Sattva Knowledge Institute SKI primer

# CARBON MARKETS: PATHWAYS TO PROMOTE SUSTAINABLE AGRICULTURE

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# Acknowledgements

## About the Authors

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# EXECUTIVE SUMMARY

## Overview of Carbon Markets

Carbon Markets have the potential to facilitate swifter progress toward meeting worldwide targets for the reduction of greenhouse gas (GHG) emissions. While innovators and investors are already engaged in solutions to decrease carbon dioxide emissions in the atmosphere, the promotion of a dedicated ecosystem for carbon markets would enable efficient discovery, scale, financing and collaborations across these projects. This would be enabled through the generation of carbon credits for every emission-reducing activity that is employed across any sector. The carbon credits can be sold further with entities aiming to buy them. This would generate revenue for the seller and the buyer would pay a cost for emissions they cannot avoid.

## Integrating learnings from global and Indian lens

Carbon offset projects are proliferating globally as well as in India. Energy and industrial projects have been utilising this option actively, with more than half of the carbon offset projects focused on renewable energy and forestry. Countries have been witnessing growth of independent, voluntary projects, including India. Additionally, many countries have set up compliance markets at national level, most recently countries like China. In India, more than three thousand Clean Development Projects have been approved by the Indian government, as of 2020. However, most of the efforts in India currently are scattered, making it hard to track and realise full effective value. There is also the lack of a homogenous market for carbon credits in India at the national level, which leads to inefficient discovery of buyers and sellers. The pricing is not uniform and abysmally low as compared to other countries around the world.

## Carbon Market as an enabler to promote Sustainable Agriculture

The Indian Agriculture sector is at a stage where climate-resilient innovations are emerging at a rapid scale. To effectively build scale and incentivise low carbon projects at the farm level, the utility of carbon markets as a revenue generating solution holds promise. Trading of carbon at farm level shall open up additional income streams for farmers, and also reward for them their innovations. This would also significantly add to the push towards meeting climate targets for the future.

# Way Forward

Learnings from other countries like China, Japan, and EU countries who have adopted and are ideating the adoption of a national carbon market, could help inform the building of an effective strategy in India as well. A better understanding of this concept can help sectors such as agriculture realise their potential in leveraging progress towards innovations and climate-resilient solutions. Carbon reduction projects in Indian agriculture face some challenges in scaling up due to long gestation periods. Standardised carbon trading platforms at the farm level could enable useful synergies between stakeholders such as carbon project developers, trading platforms, government agencies, FPOs and philanthropic institutions. In order for them to execute carbon market strategies effectively, philanthropy could contribute to them, thus:

- Driving narratives and capital to set up strong regulatory and standardising mechanisms to facilitate scaleup of voluntary markets and paving way for national price on carbon to strengthen the carbon market ecosystem.
- Strengthening and codifying understanding in the farm ecosystem through knowledge dissemination and stakeholder engagements using learnings from other sectors like energy.
- Aiding financial interventions to eliminate risks for end level beneficiaries and fuel low carbon innovations in agriculture.
- Leveraging value of FPOs and cooperatives.

# OVERVIEW OF CARBON MARKETS

# What is a Carbon Market?

Carbon Market refers to a market where **carbon credits** (also called carbon certificates) are bought and sold within defined standards with the aim to prevent or reduce emission of **greenhouse gas emissions**.

**Studies find that carbon markets have been proliferating globally due to countries and organisations aggressively setting targets to limit carbon emissions.**

USD
851 billion

is the **global carbon market value** for carbon credits under compliance till 2021 (Refinitiv Analysts 2022).

More than
150%

**increase in worth** of carbon markets globally as compared to last year.

This drastic increase in worth is due to:

- Increase volume of **carbon credits** generated and traded;
- Increasing **carbon prices.**

**Carbon Markets are a climate mitigation instrument which can fuel adoption of low carbon investments across sectors by providing incentives towards implementing carbon-reducing projects.**

One tradable carbon credit equals one tonne of carbon dioxide or the equivalent amount of a different greenhouse gas reduced, sequestered* or avoided (UNDP).

**Introducing more avenues** for remuneration by putting prices on carbon.

**Incentivising finance** towards climate resilient, carbon-reducing solutions.

**Increased transparency** through collaborative market platforms.

*Sequestration: Process of storing emissions in sinks like soils, water, etc. so that they do not contribute to pollution in the atmosphere.

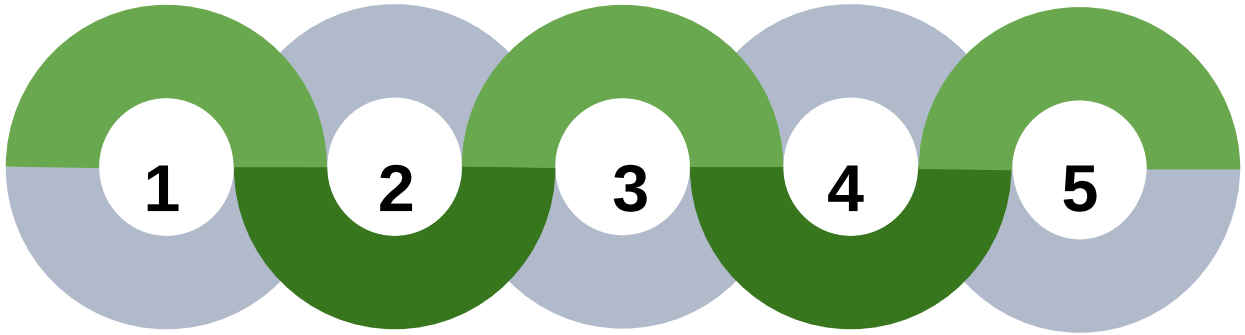
# Components of a Carbon Market

**1** Generation of **Carbon emissions** in the atmosphere:

- Carbon forms the major component of maximum GHG emissions like $CO_2$, CHCs (Chlorofluorocarbons), methane, etc.
- Industrial and agricultural activities are the major contributors of these GHG emissions.

**2** Employment of **Carbon-Sequestering** activities:

- Carbon Sequestration is the process of aiming to bring released carbon in the atmosphere back to carbon sinks like soils and forests.
- Example: Deforestation is carbon emitting activity but regrowing forests would be a carbon sequestering activity.




**3** Introduction of **Carbon Credits:**

- A carbon credit (or carbon offset) is a credit for greenhouse emissions reduced or removed from the atmosphere by an emission. reduction/carbon sequestering project.
- One carbon credit is equal to one metric ton of carbon dioxide, or in some markets, carbon dioxide equivalent gases ($CO_2$-eq).

**4** Generation of **Carbon Markets:** Carbon Credits can be exchanged between buyers and sellers

- Sellers: Entities that generate carbon credits through activities.
- Buyers: Entities that buy carbon credits to offset the emissions through their GHG-emitting activities.

**5** Carbon **Pricing** and **Trading:**

- This existence of demand leads to generation of a price for carbon, much like any other marketable commodity.
- Carbon Credits are thus traded at the price agreed between buyer and seller.
- Platforms could be over the counter (OTC), like international brokers, online retailers, and trading platforms, or national platforms.

# Ecosystem Players in the Carbon Market

| | | |
|---|---|---|
| **Brokers, Exchangers, Retail Traders** | • Purchase large amounts of credits directly from suppliers.<br>• Bundle those credits into portfolios.<br>• Sell those bundles to end-buyers, typically with some commission. | EVERLAND, European Climate Foundation, VERTIS, Carbonfund.org, Life |
| **Project Funders** | • Fund and drive capital towards low carbon projects. | ClimateWorks Foundation, The Minor Foundation for Major Challenges |
| **Project Owners** | • The operators and owners of the physical project installation where the emission reduction project takes place.<br>• Can be an individual, company or other organisations. | The Nature Conservancy, CQuest Capital, CPLC Carbon Pricing Leadership Coalition |
| **Project Developers** | • Upstream part of the market.<br>• Set up the projects issuing carbon credits.<br>• Create projects ranging from large scale (hydroelectric power plants) to small scale (clean cookstoves). | 3Degrees, RADICLE, Livelihoods Funds, VNV Advisory, EnKing International, CCA Carbon Capital Advisors |

# Ecosystem Players in the Carbon Market

| | |
|---|---|
| **Carbon Offset, Credit Providers, Registry** | • Issue, hold and transfer carbon offsets.<br>• Can also retire offsets and move them out of the market.<br>• Compliance markets have designated registries, voluntary markets have independent registries. |
| **Validators and Verifiers** | • Ensure rules and requirements of individual methodologies.<br>• Verify third party standards and jurisdictional law adherence on time. |
| **Standard Organisations** | • Unique player in carbon markets.<br>• Standard certification organisations, usually NGOs.<br>• Use methodologies to certify that a particular project meets its stated objectives and stated volume of emissions. |
| **Carbon Offset Buyers** | • Downstream part of the market.<br>• Buyer companies – or even individual consumers.<br>• Commit to offset part or all of their GHG emissions. |

# There are four types of carbon market instruments that have evolved over time to mitigate carbon dioxide emissions.

## Compliance Markets - Emissions Trading Scheme

- A regulatory cap or 'ceiling' set on the amount of GHG a business organisation can emit.
- Only a limited quantity of emission permits or allowances issued for each sector.
- Free trading for allowances in market to set a uniform carbon price.
- Eg. UN Carbon Markets are main 'compliance' markets.

## Carbon Taxes

- Defines a tax rate on GHG emissions.
- Makes pollution due to carbon dioxide emissions costlier.
- Regulated by government.

## Voluntary Markets - Credit-based Scheme

- Remuneration-based mechanism based on specific organisations certifying that emission reductions have environmental integrity (called 'GHG programmes').
- Tradable certificates are issued according to a set baseline for minimum value of emissions.
- Voluntary Participation - System not backed by any government standard or mandatory goals aimed at CSR or public image benefits.

## Other Carbon Offsetting Mechanisms

- Results-based climate finance (RBCF).
- Internal carbon prices set by organisations.

# While in the short term, private players should be pushed to increase adoption of voluntary markets rapidly, governments can complement the progress by setting up compliance standards in the long run.

## COMPLIANCE CARBON MARKETS

**These markets are created and regulated by mandatory national, regional, or international carbon reduction regimes.**

**Examples include RGGI, EU ETS, California's Cap & Trade, China ETS etc.**

- **Scope:** Compliance markets are currently limited to specific regions.
- **Motivation:** Based on the mechanisms mentioned under Kyoto Protocol.
- **Strengths:** Have the ability to drive narrative at a larger level and influence VCM markets as well.
- **Major Challenges:** Ineffectiveness of projects driven majorly by mandates, and issues in monitoring the scale by a single authority.

## VOLUNTARY CARBON MARKETS

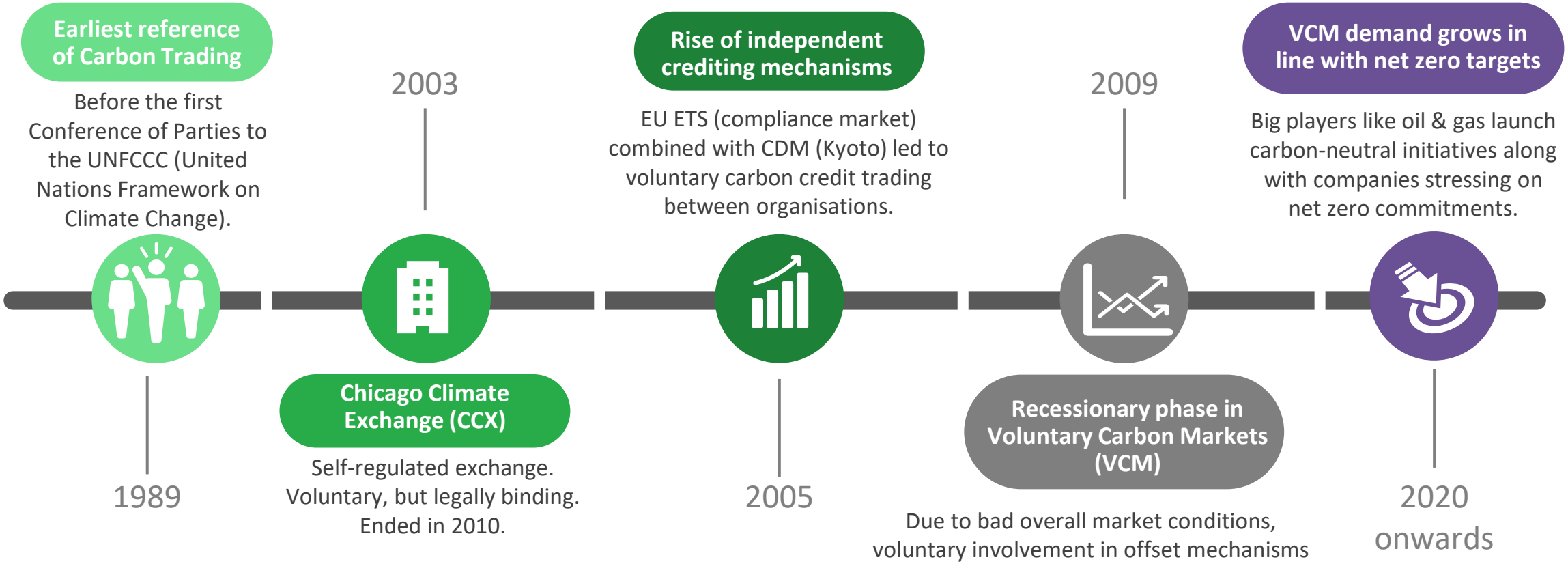
**Outside of compliance, these markets enable companies and individuals to purchase carbon offsets on a voluntary basis.**

**Standardised by private standards like American Carbon Registry, Climate Action Reserve, Verified Carbon Standard, Gold Standard, Plan Vivo System, etc.**

- **Scope:** Voluntary carbon credits are significantly more fluid, unrestrained by boundaries set by nation states or political unions.
- **Motivation:** Based on Corporate Social Responsibility, Public Relations, Environmental concerns etc.
- **Strengths:** Can be used by stakeholders in countries that do not have national carbon market schemes.
- **Major Challenges:** Non-uniformity in scale and quality standard issues.

# CARBON MARKETS: GLOBAL LENS

# Most of the countries start with adoption of independent, voluntary trading mechanisms to bring innovation, finance and engagement of multiple private stakeholders to the Carbon Markets.



# Developed countries around the world have also followed with compliance mechanisms to strengthen Carbon Markets.

## 2005 — EU Emissions Trading System (EU ETS)

- Carbon dioxide equivalent only
- Sectors: Power and heat generation in energy-intensive industries. Perfluorocarbons from aluminium production.
- Linked with many cap and trade systems of various countries like Norway, Australia and 28 other European nations.
- Also linked with CDM and JI (Joint Implementation) credit systems.

## 2005 — Regional Greenhouse Gas Initiative (RGGI)

- Carbon dioxide only
- Only Power sector covered.
- Linked with 10 states in the USA.

## 2010 — Tokyo Cap and Trade

- Carbon dioxide only
- Sectors: Office, commercial and public buildings, district heating and cooling plants
- It has linkage with CDM.

## 2013 — California ARB Emissions Trading Programme

- Carbon dioxide, methane ($CH_4$), nitrous oxide ($N_2O$) and fluorinated GHGs
- Sectors: Cement, acids, lime, natural gas, electricity generation, and other industrial activities.

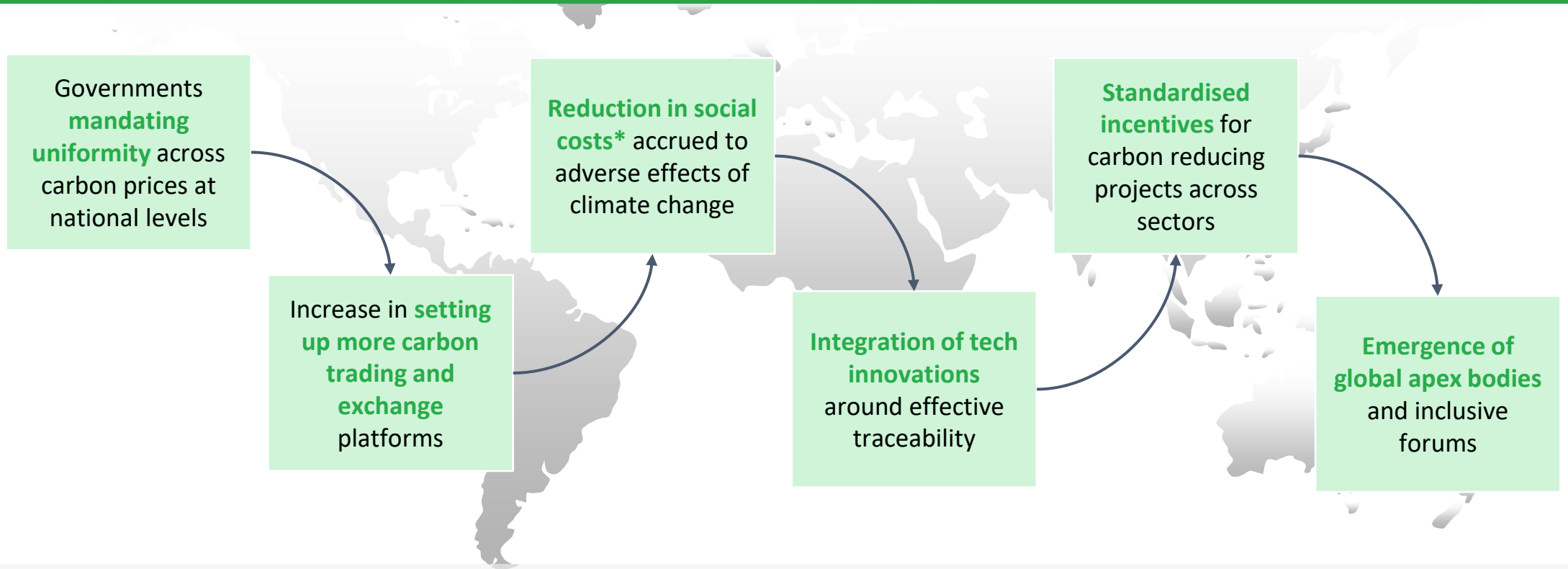
## 2021 — China's National Emission Trading Scheme

- Carbon Emissions
- Initially, the pilots will continue to operate in parallel with the national ETS, covering the sectors and entities not included in the national market.
- Largest carbon market in the world in terms of volume.

## Countries such as China, Japan, South Korea, Canada, and South Africa are aggressively setting climate targets till 2050.

It is expected that carbon trading will play a major enabling role towards achieving these targets.

**Future Scenario: Major themes for the future of carbon markets globally.**




*Social Costs include challenges such as catastrophic events, events affecting health, food security, livelihood security, migration, water security, cultural identity, and other related risks.

# CARBON MARKETS: POTENTIAL FOR INDIA

# Among 3000+ carbon offsetting projects implemented in India between 2013 and 2020, the projects under voluntary standards had a higher rate of implementation than those under compliance standards.

**Most of the carbon offset projects in India are focused on energy generation (solar, wind, hydro, biogas etc.)**

| **Type of Standard** (Source: PwC, GIZ, MoEFCC, 2020) | **Clean Development Mechanism (CDM) projects implemented by National Clean Development Mission Authority, India** | **Verra (VCS)** | **Gold Standard (GS)** | **Others (CCB, Plan Viso, SD VISta)** |
|---|---|---|---|---|
| | **COMPLIANCE STANDARDS** | **VOLUNTARY STANDARDS** | | |
| **Number of Registered Projects** | 1672 | 660 | 251 | 7 |
| **Projects never implemented** | 55% | Only 8% of total VCS projects | Only 2 projects | 3 projects withdrawn |
| **Relevant Details of Implemented Projects** | 87% are under Scope 1 (Energy generation industries) followed by Scope 3 (Energy efficiency and energy demand) projects (7%). | 85% of these projects are from the private sector, while the rest are public sector-owned projects. | Energy industries, energy demand and efficiency, manufacturing industries, transport, afforestation, reforestation and waste handling. | - |
| **Price** | Selling at a relatively low and consistent price since the 2012 price crash | No fixed price, varies from project to project | | |

# Nascent initiatives in the carbon crediting and trading space in India

| Current focus areas | Overview of the initiative | Key players involved |
|---|---|---|
| • **Energy and Industrial Sectors**<br>• **Emissions Trading Scheme**<br>• **Pollutant - Particulate Matter** | • **Who?** Ministry of Environment, Forest and Climate Change, Central Pollution Control Board and State Pollution Control Boards.<br>• **When?** In 2011, 3 states, Gujarat, Tamil Nadu and Maharashtra received mandates to unveil pilot Emissions Trading Scheme (ETS), later improvised by Gujarat in 2019.<br>• **Why?** The purpose of the programme was to improve air quality by setting mandates on emissions (tradable on NCDEX, MCX etc) and pollutants and incentivise stakeholders to reduce pollution. | J-PAL ABDUL LATIF JAMEEL POVERTY ACTION LAB<br>Ministry of Environment, Forest & Climate Change<br>CPCB<br>EPIC ENERGY POLICY INSTITUTE AT THE UNIVERSITY OF CHICAGO<br>HARVARD Kennedy School |

**Projects relevant to Indian agriculture indicate fuelling interest in this space as well.**

nurture.farm

- Indian startup agri firm Nurture.Farm sold carbon credits to global carbon markets as a pioneer initiative.
- Sold 20,000 carbon units through its dry-seeded cultivation project that saves water.

**Notable mention:**

- In 2004, Powerguda village in Andhra Pradesh sold carbon credits worth $645 to the World Bank.
- Carbon credits were generated by extracting biodiesel from Pongamia trees.

INDIAN AGRICULTURAL RESEARCH INSTITUTE
CIMMYT International Maize and Wheat Improvement Center
growindigo
mahyco grow
indigo

- Collaborative effort by IARI, CIMMYT and Grow Indigo Pvt. Ltd. (platform created by leading agriculture firm Mahyco and Indigo Ag).
- Building a marketplace where agricultural carbon credits could be exchanged and traded by Indian farmers.
- Initiated projects in Punjab and Haryana.
- Aiming for Uttar Pradesh, Bihar, Odisha, Chhattisgarh, Andhra Pradesh and Telangana.

# Carbon Markets in India show various opportunities for adoption and scaling up.

### Political Advantage
With a large population still lacking basic infrastructure in India, a carbon tax would be less politically feasible than a carbon market, which can be tailored to accommodate multiple priorities and stakeholder interests.

### Efficient Cost Mechanisms
Carbon markets facilitate predictable, least-cost reductions by encouraging emission reduction where costs are competitive and decided by market forces. This is relevant for India's priorities towards enabling a smooth transition towards a sustainable future.
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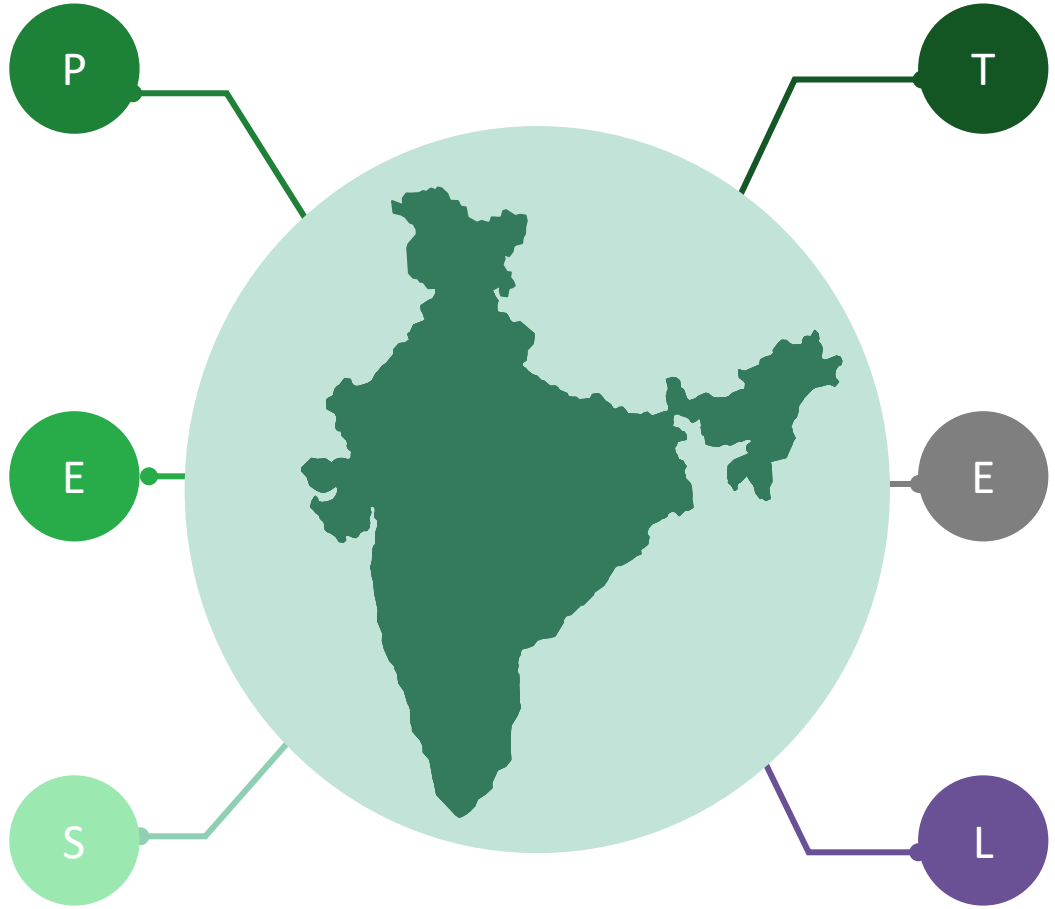
### Reduction of Social Costs
Carbon Markets would also generate positive spillovers like air quality improvement, thus reducing public health costs associated with poor air quality.

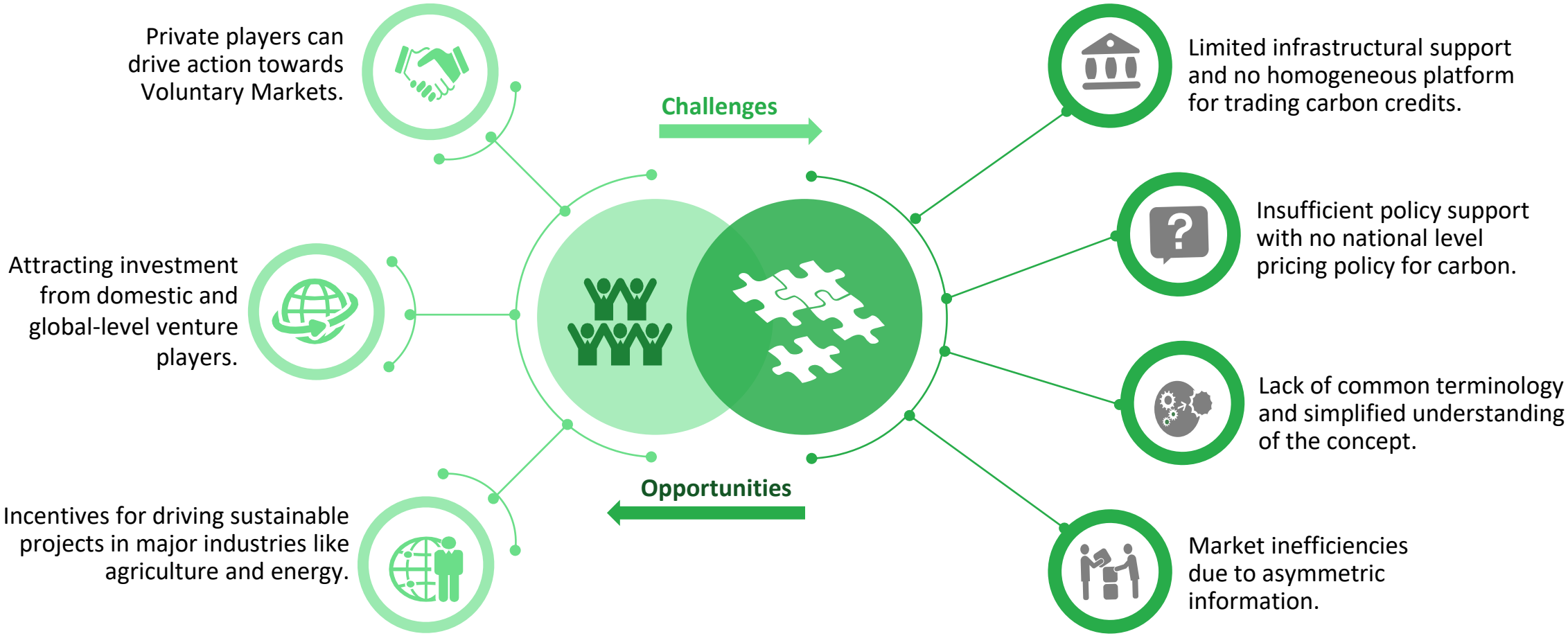



### Technological Incentives
India can create long-term market signals and pathways for the industry, thus providing clarity and predictability for businesses to invest in and develop low carbon technologies, setting India on the path of sustainable development.

### Climate Change Mitigation and Adaptation
As India looks towards reducing overall emissions, a carbon market, as one of the key policies could reduce climate-related risks, thus lowering future physical and ecological climate costs.

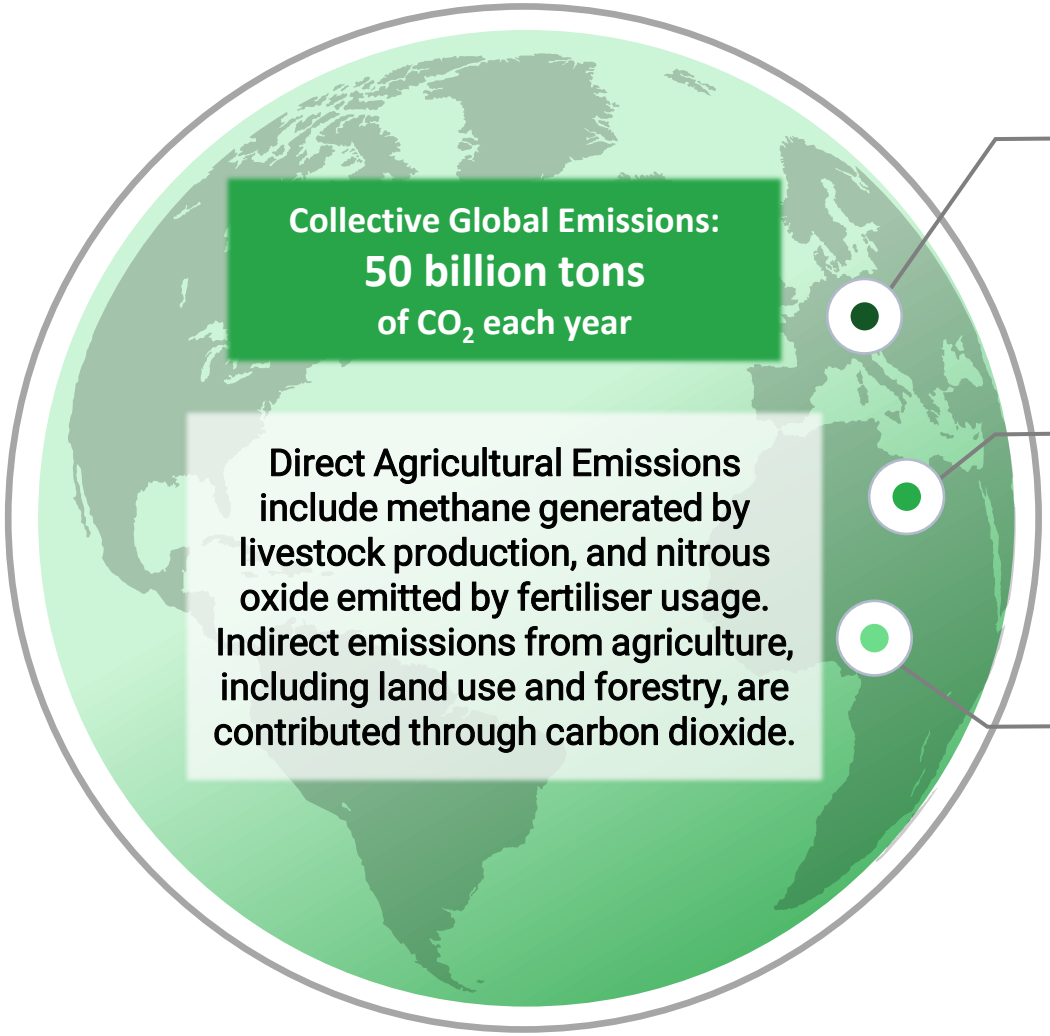
### Feasible from Policy Perspective
PAT/REC already exist, there is initial infrastructure, institutional awareness, as well as some capacity developed via trading exchange platforms, reporting of energy efficiencies, verification agencies.

# Carbon Markets, however, face systemic challenges which need focused interventions to derive their maximum potential for India.



# CARBON MARKETS IN AGRICULTURE

# Agriculture, Forestry and Land Use (AFOLU) activities make up almost a quarter of total greenhouse gas emissions




**9.6** **billion tons of carbon dioxide** (highest GHG contributor) is emitted as a result of agricultural activities globally (Ritchie, Roser and Rosado 2020).

**25%** of collective GHG emissions are accrued to Agriculture, Forestry & Land Use (AFOLU) **globally** (Food and Agriculture Organization 2022).

**18%** of GHG emissions in India are accrued to AFOLU - **Deforestation** (74%), **Drained Organic Soils** (18%), **Organic Soil Fires** (5%), **Biomass fires** (2%) (Government of India 2021).

# Climate-resilient and carbon-sequestering crop and livestock production activities in Indian agriculture can significantly reduce GHG emissions in the atmosphere.

**India has pledged net zero carbon emissions by 2070 at the 26th United Nations Climate Change Conference in 2021.**

**To reach that goal faster, it is important to adopt emission-reducing agricultural practices at scale.**

## 1 Organic Farming

- No fertiliser usage
- Vermicomposting
- Usage of green manures
- Using climate resilient, good seed varieties

## 2 Agricultural Diversification

- Crop-based diversification - Intercropping, multi-cropping, mixed cropping, crop rotation

## 3 Precision Farming

- Site-specific applications like remote sensing
- Smart irrigation techniques

## 4 Natural Farming

- No till farming
- Reduced tillage
- No synthetic fertiliser usage

## 5 Regenerative Farming

- Permaculture, aquaculture
- Livestock management activities like milk and egg production

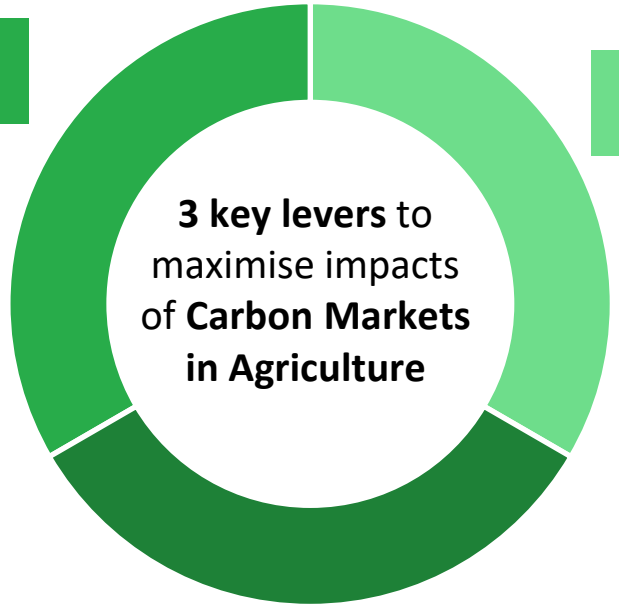
## 6 Use of climate-resilient inputs

- Usage of bio-fertilisers and pesticides
- Drip irrigation techniques
- Nitrification inhibitors
- Biochar

# Carbon Markets will enable adoption of emission-reducing agricultural practices to generate long-term impacts.

**Financial Risk Reduction**

Through improved access to finance, such as collateral-free, or soft loans.




**Cost Reduction**

Through supply of subsidised farm infrastructure such as solar mills, cold storage, cookstoves, dryers and so on.

**Uncertainty Reduction**

Through enabling trust between value chain stakeholders.

**Desired long term impacts**

- Better soil health
- Better water management
- Optimal use of inputs like fertilisers, pesticides, etc.
- Increased crop quality
- Reduction of negative crop yields
- Effective and localised farmer training and employment
- Leveraging value of farmer groups and collectives
- Support towards SHGs for women

# Knowledge, finance and community-led institutional support will enable farmers to actively participate in carbon markets.

| Requirements for agricultural projects | | Ways to derive maximum value |
|---|---|---|
| Requirement of **Scale** | Agricultural projects require a threshold to be deemed as an agricultural project of optimum scale for example, a minimum 10,000 hectares of area under a farm. | FPOs and cooperative models can collaborate efforts to drive up scale. |
| Requirement of **Time** | Agricultural projects have large gestation periods. For example, in most cases farmers would require 10-15 years to commit to a farmland. | Providing farmers with insurance and risk mitigation measures to sustain livelihoods. |
| Requirement of **Incentives** | For new initiatives in agriculture, farmers and other stakeholders should be incentivised to make the projects remunerative. | Effective remuneration avenues should be provided to farmers in terms of minimising input costs, obtaining credits and loans, and including carbon prices in MSPs. |
| Requirement of **Knowledge** | Farmers have to be made generally aware of the long-term benefits of investing in carbon projects and the utility of carbon markets in the space. | Holding workshops and training programmes, including farmers in pilot projects and educating about the effects of climate crisis on livelihoods. |

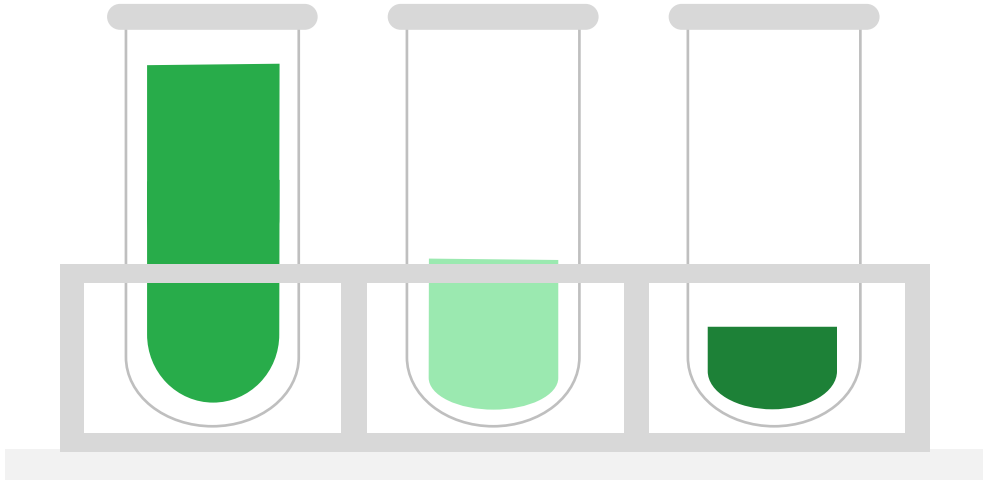
# WAY FORWARD FOR PHILANTHROPY

# Funding patterns indicate that philanthropic interventions in climate change for India can be effectively facilitated by carbon markets.

Total Grants for **social causes** in India from 2006-2023

Total Grants for **'Environment** (including climate change) in India from 2006-2023

Total Grants for **'Climate Change'** in India from 2006-2023



**$9.2 Billion**

**$892.3 Million**

**$1.4 Million**

**2099** Funders for 'Environment'

**29** Recipients for 'Environment'

**9.7%**

**Proportion of Total funding for 'Environment'** (including biodiversity, climate change, domesticated animals, environmental education, environmental justice, natural resources) vs **Total Funding for all social causes from 2006-2023 for India** indicating high scope for growth, given the strengthening climate narrative.

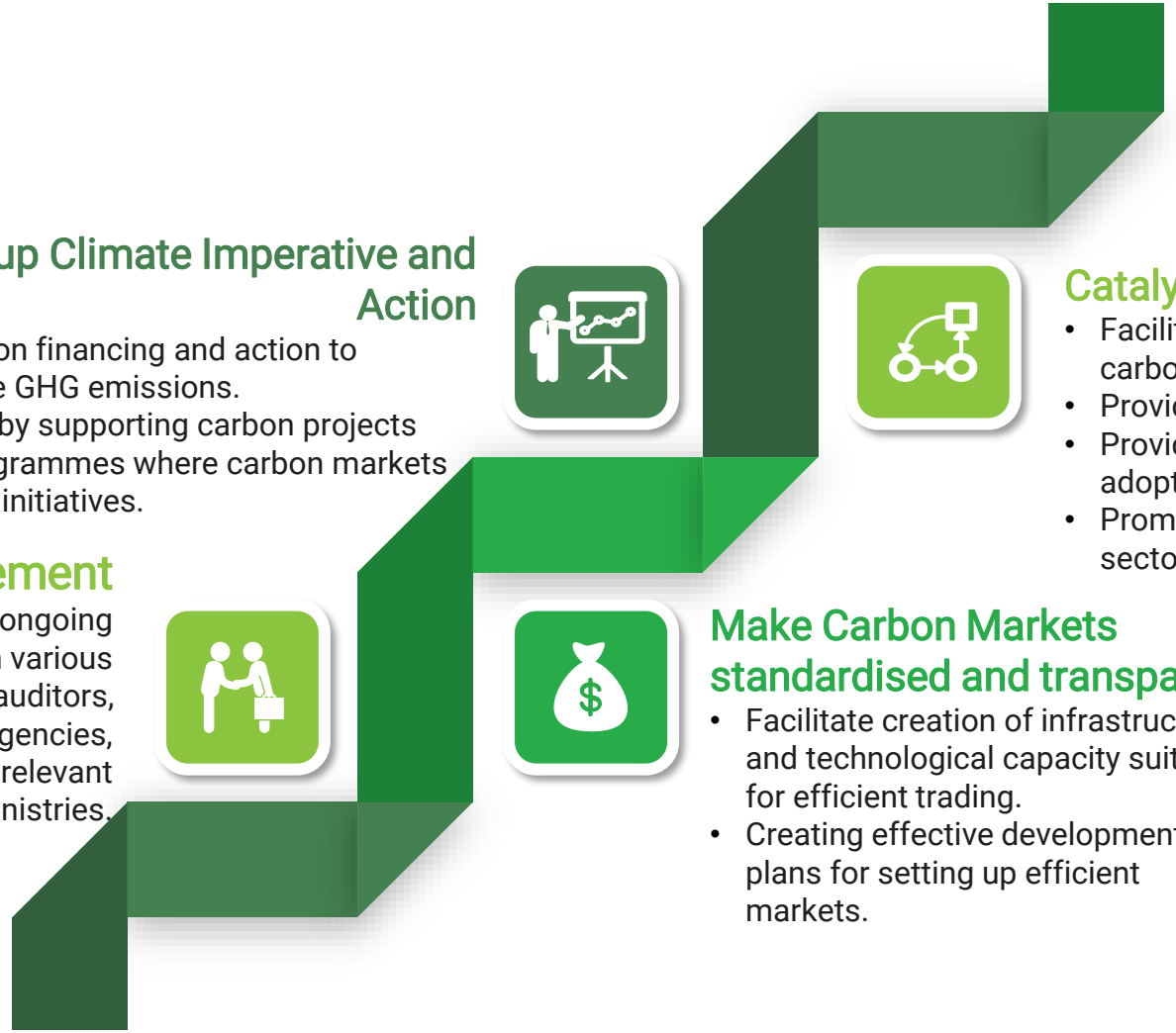
**37.4%**

Proportion of total funders funding causes related to 'Environment' from 2006-23 for India.

**Top Funders for 'Environment' in India majorly led by public sector enterprises (PSUs) and established private players** (Candid Foundations Mapping 2022)

| | |
|---|---|
| Banks | AXIS BANK, YES BANK, IndusInd Bank |
| PSUs | NTPC, NCL, CONCOR, IndianOil, ONGC, HAL, POWERGRID |
| Private Players | Infosys, MARUTI SUZUKI, wipro, Mahindra, BAJAJ, LARSEN & TOUBRO, Hindustan Unilever Limited, Coca-Cola India |

# It is imperative for philanthropy to urgently address climate change risks by leveraging mitigation strategies like carbon market instruments



## Scaling up Climate Imperative and Action

- Increase mitigation financing and action to effectively reduce GHG emissions.
- Can be achieved by supporting carbon projects through pilot programmes where carbon markets incentivise these initiatives.

## Stakeholder Engagement

Covering workshops, round tables, ongoing communication and dialogue with various stakeholders, including industry experts, auditors, registry operators, accreditation agencies, academics, civil society as well as relevant government ministries.

## Catalysing Adoption

- Facilitating financial sector advocacy for effective carbon market policies.
- Providing impetus through concessional capital.
- Providing innovative finance for wider commercial adoption of carbon market instruments.
- Promoting leadership and best practices in the sector.

## Make Carbon Markets standardised and transparent

- Facilitate creation of infrastructure and technological capacity suitable for efficient trading.
- Creating effective development plans for setting up efficient markets.

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