly to GHG emissions and other pollution related problems. Addressing this, Together for Restoration (a program by SRCNatura Sure Pvt. Ltd.) has launched Project Terre Boost, an initiative aimed at converting crop residues into biochar for soil enhancement across seven Indian state viz. Assam, Nagaland, Rajasthan, Maharashtra, Madhya Pradesh, Chhattisgarh, and Jharkhand. The Project leverages flame curtain pyrolysis technology in steel-shielded soil pits to convert crop residue into biochar. This biochar, mixed with manure and applied deep into the soil, promises a sustainable solution to waste management in agriculture. The project includes an initial cohort of 5,000 farmers (biochar producers). Environmental impact of Project Terre Boost is significant, with an estimated removal of 818,727 tCO2e over a seven-year crediting period. In addition to environmental impact, project is also impacting life of marginalised farmers in these states.

5.2 Ensuring Integrity and Quality in VCM Projects

Regardless of the project type, carbon integrity and the quality of co-benefits play a critical role in shaping a project's revenues and costs. The success of voluntary carbon markets depends on carbon projects that consistently deliver high-integrity, high-quality outcomes capable of withstanding scrutiny.

Integrity means the project delivers real, measurable, and verifiable carbon emission reductions or removals. **Quality** refers to the additional environmental and social benefits the project provides beyond carbon mitigation. Monitoring, reporting, and verification (MRV) systems, use diverse native species and ensure fair benefit-sharing with local communities. These efforts help such projects earn a price premium for their carbon credits due to their credibility and demonstrated co-benefits.

The Integrity Council for the Voluntary Carbon Market (ICVCM) developed the Core Carbon Principles (CCPs) to set a global benchmark for high-quality carbon credits. These ten principles guide the integrity and quality of carbon projects.

Below are six key components derived from the CCPs that define high-integrity, high-quality projects in the voluntary carbon market:

Key Components of High-Integrity and High-Quality VCM Projects

Ensure Additionality

Projects must deliver emission reductions or removals that would not have occurred without the project, proving the climate benefit is genuine.

Guarantee Permanence

Projects must make the carbon benefits last over time and implement safeguards to reduce risks of reversal from natural or human disturbances.

Quantify Emissions Accurately

Project developers must use scientifically robust methods to measure reductions or removals and clearly document all data and assumptions.

Undergo Independent Verification

Accredited third-party verifiers must review and confirm the project's compliance with standards and the accuracy of reported outcomes.

Deliver Sustainable Development Benefits

Projects should go beyond carbon mitigation and create environmental and social gains, such as conserving biodiversity, managing water resources, or supporting community development.

Prevent Double Counting

Project developers must ensure that no other party claims the same emission reductions or removals, preserving transparency and trust in carbon accounting.

6. THE CARBON PROJECT DEVELOPMENT LIFECYCLE

Below is an overview of the steps involved in developing a voluntary carbon project.

Figure 3 *Steps Involved in VCM Project Development*

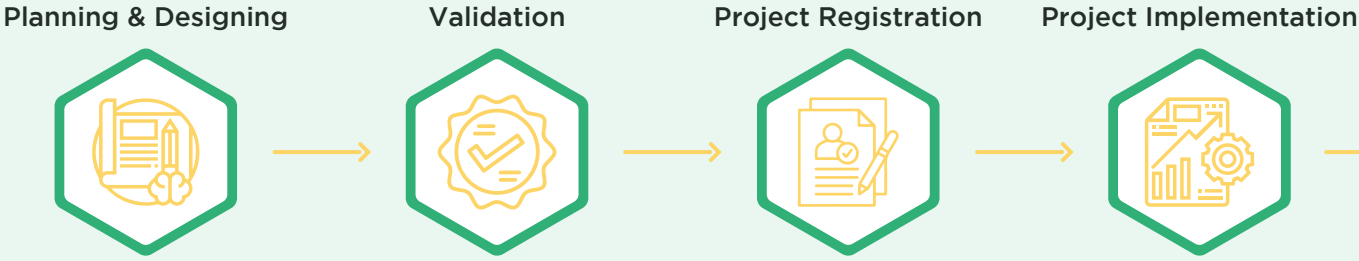
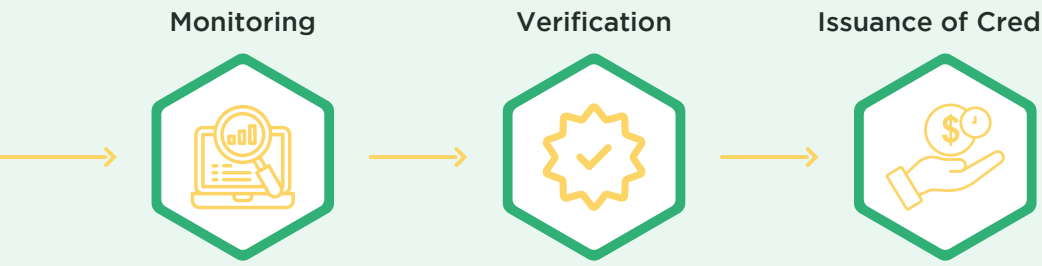


Table 5 *Players involved in VCM Project Development*

Stage	Description	Stakeholders	Timelines
Planning	Involves identifying a project idea that has the potential to generate carbon credits. Additionality should be highlighted at this stage	Local Govt, academic and financial institutes, project developers, implementation partners, and community stakeholders	1-2 Months
Designing	Developing a project based on the chosen VCM standard and methodology. Baseline should be defined at this stage	Project Developer, implementation partner, community stakeholders	1-3 Months
Validation	Involves reviewing the project design, verifying the data used for the baseline scenario and estimating the emissions reduction, and ensuring the monitoring plan is in place	Project Developer, Implementation partner, validation and verification body (VVB), VCM standard, and community stakeholders	4-6 Months, depending on the registry
Registration	The project developers submit the necessary documents, and the VCM standards registers the project on its registry.	Project Developer, implementation partner, VCM standard and community stakeholders	4-6 Months, depending on the registry



Stage	Description	Stakeholders	Timelines
Project Implementation	Implement the planned agricultural practices, train farmers, and establish monitoring systems.	Farmers & landowners, project developers, agricultural extension services, local NGOs	2-4 Months, depending on the identified activity
Monitoring	Includes regular site visits to verify the implementation of the project.	Implementation partners and community stakeholders	6-12 Months, per cycle
Verification	Monitoring reports are verified by third-party independent verifiers/ auditors and the VCM standard to ensure compliance	Project developer, implementation partner, validation and verification body (VVB), VCM standard, community takeholders.	
Issuance	Issuance of credits	Project developer, VCM standard	1-2 Months
Trading of credits		Central Govt, Project developer, VCM standard buyer	1-2 Months

Note: *Timelines are indicative and can vary based on project specifics, stakeholder engagement efficiency, and certification body processing times.*

Source: Adopted from Framework for Voluntary Carbon Markets in Agriculture Sector, MoA&FW, 2024

7. FINANCIAL MECHANISMS TO SUPPORT PROJECT DEVELOPMENT

For businesses and project developers, knowing the types of capital providers available is key to raising funds effectively. The ease of accessing capital depends largely on the nature of the carbon project.

Projects where carbon is **not the core activity**—for example, using carbon credits to make emission-reducing products more affordable, —can tap into **traditional sources of finance** like commercial loans or equity, in addition to carbon finance.

In contrast, projects where carbon is **central to the business model**—such as those focused on **emission reduction or removal**—mainly rely on **carbon investors and grant funding.** Access to mainstream financial capital for these projects is still limited.

However, as carbon markets grow and become more established, **traditional investment instruments like debt and equity** are expected to become more widely available for carbon projects—like how they are used in sectors like renewable energy and forestry.

7.1 Investment instruments for carbon projects

Carbon Finance

Carbon finance involves investing in projects in exchange for carbon credits instead of cash returns. While some companies provide carbon finance directly, it is now more common for intermediaries like carbon brokers and retailers to do so.

Carbon finance helps project developers by offering upfront funding or guaranteed purchase agreements for future carbon credits.

This gives them more confidence about future income and helps attract additional investment.

There are five main types of carbon finance instruments, each designed to support projects at different stages and with different financing needs.

- **Pre-purchase agreement**

  In a pre-purchase agreement, the buyer gives upfront funding to help develop the carbon project. In return, the project agrees to deliver a fixed number of carbon credits once they are issued. The agreement also locks in the price at which the credits will be sold, giving both sides more certainty.

- **Streaming agreement**

  In a carbon streaming agreement, the buyer provides upfront funding to support project development in exchange for a share of the carbon credits generated over a set period. Both the developer and the buyer share the risks and rewards—if credit generation is higher or lower than expected, both are affected. The instrument combines features of equity (risk-sharing, no fixed repayments) and debt (secured position in the project).

- **Offtake agreement**

  In an offtake agreement, the buyer agrees to purchase a set amount of carbon credits in the future, once they are issued, at a fixed or variable price. Unlike pre-purchase or streaming deals, it does not provide upfront funding.

  However, it gives the project developer confidence in future revenue, which can help attract financing. Offtake agreements are widely used in sectors

like energy and infrastructure to manage risk and support funding.

- **Brokerage agreement**

  A brokerage agreement is a contract where a carbon broker agrees to sell some or all of a project's carbon credits in return for a commission. The broker usually gets exclusive rights to sell a set volume of credits. This helps the developer reach more buyers and aim for better prices, but it doesn't guarantee revenue, as the broker isn't legally responsible if the credits don't sell.

- **Results-Based Carbon Finance**

  Results-Based Carbon Finance, also known as Results-Based Climate Finance (RBCF), is a performance-driven funding mechanism where payments are made only after pre-agreed climate outcomes—typically verified GHG reductions—have been achieved and independently confirmed. Unlike traditional upfront project financing, RBCF (covering activities like sustainable forestry, clean cooking, and renewable energy access) incentivizes real-world emission reductions by linking financial disbursement directly to measurable results. The emissions reductions counted under RBCF can contribute to a country's Nationally Determined Contributions (NDCs) and generate carbon credits under Article 6 of the Paris Agreement. By ensuring high-integrity MRV systems, RBCF encourages institutional capacity building, fosters private-sector engagement, supports socially inclusive benefit-sharing, and accelerates transformative, low-carbon development pathways.

Commercial finance

Commercial finance can help scale carbon projects, but it is still not widely available. Two common types are equity and debt.

- **Equity**

  Equity involves investing money in exchange for ownership in a project or company. Investors may earn returns through dividends, resale, or buy-backs. While some want control, others are fine with smaller stakes if protections are in place. Equity is rarely used at the project level due to the high risk of carbon-only projects.

- **Debt**

  Debt is a loan that must be repaid with interest. Lenders look at cash flow and project assets for repayment. Carbon projects often need longer loan terms and grace periods, especially for activities like restoration that take time to generate credits. While debt is cheaper than equity and doesn't require giving up ownership, it adds risk if revenues are delayed or uncertain. Many lenders hesitate to finance carbon projects due to unclear risks, limited collateral, and unpredictable cash flows.

Debt financing for Megcare project in Meghalaya by Caspian debt

IORA Ecological Solutions has raised ₹8.5 Cr in debt from Caspian debt for its Megcare project in Meghalaya. The project aims to cover 1.5 Lakh hectares land (revitalize 100,000 hectares through new plantations and recover 50,000 hectares of degraded forest land), while creating sustainable rural livelihoods. It is a 30-year community-driven program, being implemented with the Government of Meghalaya. The project links forest restoration, agroforestry training, and carbon finance to benefit 80,000 smallholder farmers. Project also involves local women and youth, in nursery activities and land restoration with native tree planting. This is one of India's first structured loans backed by future Carbon Removal Units (CRUs). These CRUs will be traded in global markets thereby creating economic opportunity through environmental impact. The project is expected to capture 25 Mn tonnes of CO2 while creating sustained livelihood for small farmers. The deal was facilitated via Rabo Foundation and Rabobank's ACORN platform (source: Caspian Debt)

Catalytic finance

Grants and concessional capital are important in the early stages of carbon projects, especially for reducing risk, supporting innovation, and creating community benefits.

- **Grants and concessional capital**

  Concessional capital is funding offered on easier terms than regular market finance. This could mean lower interest rates, longer repayment periods, fewer collateral demands, or lower return expectations. Grants are the most concessional form. Such funding usually comes from governments, development banks, NGOs, foundations, or impact investors with social or environmental goals.

  Because concessional funding is limited, it should be used carefully to support, not replace, private investment. Its goal is to unlock more capital from the wider market.

- **Blended finance**

  Blended finance uses concessional capital to reduce risks or improve returns, helping attract commercial investors to projects they might otherwise avoid. It can also help lower transaction and coordination costs.

7.2 Financial Continuity

Identifying a finance pathway alone does not guarantee the sustained flow of funds necessary for the smooth operation of voluntary carbon markets. To ensure long-term financial viability, it is crucial to establish mechanisms for channelizing and maintaining finance effectively. This section examines key approaches for the same.

Adoption of the green taxonomies

Green taxonomies provide a standardized framework for classifying environmentally sustainable activities, ensuring that climate

finance is directed toward genuinely impactful projects. By adopting these taxonomies, financial institutions and investors can differentiate credible climate initiatives from greenwashing, increasing confidence in voluntary carbon markets. Clear criteria for sustainable investments also help streamline regulatory compliance and attract more institutional funding, ensuring a steady flow of capital into carbon credit projects.

In a significant step toward mobilizing climate-aligned investments, the Government of India has released a draft Climate Finance Taxonomy aimed at channeling capital into green technologies and low-carbon solutions. Spearheaded by the Ministry of Finance and the Department of Economic Affairs, the draft taxonomy is currently open for public consultation.

The initiative is intended to enhance the flow of resources to climate-friendly technologies and activities, supporting India's long-term climate ambitions—including the national target of achieving net-zero emissions by 2070. According to the finance ministry, the taxonomy is also designed to safeguard access to reliable and affordable energy while steering the economy toward sustainable development.

Transparent tracking of the finances

Transparency in climate finance is crucial for maintaining investor trust and ensuring funds are used effectively. Implementing robust tracking mechanisms enables stakeholders to monitor how climate finance is allocated and whether it achieves its intended environmental impact. For voluntary carbon markets, transparent financial reporting strengthens credibility, reduces risks of fraud, and facilitates participation from both private and public investors who seek accountability in their sustainability investments.

Financial Risk Management

Managing financial risks associated with climate finance and voluntary carbon markets is essential for long-term stability. Risks such as price volatility, regulatory uncertainty, and project underperformance can deter investors if not properly mitigated. Developing risk assessment frameworks, hedging strategies, and insurance mechanisms ensures resilience against financial fluctuations. By proactively addressing financial risks, carbon market participants can create a more predictable and attractive investment landscape, ultimately sustaining the flow of climate finance.

Carbon Revenue Recycling

Carbon revenue recycling is the process of using money raised through carbon credits to support economic and climate goals. This can include returning money to households to help manage higher energy costs, cutting other taxes to boost economic efficiency, or supporting sectors vulnerable to carbon pricing. These actions help address concerns around fairness and competitiveness while building broader acceptance for carbon pricing.

When used wisely, carbon revenues become a sustainable source of finance for climate action. Governments can invest in clean energy infrastructure, public transport, or green technology development—initiatives that reduce emissions and generate long-term benefits. This strategic use of funds ensures that carbon pricing not only reduces pollution but also drives inclusive growth, supports vulnerable communities, and sustains momentum for deeper decarbonization.

8. CHALLENGES AND ADAPTIVE MEASURES

Maturing and scaling the voluntary carbon ecosystem requires addressing a range of complex challenges. These include navigating evolving global standards and regulatory frameworks—such as frequent updates by Verra, Gold Standard, and developments under Article 6 of the Paris Agreement. Financial uncertainties also pose a concern, affecting the confidence of all stakeholders and making investments in carbon projects less predictable. Additionally, smallholder farmers face significant barriers in adopting new practices and participating effectively in carbon credit markets. The following section outlines these challenges along with adaptive measures to address them.

Table 6 *Voluntary Carbon Markets- Challenges and Adaptive Measures*

Description	Impact	Adaptive Measures
Challenge: Ensuring Additionality		
Additionality is crucial for ensuring carbon credits reflect true emission reductions. Demonstrating additionality remains complex, with risks of over-crediting if emission reductions would have occurred anyway.	• Undermines the integrity of the project • Causes financial risk for credit buyers • Damages the reputation of the involved stakeholders • Reduces market confidence in carbon credits	• Leverage Digital MRV, • Auto-Additionality for Smallholders (Annexure 1)
Challenge: Credit Reversal		
Reversal poses a critical risk in voluntary carbon markets because it occurs when sequestered carbon is later released—through wildfires, floods, pests, or human actions—undermining the environmental benefit of the credit. As climate change intensifies, such events are occurring more frequently, especially in nature based solutions like forestry, amplifying concerns about credit permanence	• Released carbon forces registry cancellations and invalidations • Increased buffer-pool contributions or insurance premiums elevate project costs and raise credit prices. • Buyers may face greenwashing allegations if credits fail to deliver lasting reductions	• Use diversified buffer reserves and project-level insurance. • Enforcing strong MRV and legal safeguards. • Leveraging frameworks such as Bezero and Sylvera for doing due diligence.

Description	Impact	Adaptive Measures
Challenge: Uncertainty Around Standards and Project Verification Methods		
Adverse changes to carbon markets regulations, including new permitting processes, changes to accepted methodologies or jurisdictions, or higher taxes	• Increases financial risk for all stakeholders • Limits the participation of small-scale farmers • Raises operational costs for project developers • Adds complexity and compliance burden on farmers	• Understand existing regulations in the host country, as well as policies under development. • Proactively engage with relevant policymakers. • Establishing Self- Regulatory Bodies (Annexure 1)
Challenge: Double Counting		
Double counting occurs when the same carbon reduction is credited more than once.	• Undermines the credibility of carbon credits • Leads to disqualification from registries • Creates compliance issues for buyers • Reduces trust in project developers • Hampers countries' climate reporting accuracy	• Using Digital MRV techniques such as remote sensing and GIS can support.
Challenge: Land Tenancy and Carbon Credit Rights		
In India, tenant farmers who adopt regenerative practices to reduce emissions and enhance soil carbon storage can't participate in carbon credit markets, as the current system links credits only to landowners	• Limits the adoption of regenerative practices by tenant farmers. • Excludes the majority of cultivators from carbon market benefits. • Reduces the scale and impact of carbon farming projects. • Increases project risk due to unclear land tenure.	• Assess land ownership and tenure requirements based on project type and developer status. • Identify and account for all costs related to securing land rights. • Allocate adequate time in planning for land rights acquisition if not already in place. • Collaborate with trusted local partners to navigate land tenure with communities when needed. • Include a benefit-sharing mechanism. • Agreements catering to both tenants and landowners

Description	Impact	Adaptive Measures
Challenge: High Upfront Costs for Changing Practices		
Shifting to regenerative practices involves high initial costs—new inputs, equipment, labour, and possible yield drops.	• Limits the participation of small-scale farmers • Adds complexity and compliance burden on farmers	• Providing forward purchase agreements with predefined minimum prices with income certainty before project implementation. It will reduce financial risk and encourage the adoption of sustainable practices. An example of this is World Bank's emission reduction purchase agreement (ERPA), which is legally binding, results-based forward contract under which the World Bank (through climate funds like FCPF, CPF, or Ci Dev) commits to purchasing a specified amount of future verified greenhouse gas reductions. The agreement—typically lasting 5–10 years—stipulates the volume of emission reductions, payment amount, delivery schedule, and independent verification requirements
Challenge: Uncertainty in the Delivery of Carbon Credits		
Failure to deliver carbon credits on the agreed date due to delays in project implementation and validation, and/ or verification by standards bodies	• Loss of buyer trust and credibility • Revenue delays for project developers/farmers • Higher costs due to re-verification or extensions • Reputational risk for all stakeholders	• Building realistic timelines with buffers • Secure bridge financing or advance payments • Include flexible clauses in agreements • Diversifying Revenue Streams • Investing in insurance

Description	Impact	Adaptive Measures
Challenge: Limited Farmer Capacity and Information Access		
Many farmers are unaware of carbon credits, eligible farming practices, and how they can benefit from participating in carbon markets.	• Low farmer participation in projects • Incorrect or inconsistent practice adoption • Reduced long-term engagement • Risk of misinformation or exploitation	• Creating awareness and providing training to educate farmers on their current agricultural methods and how they can transition to sustainable practices. • Establishing model farms and demonstration plots to showcase the ease and benefits of adopting carbon-smart practices. • Partnering with cooperatives, NGOs, and agri-tech companies to provide farmers with tailored guidance and resources. An online decision support system may also help.
Challenge: Difficulties in Farm and Farmer Data Collection		
Small-scale farmers, the primary beneficiaries of carbon credit projects, often miss out on the intended benefits due to data collection hurdles.	• Delays in farmer onboarding and project registration • Exclusion of eligible farmers from carbon benefits • Lower scale and impact of carbon projects • Increased administrative burden on project teams • Reduced trust and participation from farmers	• Use community-based data verification and mobile enrollment drives. • Leveraging initiatives like Agri Stack, that are building a nationwide database of farmers, documenting land ownership and other key details, making the data collection process more efficient. • Programs like Bhu Aadhaar can aid in land parcel identification, simplifying the registration process for carbon credit projects. • Partner with FPOs/cooperatives to mobilize and aggregate farmer participation.

9. STRATEGIC CONSIDERATIONS

Building on the challenges and adaptive measures discussed in the previous section, the following are key considerations agribusinesses should keep in mind when developing carbon projects, buying credits, and engaging with smallholder farmers.

9.1 Regulatory and Standards Alignment

- **Stay ahead of evolving market standards:** Carbon registries frequently update their methodologies. Agribusinesses can align their project designs with the latest criteria from recognized standards like Verra or Gold Standard by actively monitoring registry updates, working with approved validation and verification bodies (VVBs), and using registry-approved digital platforms etc.
- **Plan for additionality early on:** Clearly demonstrate how your carbon project goes beyond "business as usual." Consider adopting digital MRV (Measuring, Reporting, and Verification) tools, establishing clear baselines, documenting practice shifts, addressing barriers, engaging third-party auditors, benchmarking against norms, and highlighting co-benefits.
- **Avoid credit overlaps:** Prevent double-counting to maintain project credibility. Implement a robust internal registry or align with sector-wide efforts to map and track enrolled farms, ensuring exclusivity.
- **Consider tenant farmer inclusion:** Current carbon credit frameworks often benefit landowners. However, agribusinesses can adopt models that recognize carbon stewardship by tenant farmers and explore innovative benefit-sharing mechanisms.
- **Catering to evolving market expectations:** Showcase the co-benefits your project delivers—such as biodiversity conservation and social impact. Investors and buyers increasingly seek projects that not only reduce emissions but also generate broader environmental and community benefits, so incorporate additional assessments and certifications accordingly.

Bayer Rice Carbon Program: Leveraging Digital MRV for Strengthening Integrity and Quality

Bayer has launched its first carbon credit initiative in India, leveraging regenerative agricultural practices to reduce greenhouse gas (GHG) emissions and enhance farm profitability. The initiative, known as the **Bayer Rice Carbon Program,** is being implemented across 11 states in India, helping farmers transition to Direct Seeded Rice (DSR) and alternate wetting and drying (AWD) techniques. Credits of up to 250,000 tonnes of carbon dioxide equivalent (CO_2e) are being validated, certified and issued by Gold Standard.

Bayer has leveraged advanced technology and scientific collaboration to enable robust digital Monitoring, Reporting, and Verification (MRV) for its carbon projects. The company has collected data on over 100 parameters—including methane emission reductions, water savings, yield improvements, and soil health indicators—to support third-party verification. For select indicators, Geographic Information Systems (GIS) have been used to enhance data accuracy. Additionally, in partnership with the International Rice Research Institute (IRRI), Bayer has deployed methane measurement chambers in experimental rice fields under various treatment regimens—such as control, Alternate Wetting and Drying (AWD), and Direct Seeded Rice (DSR)—to scientifically validate methane flux data. This integrated approach ensures credible, technology-enabled MRV for climate-smart agriculture initiatives.

Carbon Mint Leveraging Technology for Traceability and Accountability

Carbon Mint developed a technology-driven approach to promote sustainable agriculture by embedding traceability and accountability into every stage of the farming process. Through its digital platform, the company enabled end-to-end visibility across the agricultural lifecycle—from on-farm practices to final produce—ensuring transparency for both businesses and consumers.

To drive adoption, Carbon Mint worked with agri-businesses to integrate regenerative practices into their sourcing models. These businesses used the traceability tool to highlight the nutritional value of the produce and strengthen consumer trust by showcasing the journey from farm to table. This also supported long-term soil health through the accumulation of soil organic carbon, going beyond traditional organic certifications.

On the farmer side, Carbon Mint collaborated with Praanadhaara to transition smallholders from conventional rice transplanting to Direct Seeded Rice (DSR) using a Farming-as-a-Service model. This shift reduced water and energy use, cut methane emissions, and improved cost-efficiency through mechanization. The IT-enabled platform captured verifiable data on practices and outcomes, allowing farmers to access rewards such as food tokens, carbon credits, and biodiversity credits from climate-related programs.

Through this integrated digital approach, Carbon Mint successfully created a transparent and accountable ecosystem that benefited farmers, businesses, and the environment alike.

9.2 Financial Structuring and Risk Planning

- **Upfront investment needs**

  Transitioning to regenerative agriculture may involve costs related to new equipment, practices, or temporary yield changes. Agribusinesses should structure upfront incentives, such as practice-based payments or blended finance, to ease this transition.

- **Revenue predictability**

  Carbon revenues are often realised 1–3 years after implementation. Agribusinesses can reduce risk by exploring forward contracts, price floors, or partnerships with credit buyers who guarantee purchase commitments.

- **Market volatility and permanence**

  Agribusinesses must factor carbon prices and permanence risks (e.g., from climate variability) into financial planning. They can use tools like buffer pools and weather-indexed insurance to help mitigate this uncertainty.

- **Investing in insurance**

  Insurance remains relatively uncommon in carbon projects, although it is a standard feature in most large-scale infrastructure projects, such as those in the renewable energy sector. As voluntary carbon markets expand and attract larger pools of traditional capital, agribusinesses will reduce financial risk by using insurance—alongside other typical investor protections.

Bayer's Rice Carbon Program: Facilitating Upfront Payment Agreements

To support the transition to regenerative practices, under its Rice Carbon Program, Bayer provided upfront incentives to farmers before each season, recognizing that the shift to regenerative practices like Direct Seeded Rice (DSR) and Alternate Wetting and Drying (AWD) could be financially challenging. This proactive support helped motivate farmers to adopt and consistently follow these practices.

9.3 Enabling Farmer Participation at Scale

- **Invest in awareness and capacity building**

  Many farmers are unfamiliar with carbon markets. Agribusinesses should provide training, conduct model demonstrations, and offer handholding support, possibly in collaboration with KVKs, FPOs, or NGOs.

- **Increasing farmers digital literacy**

  Boosting farmers' digital/mobile literacy enables them to use mobile apps and sensor-based platforms for MRV—making carbon sequestration traceable, credible, and eligible for voluntary carbon markets—while also empowering them to list credits and

receive payments directly via mobile wallets, cutting out intermediaries. Farmer field school–style digital training, combining in-person group sessions with interactive micro-courses (e.g., via WhatsApp) that teach smartphone basics and mobile wallet setup can help boost literacy.

- **Streamline onboarding**

  Digital platforms and tools like AgriStack and Bhu-Aadhaar can make farmer enrolment and KYC collection more efficient. Aligning with these systems early can reduce transaction costs later.

- **Ensure technical continuity**

  Sustained adoption of carbon-smart practices often requires ongoing advisory support. Agribusinesses may deploy or partner with field-level agronomists or advisors to ensure this support.

- **Bundle co-benefits**

  Buyers increasingly demand carbon credits with additional environmental or social outcomes. Projects that also improve soil health, water use, or biodiversity may command premium prices—an incentive to integrate holistic sustainability metrics from the outset.

- **Aggregation is key**

  Smallholder projects are often not viable in isolation. Aggregating multiple farmers under a single carbon program spreads monitoring and verification costs and increases scalability. FPOs and cooperative societies can be leveraged to onboard higher number of farmers.

Grow Indigo – Building Awareness and Supporting Farmers for Regenerative Agriculture

Grow Indigo's carbon program in Maharashtra and Gujarat supports smallholder farmers in adopting regenerative practices through training, continuous engagement, and carbon market incentives. Farmers are required to implement at least one eligible sustainable practice, with support provided to improve land management and drive long-term adoption.

The program is anchored by over 100 Kisan Advisors who offer on-ground guidance and personalized support. Partnerships with stakeholders in the cotton and sugarcane value chains help align incentives and scale the initiative.

To build trust and awareness, Grow Indigo conducts regular field visits, community meetings, and peer learning sessions, while leveraging digital platforms like WhatsApp, Facebook, YouTube, and a dedicated call centre. These efforts help share success stories, resolve farmer queries, and address adoption barriers, creating a robust support system for sustainable agriculture.

Building Climate Resilience at Scale- ITCMAARS

ITC Limited, a diversified conglomerate with deep roots in agribusiness, is strengthening the climate resilience of its agricultural value chains through its innovative phygital platform—ITCMAARS (Metamarket for Advanced Agricultural Rural Services).

By partnering with Farmer Producer Organisations (FPOs), ITCMAARS delivers customised advisories, weather forecasts, and capacity-building programmes to more than two million farmers. The platform enables early identification of climate risks, hotspot mapping, and real-time monitoring—equipping farmers with actionable climate intelligence to adopt adaptive practices.

Through this integration of digital tools and on-ground engagement, ITCMAARS not only enhances farmer resilience but also fortifies ITC's supply chains against physical climate risks, making it a model for climate-smart agribusiness transformation.

Bagepalli CDM Reforestation Programme

Initiated by Agricultural Development and Training Society (ADATS), The Gold Standard Certified Project is aimed at doing reforestation activity on the degraded agricultural land of 5 taluks of Chickballapur District of Karnataka, India. These lands are currently private uncultivable lands, fallow lands or marginal croplands belonging to farmers. As part of the reforestation activity, Mangifera Indica (Mango), Tamarindus indica(Tamarind), Anacardium occidentale (Cashew), Neem etc are being planted. The project activity is expected to play a vital role in poverty alleviation as farmers will be benefitted not just from carbon credits but also from produce. The project is thus designed to create long-term secure income for marginal farmers in the Bagepalli, Chickballapur, Chintamani Gudibanda and Siddalaghatta taluks of Chickballapur District, as well as creating a lasting tree cover in the region. 91092 carbon credits were issued as part of the project.

9.4 Ensuring responsible use of carbon credits

The Voluntary Carbon Markets Integrity Initiative (VCMI) guides companies on how to credibly and transparently use carbon credits in their climate strategies. It pushes businesses to prioritize deep emissions cuts first and then use carbon credits in a way that builds trust and integrity.

By following VCMI guidance, agribusiness can:

- Avoid greenwashing and maintain credibility with customers and investors. Rating frameworks like BeZero and Sylvera can be used for the same. A draft due diligence checklist is given in Annexure 3 for reference.
- Stay ahead of regulations by aligning with emerging global standards.
- Show leadership in climate action through responsible carbon credit use.

VCMI's Claims Code of Practice helps companies make credible public climate claims when they use carbon credits. It ensures you follow a science-aligned emissions pathway and use credits in a transparent, meaningful way.
To make a VCMI-aligned claim, agribusiness must:

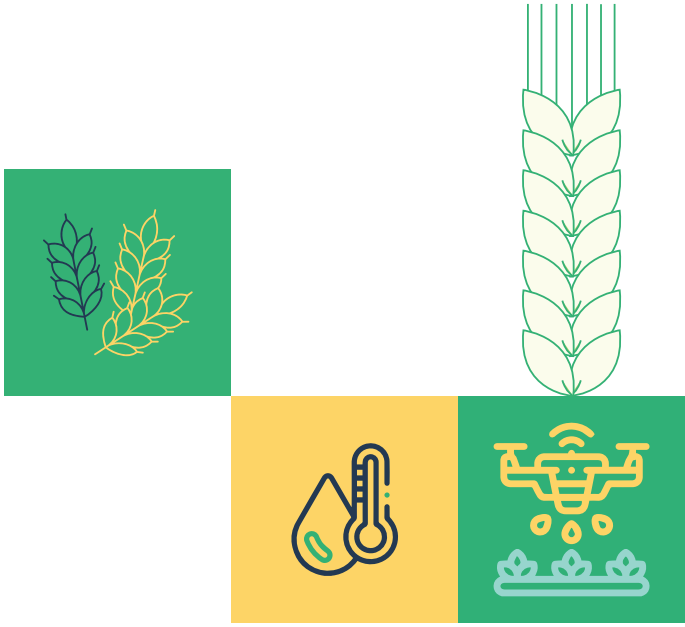
1. Measure and disclose full greenhouse gas emissions (Scope 1, 2, and 3).
2. Reduce emissions by setting and acting on near-term climate targets.
3. Buy only high-quality credits that meet global standards (e.g., ICVCM's Core Carbon Principles).
4. Make a clear claim based on how much of residual emissions were offset.

Agribusiness can choose from these VCMI Claim Levels:

Silver
Offset at least **20%** of remaining emissions.

Gold
Offset at least **60%.**

Platinum
Offset **100%** or more.



10. TRADING OF VOLUNTARY CARBON CREDIT

10.1 What is Traded in Voluntary Carbon Markets?

In the voluntary carbon market, the main product being traded is the carbon credit. Each credit represents one tonne of GHG emissions that has either been reduced or removed from the atmosphere.

Alongside individual credits, derivative contracts are also traded. These contracts bundle or repackage carbon credits in different ways. They let investors hedge risks or speculate on future changes in carbon credit prices. Derivatives are based on actual carbon credits and can also take the form of index-based products.

Carbon credits can be bought in two main ways:

- **Spot Market:** where buyers and sellers trade carbon credits immediately (over the counter).
- **Forward or Future Agreements (Offtake Agreements):** where the buyer agrees to purchase credits that will be delivered at a future date.

To improve liquidity and simplify trading, index products such as Global Emissions Offsets (GEO) and Nature-based Global Emissions Offsets (N-GEO) are used. These allow buyers to purchase a standardized contract instead of choosing a specific credit. When the contract is settled, the seller must deliver credits that meet the GEO or N-GEO criteria.

10.2 How are Credits Bought and Sold?

There are two main ways carbon credits are traded in the voluntary carbon market

1. **Project developer to end buyer:**

Buyers can purchase carbon credits directly from the project developer. They can then retire the credits to meet their own climate goals.

This direct route may seem simple, but it can be challenging for buyers who are not familiar with how carbon markets work. Even though there are fewer parties involved, the process lacks transparency. Buyers often don't have to reveal the details of their purchase, and while they can be sure that their money reaches the project developer, they rarely know how that money is used. The developer may spend it on climate action, community benefits, or profits—but this breakdown is almost never shared publicly.

2. **Project developer to intermediary to end buyer:**

In many cases, carbon credits pass through one or more intermediaries before reaching the final buyer. These intermediaries can be brokers, resellers, online marketplaces (also called "exchanges"), or even crypto platforms.

Larger companies with in-house trading teams, like Shell, often deal directly with exchanges such as Carbon EX, Air Carbon Exchange(ACX), Carbon Trade Exchange (CTX) etc. Smaller buyers typically rely on brokers or consultants who help them find suitable credits.

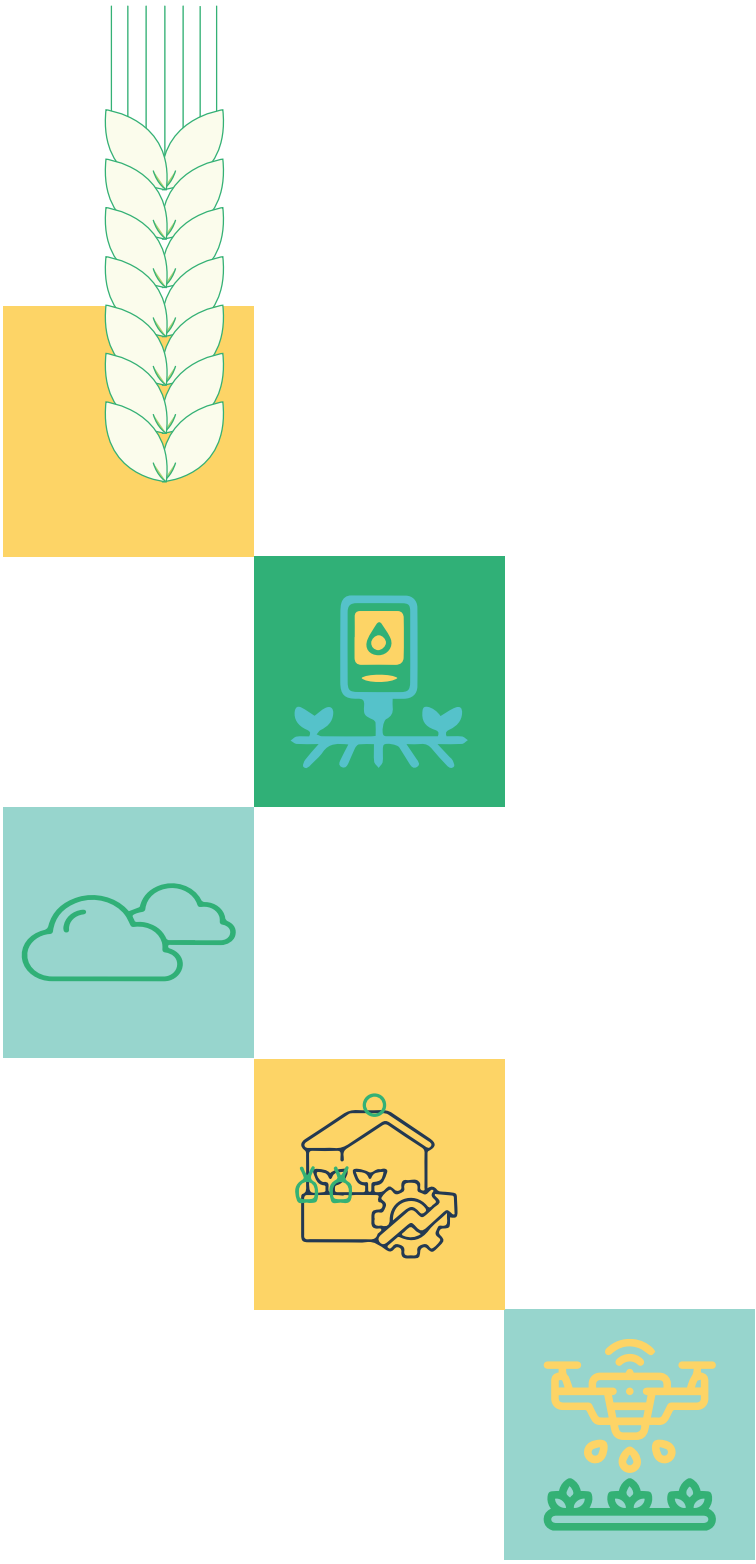
Intermediaries make it easier for both buyers and sellers. They help buyers who lack experience in carbon markets and assist project developers in finding customers. However, this added layer comes with extra costs—intermediaries charge fees or mark up the price of credits. As a result, less money may reach the actual project or the local communities involved. Also, financial transparency is very limited in the voluntary carbon market, so it's hard to track where the money really goes.

10.3 Types of Intermediaries in Voluntary Carbon Credit Trading

Retail Traders
Retail traders buy carbon credits in bulk from project developers and sell them to other intermediaries for a profit, usually adding a commission or markup.

Brokers
Brokers act on behalf of final buyers. They help buyers choose suitable credits and often retire them directly. In return, brokers charge a commission fee, which can be high.

Exchanges
Brokers act on behalf of final buyers. They help buyers choose suitable credits and often retire them directly. In return, brokers charge a commission fee, which can be high.



11. CONCLUSION

As climate change fundamentally reshapes the future of agriculture, agribusinesses in India stand at a pivotal crossroads. They not only have an unprecedented opportunity but also a growing responsibility to lead the transition toward low-carbon, climate-resilient food systems. This playbook is designed as a practical starting point for agribusinesses to initiate their sustainability journey—equipping them with the foundational understanding of emissions scopes, actionable pathways, and the evolving ecosystem of voluntary carbon markets (VCMs).

Agribusinesses can begin by addressing emissions within their own operations—Scope 1 and 2—while strategically leveraging VCMs to tackle the more complex and dominant Scope 3 emissions across their supply chains. Through participation in VCMs, companies can support farmers in adopting carbon-smart practices, generate high-quality carbon credits, and unlock co-benefits such as improved soil health, biodiversity, and farmer incomes. This not only aligns with global climate standards and ESG benchmarks but also builds resilient, transparent, and future-ready agri-value chains.

Yet, realizing the full potential of VCMs in agriculture requires more than intention. Challenges remain, ranging from financing and regulatory clarity to project integrity and equitable smallholder participation. Government support will be vital in enabling digital infrastructure, land parcel mapping, farmer training, and the inclusion of tenant farmers. But the enabling environment is rapidly evolving: India's carbon market framework is taking shape, digital MRV and traceability tools are maturing, and demand for credible carbon credits is surging.

The message is clear: the time to move from pilots to scale, and from ambition to action, is now. By embracing the tools, strategies, and partnerships outlined in this playbook, agribusinesses can not only chart their net-zero pathway but also help shape a regenerative future where climate action, farmer livelihoods, and business growth go hand in hand.

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GLOSSARY

Term	Definition
Additionality	A term to refer to a key issue for carbon-offset projects, which is whether they can be sure that the emissions reductions achieved are truly "additional" to what would have happened without the project. If not, the carbon offsets sold could be considered worthless.
Avoidance/avoided emissions offsets	A type of carbon offset that involves emissions reductions compared to a hypothetical alternative. (For example, when a windfarm is built instead of a coal project.)
Carbon Credits	One credit = a transferable token issued by a carbon credit rating agency, representing one ton of carbon or equivalent greenhouse gas (ton CO2e) reduced from the atmosphere
Carbon Offsetting	A process that allows individuals, businesses or governments to compensate for their emissions by supporting projects that reduce or remove emissions elsewhere.
Compliance Carbon Market	Emissions markets that are linked to meeting of mandatory/regulatory emissions targets e.g. Cap & Trade. This can relate to national emissions targets which countries are legally committed to, or in some cases sectoral or regional targets (based on the individual country).
Corresponding Adjustments	Part of Article 6 of the Paris Agreement, corresponding adjustment is a stipulation intended to guard against double-counting of emissions reductions. When Parties transfer a mitigation outcome internationally to be counted toward another Party's mitigation pledge, this mitigation outcome must be 'un-counted' by the Party that agreed to transfer it. While this seems straightforward, questions around how and when a corresponding adjustment should be applied remain contentious.
Double Counting	When two entities, such as governments, businesses or individuals, both use the same carbon credit to claim they have achieved their climate targets.
Greenwashing	A term used for false, misleading or untrue claims about an entity's positive impact on the environment. Some entities use carbon-offsetting to make claims that amount to greenwashing.
Internationally Transferred Mitigation Outcomes (ITMOs)	Credits that can be traded between Paris Agreement parties to meet climate goals under the new Article 6.2 system.
Kyoto Protocol	A global accord signed in 1997 that aimed to decrease greenhouse gas emissions. The phrase "carbon credit" appeared for the first time in the Kyoto Protocol. The Kyoto Protocol would later be superseded by the Paris Agreement.
Leakage	A term used for concerns that introducing a carbon-offset project in one region could lead to new emissions happening elsewhere. For example, if a forest protection scheme opens in one patch of the Amazon, deforesters may simply respond by logging another area.

Term	Definition
Net Zero	A condition in which greenhouse gases emitted into the atmosphere are balanced by the amount of greenhouse gases being removed from the atmosphere.
Paris Agreement	An agreement signed in 2015 by world leaders to cut down greenhouse gas emissions and restrict the increase in global temperature to less than 2°C above pre-industrial era levels by the end of the 21st century
Permanence	A term used in reference to how different carbon-offset projects can reduce emissions over various timescales. For example, carbon stored in a forest may remain there for tens to hundreds of years, whereas CO2 injected into rock can remain there for thousands of years.
Registries	Bodies that track offset projects as they are bought and sold, and also "issue" carbon offsets – meaning they confirm that a number of tonnes of CO2 has been cut, avoided or removed by a project. The largest in the voluntary carbon market are run by Verra, Gold Standard, the American Carbon Registry and the Climate Action Reserve.
Removals offsets	A type of carbon offset generated by projects that absorb CO2 from the atmosphere, such as tree-planting schemes.
Scope 1 Emissions	The release of greenhouse gases into the atmosphere from sources such as buildings and operations directly owned or controlled by an organization. For example, if a company owns a fleet of trucks, the greenhouse gases emitted by these trucks would count towards the company's Scope 1 emissions.
Scope 2 Emissions	The discharge of greenhouse gases as a result of the electricity, heating, cooling, or steam generation required to power an organization's buildings and other facilities. For example, if a company's headquarters building draws power from a coal-fired power plant, a proportional amount of the emissions resulting from that coal plant's electricity generation would count towards the company's Scope 2 emissions.
Scope 3 Emissions	The release of greenhouse gases into the atmosphere generated as a result of an organization's activities but physically produced by another entity. For example, if you drive a fossil-fuel-powered car, the emissions it produces would count towards the car manufacturer's Scope 3 emissions.
Standards	Sets of guidance on the monitoring and reporting of emissions cuts from offset projects. Registries tend to operate their own standards for offsets they are tracking – for example, Verra oversees the Verified Carbon Standard. There are also UN standards, for example under the Clean Development Mechanism.
Voluntary Carbon Market	A largely unregulated market where carbon offsets are traded by corporations, individuals and organisations that are under no legal obligation to make emission cuts.

ANNEXURE 1

1. Concept of Auto-Additionality

Regenerative agriculture projects, especially those involving smallholder farmers, face significant barriers in demonstrating additionality. These challenges arise due to lack of authentic literature on the adoption rate of regenerative practices, insufficient knowledge and data availability, low-resolution satellite imagery limiting remote sensing analysis, high costs of reaching smallholder farmers, need for large farmer participation due to small landholding sizes, making scalability and financial viability difficult.

Promoting regenerative agriculture carbon projects on small farms require addressing key barriers such as cost, complexity, behaviour change and access to markets. This could be achieved through technologies and specified conditions (hereinafter referred to as positive lists) that would confer automatic additionality to project activities and programmes of activities (PoAs) that apply them.

A positive list identifies specific practices or technologies that are automatically deemed additional due to their climate impact potential and low adoption rates.

a) Projects that exclusively adopt one or more of the following practices identified as Positive list can be considered automatically additional.

- Practices such as direct seeded rice, crop residue management, reduced tillage, fertigation, agroforestry, intercropping, and cover cropping.
- Use of new solutions like methane-oxidizing microbes, carbon sequestering microbes, or biofertilizers that help fix nitrogen from the air and in turn reduce synthetic nitrogen fertilizers.
- Adoption of organic soil amendments (e.g., compost or vermicompost) including biochar-based amendments.

b) Projects involving small land areas (e.g., less than 5 hectares) adopting any of the above practices, can be deemed additional due to structural barriers such as the lack of economies of scale.

c) Least developed regions: Projects located in India's least developed states, identified based on the Multidimensional Poverty Index (MDI)[1] can qualify for additional consideration.

This makes project focusing on small farm holders simpler and faster promoting more participation feasible for smallholders while still maintaining environmental integrity. This will help accelerate agriculture as a climate solution. This simplifies eligibility and incentivizes adoption by reducing technical hurdles during project development.

[1] https://niti.gov.in/sites/default/files/2023-07/National-Multidimentional-Poverty-Index-2023-Final-17th July.pdf

2. Self-Regulatory Structure for India

Given the complexity of agricultural carbon markets - where multiple ministries, private registries, and farmers interact - a self-regulatory industry body can offer a flexible and credible solution.

Below is a simple overview of how this could work:
Industry Consortium Formation:

i. Leading carbon project developers, farmer groups, agri-business companies, and other stakeholders come together.

ii. They establish shared standards and good practices for farmer enrolments in carbon programs.

iii. An independent board, including government officials, technical experts, and farmer representatives, oversees decision-making.

iv. Day-to-day operations are managed by a small executive team, which maintains a shared registry of all fields that are enrolled in carbon programs.

Unified Registry of Fields

- Every enrolled plot is digitally mapped using GPS data (satellite imagery).

- The registry tracks the me period and practice changes linked to each plot so that the same field cannot generate credits multiple times for the same activity.

- Infractions - such as double-counting credits – could be flagged to relevant par es while maintaining confidentiality.

- A small fee charged per carbon credit issued helps sustain the registry and pay for the service over me. By designing a system that both industry and government trust, the market can remain resilient, transparent, and responsive to new data or technological advances.

ANNEXURE 2

Technology	What It Monitors	How It Works	Examples/Providers
Satellite & Remote Sensing	Forest cover, deforestation, land-use change	Uses hyperspectral/ multispectral imagery for vegetation analysis and carbon stock estimation (greenup.asia, cleantech.com)	Nadar, Pachama, Sylvera, Kanop, Climate TRACE
IoT & Sensor Networks	Soil carbon, CO_2 flux, air quality, biomass	Field-deployed sensors providing continuous, real-time data streams	Regrow, Cula Technologies
AI & Machine Learning	Soil organic carbon, anomalies in land use	Models predict and validate carbon levels, reducing need for physical sampling	Downforce, Perennial, TrueBranch
Digital MRV / Blockchain	Data integrity, credit tracking, real-time MRV	dMRV platforms + immutable ledgers prevent fraud and enable auditability	Carbonfuture MRV+, DCarbonX concept
Third Party Verification Platforms	Standard compliance, project audits	Integrate real-time data into VVB processes for certification alignment	ERM CVS, Limenet (CDR), Climeworks with Puro.earth

ANNEXURE 3

Due Diligence Checklist for Carbon Credit Projects

This checklist incorporates elements from robust due-diligence frameworks such as BeZero and Sylvera. Although not comprehensive, it provides a well-founded illustrative example for review.

1. Carbon Accounting & Baseline Integrity:

Ensure each credit truly represents 1 tCO_2e avoided or removed; verify that the project's carbon accounting is transparent and conservative (BeZero's "carbon accounting" risk) .

- ☐ Review the project baseline scenario: it must be evidence-based (historical data or realistic proxies) and not inflated. An exaggerated baseline will overstate claimed reductions.
- ☐ Confirm all relevant emissions and removals are accounted (including soil carbon, non-CO_2 gases, etc.). Check that key parameters (growth rates, decay, default factors) are justified and conservative.
- ☐ Verify that carbon credits are only issued for additional reductions (after subtracting any leakage and actual emissions) – Sylvera notes that baseline–actual-leakage calculations must be sound to avoid over-crediting .

2. Additionality:

- ☐ Confirm the project was not business-as-usual: it relies on carbon revenue to proceed (financial additionality) . For example, without credits, the project should be unprofitable or far less viable.
- ☐ Check for regulatory or policy drivers: ensure no existing laws, mandates, or subsidies already require or incentivize the same emission reductions (regulatory additionality) .
- ☐ Assess common practice: evaluate whether similar projects occur in the region without credits (if the activity is already widespread, additionality is weaker) .
- ☐ Review documentation of the additionality test used (e.g. CDM/Standard tools or project developer analysis). Ensure the methodology's "barriers" or "performance" test shows the project is unlikely without carbon finance.
- ☐ Scrutinize baseline assumptions underlying additionality (e.g. deforestation rates in an ARR project). Unrealistic baseline assumptions can hide lack of additionality (over-crediting)

3. Permanence (Non-Reversal Risk):

- ☐ Identify reversal risks: has the project analyzed threats like wildfire, pest outbreak, drought, or disease? For removals (e.g. forestry), there should be mitigation plans (e.g. fire breaks, pest control, periodic replanting) and buffers or insurance to cover losses .
- ☐ Evaluate governance and tenure: confirm land tenure and carbon ownership are clear and secure for the crediting period, and that communities/landowners have given Free, Prior & Informed Consent (FPIC) 9 9 . Insecure land rights or opposition may jeopardize permanence.

- ☐ Consider financial and political stability: assess if the project developer has sufficient capital and if the host country has low risk of conflict or policy changes that could lead to land-use change (Sylvera explicitly includes capital access and geopolitical risk in permanence) .
- ☐ Confirm any committed crediting period (e.g. 25–100 years) is backed by a plan. Permanence scores reflect the likelihood GHG removals stay sequestered as claimed . 10

4. Leakage:

- ☐ For avoidance projects (e.g. REDD+, IFM): verify the project has identified all leakage pathways (e.g. displaced logging, plantation expansion elsewhere) and has quantified or conservatively estimated leakage effects .
- ☐ Check that leakage allowances are applied (e.g. Verra methodology may require a percentage buffer for leakage) and that the net reductions account for shifted emissions.
- ☐ Consider market-level leakage: if protecting timber, does it cause higher prices or substitute products elsewhere? Ensure project planning or monitoring includes such indirect effects.
- ☐ Ensure leakage is reported transparently in monitoring: an effective MRV plan will track surrounding regions or markets to catch unanticipated leakage.

5. Monitoring, Reporting & Verification (MRV):

- ☐ The project should have a clear MRV plan: specified measurement methods, data collection procedures, and quality controls. High-quality MRV uses robust, replicable methods to measure GHG changes .
- ☐ Check that an independent, accredited auditor has validated the project design and periodically verifies emission reductions or removals. Verification reports should be up-to-date and available (e.g. through the registry).
- ☐ Review monitoring reports for conservativeness: look for conservative choices (e.g. using lower bound estimates for carbon stocks, applying uncertainty buffers) and documented revisions.
- ☐ Ensure timely issuance: credits should only be issued after verification of actual reductions/ removals (no pre-issuance without follow-up MRV). Any advances or estimates should be reconciled against post-project measurements.
- ☐ Confirm transparency of MRV data: emission factors, tree measurements, or other metrics should be documented. In-situ measurements (remote sensing or field sampling) should cover project area. Sylvera notes that proper MRV limits over-crediting (by catching LAC issues) .

6. Co-Benefits and Social/Biodiversity Safeguards:

- ☐ Check if the project claims environmental co-benefits (e.g. biodiversity conservation) and whether these claims are substantiated by surveys or certifications (e.g. CCBA, SD VISta) 12 . Robust safeguards (like CCBA) signal attention to community and biodiversity, but also verify their implementation.

- ☐ Confirm social impacts: ensure local communities have been engaged and benefit (jobs, services). For example, look for Free, Prior Informed Consent (FPIC) documentation and grievance mechanisms. Sylvera incorporates FPIC in permanence risk .
- ☐ Ensure environmental safeguards: project should not harm protected species or critical habitats. Any trade-offs should be justified. (Note: Sylvera's co-benefits score is separate from carbon rating , but buyers value positive local impacts.)
- ☐ Do site-specific diligence: as Nature Conservancy notes, social and biodiversity "quality" is project specific . Review any environmental impact assessments and community outreach reports.
- ☐ Even if co-benefits are not part of the core carbon rating, list and verify them. A strong due diligence considers both carbon and "beyond-carbon" factors .

7. Governance & Transparency:

- ☐ Certification & Registration: Verify the project is registered under a reputable standard (e.g. Verra VCS, Gold Standard, CDM) and follows an approved methodology. But do not assume that membership guarantees quality – still do project-level checks .
- ☐ Documentation Availability: All project documents (project design document, monitoring reports, verification statements) should be publicly accessible on the registry or developer's website. Continued public availability is an eligibility criterion for BeZero ratings .
- ☐ Developer/Counterparty Integrity: Assess the project developer and key partners. Check for any past controversies or defaults (counterparty risk). Ensure they are experienced and transparent. Nature Conservancy emphasizes looking at counterparty/political risk as part of due diligence .
- ☐ Credit Issuance Controls: Make sure each credit has a unique serial number and the registry shows its status (issued, sold, retired). There should be no double-counting: the ton is not claimed by any other party (see ICVCM Core Carbon Principles). 17 16 15
- ☐ Legal Compliance: Confirm the project complies with local laws (permits, land use) and international norms (e.g. human rights). Lack of compliance or fraud would undermine integrity.
- ☐ Independent Ratings & Rationale: If available, review independent ratings (Sylvera, BeZero, Calyx, etc.). These agencies use transparent frameworks covering the above factors (e.g. BeZero's six risk factors). They publish rationale and scores. If such a rating exists, use it to spot high-risk issues; if not, this checklist covers similar ground.
- ☐ Ongoing Disclosure: Determine if the project commits to ongoing transparency (e.g. regular monitoring updates). Sylvera and BeZero update ratings when new info arrives, reflecting changes; similarly, projects should report material changes (fires, plan alterations) promptly.

Each bullet above can be used as a checklist item. In practice, tick each box as you verify it, and gather evidence (docs, reports, rating summaries) that the criterion is satisfied. This structured approach informed by leading agency frameworks – ensures a thorough evaluation of carbon credit quality

Notes

Confederation of Indian Industry

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering Industry, Government and civil society through advisory and consultative processes.

For 130 years, CII has been engaged in shaping India's development journey and works proactively on transforming Indian Industry's engagement in national development. With its extensive network across the country and the world, CII serves as a reference point for Indian industry and the international business community.

In the journey of India's economic resurgence, CII facilitates the multifaceted contributions of the Indian Industry, charting a path towards a prosperous and sustainable future. With this backdrop, CII has identified "Accelerating Competitiveness: Globalisation, Inclusivity, Sustainability, Trust" as its theme for 2025-26, prioritising five key pillars. During the year, CII will align its initiatives to drive strategic action aimed at enhancing India's competitiveness by promoting global engagement, inclusive growth, sustainable practices, and a foundation of trust.

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FACE
CII-Jubilant Bhartia
Food and Agriculture Centre of Excellence

FACE is CII's Centre of Excellence dedicated to building efficiencies across the agricultural value chain from farm to fork. FACE is charged with the mission of improving competitiveness of India' agriculture and food sector by catalyzing innovation, building capacity and enhancing productivity across the value chain. FACE works with farmers, companies, development institutions and the government to

- Improve on and off-farm productivity through the dissemination of best practices and technological innovation
- Invest in capacity building initiatives and skill development for supply chain participants across the value chain
- Strengthen linkages across the value chain through market access initiatives, thereby reducing losses and increasing farmer incomes

FACE's service portfolio comprises commodity specific value chain assessments and supply chain advisory services for food and agri businesses, training and consulting services in the area of food safety, and sectoral research across different market segments. FACE also works on projects in PPP mode, to develop business models that are scalable and replicable across geographies.

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