



# Assessment of Innovative Climate Financing Instruments for Adaptation Action



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## Preface

It is a well-established fact that climate change has the potential to undermine development gains in a country like India where its economy is closely tied to climate sensitive sectors like agriculture and natural resource base. In order to ensure sustainable development in the light of changing climate additional resources would be needed for implementing adaptation measures. The current sources of climate finance for adaptation in India come majorly from funds raised domestically by the government and disbursed through the state and national budgets. The involvement of private sector adaptation activities has been limited due to issues related to quantifying adaptation benefits, low return on investment as well as several institutional, policy related and legal challenges. Therefore, to minimise the burden on public funds for adaptation activities and also for large scale implementation of adaptation involvement of private sector is crucial.

The report “Assessment of Innovative Climate Financing Instruments for Adaptation Action” is prepared with the aim to understand the potential for scaling up adaptation activities in India with the involvement of private sector and has been prepared as part of Indo-German Technical Cooperation project on “Climate Change Adaptation in Rural Areas of India” (CCA-RAI). The project is implemented in partnership with the Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India. The project aims to integrate climate adaptation measures into the national and state development and strengthen the capacities of key actors for financing, planning, implementing and monitoring of climate change adaptation measures. GIZ has been supporting capacity development of relevant stakeholders (senior state officials, technical and field officers, early to mid-career scientists, scholars, non-government organizations (NGOs), women Self Help Groups (SHG)) at the state level on adaptation planning, implementation, accessing finance and monitoring & evaluation in association with respective climate change nodal department.

The report identifies potential innovative climate finance instruments that have been implemented globally and provide insights into the current adaptation activities and financing scenario in India. The study establishes potential drivers for scalability of adaptation projects through private sector financing. It further presents concepts which provides potential for application of such financing instruments to promote adaptation measures in priority sectors of India.

## List of Abbreviations

ABM	: Adaptation Benefits Mechanism
A&R	: Adaptation and Resilience
AC	: Alternating Current
ADB	: Asian Development Bank
AfDB	: African Development Bank
AIC	: Avoided Impact Cost
AMF	: Agro Micro Finance
AREG	: Adaptation and Resilience Expert Group
BPL	: Below Poverty Line
CAR	: Capital Adequacy Ratios
CDM	: Clean Development Mechanism
CER	: Certified Emission Reductions
CH <sub>4</sub>	: Methane
CO <sub>2</sub>	: Carbon Di Oxide
CRZ	: Coastal Regulation Zone
CSR	: Corporate Social Responsibility
DC	: Direct Current
DCCB	: District Central Co-operative Banks
DISCOM	: Electricity Distribution Company
DNDi	: Drugs for Neglected Diseases initiative
DRR	: Disaster Risk Reduction
DSR	: Direct Seeded Rice
EE	: Executing Entities
EFR	: European Finance Reinsurance
FC	: Finance Commission
FONDEN	: Natural Disaster Relief Fund
FPO	: Farmer Producer Organisations
GCF	: Green Climate Fund
GDP	: Gross Domestic Product
GEF	: Global Environment Facility
GHG	: Greenhouse Gases
GIZ	: Deutsche Gesellschaft für Internationale Zusammenarbeit
GoI	: Government of India
GBRF	: Great Barrier Reef Foundation
GS	: Gold Standard
ICT	: Information, Communication and Technology
ICZM	: Integrated Coastal Zone Management
IDSP	: Integrated Disease Surveillance Programme
IEF	: Income Equalization Factor
IFC	: International Finance Corporation
IISD	: Indian Institute of Skill Development
INCCA	: Indian Network on Climate Change Assessment
IPCC	: Intergovernmental Panel on Climate Change
IPZ	: Island Protection Zone
IREDA	: Indian Renewable Energy Development Agency
IRFC	: Indian Railway Finance Corporation
IUCN	: International Union for Conservation of Nature
JFC	: Joint Forest Committee



KUSUM	: Kisan Urja Suraksha evam Utthaan Mahabhiyan
LFC	: Lane Financial LLC
LPG	: Liquefied Petroleum Gas
MDB	: Multilateral Development Bank
MFF	: Mangroves for the Future
MFI	: Micro Finance Institution
MGNREGA	: Mahatma Gandhi National Rural Employment Guarantee Act
MOEF & CC	: Ministry of Environment, Forest, and Climate Change
MNRE	: Ministry of New and Renewable Energy
MR	: Monitoring Report
NABARD	: National Bank for Agriculture and Rural Development
NAFCC	: National Adaptation Fund for Climate Change
NAP	: National Agroforestry Policy
NAPCC	: National Action Plan of Climate Change
NCEF	: National Clean Energy Fund
NDC	: Nationally Determined Contribution
NDRF	: National Disaster Response Fund
NICRA	: National Initiative on Climate Resilient Agriculture
NIE	: National Implementing Entity
NMSA	: National Mission on Sustainable Agriculture
NMSHE	: National Mission for Sustaining Himalayan Ecosystem
N <sub>2</sub> O	: Nitrous Oxide
NPV	: Net Present Value
NRLM	: National Rural Livelihood Mission
NVBDCP	: National Vector Borne Disease Control Programme
NWM	: National Water Mission
OECD	: Organisation of Economic Cooperation and Development
PoA	: Programme of Activities
PDD	: Project Design Document
PMFBY	: Pradhan Mantri Fasal Bima Yojana
PPCR	: Pilot Program for Climate Resilience
PV	: Photovoltaics
R & D	: Research and Development
SAPCC	: State Action Plan of Climate Change
SDRF	: State Disaster Response Fund
SHG	: Self Help Group
SPV	: Special Purpose Vehicle
TWG	: Technical Working Groups
UNCDF	: United Nations Capital Development Fund
UNDP	: United Nations Development Programme
UNFCCC	: United Nations Framework Convention on Climate Change
UPNRM	: Umbrella Programme on Natural Resource Management
USD	: US Dollars
VCS	: Verified Carbon Standard
VCU	: Verified Carbon Unit
VPA	: Voluntary Programme Activities
VRC	: Vulnerability Reduction Credit
WB	: World Bank

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# Executive Summary

Developing countries across the globe are facing serious threats due to climate change. Considering the damages climate change can inflict and its potential to impede the development process, there is a need to direct additional resources towards adaptation measures. In comparison to mitigation activities, adaptation so far has lagged both in terms of implementation as well as financing.

In India, current adaptation activities are being funded domestically through the National Adaptation Fund for Climate Change (NAFCC) and internationally through funds like Adaptation Fund, Green Climate Fund, Global Environment Facility etc. in form of grants. Multilateral Development Banks (MDBs) like the World Bank, Asian Development Bank etc. provide grants as well as debts for adaptation activities. However, there is significant financing gap that arguably can be financed through the involvement of private sector. The major reason behind private sectors' apprehension are quantification of adaptation benefits, low return on investment as well as several institutional, political and legal challenges. In addition, adaptation activities face other barriers like socio-cultural notions of beneficiaries, lack of informational and technological advancement and "public good" traits associated with these activities that impede their implementation and causes reluctance in participation of financiers.

Despite this, adaptation is becoming a core consideration through the formulation of policies and schemes targeted at certain sectors. India's share of expenditure on programs with adaptation components increased from 1.45% of GDP in 2000-01 to 2.82% during 2009-10<sup>1</sup>. The major focus of adaptation activities has been on enhancement of human capabilities and livelihoods viz. poverty alleviation, health improvement, disease control and risk management. These activities constitute

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1 Amit Garg Vimal Mishra and Hem H. Dholakia, 2015, Climate Change and India: Adaptation GAP (2015), <https://web.iima.ac.in/assets/snippets/workingpaperpdf/10071603592015-11-01.pdf>



more than 80% of the total expenditure on adaptation in India. Out of the eight National Missions under the National Action Plan on Climate Change (NAPCC), five missions focus on adaptation in sectors like agriculture, water, Himalayan ecosystems, forestry, capacity building and knowledge management. More recently, India has also committed to better adapt to climate change as a part of its Nationally Determined Contributions (NDC).

Studies have estimated a requirement US\$206 billion between 2015 and 2030 for implementing adaptation activities in agriculture, forestry, fisheries infrastructure, water resources and ecosystems. Most of the funds for adaptation are being disbursed from budgetary sources. In addition, Government has resorted to fiscal instruments like subsidies and taxes, tax free bonds and specification related to devolution of funds under 14<sup>th</sup> Finance Commission (FC) that incentivises afforestation. An analysis of the NAFCC projects shows the thematic areas that are being focused for adaptation activities. Majority of the funds are allocated for agriculture and allied activities followed by water management and forest and ecosystem development. While a similar analysis for MDBs sponsored activities within the domestic terrain shows the preference towards forest and ecosystem services followed by water management.

To minimise the burden on public funds for adaptation activities, private sector involvement becomes imperative. Although India doesn't have much experience of private sector participation in adaptation, global experiences has been reviewed to get an overview of the existing financial instruments, their mechanism, private sector engagement, and the barriers faced and addressed by them. Apart from the MDBs and bilateral agencies, microfinance, insurance, credit, bonds, etc. have been highlighted as possible sources of adaptation finance and case studies from various countries have been included providing a robust idea about the implementation of these instruments.









# Introduction

## 1.1 Project Background

Developing countries like India with a significant percentage of its population having low income and limited access to basic necessities, are vulnerable to adverse impacts of climate change. Given that climate change has the potential to erode the gains in development, additional resources would be needed for adaptation measures. Extreme weather events and natural hazards like floods, cyclones and droughts can slow down the growing Indian economy, which is highly dependent on climate-sensitive sectors such as water, agriculture, health, forestry, energy and infrastructure.

The current sources of climate finance in India stems majorly from funds raised domestically by the Government and disbursed through the state and national budgets. Within the Indian political debate, the respective roles of public and private climate finance are well articulated in their respective domains and could work in tandem to address the mitigation and adaptation-related imperatives in the country. Thus, mobilising private sector finance is an important policy choice. Funding from private sector on adaptation activities has been limited due to issues related to quantifying adaptation benefits, low return on investment as well as several institutional, political and legal challenges (Druce et al., 2016). Funding other than grants, particularly that from private sector, also necessitates repayment, with or without interest, and therefore it is important to assess the monetary benefits of the recipient of the fund, that will enable the recipient to repay; for adaptation activities, it is often difficult to establish such co-relation.

The Government of India (GoI) is currently spending approximately 2.6% of its GDP on adaptation activities and is still left with a funding gap of US\$ 38 billion (INR 266,000 Cr. considering 1 US\$ is equal to INR 70) for effective climate action (Ganguly & Panda, 2016). This is largely because most of the Government's expenditure are on poverty reduction development programmes and lack the notion of "additionality" for climate resilient components. In other words, India has not been able to differentiate between expenditure on business-as-usual development and the additional investments on climate adaptation. Programmes like risk financing, disaster management and forest conservation that are directly correlated with climate resilience have not been able to find a niche in the national budget.

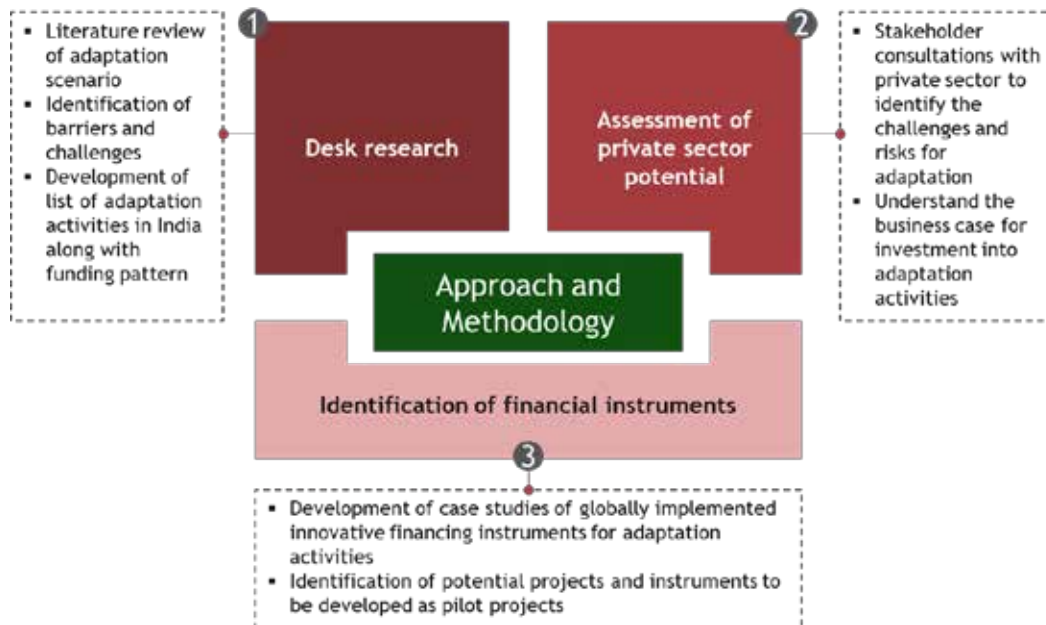
It is necessary for the country to realise the various options that can be catered to for channelising funds towards climate adaptation activities along with fiscal instruments and regulatory interventions. In tandem to this motive, the GoI has set up a National Adaptation Fund for Climate Change in 2014. NAFCC's budget provision of INR 350 Cr. (US\$ 50 million) for the year 2015-16 and 2016-17, and INR 110 Cr. (US\$ 16 million) for the financial year 2017-18 and 2018-19 is expected to address the funding challenges for dealing with climate change.

Overall, innovative financing mechanisms and exploring other sources of finance for climate change adaptation interventions is required to complement public sector efforts and the existing interventions by the multilateral/bilateral agencies. Particularly, private sector finance, which has remained unexplored for climate adaptation, needs further consideration. This approach will result in better allocation of national budgets and help in scaling-up of climate change adaptation efforts in India.

## 1.2 Approach and Methodology

The study involved significant desk research along with stakeholder consultations with the private sector (large organisations, private sector banks, non-profits etc.) to understand the potential for scaling up adaptation activities in India. The figure below represents the overall approach and methodology adopted for developing the report:

Figure 1: Schematic of Methodology Activities



The objective of the study was to present an assessment of innovative financial instruments that could be employed to mobilise investment for adaptation action and to develop two implementable finance instruments for adaptation in priority sectors in India.







# Adaptation Activities and Finance

## 2.1 What is Climate Change Adaptation?

Adaptation in natural or human system has been conceptualised as its ability to response to actual or expected climate stimuli which exploits beneficial opportunity. Adaptation is a broad concept and can be perceived in two different ways in coping with the negative impacts of climate change: anticipatory (before the impact takes place) and reactive (as a response to initial impact). While the nature of adaptation is reactive in a natural system, it can be either in case of human system. Adaptive capacity has been defined as the ability of the system to adjust to climate change through modifications in practices, processes or structure of systems. Measurement of the extent of adaptive capacity is dependent on general levels of sustainable development such as political stability (civil conflict, functioning democracy), economic well-being (increase in gross domestic product, incidence of poverty), human and social capital (literacy, life expectancy, level of local organisation, micro-finance institutions) and climate specific aspects (such as existing disaster prevention and mitigation systems).

Understanding of disaster risk reduction (DRR) and vulnerability is also an important context in the notion of adaptation. DRR relates to the people and institutions involved in preparedness, mitigation and prevention activities associated with extreme events. These include hazard forecasting and immediate relief efforts for major disasters resulting from floods, cyclones and, in some cases, pollution events. The need for, and scale of, adaptation reflects the vulnerability of people and natural systems to disruption from changes that reflect the impacts of climate conditions (IISD et al., 2003). Central to the understanding of vulnerability is the concept of resilience. The resilience ability varies among different households even in one locality and is influenced by two characteristics of people's livelihoods: their assets base and the services rendered by external infrastructure and institutions. Assets include amount and quality of knowledge and labour available to the household, the physical and financial capital they possess, their social relations, and their access to natural resources. On the other hand, external services are comprised of services provided by flood control, coastal protection and other infrastructure, transport and communications, access to credit and financial systems, access to markets and emergency relief systems. The nexus between these two characteristics ensures the proper strategies for strengthening the resilience of communities. Such combinations can be determined only through effective assessments of local needs and capabilities. Resilience and adaptive capacities are perceived to be dependent on:

- Flexibility (within livelihood, economic, water management and institutional systems);
- Diversification (multiple independent flows to livelihood systems);
- The ability to learn from events (at both individual and institutional levels);
- Education (the knowledge base required to develop new systems when existing ones are disrupted);
- Mobility (an attribute of flexibility);
- Risk pooling and spreading (institutional arrangements or other mechanisms for spreading and pooling the impacts of disruptions on the system as a whole);
- Operational techniques for risk reduction before and following disruptions (that is, techniques for directing the reorganisation process so that growth and conservation phases do not increase rigidity and ultimate vulnerability);
- Convertible assets (the ability to convert assets accumulated during periods of growth into other forms when disruptions occur).

## 2.2 Common Challenges and Barriers to Implementation of Adaptation Activities

Adaptation barriers refer to the factors that hinder the planning and implementation of adaptation action. According to Oberlack and Eisenack (2012), barriers impede adaptation activities by constraining and hampering the use of available means for adaptation. They also increase the cost of adaptation due to transaction costs, thus disincentivising adaptation activities. They can be classified on the barriers experienced by individuals and institutions/society.

Some of these barriers identified from the available literature are mentioned below:

### Barriers Experienced by Individuals

- **Informational barriers** have been given some prominence in climate change adaptation literature. Access to information on climate change characteristics is a powerful tool that can be used to enhance the adoption and implementation of adaptation strategies. Lack of appropriate climate information can result in hazardous implications. The uncertainty about future climate scenario and their impacts which arises due to limitation in knowledge, chaotic nature of the climate system, and human behaviour poses as a bottleneck in adaptation strategies. Informational barriers can also be experienced by institutions or society. However, access to knowledge is not necessarily translated into action due to various behavioural and cultural barriers.

### Barriers Experienced by Institutions/Society

- **Lack of financial resources** poses a serious barrier to climate change adaptation activities. As every form of adaptation activity entails some direct and indirect cost, the lack of availability of these funds hampers the accessibility and implementation process. Lack of financial resources includes insufficient funds, lack of credit facilities, loans and subsidies. The challenge is not only of the finance availability but expands to collaterals also. Even when credit is available, the lack of necessary collaterals prevents access.
- **Socio-cultural barriers** such as belief systems and local norms are an obstacle to adaptation. According to (Adger, et al., 2013) culture is central to the decision to adapt and thus, the identification of risks and the subsequent implementation of appropriate adaptation strategies. Strongly held beliefs, cultural practices and value systems, and the worldviews of individuals or groups greatly influence the way they perceive climate change, and thereby their subsequent adaptation strategies. For example, people in atoll islands in the South Pacific merge scientific information about climate change with pre-existing narratives about cultural in ways that discourage adaptation. In India, different ethnic groups within the fishing communities have demonstrated different responses to environmental challenges.
- **Lack of institutional capacity** to facilitate adaptation serves as an important barrier. As per (Sietz et al., 2011), institutional barriers at the individual and organisational levels dampens mainstreaming of adaptation strategies. Institutional barriers comprise of political barriers as well. The lack of climate adaptation information including weak institutional capacity coupled with a lack of explicit policies can put the target groups under considerable stress.
- **Limited technological development** constraints the range of adaptation options and results in focused groups relying on their own indigenous technology in shielding against climate change impacts. Though technological constrains poses a challenge, the causal link of this barrier is financial and institutional barriers.

Although these barriers inflict damages individually, they also have an interactive effect causing damages of higher magnitude on the livelihood of the affected communities. Lack of technological developments like state-of-the-art equipment within meteorological departments across a region can lead to lack of proper information on climate change. Further technological drawbacks are the result of financial barriers. Weak institutional structures may also be related to technological barriers including lack of human capital to properly tackle issues related to climate change adaptation. Socio-cultural barriers are also linked to the extent of formal and informal institutions within the community. There is a close link between institutional barriers and a lack of information on climate change characteristics. Such interaction between these barriers may have significant implications for climate adaptation, food security and related rural livelihoods. Hence, it is important that efforts from policy-makers in addressing these barriers are coordinated in a way that help overcome many of these interrelated climate adaptation barriers (Antwi-Agyei, Dougill, & Stringer, 2014).

## 2.3 Rationale for Adaptation Finance

The definition of adaptation finance has been a topic of much debate. Explanations given by Organisation of Economic Cooperation and Development (OECD) and MDBs are inconclusive as to the types of investment which can be considered as adaptation finance. Simply put, finance that funds efforts to adapt to the impacts of climate change qualifies as adaptation finance. However, adaptation finance is context-specific and dynamic..

As climate change impacts vary across geography, tagging of funds as adaptation finance depends upon the context-specificity of the focused region. For instance, irrigation projects for agriculture are considered adaptation relevant, but climate change will have varying effects on agricultural outputs across globe. Regions receiving less rainfall will reap the benefits of drought resistant seeds and water harvesting, while in regions with ample rainfall, such interventions are not much of importance. Therefore, every irrigation project financed cannot be classified as adaptation finance and depends upon the local context. Adaptation finance is also scale-specific. On a global level, investing in research to develop drought-tolerant seeds contributes to adaptation because many regions of the world will experience droughts. But at a national or provincial level, it might be irrelevant or even counter-productive.

The classification of activities as adaptation varies across time, and so does adaptation finance. Tagging an activity as adaptation for a specific context in the current time period may no longer be classified as the same in a future time period. Funding for climate adaptation strategies and related project requires contributions from public as well as private sources as these projects are more often than not, inter-sectoral in nature. This implies that performance and success of adaptation projects cannot be expressed in a single indicator matrix, making it difficult for the policy makers to draw direct linkages between desired outcomes and financing required. It is also challenging to compare and identify trade-offs between various adaptation options.

Various global organisations including Intergovernmental Panel on Climate Change (IPCC), OECD have further concluded that available literature on climate adaptation is very limited, and these resources provide very little quantified information of adaptation financing requirements for developing countries. The available literature is based largely on assumptions and provides very little insight into cross-sectoral interlinkages, cumulative effects within countries, and macroeconomic consequences of adaptation.

Despite these challenges, a number of organisations have published data on aggregate estimates of financial needs of adaptation. United Nations Framework Convention on Climate Change (UNFCCC) data suggests requirement of US\$60-182 billion in 2030 for adaptation financing. These costs will include infrastructure costs and that for agriculture, water, health, ecosystem



protection and coastal-zone protection, most of which would be used in developing countries. Similar studies and figures have been published by the World bank, United Nations Development Programme (UNDP), and Oxfam International majorly focusing on developing countries as financing needs for adaptation in developing countries form a part of global climate policy. These studies demonstrate that there is a need for increased availability of funds for adaptation in developing countries. However, most of these studies do not provide solutions for meeting the financing needs on specific adaptation activities and fail to identify direct benefits of adaptation investments. Therefore, to address these concerns, several organisations have initiated follow-up activities. There is a need for an in-depth study that provides an overview of various options available to deliver the necessary financing to address climate change through adaptation (Klein, R.J.T. and A, Persson, 2008).

## 2.4 National Scenario on Climate Change Adaptation Activities

Indian approach considers not only its commitment to conservation of nature, but also the necessities for addressing the challenges of poverty eradication, food security and nutrition, universal access to education and health, gender equality and women empowerment, water and sanitation, energy, employment, sustainable urbanisation, and new human settlements. It also takes into account the means of implementation for enhanced action for achieving among others, the sustainable development goals for its 1.2 billion people.

India's share of expenditure on programs with adaptation components increased from 1.45% of GDP in 2000-01 to 2.82% during 2009-10. More than 80% of adaptation expenditure is focused on poverty alleviation, health improvement and disease control and risk management (India's NDC).

NAPCC was launched by the Government of India to combat climate change. Eight National Missions form the core of NAPCC. Out of the eight National Missions, five missions focus on adaptation in sectors like agriculture, water, Himalayan ecosystems, forestry, capacity building and knowledge management. More recently, India communicated its NDCs to the UNFCCC. India's NDCs also focus significantly on adaptation. This is because majority of the population lives in rural areas and depends on climate sensitive sectors for livelihood. Thus, climate change results in amplified impacts on the developmental process making adaptation actions not only inevitable but an imperative.

State Action Plans on Climate Change (SAPCC) guide the climate action at sub-national level. Several SAPCCs also focused on adaptation issues as it tied to their development concerns. Recently, the States/ Union Territories have initiated the process of revision and alignment of their SAPCCs with NDCs. Given India's strong commitment to adaptation, it is a strong possibility that the

### India's NDC Goals for Adaptation

- To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan region, coastal regions, health and disaster management.
- To mobilise domestic and new and additional funds from developed countries to implement the above mitigation and adaptation actions in view of the resource required and the resource gap.
- To build capacities, create domestic framework and international architecture for quick diffusion of cutting-edge climate technology in India and for joint collaborative research and development for such future technologies.

SAPCCs may also emphasise on adaptation strategies based on their local context.

The sector-wise highlight of the adaptation measures adopted are outlined below:

## Agriculture

A significant proportion of the population depends on agricultural activities as a source of livelihood generation. The performance of agriculture sector has a direct bearing on food supplies and food security. At the same time this sector is highly vulnerable to climate change. It is predominantly rainfed covering about 60% of the country's net sown area and accounts for 40% of the total food production. Droughts and floods are frequent, and the sector is already facing high degree of climate variability. GoI has taken various targeted measures to address the above challenges:

- The National Mission on Sustainable Agriculture (NMSA) focuses on deployment of suitable technologies and practices in cultivation as well as genotypes of crops with enhanced carbon dioxide (CO<sub>2</sub>) fixation potential, lesser water consumption and more climate resilient. The aim is to enhance food security and protection of resources such as land, water, biodiversity and genetics. The main components under NMSA are Rainfed Area Development, Sub-Mission on Agroforestry, National Bamboo Mission, Soil Health Management and Climate Change, and Sustainable Agriculture: Monitoring, Modeling and Networking.
- A mega project called the National Innovations on Climate Resilient Agriculture (NICRA) was launched to enhance the resilience of Indian agriculture to climate change through strategic research and technology demonstration. Its four main modules include strategic research on crops, livestock, fisheries and natural resource management, technology demonstration, capacity building and sponsored/ competitive grants.
- A Scheme has been launched to provide Soil Health Card to every farmer in mission mode. Soil health card is field-specific detailed report of soil fertility status and other important soil parameters that affect crop productivity. Additionally, 100 mobile soil-testing laboratories have been setup across the country.
- National Agroforestry Policy (NAP) aims to protect and stabilise ecosystems and promote resilient cropping and farming systems, to minimise the risk during extreme climatic events. It will also help in achieving the target of increasing forest/ tree cover in the country.
- Other policies adopted for this sector are National Food Security Mission, Mission for Integrated Development of Horticulture, Paramparagat Krishi Vikas Yojna to promote organic farming practices, Pradhan Mantri Krishi Sinchayee Yojana to promote efficient irrigation practices, and National Mission on Agricultural Extension and Technology.

## Water

The adaptation strategies pertaining to this sector focuses on enhancing water use efficiency, ensuring access, and tackling the adverse impacts of climate change.

- The National Water Mission (NWM) targets to enhance water use efficiency by 20%. The objectives of NWM are water conservation, minimisation of wastage, and equitable distribution across and within states through integrated water resources development and management.
- Over the last three decades, groundwater table has shown major decline, impacting the total water availability. Rainwater harvesting provides a solution by replenishing and recharging groundwater and has been taken up under various schemes of Central and State Governments.
- Neeranchal is a recent programme by Government to give additional impetus to watershed

development in the country.

- National Mission for Clean Ganga initiative seeks to rejuvenate the river along its length through multifarious activities such as pollution inventorisation, assessment and surveillance, laying of sewerage networks, treatment plants etc.
- Government of India has also set up the National River Conservation Directorate for conservation of rivers, lakes and wetlands in the country and improving the water quality.

## Health

Climate change induced weather-related disasters impacts health through occurrence of vector borne diseases such as malaria and dengue. To counter this problem, India is in the process of formulating the National Mission on Human Health and Climate Change under the ambit of NAPCC for mitigating, containing, and managing the adverse impacts of climate change on health. The mission aims at analysing epidemiological data, identify vulnerable population and regions, build knowledge base and expertise, increase awareness and community participation. GoI has also launched programmes like Integrated Disease Surveillance Programme (IDSP), National Vector Borne Disease Control Programme (NVBDCP) to deal with vector borne diseases like malaria, dengue etc. As part of this programme, India aims to eliminate malaria by 2030.

## Himalayan Ecosystem

The National Mission for Sustaining Himalayan Ecosystem (NMSHE) was launched to target the concerns related to the Himalayan Glaciers and the associated hydrological consequences, biodiversity and wildlife conservation and protection, traditional knowledge societies and their livelihood and planning for sustaining of the Himalayan Ecosystem. National Mission on Himalayan Studies was launched with the motive of complementing the NMSHE by building a body of scientific and traditional knowledge along with demonstrating replicable solutions to the problems in thematic areas including natural resource management, capacity building, long-term ecological monitoring etc.

## Knowledge Management and Capacity Building

- Indian Network on Climate Change Assessment (INCCA) comprising of 127 institutions has been set up to share knowledge and work in a collaborative manner on climate change issues.
- Eight Centres of Excellence have been established under the National Mission on Strategic Knowledge for Climate Change (NMSKCC) to undertake research on various aspects of climate change.
- Five national knowledge network programmes have been launched in the thematic areas of climate modelling, climate change and human health, coastal vulnerability, urban climate, and Himalayan cryosphere.
- A Human Capacity Building Programme has been initiated where various institutions like Indian Institute of Forest Management, Indian Institute of Public Administration, Tata Institute of Social Sciences, etc. are conducting training for different stakeholders.
- A Human and Institutional Capacity Building Programme was also launched to support researchers, faculty, and students of universities and academic institutions in the Indian Himalayan region.
- Climate Change Cells have been established in 22 States/Union Territories to undertake work on vulnerability and risk assessment, human and institutional capacity building and public

awareness programmes under NMSKCC and NMSHE.

- State Governments have associated themselves with local research institutions to ensure continuous updation of their SAPCCs.
- A part of the funding collected through the provisions of National Training Policy are diverted to training in climate change and sustainable development issues.
- As per the provisions of Skill India, the Government is aiming to provide training in various sectors including sustainable development for about 400 million people by 2022.

## Coastal Regions

The accelerated rise in sea level due to global warming is posing a threat to the coastal regions. To address the issues the Government has taken the following measures:

- The vulnerable areas on the coast have been declared as Coastal Regulation Zone (CRZ) and norms have been developed for setting up and expansion of industries, operations and processes in these areas.
- With the aim of implementation of comprehensive coastal management through activities like ecological management, conservation and protection of critical habitats, and better coastal governance, programmes like Integrated Coastal Zone Management (ICZM) are being implemented.
- Initiative like Mangroves for the Future (MFF) coordinated by International Union for Conservation of Nature (IUCN) are being taken up in India for protection of coastal livelihood.
- Island Protection Zone (IPZ) notified by the Government in 2011 focuses on disaster risk reduction through bio-shields with local vegetation (mangroves) and other soft protection measures, and the conservation of beaches and sand dunes.

**Table 1: Details of National Missions Targeting Adaptation**

National Missions	Key Achievements	Amount Allocated
<b>National Water Mission. This mission is under the purview of Ministry of Jal Shakti.</b>	Revised National Water Policy (2012) adopted by National Water Resources Council; Created 1,082 new Ground Water Monitoring Wells; Several capacity building and training programmes are underway.	The mission required budgetary support of INR 89,101 Cr. during the 11 <sup>th</sup> (2007-2012) and 12 <sup>th</sup> (2012-2017) five-year plan periods. Proposals for INR 196 Cr. have been approved.
<b>National Mission for Sustaining the Himalayan Ecosystem. This mission is under the purview of Department of Science and Technology (DST).</b>	Established 8 new centres relevant to climate change in existing institutions in Himalayan states; Created an observational network to monitor the health of the Himalayan ecosystem; Several capacity building and training programmes underway.	The total funding requirement for 2010 to 2017 was INR 1,695 Cr. Proposals for INR 500 Cr. have been approved.

<b>National Mission for Sustainable Agriculture. This mission is under the purview Ministry of Agriculture and Farmers' Welfare.</b>	Developed 11,000 hectares of degraded land; 1 million hectares brought under micro irrigation to promote water efficiency; Created 5.4 million metric tons of agricultural storage capacity	The mission requires budgetary support of INR 1,08,000 Cr. up to the end of 12th five-year plan period (2011-2017). Proposals for INR 13,034 Cr. have been approved.
<b>National Mission on Strategic Knowledge on Climate Change. This Mission is under the purview of Department of Science and Technology (DST).</b>	Established 5 thematic knowledge networks; Developed 3 regional climate models; Trained high quality climate change professionals.	The total funding requirement for the 12th five-year plan period (2012-2017) was INR 2,500 Cr. The allocations to undertake these mission activities will be met out of the budget allocation of the existing scheme of the DST, Government of India

Source: India NDC; www.dst.gov.in

## 2.5 National Scenario on Climate Change Adaptation Finance

Finance is an imperative for the implementation of climate change action. However, concluding on a consolidated financial requirement for climate change activities is not sufficient, considering the evolving technologies and innovation in the sector. Though estimates according to various studies vary in their projection of requirements but they converge on the enormity of funds that would be needed. It has been estimated that India would require around US\$206 billion (at 2014-15 prices) between 2015 and 2030 for implementing adaptation activities in agriculture, forestry, fisheries infrastructure, water resources and ecosystems. For strengthening resilience and disaster management additional investments are required. According to a study on assessment of climate change adaptation cost in South Asia by Asian Development Bank (ADB), it is estimated that the region would require to provide an average adaptation expenditure of 0.48% of GDP per annum (US\$40 billion) by 2050 and 0.86% of GDP per annum (US\$73 billion) by 2100. It also projects that by 2050, the economic damage and losses in India from climate change would reach 1.8% of GDP (Mahfuz & Suphachalasi, 2014).

India's climate actions have largely been financed from domestic resources. There has been no increase in the overall allocation for the Ministry of Environment, Forest and Climate Change (MoEFCC), the nodal Ministry for climate change in India in 2018-19 (BE), as compared to last year. However, an increase of 14% in the overall allocation was observed in 2017-18 (BE) as compared to 2016-17 (RE). Within the overall budget also, there was no increase in allocation for climate adaptation interventions. NAFCC was given an allocation of INR 110 Cr. in 2018-19 (BE). When compared to the revised estimates of the previous budget, there is only a marginal increase in the allocations of this scheme aimed at adaptation.

In this budget, agriculture sector saw some positive developments. The allocation for Pradhan Mantri Fasal Bima Yojana (PMFBY) in 2018-19 (BE) is INR 13,000 Cr. up from INR 10,698 Cr. in 2017-18 (RE). Similarly, budget allocation for Pradhan Mantri Krishi Sinchai Yojana in 2018-19 also saw an increase of INR 1,000 Cr. from 2017-18. An additional INR 110 Cr. was allocated for Paramparagat Krishi Sinchai Yojana in 2018-19 (BE). However, a minor increase in allocation from



2017-18 (RE) was observed in the budget for Rainfed Area Development and Climate Change. The Long-Term Irrigation Fund created in National Bank for Agriculture and Rural Development (NABARD) to boost irrigation facilities received an initial corpus of INR 20,000 Cr. These would make agriculture more robust and resilient to the negative climate impacts.

The budget saw an increase of 12% in allocation under Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) pegged at INR 55,000 Cr. in 2018-19 (BE) from 2016-17. An increase in allocation towards MGNREGA is welcome step and would greatly facilitate adaptation. The allocation for National Rural Livelihood Mission (NRLM) for promotion of skill development has also been increased to INR 5,750 Cr. in 2018-19. This was an increase of INR 1,400 Cr. from the 2017-18 (RE), which was pegged at INR 4,350 Cr. The budget allocation for research and development and implementation of National Water Mission in 2018-19 (BE) witnessed a substantial increase of ~39% from last year.<sup>2</sup>

GoI has set up two dedicated funds at the national level for mobilising finance for climate change activities:

- Cess on coal which is INR 400 per ton of coal forms the corpus for the National Clean Environment Fund, used for financing clean energy, technologies, and projects related to it. The total collection of INR 170.84 billion (US\$2.7 billion) till 2014-15 is being used for 46 clean energy projects worth INR 165.11 billion (US\$2.6 billion). However, the funds have now been directed to the GST Compensation Fund.

<sup>2</sup> [www.indiabudget.nic.in](http://www.indiabudget.nic.in)

- NAFCC which had an allocation of INR 110 Cr. In 2018-19 to combat the adaptation needs in sectors like agriculture, water, forestry etc. in addition to sectoral spending by the respective ministries.
- National Disaster Response Fund (NDRF) is a fund managed by the Central Government for meeting the expenses for emergency response, relief and rehabilitation due to a disaster. NDRF is constituted to supplement the funds of the State Disaster Response Funds (SDRF) of the states to facilitate immediate relief in case of severe calamities. The financial assistance from SDRF/NDRF is for providing immediate relief and not compensation for loss/damage to properties/crops.

Several schemes and programmes are also being implemented at the state level. For example, Kakathiya Mission is being implemented by the Government of Telangana. The objective of this Mission is development of agriculture-based income for small and marginal farmers, by accelerating the development of minor irrigation infrastructure, strengthening community-based irrigation management, and adopting a comprehensive programme for restoration of tanks. The total budget provision for this initiative in 2017-18 was 2193.74 Cr<sup>3</sup>.

## NAFCC<sup>4</sup>

National Adaptation Fund for Climate Change was established with an initial budget of INR 350 Cr. In 2015-16 to scale-up climate change adaptation interventions in accordance with the NAPCC and SAPCCs. NABARD has been designated as National Implementing Entity (NIE) for implementation of adaptation projects under NAFCC. As NIE, NABARD is responsible for overall implementation of the project through its regional offices located in the States/UTs. State Government Departments are the Executing Entities (EEs) and are eligible to submit proposals for accessing resources from NAFCC. The objectives followed by this flagship scheme are:

- Funding adaptation projects in sectors like agriculture, horticulture, agro-forestry, water, forestry, urban, coastal and low-lying system, disaster management, human health, marine system, tourism, habitat sector and other rural livelihood sector which aligns with the missions under NAPCC and the SAPCCs.
- Preparing and updating climate scenario, assessing vulnerability and climate impact assessment.
- Capacity building of various stakeholders on climate change adaptation and project cycle management and developing knowledge network.



Figure 2: Focus Areas of NAFCC Sanctioned Projects in India

3 <https://missionkakathiya.cgg.gov.in/homemission>

4 <https://www.nabard.org/content.aspx?id=585>

- Mainstreaming the approaches/ learnings from project implementation through knowledge management.

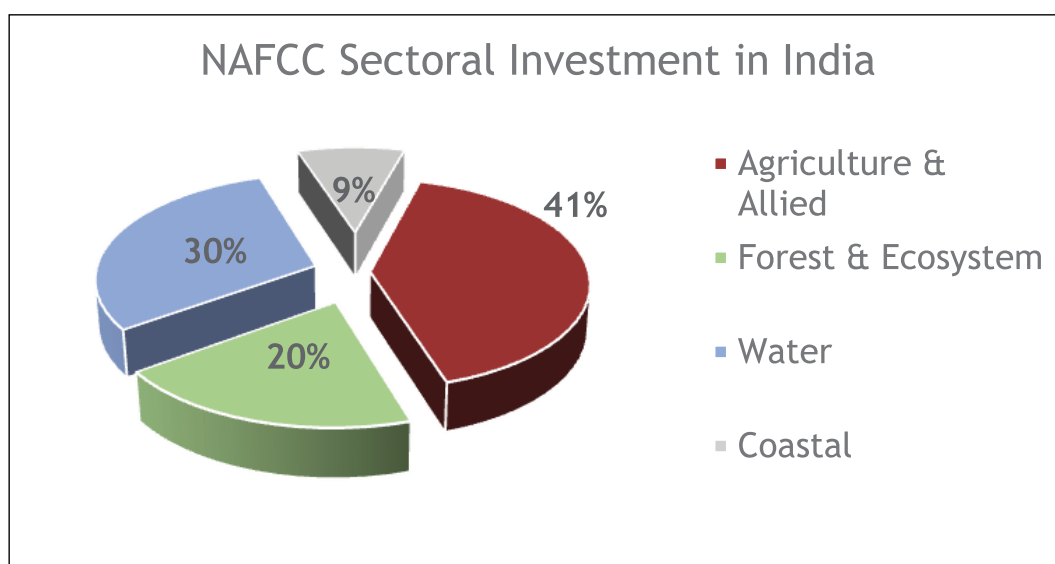
In line with this, the adaptation projects are meant to result in outcomes which are beneficial to the country, private sector as well as the communities at large. The expected outcomes from the adaptation projects are represented below.

The projects funded through NAFCC should produce concrete results by reducing vulnerability and increasing the adaptive capacity of human and natural systems to respond to the impacts of climate change, including climate variability and are measurable and verifiable. Apart from the targets mentioned above, the following programme management and execution components can be considered under NAFCC funding:

- The project formulation cost which will form a part of the preparation cost.
- Execution cost borne by EE as per the rules of GoI.
- Project cycle management, i.e., 3% of the project fee to NABARD.
- Cost of capacity building of stakeholders/workshops/seminars/meetings outside the project.

In line with these components the sectoral investment portfolio of NAFCC in India are as follows:

**Figure 3: Sector-wise NAFCC Fund Allocation**



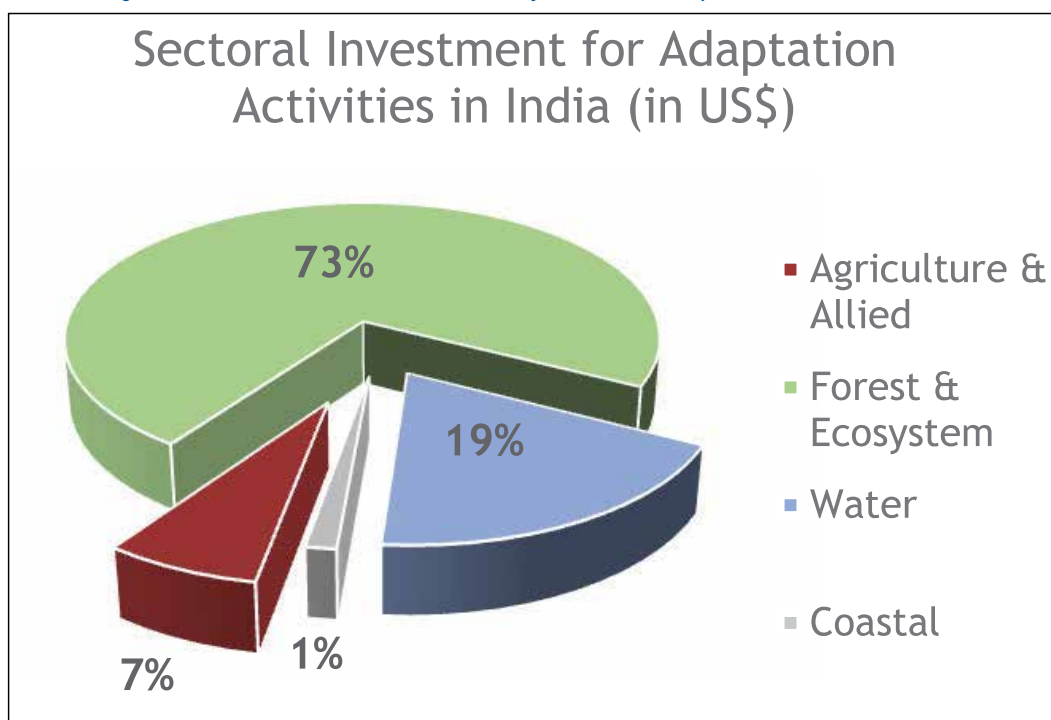
NAFCC sponsored projects does not target any state-wise allocation, rather they are approved on first-come-first served basis. The funds are disbursed in instalments to the State Government/EE. The first installation is released on the submission of half yearly action plan. The disbursement of subsequent instalments is based on the utilisation of the previous funds (75%) along with submission of utilisation certificate. Number of instalments will be linked to project implementation period and a maximum of two instalments per year will be disbursed. The list of activities funded by NAFCC is presented in Annex 2 along with the sectoral focus and the beneficiaries and benefits accrued from the intervention.

### **MDBs and Adaptation Finance in India**

In addition to the funds being pooled in from NAFCC, MDBs are also playing an important role in scaling-up of adaptation projects in India by providing funds for the primary sectoral thematic areas.



Figure 4: Sector-wise Fund Allocation by MDBs for Adaptation Activities in India



The list of adaptation projects funded by MDBs are presented in Annex 3.





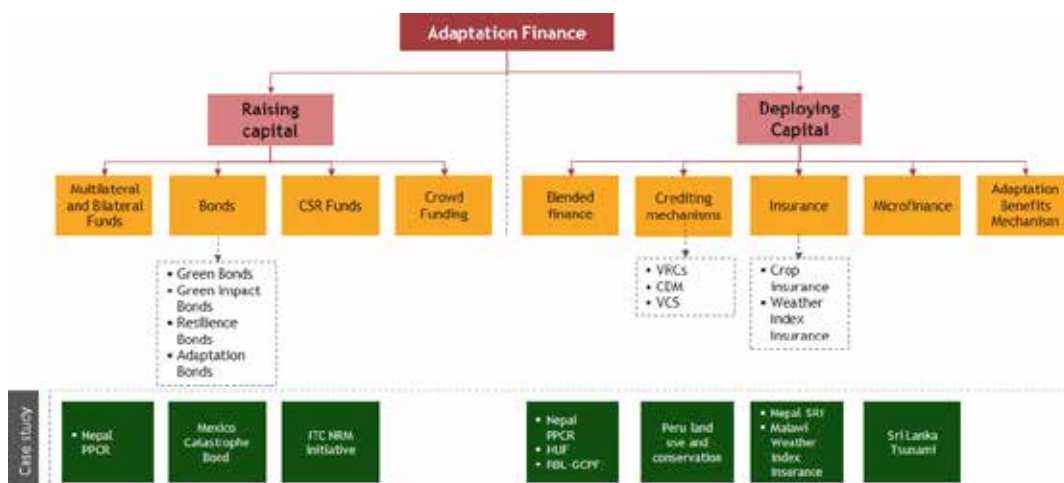


# Innovative Financial Instruments for Adaptation Activities

### 3.1 Overview of Financing Instruments

Intangibility inherited in adaptation projects makes it difficult to assess the value gained from engaging in an activity or evaluating the benefits, thus making it difficult to determine a business case. As a result, there is a lack of consensus regarding the extent to which different financial instruments should be considered as contributing to scaling-up international climate finance. Based on the experiences across the globe regarding adaptation finance, this section gives an overview of various instruments categorised under broader themes (Kamleshan Pillay et al., 2017):

Figure 5: Overview of Financial Instruments



Based on the literature review, the table below briefly describes the various instruments which are either used to finance adaptation activities or those which have the potential to be expanded from mitigation to adaptation, along with the limitations of each instrument.

Table 2: Features of Financial Instruments

Finance mechanism	Main features and limitations	Applicability
<b>Raising capital</b>		
<b>Multilateral and bilateral funds</b>	Provides incentive for private financing by financing actions with lowest return	Widely used in India for adaptation (e.g. NAFCC projects)
<b>Bonds</b>		
Green Bonds	Available only for large-scale investments targeting energy-efficiency, renewable energy projects etc.	Widely used for mitigation only (e.g. renewable energy, green buildings), including possibly adaptation/resilience (e.g. Belgium Green Bond)
Impact Bonds	Outcome based finance mechanism, requires evidence-base that the initiative works, relatively new mechanism used in the social space	Yes, used in India and other developed countries such as Australia in social impact investing but not for adaptation
Resilience Bonds	Linked to catastrophe (CAT) bonds, but 'proceeds' used for resilience	Not used in India yet, but piloted in Mexico

Adaptation Bonds		Challenges related to revenue streams	Climate Bonds Initiative developing a Water Standards, Great Barrier Reef Foundation piloting a Great Barrier Reef Bond.
<b>Corporate Responsibility Funds</b>	<b>Social (CSR)</b>	Internal CSR fund designated based on profits but typically directed towards infrastructure development and mitigation	Used in India by few corporates (e.g. ITC)
<b>Crowd Funding</b>		Funding/financing by collecting small scale funds via Internet platform	Not used extensively for climate change
<b>Deploying Capital</b>			
<b>Blended finance</b>		Most used mechanism for deploying funds from multilateral and bilateral organisations through PPPs	Used in developing countries (e.g. Nepal)
<b>Crediting mechanisms</b>		Cross-cutting agri-based activities resulting in payments through results-based payments and vulnerability reductions	Typically used for Agro-Forestry (e.g. REDD+ projects) and cross-cutting (mitigation and adaptation) projects such as improved cook stoves, micro-irrigation
<b>Insurance</b>		Risk based financing typically used for post-disaster funding	Used in developing countries for crop protection and public-property rehabilitation (e.g. Malawi, Nepal SRI)
<b>Microfinance</b>		Small scale financing provided to those who cannot access mainstream financing from banks and Government	Used in developing countries for rehabilitation (e.g. Sri Lanka Tsunami rehabilitation)
<b>Adaptation Mechanism</b>	<b>Benefits</b>	A non-market based mechanism which certifies social, economic and environmental benefits of adaptation activities. De-risks and incentivises investments by facilitating payments for delivery of adaptation benefits.	Developed by the African Development Bank, it is being piloted in Africa.

## Raising capital

### Multilateral and Bilateral Funds

Described as public finance mechanisms, multilateral and bilateral funds have stimulated adaptation finance in developing countries, with flows generally being realised from donor countries or international donor organisations. These funds are disbursed as grants and aim to support entities implementing adaptation projects. These grants are relatively easier to manage as they don't involve

any administration costs apart from monitoring of the project. They do not entail risk to the project developer and are also particularly appropriate in the early project development phase.

Apart from creating an enabling environment for private investments by strengthening local capacities and institutions, these funds also provide incentives for private finance by financing actions with lowest returns like capacity building or training of the focused groups, which might be the initial phase of a project. Thus, they address the profitability barrier to private investment in an adaptation project and act as a positive externality for private finance.

As of October 2016, funding amounting to close to US\$3.5 billion cumulatively had been dedicated to projects targeting adaptation in developing countries since 2003, amounting to around 26% of total approved funding by multilateral climate funds (CFU 2016). 90% of the approved allocations were given as grants, while concessional loans comprised 10% of total approved allocations to adaptation projects. The largest shares have been allocated via the Pilot Program for Climate Resilience (PPCR) and the Least Developed Countries Fund (LDCF). Other large contributing climate funds included the Adaptation Fund, the Special Climate Change Fund, the Adaptation for Smallholder Agriculture Programme, and the Green Climate Fund.

## **Bonds**

### **Green Bonds / Climate Bonds/ Adaptation Bonds**

Bonds are large scale debt finance instruments that are used to fund one or several large-scale projects. Bonds represent liquid assets which represent long-term investments because they are difficult to sell as there are fewer interested buyers. Green bonds and climate bonds are used to finance projects that come with environmental benefits. Both bonds presently target primarily clean energy projects. These bonds are also tied to standards (Climate Bonds Initiative) to ensure investors are assured of the expectations to be met by the bonds.

India has the second largest emerging green bond market, with a total of US\$7.2 billion issued to date. A number of Government agencies have contributed significantly to issuance, among them the Indian Renewable Energy Development Agency (IREDA) and the Indian Railway Finance Corporation (IRFC). In 2018, the State Bank of India entered the market with a US\$650 million Certified Climate Bond, the first of a US\$3 billion issuance programme. The proceeds of these bonds are allocated to renewable energy projects, low carbon transportation, and to energy efficient projects and green buildings (Climate Bonds Initiative, 2018).

One possible avenue to increase green bond issuances in adaptation would be backing the bond issue using the cash flow generated from climate resilient initiatives (asset-backed securities). For example, water infrastructure improvements and climate-smart agriculture initiatives may allow for greater revenue streams to be generated from water sales and increased agricultural productivity, respectively. Notably, the World Bank was involved in issuance of green bond for proceeding a loan of US\$100 million (45% of the project cost) for the Bengbu Integrated Environment Improvement project in China. The rest of the fund was provided by the Government of China.

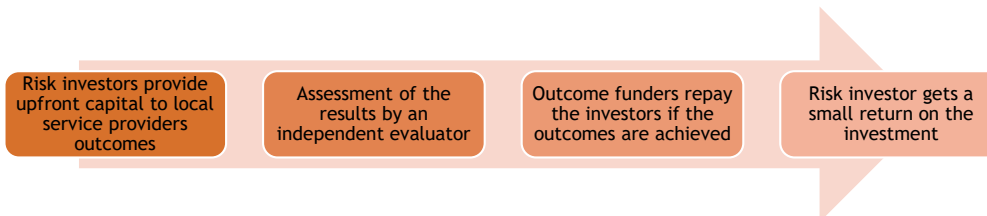
### **Impact Bonds**

Impact bonds, an outcome-based financing instrument is an innovative mechanism targeting social investors and philanthropic funds in India. These outcome-based investments are set to attract new and strategic funds in the social impact space.



Source: The Business Standard

### How impact bond works



Studies show that impact investment in India has reached US\$5.2 billion between 2010-2016 period whereas annual investments touched US\$1.1 billion in 2017, with a 20-25% growth potential. With climate change adaptation also adversely impacting the rural sector, impact bonds could play an important role in attracting funds for implementing cross-cutting projects.

### Resilience Bonds

A Resilience Bond is a new insurance instrument designed to help cash-strapped Governments increase both physical protection and financial insurance against disasters. These bonds link insurance coverage that public sector entities can already purchase (including parametric insurance policies and catastrophe bonds) with capital investments in resilience projects (such as, flood barriers and building retrofits) that reduce expected losses from disasters. These bonds are more like insurance policies than traditional municipal bonds and are designed to reduce the financial risks associated with very low-probability, high-consequence natural disasters. For example, if a hurricane strikes, the aim of a catastrophe bond is not to limit the damages on the ground, but instead to reduce the resulting economic disruption<sup>5</sup>.

**Adaptation Bonds<sup>6</sup>:** The possibility of raising adaptation bonds is being explored by many organisations. However, challenges related to revenue streams are much more significant than in case of mitigation. The Climate Bonds Initiative is working on a “Water Standard”. The Climate Bonds Water Standard will bring vulnerability assessment and climate mitigation and adaptation planning to the fixed income space. It will allow investors to easily prioritise projects that are seriously considering their climate impacts and climate resilience. The proposed Water Standard will certify water investments that have carried out climate vulnerability assessments considering past, present, and future climate risks and environmental losses and, created climate adaptation and/or mitigation plans. The Australia’s Great Barrier Reef Foundation (GBRF) has been developing a

5 REbound Programme: A guide for public sector – Resilience Bond Sponsorship

6 Climate Bonds Initiative, 2015, Water Climate Bond Standard Opens for Public Consultation, <https://www.climatebonds.net/2016/04/water-climate-bond-standard-opens-public-consultation>

new program of research into how the Great Barrier Reef (the Reef) might adapt to climate change impacts. It launched a portfolio of projects called Resilient Coral Reefs Successfully Adapting to Climate Change. The Reef is experiencing the damaging first wave of climate impacts, yet there is almost nothing practical to hand with which to combat their effects. GBRF needs funding as quickly as possible to fund its research and development program, to roll out pilots, and to then scale up successful trials. It needs \$AUD100 million with 60% of that required upfront. The GBRF worked with pro-bono partners Goldman Sachs and KPMG to explore the idea of raising money from the domestic and international capital markets with a five-year “Great Barrier Reef Bond”. The bond would be serviced with a revenue stream assembled from those who use the Reef and others who benefit most directly from having a healthy Reef (i.e. those who have the most to lose from a catastrophic climate-induced event on the Reef). KPMG has looked at a revenue stream based on collecting very small increases in existing levies and charges relating to Reef use or benefit (effectively hypothecated tax revenue), and to see if it could be brought to scale. The political palatability of any such charge or levy is the main issue; it will rely on support from Reef-dependent business. The user-pays revenue stream is central to the model’s success in the longer term; it will provide long-term, sustainable funding for climate adaptation research over the years to come and it is absolutely key to its replicability to a host of other valuable public and private applications. GBRF will allocate the funds so raised by the Bond, in priority order, to its Portfolio of Reef adaptation research projects, a process directly overseen by GBRF’s own governance and compliance processes. The Climate Bonds Initiative sees this asset-backed or asset-linked approach as essential to assure investors, Governments and other stakeholders that funds intended for climate change solutions are going to the right places.

The Climate Bonds Initiative has also convened an Adaptation and Resilience Expert Group (AREG) to discuss and develop the adaptation and resilience (A&R) Principles, which will provide high-level guidance for determining when projects and assets are compatible with a climate resilient economy, and therefore should be certified under the Climate Bonds Standard. The A&R Principles will provide the framework under which sector-specific A&R Criteria will be subsequently developed by sector based Technical Working Groups (TWGs), following review by the AREG. For the sectors that already include A&R Criteria, the AREG will evaluate their fit with the framework and provide recommendations on alignment. For the new sector criteria under development, the AREG will provide guidance to ensure alignment with the framework. Potential projects include water-efficient technology, drip irrigation, wind-, flood-, and heat-resilient building materials, new financial and insurance products, early warning systems, drought-resistant seeds, and new health products, among many others<sup>7</sup>.

#### **Investments in product diversification by companies:**

Climate change may present new opportunities for businesses. Companies can develop and deploy new products, technologies, and services that support climate mitigation or which help improve the climate adaptive capacities of their target audience or markets. Examples include BASF, a chemicals manufacturer which has developed products to help coastal settlements protect local dykes by absorbing the force of breaking waves and slowing down water masses. BASF’s researchers are also developing stress-tolerant plants that are more resistant to extreme weather conditions such as drought and superabsorbers are being trialed for a reforestation project in Brazil to increase water storage capacity. Second example is of Sanofi, a pharmaceutical company that has launched the first dengue vaccine. On December 9, 2015, Mexico was the first country to grant marketing authorisation to Dengvaxia, Sanofi’s tetravalent vaccine for the prevention of diseases caused by all four dengue virus serotypes in preadolescents, adolescents and adults (aged 9 to 45) living in endemic areas. The marketing authorisation of Dengvaxia in Mexico was followed by approvals in the

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<sup>7</sup> Climate Bonds Initiative, undated, Adaptation and Resilience, <https://www.climatebonds.net/adaptation-and-resilience>



Philippines and Brazil in 2015 and El Salvador in 2016. The company promotes access to treatment at affordable prices in the areas most affected by malaria. In 2007, Sanofi developed Artesunate Amodiaquine Winthrop (ASAQ Winthrop), a malarial drug, under a public private partnership with the Drugs for Neglected Diseases initiative (DNDi). This drug has been distributed at tiered prices in 34 countries, particularly in Africa, with over 400 million doses have been produced since 2007. Sanofi did not seek patent protection for that drug (Environment Department, Government of Maharashtra, 2017).

### **CSR Funds**

CSR is an evolving and dynamic framework that aims at aligning public expectations with the conduct of the private sector. With climate change risks becoming more and more evident, they come with potential financial opportunities for the private sector. As India has become efficient in ensuring that the private sector spends significantly into CSR initiatives through compliance and regulation, climate change also promises to be an important avenue for consideration. In line with Section 135 of the Companies Act 2013, private sector is entitled to spend the profits into the broader CSR thematic areas, of which 'environmental sustainability' is one such theme. During 2016-17, majority of the expenditure by top 100 listed companies as per market capital was in the areas of education, health and sanitation, rural development and environment. INR 797 Cr. was spent by companies on initiatives around environment in 2016-17. This constituted ~11% of the total CSR spend (KPMG, 2018). In the area of environment, programmes funded were on the theme of recycling of plastic and paper products and promotion of use of solar products (NGOBOX & CSRBOX, 2018).

Given this fact, this level of funding could be integrated as a holistic adaptation fund which could be diverted towards adaptation activities as well as cross-cutting activities (mitigation and adaptation) rather than private sector undertaking initiatives as silos.

### **Crowd Funding**

Crowd funding is a relatively new financing instrument largely unexplored for climate change activities. This financing involves large number of individuals investing into a fund through a 'crowd funding platform'. The key feature of crowd funding is that it is accessible to all individuals and organisations that are often outside of the scope of traditional private sector finance. Crowd funding has been applied to a range of projects, programs and product developments. For e.g. Kiva crowd funding platform in partnership with BarefootPower raised funds which were loaned to local distributors (micro-entrepreneurs) of solar systems, lanterns and renewable batteries to help accelerate adoption amongst the marginalised sections of the society in Africa. These loans were provided at zero interest, allowing energy entrepreneurs to establish their businesses in centralised locations that have high upfront costs but higher sales volumes.

## **Deploying capital**

### **Blended Finance**

Blended finance approaches make use of development finance sources, such as development assistance from donor Governments and funds provided by philanthropic foundations, to mobilise additional finance - primarily from private and commercial sources - in order to address and promote climate action in developing countries (OECD, 2017). This mechanism revolves around a simple logic – private investors, businesses and project developers respond to and are constrained by risks and returns associated with investments. As a result, investments in developing countries with important public good dimensions may be backed by a sound business case but cannot necessarily be financed by commercial investors due to high risks associated with projects or uncertainty related to returns.

In this regard, it has to be noted that International Finance Corporation (IFC) has been a pioneering in steering blended finance-based models for climate activities in developing countries. Most IFC investments have been made on a commercial basis; however, the Global Environmental Facility (GEF), the Climate Investment Fund (CIF), and bilateral donor funds have been a major source of concessional financing for IFC projects. The outside funds are often matched by IFC resources and can be deployed as concessional loans, guarantees, equity, and grants for private sector projects that would generally not have proceeded due to market barriers.

In this context, as adaptation activities require adequate financing, it is quintessential for development actors to identify innovative ways to blend finance through different instruments so as to attract commercial, private finance towards climate change adaptation. Amongst the different models, collective vehicles, such as funds, bring investors together to pool financing and offer opportunities for scaling up blended finance. In particular, structured funds allow donor Governments to use concessional finance in a first loss position to provide a risk cushion for commercial investors. Blending can also occur through equity or debt investments in projects and companies in developing countries.

### **Insurance**

Insurance is a noted instrument and a risk transfer tool for disaster risk management and used to address potential losses as a result of climate variability. Being aware of the implications of climate-related events and the risks it imposes on their existing portfolios of products and clients, this sector has taken various initiatives. In 2015, the G7 committed to increase insurance in developing countries to cover at least 400 million people by 2020. Furthermore, the UN Secretary-General and the International Cooperative & Mutual Insurance Federation launched the 5-5-5 initiative which seeks to roll-out micro-insurance to cover 25 million in the five poorest countries by 2020. Micro-insurance has developed into a useful mechanism for the poor communities in the developing countries to increase the resilience of the economy to climate change.

Typically, they are index-based products according to some threshold such as the level of rainfall in a given period. Traditional insurance products directed at the crop failure of smallholder farmers are faced with the risk of moral hazard. As a result, they find it difficult to avoid higher premiums. To avoid insurance malpractice, establishing payouts based on relationships between environmental variables and crop failure ensures that farmers have an incentive to promote productive farming management while being covered against climate risks. One such example is derived from Malawian experience where a mixture of loan and insurance was used, and the insurance payouts or the selected index was based on the requirement for water (a weighted sum of cumulative rainfall during the 130-day growing period, with individual weights assigned to (10-day) rainfall totals).

### **Micro-finance**

While the public sector initiatives towards adaptation activities follows a top down approach, need arises for initiatives to address the scenario at household or company level, i.e., bottom up approach. Despite the increasing financial flows available for adaptation from a top-down approach, most notably the grants from the GCF, funds seldom reach the household level in enough quantities to promote resilience. Microfinance is a key solution to providing support household adaptation.

Microfinance refers to formalised financial services tailored and offered to low-income and disadvantaged communities. Dichotomy to public safety nets and private micro-financing schemes lies not only in the contract that elaborates on payout terms and conditions, but also in the scheduling of disbursement on the ground. But together with public financing, microfinance can be a possible measure to fill the financial gaps that may occur. An example from Bangladesh highlights the importance of microfinance where Noapara Village, which is primarily dependent on agriculture and small-scale livestock farming and prone to riverine flooding prefers micro finance institutions (MFIs) for credit over any other financial institutions. This is due to the trust and the

flexibility with regards to repayments offered by these MFIs. Another case is that of Sri Lanka where Agro Micro Finance (MFI) with support from ETIMOS (Donor) helped build up the damages suffered by various districts of south Sri Lanka post the Tsunami in 2004.

### **Crediting Mechanisms**

The demand for adaptation projects could also be created through a crediting mechanism like the Clean Development Mechanism (CDM) under the Kyoto Protocol of the UNFCCC. A credit mechanism for adaptation will also allow for private sector to be engaged if entities are legally bound to meet a given quantitative adaptation credit target. Through prioritising different sectors by different accounting schemes, adaptation projects can be expanded beyond those that are implemented in water and agriculture sector.

Vulnerability Reduction Credit (VRC) instrument offers policy makers an approach for considering adaptation costs within a crediting framework. Critical elements that need to be addressed include: the implementation of policy that creates the demand for VRCs; appropriate procedures for the approval of methodologies that avoid the bottlenecking of projects; robust governance and transparency frameworks; and, lastly, the avoidance of high transaction costs, amongst others. The VRC concept enables the adaptation potential of a project to be quantified that is the avoided losses and damages in terms of the cost. The VRCs is a function of the project's Avoided Impact Cost (AIC) and an Income Equalization Factor (IEF). The quantity of VRCs yielded from a particular project can be described by the following equation:

$$\text{No. of VRCs} = (\text{AIC} * \text{IEC}) / \text{Euro } 50$$

VRCs are designed to be issued ex post, after vulnerability reduction measures have been implemented and their cost reduction effects validated. Although VRCs have not been piloted yet, the mechanism is gaining interest from international organisations such as UNDP.

### **Adaptation Benefit Mechanism (ABM)<sup>8</sup>:**

The ABM is an innovative mechanism for mobilising new and additional public and private sector finance for enhanced climate change adaptation action. ABM will de-risk and incentivise investments by facilitating payments for delivery of adaptation benefits. ABM will certify the social, economic and environmental benefits of adaptation activities. The value of adaptation action captured in these certificates, including the incremental costs of generating the benefits, will be promoted to potential investors or lenders. The expectation is that verified certificates of the benefits of specific adaptation activities issued by a reputable international organisation and based on sound methodological and technical work, in consultations with stakeholders and with the approval of the host country Government will guarantee the credibility of the adaptation activities. It will also increase their attractiveness to potential investors or lenders. In response to demand by African countries, ABM was developed theoretically by the African Development Bank (AfDB) in collaboration with Governments from several African countries and various stakeholders. In the intergovernmental climate change negotiations under the UNFCCC, ABM is part of the discussions on Article 6.8 on Non-market-based approaches. ABM is considered a non-market-based approach, because no international transfer of outcomes is envisaged and its aim is consistent with the aim of non-market-based approaches, referred to in Article 6, paragraph 8 of the Paris Agreement. With funding from the Climate Investment Funds and support from the Governments of Uganda and Cote d'Ivoire, the African Development Bank has developed the initial concept. Starting in 2019 to 2023, ABM will be tested on the ground through pilots in collaboration with partners, such as the United Nations Capital Development Fund (UNCDF). The pilot phase will aim at 10-12 demonstration projects in Africa. ABM will be tested with small-scale projects, which are either replicable or scalable, or need funding for continued maintenance and operation. The certificates

8 <https://www.afdb.org/en/topics-and-sectors/initiatives-partnerships/adaptation-benefit-mechanism-abm>

for the Adaptation Benefits of the demonstration projects will be granted to the project developer for free, while the Adaptation Benefits of replication, up-scaling or continued maintenance and operation will be promoted to various potential investors or lenders to mobilise enhanced action and finance. An ABM Board, Methodology Panel, and Secretariat will be established by the AfDB in 2019 to guide, advise and facilitate the pilot phase. The use of Adaptation Benefits certificates would be tracked through a register. Based on the experiences and lessons learned from the pilot phase, ABM will be delivered to the international climate change community for wider use as a voluntary tool. ABM is deemed relevant for all countries in all regions. Funding from various sources, such as international funds and donor countries is welcome to demonstrate the mechanism during the pilot phase.

The scope for ABM projects is very broad covering all aspects of adaptation and resilience to climate change. AfDB has developed some initial methodologies that can be tailored to a specific context. However, project developers are free to propose new methodologies. Early concepts include:

- Solar powered irrigation pumps to help farmers overcome unreliable rainfall;
- Drip irrigation technology to make better use of available irrigation water;
- Sustainable practices to protect cacao plantations from diseases exacerbated by climate change;
- Climate resilient agriculture to diversify income streams of vulnerable farmers;
- Development of weather information systems to provide farmers with accurate weather forecasts;
- Job creation for the most vulnerable groups affected by climate hazards, particularly women and youth;
- Coastal protection through afforestation with mangrove trees;
- A range of clean energy technologies, which free up women and children's time enabling them to become more economically productive or attend school, and hence become less vulnerable to the negative impacts of climate change.

## 3.2 Case Studies

The section below elaborates a few examples of financing adaptation activities through innovative instruments. These case studies have been selected to reflect a mix of different instruments across geographies and their success in implementation. Inputs of experts were also considered while selection. The potential for their application in India has been explored.

### 3.2.1 Blended Finance

#### **Making Adaptation a Private Sector Business: Insights from the Pilot Program for Climate Resilience in Nepal**

##### **Context/Overview**

Private actors can make important contributions to adaptation efforts in Nepal, particularly in its vulnerable agriculture sector. By offering products and services that can smoothen the path to adaptation and making their assets and businesses more climate-resilient, private actors can help reduce the country's vulnerability to changing climate conditions. The PPCR is the largest dedicated adaptation funding program, and the one most targeted toward private sector involvement. The program is designed to allow for private sector involvement at several different entry points: in its governance structure, at the country-level, in the planning and design of investment plans, programs and projects, and in their implementation. Nepal is the first country within the PPCR portfolio to gain private actors' formal commitment to participate in climate resilience interventions. It is also the first to see its private sector project moving from design to implementation.

## Instrument Description

By leveraging the shared interest of buyers and suppliers in agricultural supply chains, the mechanism aims to reduce credit risks and close capacity gaps that hinder small- to medium sized farmers from accessing medium-to long term financing for investments in agricultural measures that could help reduce their climate vulnerability. Pilot Programme for Climate Resilience (PPCR) is a targeted window of the multi-donor climate investment funds aimed at providing technical assistance and financial support to public and private investment for countries to incorporate climate risk and resilience into its development planning and implementation.

## Business Model

PPCR would be structured as a donor trust fund administered by the World Bank. With its grant facility PPCR allows IFC to:

- Associate with local commercial banks in a risk sharing facility. By deploying first loss credit protection and in conjunction with market-rate loans to and through partner agricultural corporation(s), it mitigates potential losses from a high-risk portfolio. The first-loss guarantees, extended as partial credit risk guarantees, would provide credit enhancement to the pool of eligible loans, thereby enabling corporations to extend and service loans at longer than market terms and lower risk premiums to their suppliers.
- Provide technical and financial assistance to strengthen corporations' ability to further indulge into an interlocking of factor markets where the corporation ensures financial accessibility for the suppliers whereas the suppliers provide consistent supply to the corporations. By ensuring unperturbed supply, corporations enhance their ability to respond to market demands. For the supplier improved accessibility to credits at terms and conditions not available in the market ensure increased crop productivity or avoid crop loss, thereby increasing suppliers' income or making it less vulnerable to climate impacts. Enhanced supply for the corporation(s) ensures better repayment capacity of the loans.

Figure 6: Schematic of Tools and Barriers Addressed by PPCR

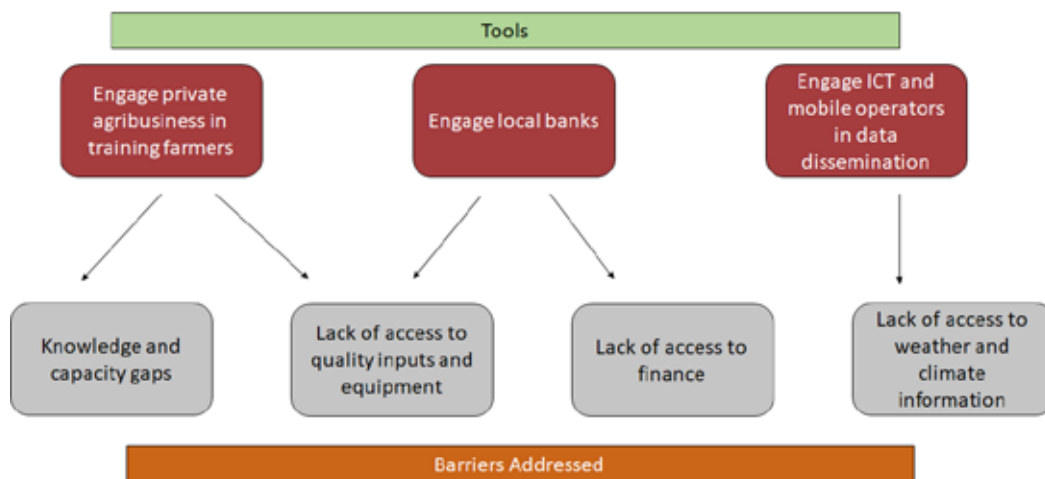


Figure 7: Three Possible Options for Risk Sharing Facility in PPCR

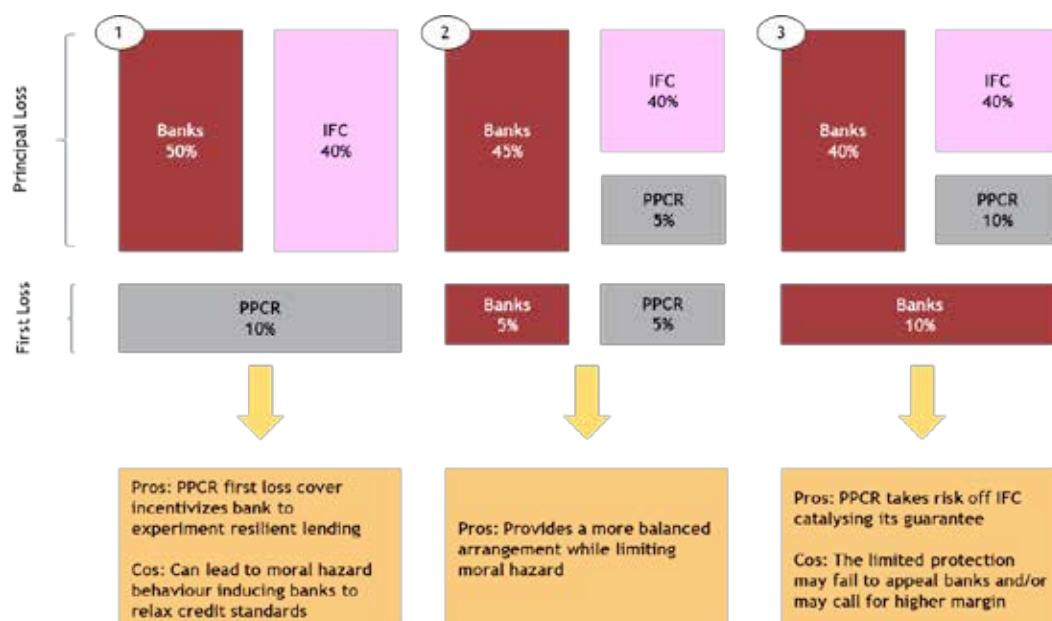
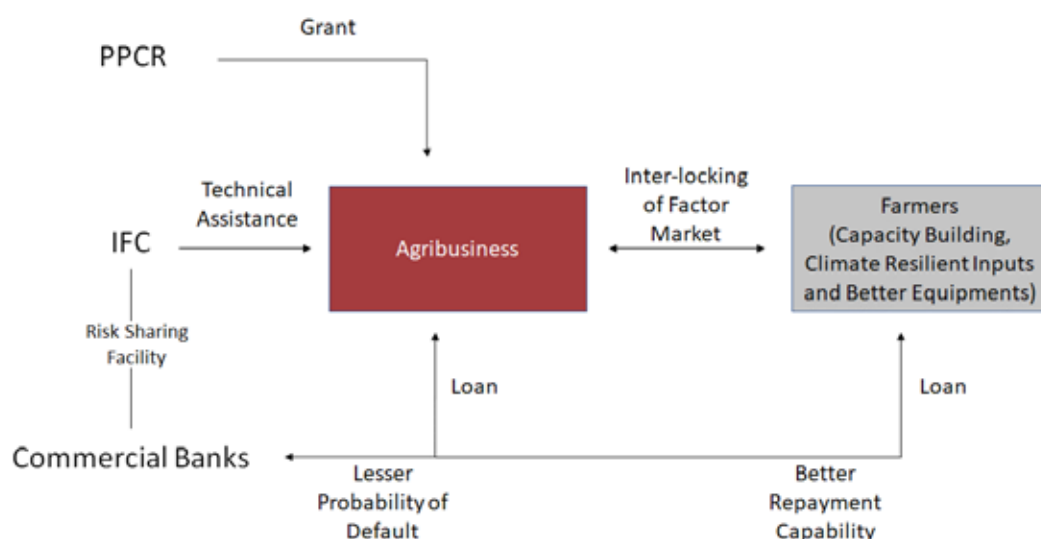


Figure 8: Investment Flow Diagram in PPCR



### Barriers Addressed and Implementation Challenges

Barriers addressed by the instrument include the following:

- Lack of access to medium and long-term credits for small to medium sized producers
- Information, capacity and incentive gaps
- Lack of access to inputs and technologies
- Third party lenders' credit risk
- Lack of farmers access to market

The challenges faced by the facility during implementation are:

- Securing adequate donor funding and negotiating the related conditions
- Lack of local reliable climate data and limitations in current knowledge causes uncertainty in

determining the portfolio of climate resilient investments

- High transaction cost involved in engaging suitable corporation
- Socio-cultural barriers resulting in non-engagement of end beneficiaries
- Possibilities of moral hazard behaviours of the corporations due to the risk sharing facility
- Institutional barriers in the form of unfavourable or unanticipated changes in policy and regulation

### Private Sector Involvement

The private sector engagement in this facility is in the form of agribusiness and commercial banks. Low agricultural productivity incentivizes agribusinesses to participate in the project, as it constrains their business operations and ability to effectively respond to market demand. Without adaptation, productivity will deteriorate further under changing climate conditions. The participation of local commercial banks in the project is designed to enhance their knowledge of and capacity for agricultural lending. Risk-sharing arrangements with IFC-PPCR and through the involvement of agribusiness firms, give local banks the chance to experiment with lending to non-traditional agricultural practices and tap into the sector's potential for their portfolios. PPCR focused on strengthening the resilience of farmers growing rice, sugarcane and maize by skilling the farmers on improved agronomic practices, and facilitating access to stress-resilient seeds, irrigation technologies and fertilizers (Climate Policy Initiative, 2013).

The benefits accrued by these actors are given in the following table:

**Table 3: Benefits Accrued by Actors**

Agribusiness	Commercial Bank
Enhanced supply and improved quality of crops	Opportunity for diversification of portfolios
Interlocking of factor market	Addressing Capital Adequacy Ratios (CAR) constraints
Potential opportunity in future association with IFC	Association with IFC would enhance their capability in evaluating and managing the risks specific to agricultural sector lending
Might attract investment in the future	Extend their skill set on developing tailored financial products
Enhanced knowledge and capabilities in training farmers and climate adaptive practices	Lesser probabilities of suffering loss thus improving their profitability and performance
Monitoring and evaluation of the outcome of the training activities	

## 3.2.2 Microfinance

### Microfinance in a Post-Disaster Context: The Case of the 2004 Tsunami in Sri Lanka<sup>9</sup>

#### Context/Overview

The case study highlights the role of microfinance institution, Agro Micro Finance (AMF) in rebuilding tsunami affected localities in South Sri Lanka. After the 2004 tsunami, ETIMOS foundation recapitalised AMF which witnessed a severe loss in its loan portfolio caused by the insolvency of many tsunami-damaged borrowers who lost all their capital assets were unable to repay their loans. The tsunami affected the borrower's wealth, income and life satisfaction through

<sup>9</sup> Microfinance: From Theory to Practice

significant drop in income and psychological effects. With the capital infusion by ETIMOS, AMF provided concessional loans to the affected groups and supported them in their recovery path through technical support. Such loan policy is estimated to be effective since the loan to income ratio positively affected borrowers' income and worked hours especially for damaged relative to non-damaged borrowers.

### **Instrument Design**

In the initial phase of a post disaster context, microfinance plays a subsidiary role by utilising its local networks for disbursing the foreign aid provided by Government, international donors and individuals. MFIs themselves, supported by donors, act to provide immediate relief and rescue operations in the communities in which they work. MFIs are in fact widely spread throughout the territory. They have relationships with local administrative authorities and are present in every village through their own agents of credit, the Credit and Saving Cooperatives, Community Based Organisations (CBOs) through which they play microcredit programs. The action is facilitated in case of need for the rapid mobilisation and knowledge of the territory.

The second phase is defined as "post emergency", where the focus is to support the people affected by the catastrophe to achieve a minimum level of security. It is in this phase in which microfinance becomes a technical tool for intervention by helping the rapid resumption of economic activities starting from the base of the destroyed communities and hence spreading widely. It may encourage savings for groups and can intervene with forms of insurance and leasing products, with credits for the construction of houses or to purchase assets for production that provide the opportunity - for those affected - to resume economic activities and to be able to regenerate income for the family.

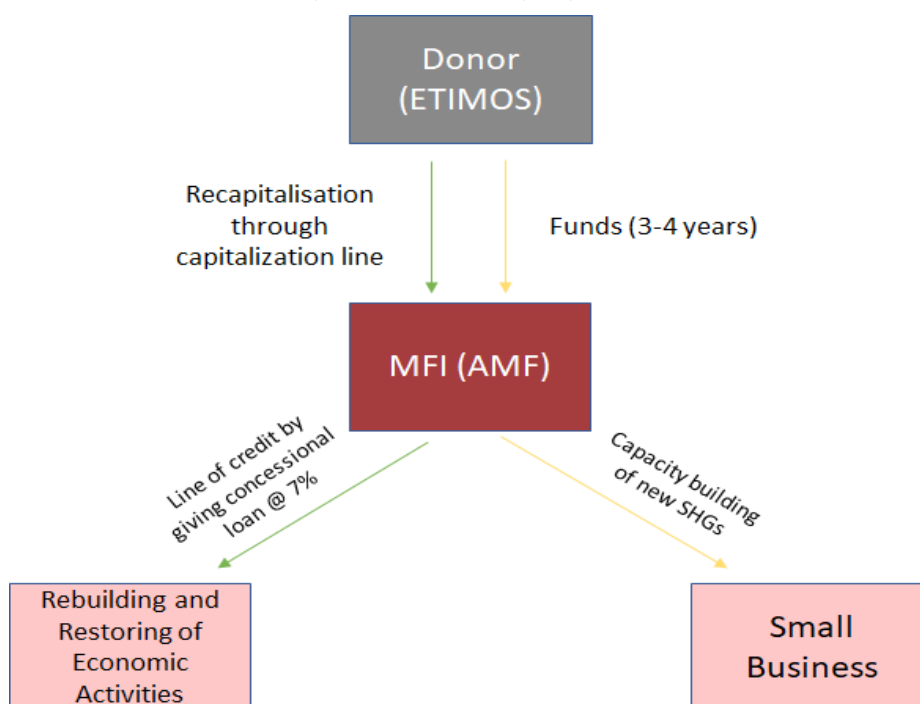
The funds were disbursed by ETIMOS for the population to restore normal economic conditions. The beneficiaries of this intervention, AMF provided technical assistance and training for the creation of self-help groups aimed at conducting small businesses. Agro Micro Finance financed the final beneficiaries, especially in rural areas, through the village organisations, which are concerned with the selection of customers. The intervention in support of its microfinance activities was carried out in three ways: capitalisation line, line of credit and capacity building. The line of capitalisation allows local MFIs to receive funds by paying a one-time 1% commission for monitoring. The initiative is designed to restore the operating conditions previous to the tsunami and, subsequently, to support the development of organisations by strengthening the capital structure. The funds are included for the first two years in the liabilities of the balance sheet but do not involve the payment of interest or repayment of the capital. In this first phase they should be used for the purposes set out in the contract and any use is subject to monitoring by ETIMOS. Through the credit line, ETIMOS provides funding for a period of 3-4 years, to support the recovery of the productive activities of the beneficiaries or the launch of new business initiatives by micro entrepreneurs directly or indirectly affected by the tsunami. The loan is granted to organisations at an interest rate of 7%, with repayment in monthly instalments and without requiring collateral. The rate of 7% is about 4 points percentage below the average rate at which organisations are funded on the market. The line of capacity building initiatives was to strengthen both institutions in the management of microcredit activities, both entrepreneurial skills of the beneficiaries, and of the institutions themselves. The loan is then directed to the strengthening of the institution and/ or the beneficiaries of micro-credit: funding, assistance, and training for the entrepreneur and the enterprise, and training and tutoring to staff and members of the institutions, the installation of a software created especially for the management of microfinance programs, and counselling in the preparation of plans development.



Figure 9: Initial Phase



Figure 10: Post-Emergency Phase



#### Barriers Addressed

- With the exorbitantly high requirement of funding on climate change activities such new and additional sources of funding will ensure adequate volume of funds.
- Ensuring access for those who most need and can effectively use climate finance.
- Accelerating the speed of funding to ensure urgency in climate action.
- Encouraging risk taking in fund allocation thus, demonstrating climate finance’s willingness to tolerate higher risks than financial markets and ODA typically offer, and develop instruments to reduce the risk of payment defaults and project failure to manageable levels.

### 3.2.3 Bonds

Adapting to the impacts of extreme weather events through issuance of Catastrophic Bonds: Case study from Mexico’s MultiCat Bond<sup>10</sup>

#### Context/Overview

Mexico is highly vulnerable to the impacts of anthropogenic climate change and extreme events, such as hurricanes, large earthquakes, floods, and volcanic eruptions. In 1985, two earthquakes

10 Developing the Framework for Issuance of Catastrophic Bonds

of magnitudes 8.0 and 7.5, respectively, killed more than 10,000 people and destroyed more than 100,000 homes. Due to the nature and intensity of such events, the Government of Mexico established a Natural Disaster Relief Fund (FONDEN) which provides post-event funding to aid in recovery from catastrophic events. However, there have been several budgetary issues such as insufficiency of funds of FONDEN and a consequent shortfall in funds available for recovery from a catastrophic event. Thus, to enhance the post-event funding, the World Bank along with Mexico, engaged Lane Financial LLC (LFC) to assess the feasibility and develop a first-ever sovereign Catastrophic Bond to transfer Mexico's earthquake risk to the international capital markets.

### Instrument Design

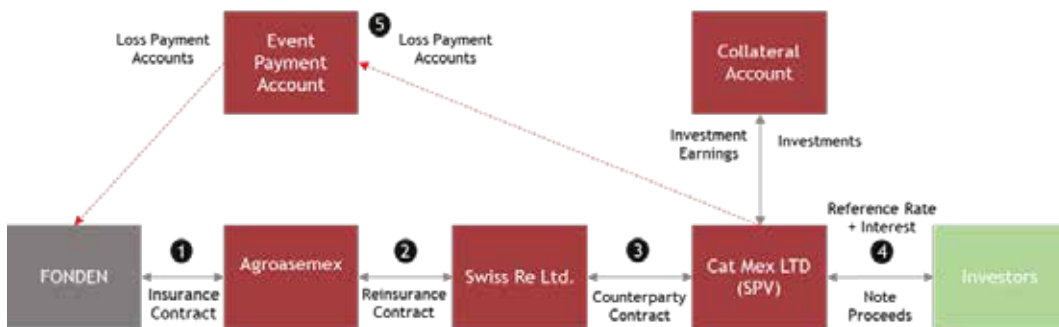
Mexico's MultiCat Bond is a four-tranche cat bond with a three-year maturity under the World Bank's MultiCat Program. The issuer of the bond is a Special Purpose Vehicle (SPV) that indirectly provides parametric insurance to FONDEN against earthquake risk in three regions around Mexico City and hurricanes on the Atlantic and Pacific coasts. The cat bond will repay the principal to investors unless an earthquake or hurricane triggers a transfer of the funds to the Mexican Government.

Swiss Re is the designated insurance company that provides insurance protection to Mexico from the risk of loss from an earthquake occurring in three specified zones. The total loss protection is US\$450 million, consisting of US\$150 million for each zone. The insurance is provided to FONDEN by European Finance Reinsurance Ltd., ("EFR") a Barbados subsidiary of Swiss Re. EFR is reinsured by Swiss Re and, additionally, Mexico's exposure to EFR is fully guaranteed by Swiss Re. Swiss Re's (and EFR's) obligation to make loss payment to Mexico is triggered by the occurrence of an earthquake of magnitude 7.5 or 8.0 and depth of 150 km or 200 km, depending on zone. Payment is "binary" which means that a single event meeting the required parameters will generate a full payment of \$150 million per zone.

### Instrument Transaction Model

The transaction model of the Catastrophic Bond is explained below with the help of the schematic:

Figure 11: CatBond Investment Structure



- FONDEN enters into an insurance contract with local insurance company Agroasemex.
- Agroasemex enters into a reinsurance contract with Swiss Re to transfer all of the catastrophe risk.
- Swiss Re enters into a derivative counterparty contract with a Cayman Islands-based special purpose vehicle (Cat Mex Ltd.) to transfer the catastrophe risk.
- The SPV issues floating rate notes (Cat Bonds) to capital markets investors to hedge its obligations to Swiss Re under the counterparty contract. The proceeds received from investors are invested in US Treasury money market funds and deposited in a collateral account.
- A separate event payment account is established with a third-party bank to allow FONDEN to receive parametric loss payments directly from the SPV, subject to the insurance contract.



One additional key participant is the rating agency (Standard and Poors) which examines all aspects of the transaction including the structure, participants, and AIR modelling results (An independent event verification agent, AIR Worldwide Corp. determines if an event meets the requirements for a loss payment). The rating agency then issues its rating of the transaction. The investor places a great deal of importance in the rating; most will have a minimum acceptable rating. In the case of CAT-Mex Ltd. a rating of BB+ was assigned; this was as expected and was acceptable to the investors.

### 3.2.4 Insurance

Enhancing climate resilience of rice farmers in Nepal by coupling crop insurance to value chain development and climate change adaptation<sup>11</sup>

Context/Overview

Rice production has a major influence on Nepal's economy and livelihood. It contributes to 7% of country's GDP and 75% of working population is fully or partly engaged in rice cultivation. Most of the farmers have a weak economic condition with an average farm size of 0.72 hectares and an income of US\$1.28/day/person. Attempts have been made to improve their livelihood by increasing production, but mostly with little success.

Moreover, rice farmers are perceived as GHG emitters (mainly methane), which they are largely unaware of. The rice farmers bear the adverse effects of climate change in the form of erratic monsoon rainfalls, which is the main source of water for rice cultivation. Such unpredictable and inadequate monsoon directly results in decline of rice yield, thereby leading to increased food imports in Nepal.

As a result, there was a growing need to implement innovative solutions which could address the climate change impact as well as improve the livelihood of rice farmers. To increase the adaptive capacity of vulnerable rice farmers the following solution was identified:

- i. Climate resilient rice cultivation through 'System of Rice Intensification' (SRI) technique
- ii. Development of rice value chain
- iii. Crop insurance to recover from catastrophic events<sup>12</sup>

<sup>11</sup> <https://www.climatecolab.org/contests/2017/absorbing-climate-impacts/c/proposal/1334418>

<sup>12</sup> Crop insurance is at an early stage (<10 years) in Nepal and existing products are not appealing or accessible to

To ensure sustainability and effectiveness, the project focuses on enhancing climate resilience of rice farmer by coupling crop insurance to value chain development and climate change adaptation measures.

**Climate resilient rice cultivation through SRI** focuses on changing the current rice growing practice (flood based) to the climate resilient SRI method and aiding in reduction of methane emissions.

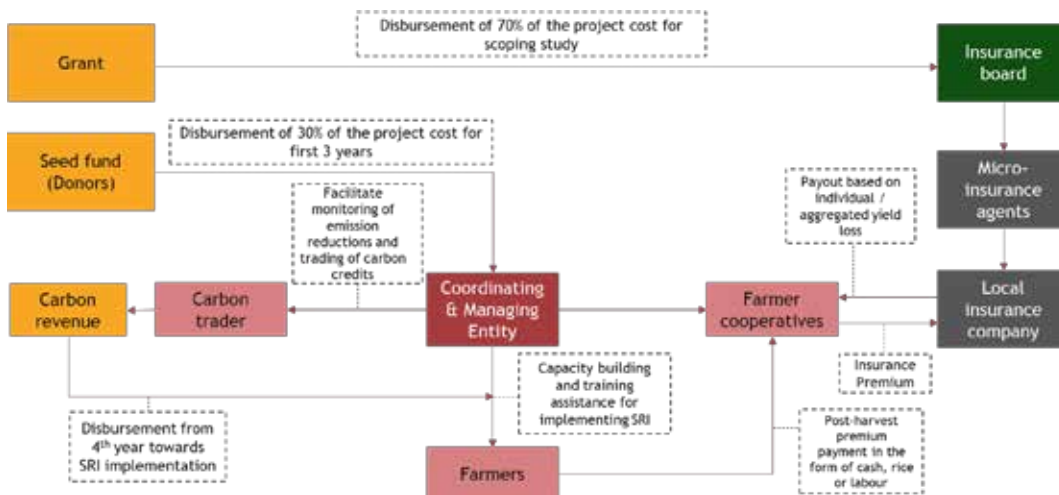
**Value chain development for rice** focuses on the development of a market strategy to improve the farmer's access to market and strengthen their entrepreneurial competence. Market measures are one of the important social protection measures, where social safety nets and social insurance are difficult to set up.

**Two-tiered insurance based on yield loss** focuses on development of a two-tiered crop insurance scheme managed at the community level. The insurance is managed by the cooperatives and provide yield-based insurance to member farmers and the cooperatives are also covered through a group risk insurance to avoid exposure of the cooperatives to losses during catastrophes.

## Instrument Design

### Investment structure

Figure 12: SRI Nepal and Crop Insurance Investment Flow



- **SRI implementation**

The investment required for the project was estimated to be around US\$1.5 million for 10 years and 9 months, this includes cost for project implementation and coordination and for the accreditation as a CDM project. Main project cost of US\$560,000 is expected to be spent on capacity building and trainings on the farmers as well as developing an institutional arrangement to raise farmers' capacity.

The project is developed as a CDM project which will co-finance the project through revenue generated from sale of CO<sub>2</sub> credits. Hence, the initial funding of approx. US\$450,000 for the first 3 years is to be acquired from MDBs and other private sector organisations and thereafter, the remaining funds for 7 years will be finance through carbon revenue. The surplus of carbon revenues after completing 10 years project period is anticipated to be used to launch new projects in other countries in South-East Asia.

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most of the rice farmers

- **Development of insurance scheme**

The investment required for the development of the insurance scheme is around US\$60,000, of which, US\$40,000 is provided as seed fund (by Climate-KIC Europe) and the remaining US\$20,000 is borne as ‘in-kind contributions’ by the scoping agency. The cost includes a pre-feasibility assessment on crop insurance including desktop research (review of policies and regulations, weather/crop data, stakeholder analysis, existing insurance schemes) and a questionnaire survey on the rice farmer’s risk perception.

**Group risk insurance**

The scheme will cover production loss based on an average yield from the cooperative having approximately 50 farmers. The cooperatives together with local agriculture office or NGO will be responsible for collecting data from each farmer which the insurance company will audit. The reference yield is derived from the historical data (5 – 10 years) and not from a reference field. The historical data on rice yield are available from district agriculture development office. When the average yield falls below 80% of the reference value the payout is triggered, 20% is the deductible.

**Community-managed insurance**

This insurance is based on the group insurance plan that an insurance company can provide. The cooperatives who are trained by external experts distribute and manage the insurance portfolio. This insurance scheme lowers the administration costs and risks of moral hazard which makes it an attractive case for insurance companies.

Role of the project proponents in this scheme

**Table 4: Role of Project Proponent**

<b>Project proponent</b>	<b>Role</b>
<b>Farmer cooperatives</b>	<ul style="list-style-type: none"> <li>• Central role in the project by formally managing the community-based insurance scheme</li> <li>• Data collection and handling, loss calculation, account maintenance</li> <li>• Monitoring and evaluation of the overall project including all 3 work streams</li> </ul>
<b>Farmers</b>	<ul style="list-style-type: none"> <li>• Operation and maintenance of the climate risk measures (e.g. building and maintaining irrigation channel, training other farmers etc)</li> <li>• Operation and maintenance of market measures (e.g. running rice or flour mills, packaging of rice etc.)</li> </ul>
<b>Insurance companies</b>	<ul style="list-style-type: none"> <li>• Commercial insurance providers</li> <li>• Work with cooperatives to develop group risk insurance scheme</li> <li>• Provide payout based on the aggregated yield loss and oversee data and bookkeeping of cooperatives</li> </ul>
<b>NGOs and development organisations</b>	<ul style="list-style-type: none"> <li>• Provide training, technical support and guidance to cooperatives for the development of climate resilient rice cultivation strategy and value chain development</li> </ul>
<b>District Agriculture Office</b>	<ul style="list-style-type: none"> <li>• Collaborate and facilitate the project implementation</li> </ul>
<b>Insurance Board</b>	<ul style="list-style-type: none"> <li>• Regulatory agency entitled to systemise, regulate, develop and approve the insurance product</li> </ul>



### **Insurance payout**

The production loss is based on the average yield of the area and the rice variety. Low income farmers can pay the insurance premium in rice or labour (e.g. building irrigation channel – work stream 1 or running rice mill – work stream 2). The farmers are eligible for 75% Government subsidy and thus, most of the cooperative members were in a position join the program. When the average yield is below 80% of the reference yield, the payout is triggered.

### **Supply chain development and Weather Index Insurance based risk management in Malawi<sup>13</sup>**

#### **Context/Overview**

Malawi, a landlocked country in Southern Africa is highly vulnerable to drought. 38% of the country's GDP is dependent on agriculture, but rainfall is erratic. When a severe drought brought widespread hunger to the region in 2005, millions of farmers in Malawi needed food aid. The Government spent US\$200 million responding to the crisis. Donors also contributed a similar amount. Contract farming was identified as a good option to integrate supply chain development along with risk mitigation. Introducing insurance products within such integrated systems facilitated simpler contract design, as other mechanisms will more efficiently address other, non-indexable risks within the supply chain. The Bank responded by helping the Government in this program by unlocking credit for small holders, which enabled farmers to access new productivity enhancing technologies and high value markets. The Bank also transferred a portion of the risk of severe drought to the international financial market using weather derivatives. If a severe and catastrophic drought occurs, bank would receive payouts based on weather indexes and the farmers loans would be waived off appropriately.

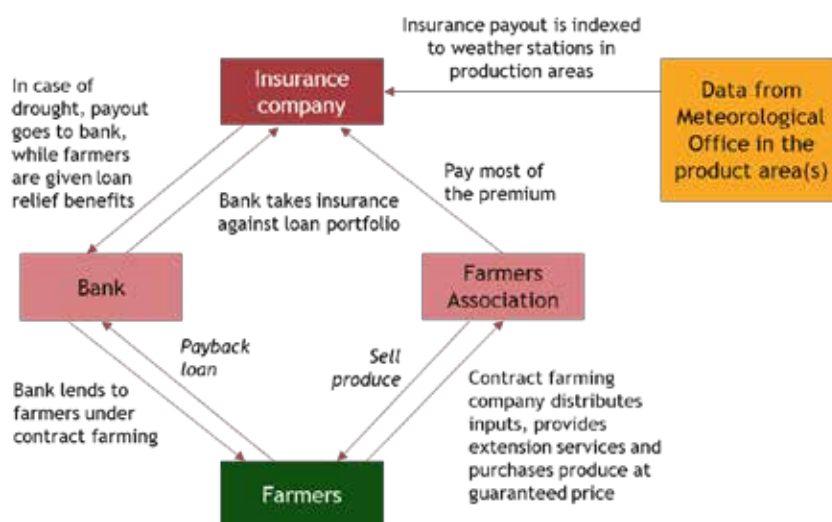
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13 Weather Index Insurance for Agriculture: Guidance for Development Practitioners, World Bank

## Instrument Design

The weather index insurance contracts were structured as an option on a rainfall index. The index links rainfall and maize production, so that if precipitation falls below a certain level, the index will reflect the projected loss in maize production. Under the 2009-10 contract, if maize production in Malawi, as estimated by the rainfall index, fell significantly below the historical average, then Malawi would have received a payout of up to a maximum of US\$4.4 million. In the event of a drought, maize prices in the region typically increase. In 2009-10, the Government of Malawi agreed to use any payout from the weather derivative contract to lock in the price of maize imports before market prices increase as a result of poor harvest due to drought.

Figure 13: Weather Index Insurance Investment Structure



The Bank acted as an intermediary between Malawi and reinsurance companies or investment banks for the transaction. Malawi was required to pay a premium up-front, which was financed by the UK Department of International Development (DfID). In addition, the bank also provided loans to farmers for growing productive crops under contract farming.

Barriers addressed

Although weather index insurance is still being applied globally, there are a number of barriers which were addressed through this product

Table 5: Barriers Addressed through Weather Index Insurance

Risk	Description
<b>Reduced risk of adverse selection</b>	Adverse selection can occur in agricultural insurance because farmers are more likely to buy insurance if they are a higher risk. In this case, farmers subscribed based on the terms, conditions, and payout scale for all farmers in their defined area, virtually eliminating the adverse selection problem for insurers.
<b>Reduced moral hazard</b>	In traditional insurance, farmers may be able to influence the claim (by exacerbating physical losses) through their behaviour, a phenomenon referred to as moral hazard. With this index insurance, farmers have no ability or incentive to influence the claim, since payout is based on an independent and exogenous weather parameter, independent of farmers' behaviour.

<b>Elimination of field loss assessment</b>	Loss assessment is a challenge for any traditional crop insurance program, because of the need to mobilise large numbers of skilled or semiskilled assessors who possess some agronomic knowledge. The ability of index insurance to make payouts without field assessment clearly reduces administrative costs, by eliminating the need for assessors.
<b>Reduced information requirements and bureaucracy</b>	Traditional insurance products require considerable work to collect data to establish yields and to classify farmers according to their individual risk exposures. Because of the use of the index, it is not necessary to collect such detailed data, nor to differentiate between individual farmers. This can be particularly useful in countries in which there is limited access to detailed data.
<b>Facilitating access to financial services</b>	By removing the most catastrophic, spatially correlated risk from vulnerable communities, successful index insurance markets have the potential to facilitate other financial instruments that are important for poverty alleviation and economic development.

### 3.2.5 Credit Mechanisms

Financing Conservation and Sustainable Land Use in the Peruvian Amazon<sup>14</sup>

#### Context/Overview

The lowland Amazon region of Peru is one of thirty-six internationally recognised ‘biodiversity hotspots’. However, rates of deforestation in the Peruvian Amazon have been rising over the past 15 years, particularly in the southern region of Madre de Dios. In 2014, Althelia Ecosphere, an environmental asset manager, partnered with the Peruvian Government and a Peruvian NGO to structure an innovative project in Madre de Dios, known as the Tambopata-Bahuaja Agroforestry Project. The project is a successful example of a public-private-people partnership. In particular, it aggregates funding from international public and private investors, a guarantee from a development institution, and co-financing from the Peruvian Government to address deforestation and social development in an at-risk area of the Peruvian Amazon.

#### Instrument Design

##### Investment structure

The primary financing for the project takes the form of a six-year (2014-2020) EUR 5.6 million loan from Althelia to Asociación para la Investigación y Desarrollo Integral (AIDER). AIDER benefitted from a low interest rate and has a three-year grace period in respect of capital and interest repayments. These repayments are earmarked from diversified revenue sources including the commercialisation of environmentally certified agroforestry products and certified environmental services such as carbon credits. The investment was divided into two major legs:

- a) The Production Leg, with a target to reach 1,250 hectares of agroforestry systems and launch of a cocoa producers social business (Cooperativa Tambopata - COOPASER), runs from Q2 2014 to Q4 2017;
- b) The Protection Leg, in order to secure operational expenses of the administration contract, including control and surveillance activities of Tambopata National Reserve and Bahuaja-Sonene National Park, that runs from Q2 2014 to Q2 2020.

<sup>14</sup> Financing Conservation and Sustainable Land use in the Amazon- Forest Trends Initiative



The overall investment of Althelia through AIDER is EUR 5.6 million, consisting of:

- EUR 3.6 million for the productive leg
- EUR 2.0 million for the protection leg

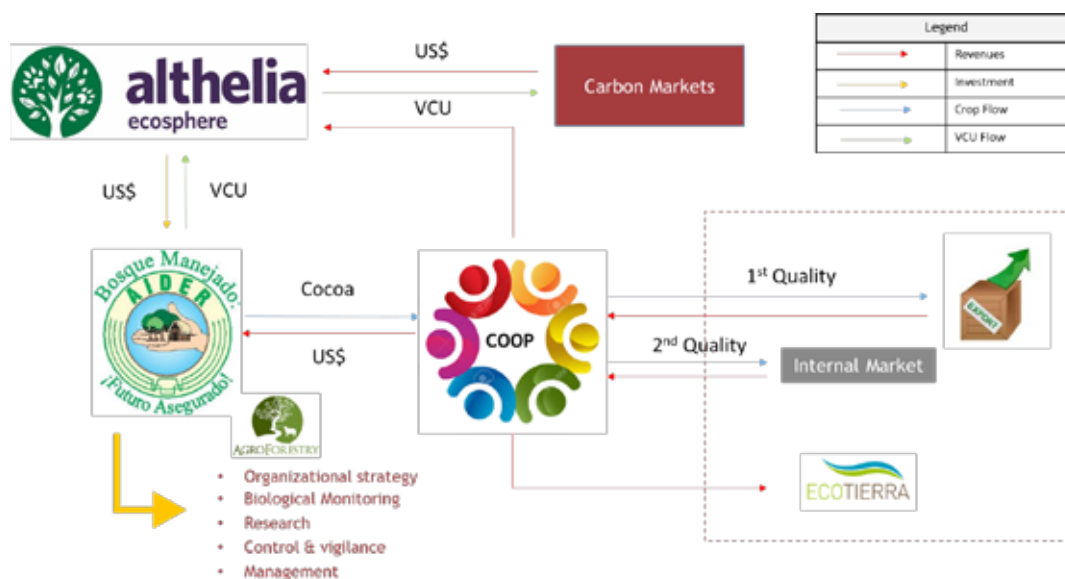
An additional grant US\$60,000 from Peru's Ministry of Environment (MINAM) has been given to COOPASER to establish a cocoa quality control lab within the cocoa fermentation and drying facilities financed by Althelia.

### Financial risk management

The loan from Althelia to AIDER has a term of six years and a low interest rate, and AIDER benefitted from a 3-year grace period over both principal and interest payments. These concessional terms gave AIDER operational and financial flexibility, as it did not need to prioritise early generation of cash flows to meet principal and interest payments, and furthermore the interest rate on the loan was significantly lower than the average market rate from commercial banks.

Althelia has included several financial mechanisms to reduce the credit risk of lending to AIDER and safeguard interest and capital payments. The main credit risks include - lack of farmer's experience working with cocoa, increasing migration, usage of agrochemicals and contamination of member farms, market price volatility, competing economic activities with illegal options like mining, climate, social and political risks, among others.

Figure 14: Production and Protection Component



### Fund level guarantee

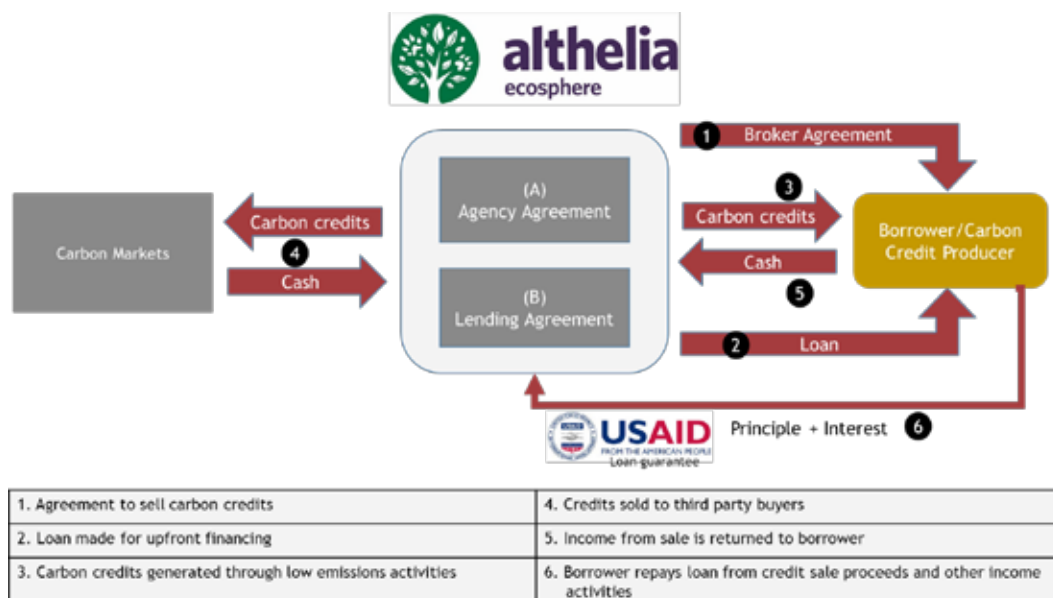
Athelia and United States Agency for International Development (USAID) entered into a partnership whereby the USAID Development Credit Authority (USAID DCA) guaranteed private investors in Althelia Climate Fund up to 50% of the fund's performance on a portfolio basis. The USAID DCA guarantee, for an amount of US\$133 million/EUR100m, was intended to support Althelia's global strategy to attract more private investors and has proven successful as Althelia was able to attract private investors into the Fund.<sup>15</sup>

In addition, the USAID DCA guarantee allowed Althelia to take more risks at a project level

15 USAID DCA makes partial loan guarantees available to financial institutions in partner countries to reduce the risk of private sector lending. The guarantee allows financial institutions to create new loan products, offer improved lending terms such as grace periods or reduced interest rates, and lend to higher risk sectors such as entrepreneurs and small-holder farmers. Between 1999 and 2015, USAID DCA unlocked around US\$4.2 billion of capital across 74 countries. The cumulative default rate is 2.36%.

including investment into projects which can earn carbon credits, where payments are directly and indirectly dependent on smallholder farmer activities. Such aspects are traditionally considered as risky by the financial sector. The figure below shows the articulation of Athelia's investment using the USAID DCA guarantee as a risk mitigation tool to attract private investors and reduce its credit risk profile.

Figure 15: Investment Structure and USAID Loan Guarantee



#### Acceptance of carbon credits as loan collateral and source of loan repayments

During the six-year term of the loan, around 4 million tons of verified carbon dioxide equivalent emissions reductions (tCO<sub>2</sub>e) is estimated to be generated from 12,000 hectares of avoided deforestation in the two protected areas under co-management by AIDER. The Carbon Credits will be validated and verified annually under the Verified Carbon Standard (VCS), the world's most widely used voluntary carbon standard, and the Climate, Community and Biodiversity Standards (CCB Standards) Gold Level and will be sold in the international carbon markets. In addition to the project activities, Athelia also financed the generating carbon costs such as monitoring, reporting and verification, third party certification bodies, among other costs that are incorporated in the project investment.

#### *Provision of In-Kind packages to producers rather than credits*

As part of the joint venture agreement between AIDER and COOPASER, all members of COOPASER received an in-kind package of farming inputs valued at US\$2,000/hectare, which was distributed over the course of three years. The package consists of seed inputs, grafting materials, fertilisers and farming tools.

#### *Primary revenue management and use of revenue sharing agreement*

To ensure strict control over the cooperative revenue and to maintain good governance over the cash management of the business, a revenue sharing agreement was agreed between COOPASER and AIDER. Once cocoa production reaches the required levels and the cocoa beans exports commence, COOPASER will assign to ACF the export sales invoices and the final client will pay directly to an escrow account. After subtracting capital amortisation and accrued interest for the working capital provided, Athelia will transfer the balance to COOPASER.

Under the revenue sharing agreement between COOPASER and AIDER, AIDER will receive from COOPASER, annually, the equivalent to 1.5% of sale proceeds to support conservation in the two protected areas, thus contributing to the financial sustainability of the Tambopata National Reserve and the Bahuaja-Sonene National Park.

It is expected that certified fair-trade and organic cocoa will provide price premiums that will support the operation and create the margins required to make the business sustainable for all practices.

### **Operational risk management**

#### *Establishment of cooperative*

A key element of the project design was the establishment of a new cooperative to aggregate farmers. Although incurring short term costs, these should be offset in the longer term by lower overall transaction costs and a reduction in the operational, social, and financial risks associated with dealing with individual farmers.

#### *Use of mixed-crop systems*

Farmers were encouraged to grow timber trees and bananas on their plots to create shade for their cocoa plants. Mixed cropping also provides alternative sources of income to meet short-term cash needs at differing harvest cycles and can address smallholder food security. Alternative crops are also important if cocoa trees fail to produce sufficient returns for reasons that are beyond farmers' control (such as reduced international cocoa prices, pests and/or climatic events).

### **Key challenges to be addressed**

**Table 6: Key Challenges to be Addressed**

<b>Challenges</b>	<b>Description</b>
<b>Lack of land title</b>	<ul style="list-style-type: none"> <li>• Farmers must have formal land title to join the project, in order to ensure land use stabilisation, engagement of the farmers in the long term, and avoid land trafficking</li> <li>• Acceleration of land title can increase the outreach of the project by integrating large number of smallholders and generating broader socio-economic and environmental impacts.</li> </ul>
<b>Working capital requirements</b>	<ul style="list-style-type: none"> <li>• Continuous flow of funds is required to procure seeds.</li> </ul>
<b>Lack of management and business skills</b>	<ul style="list-style-type: none"> <li>• Developing skills of farmers is critical to the project success</li> <li>• There is a need for an external trainer to assist farmers in acquiring skills to manage their farms in a profitable way, using the right combination of short-, mid- and long-term economic activities to optimise the economic returns on their farms.</li> </ul>





# Private Sector Involvement in Adaptation Activities

During the study, an assessment of the private sector involvement in adaptation projects across India was conducted through stakeholder consultations with large organisations, private sector banks and non-profits among others. The objective of this assessment was to examine private sector initiatives, financing model adopted, systems in place to ensure sustainability of the project and investment challenges faced and addressed. Information collected through desk review and in-depth interviews revealed the following barriers and drivers for involvement of private sector into adaptation related activities.

## Barriers for private sector

The private sector possesses the bandwidth to fund adaptation projects; however, they are constrained by certain barriers and challenges. Some of these were highlighted during the interviews conducted with them and these are listed below:

- **Lack of clear-cut financial revenue stream:** One of the major barriers for the private sector is identifying adaptation projects with a revenue stream. Private sector companies are driven by their profit motive and are not usually looking to invest in projects for philanthropic purposes alone. The value add generated by adaptation strategies and measures is frequently intangible making it difficult for the private sector companies to park their money in long-term adaptation projects.
- **Lack of alignment between adaptation priorities and private sector business models:** When we discuss priorities, there exists a large gap between the priorities of the private sector business models and typical adaptation activities. The priorities of adaptation activities focus on the underlying threats emerging due to climate change which include-: water and sanitation, waste management, health hazards due to pollution, public safety, etc. Whereas, for the private sector, the focus is on generating revenue and increasing their net profit. When the relevant decision makers are unaware of the need for adaptation, the corresponding issues and policies will never be a boardroom priority for private sector companies. Thus, when it is difficult to estimate the urgency and effectiveness of potential adaptation measures, other issues are often prioritized at the expense of adaptation.
- **Lack of internal knowledge for adaptation activities and adaptation finance:** Another major challenge prevailing in the private sector is the lack of knowledge and awareness about climate adaptation which is a new discipline and most lay people and companies are not well-versed in the nuances of adaptation. Therefore, lack of exposure to this sector also prevents companies from investing their money since they are unaware of the associated returns/benefits and the potential risks involved.
- **Lack of universal methodology to calculate intangible returns:** Once a decision is made in favour of a certain climate adaptation measure, the implementation challenge remains. Further, there are a set of challenges that lie before the implementation stage which need to be addressed. The measures should be compatible with the administrative and political framework. When the measures become unrealistic, the implementation is unsuccessful. In the era of technology, adaptation measures are technologically resolvable, but the potential solutions are not available to potential parties (because they are not financially viable). In many cases, the outcomes of these measure are complex and difficult to assess, especially when these impacts become evident only in the long term. Apart from this, due to the relatively brief history of the discipline, the consultant/experts do not have sufficient experiences with the monitoring and evaluation of these measures. Also, we do not have any set mechanism or tool to measure the effectiveness/result of these measures. All these factors add to the challenges of implementing these measures.

- **Externalities and Public Good nature** of adaptation strategies acts as a barrier in their implementation. Adaptation actions undertaken by private actors would provide goods that can be sold to generate revenue, but also public goods, which benefit others but don't generate direct revenues. Such actions wouldn't attract private investment. Examples of adaptation investments with the characteristics of public goods include investment in certain kinds of infrastructure (e.g., flood defenses), R&D programmes (where these generate spillovers that cannot be fully reaped by private companies), monitoring and warning systems and protection of ecosystems.

## Drivers for private sector

With climate change expected to lead to major impacts on human and natural systems, there seems to be an increasing risk for individuals, businesses and infrastructure, assets and economies. It could be stated that no single intervention will deliver adaptation to climate change, as cross-cutting sectoral efforts and across varied timescales will be required. There also lies an uncertainty around the timescales of climate change impacts, which go beyond normal investment decision cycles in the private sector.

Understanding what might drive and motivate the private sector and large domestic companies and MNCs to undertake adaptation projects or mitigation projects with adaptation as a co-benefit is critical for policymakers to address barriers and challenges by creating a favourable environment.

## Internal drivers

Internal factors and capabilities within the organisation can influence decision on climate change adaptation. Corporations are beginning to see climate change impacts in the form of

- Logistics and manufacturing operations disruptions
- Reduction in production capacity
- Increasing cost of materials and infrastructure maintenance
- Supply chain disruptions

To maintain operational stability and competitive advantage, corporations are undertaking mitigation (with adaptation co-benefits) and adaptation activities to reduce costs, minimize disruptions to production and services, increase profitability and improve their ability to do business (Averchenkova et al, 2016).

## External drivers<sup>16</sup>

Corporations are beginning to experience direct and indirect climate impacts. It is anticipated that these could increase in the future. These climatic impacts have been identified as one of the key drivers for private sector adaptation to climate change, as corporations start to internalize and consider these risks in their investment decisions. Some of the key external drivers for venturing into adaptation as visualized by corporates due to:

- Extreme weather events (affecting corporates with operations at multiple locations)
- Regulatory and legal drivers stipulating or encouraging adaptation action
- Increasing financial disclosure requirements on physical climate risks
- Investor and stakeholder pressure on climate risks and mitigation strategies

16 Multinational and large national corporations and climate adaptation: are we asking the right questions? A review of current knowledge and a new research perspective,

- Market drivers for new products and services with minimal environmental impact across the value chain (Averchenkova et al, 2016)

In line with these drivers several sectors have recognised that adaptation presents new opportunities and avenues for intervening and contributing towards rural development and building resilience. In addition, the UN Global Compact and UNEP report revealed that the private sector recognizes the interconnections between their operability and the societal well-being across their value chain, including suppliers, employees, customers and local communities.

Currently, private sector financing is focused on climate-proofing infrastructure, agriculture and water. However, UNFCCC has estimated that investment would be required for agriculture, water, health, ecosystem protection and coastal zone protection (UNFCCC, 2017). Private sector finance would be relevant to close the investment gaps in these sectors.

The following are few examples of adaptation activities from the private sector:

## 1. Adaptation as a mechanism for a climate resilient supply chain

### ITC Limited – Natural Resource Management (NRM) Initiatives

#### About ITC

ITC is a diversified conglomerate straddling a range of businesses within the FMCG segment including branded packaged foods, personal care products, cigarettes, lifestyle retailing, education and stationery products, and safety matches and incense sticks. Over the years ITC has evolved as an organization which has embedded societal value creation as a core strategy and has made far-reaching contributions to the cause of livelihood creations, particularly in the rural areas.

#### Project rationale

ITC through its Social Investments brand, 'Mission Sunehra Kal' develops innovative development models that are sustainable, replicable and scalable in addressing livelihood opportunities, while creating a positive environmental footprint. The two key stakeholders of ITC's CSR are rural households in the command area of the agri-catchments and communities residing around ITC's manufacturing locations. The initiatives under this programme are implemented with the ulterior objective of sourcing responsible products, minimizing supply chain risks due to climate related events, create sustainable livelihoods and enrich the natural resource base.

ITC's programmes are implemented with a two-horizon strategy

- Horizon - 1: Strengthening today's livelihoods through NRM initiatives including water stewardship, climate smart agriculture, integrated animal husbandry and social forestry
- Horizon – 2: Building the capabilities for tomorrow by improving habitats to reduce morbidity and ensure a healthy community, and skill development of youth for gainful employment

#### Framework deployed for implementing the NRM initiatives

ITC's Social Investments Programme (SIP) are implemented in partnership with Implementing Partners i.e. Non-Governmental Organizations (NGOs) in project mode, who come with domain expertise and grass-root community mobilization and leadership skills. The NGO's are selected after an operational and financial due diligence process, the agreements are renewed annually, ensuring long term sustainable partnerships. ITC's SIP includes initiatives on climate smart agriculture, social and farm forestry, soil and moisture conservation, livestock development, etc.



## Project financing

ITC approaches funding with focus on convergence of both private and Government funding.



A programme is initially totally funded (including NGO admin costs) by ITC and emphasis is laid on community contribution which is a measure of participation and ownership by community. Based on initial success, ITC works for mobilizing Government funds, through structured public private partnership (PPP) agreements and through schemes/programmes leveraged at the local level. ITC has PPPs with various state Governments and NABARD to leverage Government schemes like MGNREGA, MJSA, SBM, etc.

For a typical project the Government's proportionate funding ranges from 50 to 90% in the PPPs.

### Ensuring sustainability of the initiative through community ownership

The success of ITC's SIP is due to the transformative shift from 'dependent development' to a 'community-managed development model'. By engaging with communities, ITC has formed community-based organisations (CBOs) who are involved in project planning, implementation and operation & maintenance. Through the establishment of strong beneficiary support, funds are created for the sustenance of the initiative in the long run. For example, under the ITC's water stewardship programme, CBOs formed are called "Water User Groups (WUGs)" who are responsible for project implementation, up-front beneficiary contribution, operation and maintenance of watershed structures & activities. The WUGs maintain a fund known as "WUGs Maintenance Fund" in which all the WUG members contribute monthly for the O&M of the watershed structures and related activities. This kind of onus on the CBOs ensures long term sustainability of the programme.

## 2. Mitigating climate risks and conserving natural resources

Hindustan Unilever Foundation (HUF) – Water for Public Good

### About Hindustan Unilever

One of the largest FMCG companies in India, HUL owns around 35 brands spanning 20 distinct categories. The company strives on the vision to deliver growth by serving society and the planet. In line with this vision, HUF was set-up as a non-profit organization to act as a vehicle which spurs water management and community development initiatives across India.

### Project rationale

Built on the holistic 'Sustainable Living' strategy, HUF's water programme is aimed at addressing water scarcity holistically to enable HUL to thrive in a resource constrained world. 90% of water is consumed at home due to the home care and other beauty products thereby shifting the consumer demand for the products. As water is critical to their business, it is imperative for HUL to create products with the same quality but with lesser water consumption.

HUF is implementing 'Water for Public Good' programme across 19 states and 57 districts in the following areas:

- Mitigate drought distress
- Enable water security
- Promote water use efficiency
- Community institutions for water governance

#### Benefits envisaged by HUF

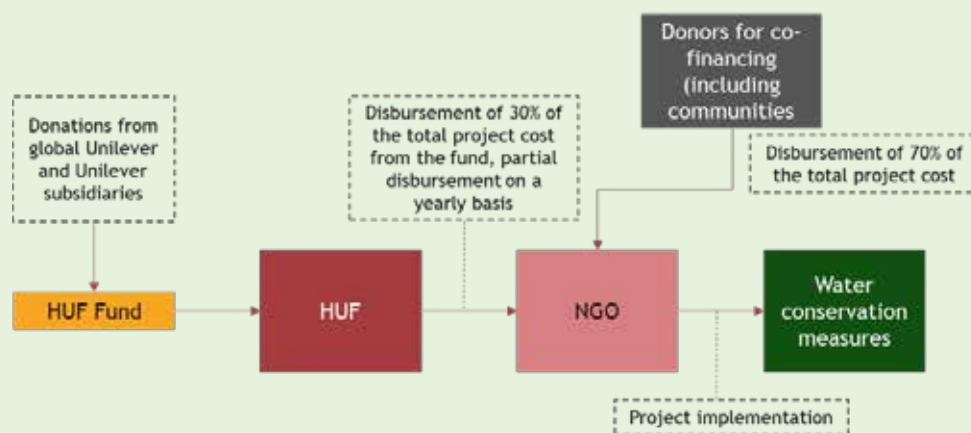
Through its initiatives in the country, HUL reduced the water usage in its manufacturing operations. Realising the stress on water availability due to climate change, HUL through the 'Water for Public Good' programme, aims to look beyond its value chain to address the root causes of water stress and work collaboratively with the community. Apart from increasing the efficiency of water use and availability of water, it also aims to generate farm and allied employment, enhance agricultural production and generate income for the communities.

#### Framework deployed for implementing water conservation initiatives

HUF's programme is implemented through NGOs in project mode, who come with domain expertise and grass-root community mobilization and leadership skills. HUF provides the required investment and the implementation is undertaken by the NGO.

#### Project financing

HUF approaches the project on a co-financing basis with emphasis on tapping existing Government schemes and other funds for the implementation of the project.



For a typical project, HUF provides funding for 4-5 years amounting to around 30% of the total project cost whereas the remaining 70% is sourced from co-financers including NABARD and other organisations. Communities are also required to co-finance in order to ensure the ownership and success of the project. HUF disburses the fund on a yearly basis based on the estimated budget for each year of the activity.

### 3. Mitigating climate risks through Enterprise Risk Management

#### Hindustan Coca Cola Beverages (HCCB) – Water Stewardship and Replenishment

##### About HCCB

HCCB is one of India's largest beverage manufacturing and distribution companies. It is responsible for the manufacture, package, sale and distribution of beverages under the trademarks of The Coca-Cola Company. The Company owns and operates 21 factories in India. It also sources from and supports 11 contract packers' plants.

### **Project rationale**

Water is the primary ingredient in most products and central to their manufacturing process. As India is a water stressed region, HCCB encountered opposition to their operations due to misperceptions about water pollution or water depletion at the detriment of communities.

During the group wide risk management study, 'Source water risk' emerged as one of the key enterprise risks which needs to be mitigated with utmost urgency, thereby, demanding disclosures on mitigation actions from global investors. It was therefore quintessential for HCCB to advance water stewardship to the Indian sub-continent in and around the areas where they operate.

### **Benefits envisaged by HCCB**

The ultimate objective of the programme is to 'replenish equivalent (or more than) the water HCCB uses annually'. As a result of these efforts, Coca-Cola India has achieved full balance between total water used in beverage production and that replenished through community water projects.

Although most of the actions identified were targeted towards mitigating the risk, the initiatives also have a co-benefit in the form of vulnerability reduction and building community's adaptation to water.

### **Framework deployed for implementing water replenishment initiatives**

HCCB's 'Source Water Protection Plan' are implemented in partnership with the community, local Government, civil society and businesses who wish to collaborate. This approach fosters greater transparency and enables HCCB to work collaboratively to address vulnerabilities that may exist since concerns around water quantity and quality are shared by all who rely on a shared water source. Some of the initiatives with communities include rain-water harvesting, restoration of traditional community water bodies and sustainable agriculture practices.

## **4. Implementing clean energy solutions in agriculture for livelihood and value chain improvement**

RBL Bank and Global Climate Partnership Fund (GCPF)– Clean energy solution for reducing water consumption and increasing yield<sup>1</sup>

### **About RBL Bank**

RBL Bank is one of India's fastest growing private sector banks and services over 3.98 million customers through a network of branches and ATMs spread across 20 Indian states and Union Territories. RBL Bank introduced GCPF financed climate loans for the agricultural segment in 2013 and has since disbursed US\$21 million in the area.

### **Project rationale**

The biggest challenge facing the world today is food security. While there are constantly more people to feed, natural resources are being depleted and production itself suffers from the effects of climate change. In India some 70% of the people depend on agriculture. Agriculture therefore is considered as one of the critical sectors when it comes to climate adaptation.

In addition, the sector is an important source of livelihood as well as a massive market which requires around US\$200 billion worth annual credit to grow food. Out of this, US\$100 billion comes from organized sectors like bank which provides the commercial sustainability for financing agriculture initiatives.

### **Framework deployed for implementing water replenishment initiatives**

The approach known as 'Value Chain Linkage' brings together big corporate houses (retailers) and farmers. The corporates require the farmers to grow food since they cannot grow for themselves. By linking up with them, the following benefits accrue to both companies and farmers:

- Guaranteed supply of crop
- Farmer obtains access to a buyer for the produce
- Farmer gets favourable prices
- Increased income and ability to repay the loan

Underlying these outcomes, the objective of the approach was to offer a solution which could improve the livelihood as well as mitigate climate change. Irrigation was identified as the primary solution since it consumes both water and energy. Despite water and electricity being provided free of cost to farmers, the availability of the same was the ulterior motive for undertaking this initiative.

The solution proposed was ‘Micro-Irrigation through energy efficient and solar based pumps.

#### Project financing

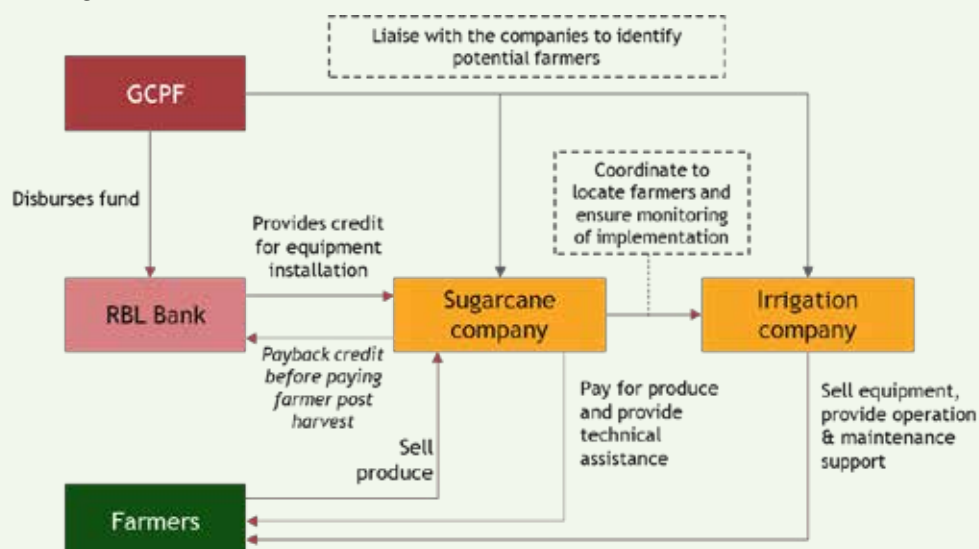
The irrigation mechanism proposed here costs roughly US\$1,000 per system with replacement of pump sets requiring US\$120 billion. A partnership was created between GCPF, RBL bank, sugarcane company and irrigation company to implement the project.

#### *Three party lending model*

To deliver the product to the farmer, the sugarcane company and irrigation company were tasked with the identification of farmers thereby reducing the cost of delivery of credit. As for repayment, sugarcane company and RBL have a deal wherein the bank gets paid by the company before they pay the farmer for the produce. With this approach there is a win-win situation created for all the project proponents:

- Farmers’ income increases
- Irrigation company’s sells its equipment
- Sugarcane company relies on better harvest
- Bank gets access to large number of customers with reduced cost of due diligence owing to reliance on the other companies for identifying the farmers

The lending model is shown below



#### Scaling up the model

Around 45% of the agriculture system uses irrigation, out of which only 5-7% is reliant on water-efficient irrigation system. The primary approach should be to target farmers who use irrigation and make them shift to an efficient system which can save water.

Climate funds like GCPF can play an important role by giving long-term credit, thereby enabling banks to provide this sort of financing to farmers. In addition, the tenure and availability of credit for new technologies could also be augmented well by these funds. By clubbing credit with technological intervention many solutions like this could be realized.

## 5. Building adaptive capacities of the community through CSR funds

Arvind Limited– Training and capacity building of farmers on sustainable agriculture practices

### About Arvind Limited

Arvind Limited (formerly Arvind Mills) is among the top players in this sector in India with its strong presence in Ahmedabad, Gujarat, a state with prominent position in textile sector in the country because of its uniquely preserved sanctity of culture and tradition. The company has diversified its business segments comprising of textiles, brands and retail and others. The company has several manufacturing facilities in India spread over eight locations and grouped into 6 Operating Clusters.

### Project rationale

With the company establishing its footprint across India, it was essential to create a positive impact around the locations where they operate. In line with the compliance as per section 135 of the Companies Act 2013, the company works extensively towards improving yields for farmers. As part of this, the following initiatives are directed towards the farmers

- Organic cotton project
- Better Cotton Initiative (BCI)

The objective of these initiatives is to provide training and capacity development of farmers on improved and climate resilient agri-practices which could thereby increase yield and livelihood.

### Benefits envisaged by Arvind Ltd.

Cotton is a key raw material for Arvind Ltd. With growing demand for garments, sustained supply of cotton at competitive costs is essential for the company. Therefore, the focus of the company was to promote effective and efficient methods of cotton farming to enhance the yield. The initiative also aimed to reduce child labour in farms.

Framework deployed for implementing water replenishment initiatives

#### *Organic cotton*

Through a contract farming model Arvind helps farmers reduce fertilizer and pesticide use in the farm fields of 3,700 farmers covering 27,000 acres in Vidarbha region. A direct buying-at-doorstep policy and a seven-day payment cycle, along with an elimination of all forms of exploitation by middlemen, has further helped improve the farmers' income levels.

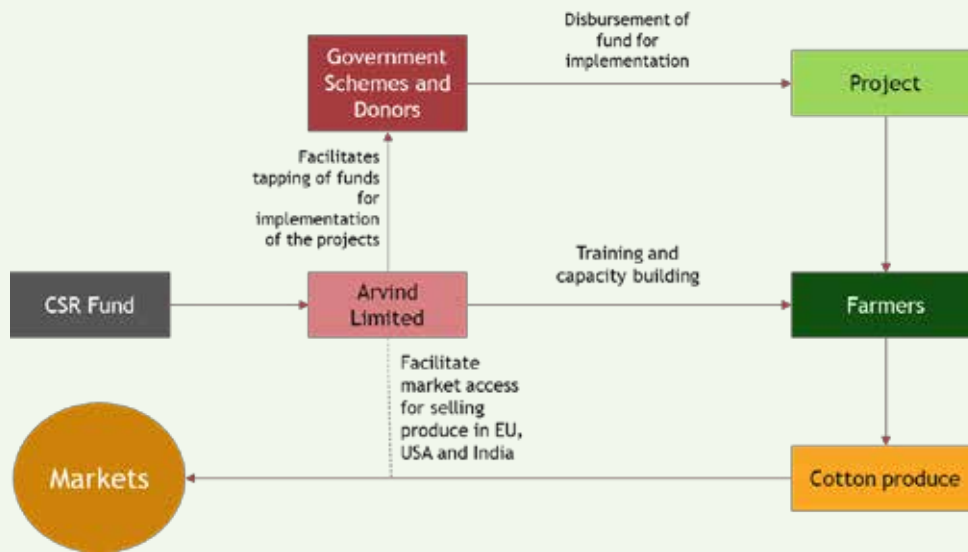
#### **BCI**

To secure sourcing of more sustainable cotton, Arvind works with BCI to grow cotton through controlled application of water, chemical fertilizers and pesticides. By assisting farmers with this initiative, Arvind also supports them by procuring 50% of the organic cotton and assists them with the marketing of rotational crops in Europe, U.S.A and India.

Under this initiative, Arvind covers 15,815 hectares of farmland and works closely with 4,000 farmers.

## Project financing

The main funding for implementation is tapped from Government schemes and donors, whereas the cost for training and development is borne by Arvind. The model in which the project operates is shown below:



## Key takeaway

Building on the above discussions large corporations experience different combinations of climate risks, some of which are internal, while some emerge across value chains and others relate to external risks such as shareholder expectations and regulatory markets. Organisations are moving away from the conventional business continuity or emergency preparedness plans to a more holistic enterprise level risk assessment to reduce vulnerabilities. Such assessments provide organisations with the opportunity to evaluate the outcome of the pertinent risks and assists them in decision-making or making investment choices.









# Conclusion

The study reviewed the adaptation scenario including the various projects being implemented, financing mechanisms for climate change adaptation and identified potential innovative climate finance instruments which were implemented globally. The study also provided insights into the current adaptation activities and financing scenario in India. It is evident that the Government is primarily responsible for implementing climate change adaptation in India and there seems to be lack of funds which hampers the implementation of adaptation activities on a larger scale. Lack of financial resources including lack of credit facilities, loans and subsidies appear to be key barriers for enhancing adaptation finance. However, since adaptation activities place significant pressure on Governments to infuse additional budgets, involving the private sector appears to be a viable and necessary solution for the long-term.

From the private sector perspective, adaptation (including finance) is not a mainstream portfolio in India, although there seems to be a recognition on the need to work not only on mitigation but also on cross-cutting initiatives with adaptation benefits. The need for adaptation finance is also affirmative among the private sector despite this not being considered as a distinct method of financing and continues to be conceptual in nature. Having said this, the study has aided in establishing the potential drivers for scalability of adaptation projects by private sector which are summarised as follows:

- Climate risks are considered as a critical enterprise risk which needs to be addressed with immediate action
- Strengthening of supply chains through de-risking measures is essential, since organisations have a sizeable share in local economies and are likely to have a significant impact on overall resilience and adaptive capacities of the society
- PPPs or multi-sectoral, multi-stakeholder partnerships are receiving increasing attention as key instruments for tackling climate change concerns as they harness the strengths of private, public, and non-profit partners
- Leveraging the knowledge of Governments and communities on local scenarios can enable the private sector to develop more robust adaptation strategies which can build adaptive capacities of the communities and ensure that their adaptation activities reduce the climate change vulnerabilities faced by these communities

#### **Linkage between adaptation and Paris Agreement**

The Paris Agreement (PA), which was adopted in December 2015 and came into force in November 2016, sets out the long-term goals for all Parties to limit the global temperature increase to well below 2°C, while pursuing a 1.5°C target. Article 6 of the PA establishes new cooperative approaches where countries can voluntarily work together to achieve their respective NDC targets. Article 6 establishes the foundation for international carbon markets post 2020, while Article 6.2 and 6.4 are mitigation focused, Article 6.8 mentions non-market approaches for adaptation. The Adaptation Fund was initiated to be primarily financed by a share of proceeds from clean development mechanism (CDM) project activities and can be considered as an example of linking carbon markets with adaptation.:

- Article 6.2, which allows Parties to cooperate using “internationally transferred mitigation outcomes” (ITMOs);
- Article 6.4, which establishes a new mitigation and sustainable development mechanism.
- Article 6.8, which enables parties to recognize the importance of integrated, holistic and balanced non-market approaches being available to Parties to assist in the implementation of their nationally determined contributions, in the context of sustainable development and

poverty eradication, in a coordinated and effective manner, including through, inter alia, mitigation, adaptation, finance, technology transfer and capacity-building, as appropriate. These approaches shall aim to:

- (a) Promote mitigation and adaptation ambition;
- (b) Enhance public and private sector participation in the implementation of nationally determined contributions; and
- (c) Enable opportunities for coordination across instruments and relevant institutional arrangements.

As observed from the review of current adaptation projects and our experience from working on NRM project, we foresee that these are cross-cutting projects with adaptation and mitigation benefits. These projects could be piloted under Article 6 of the Paris Agreement as they also come with a host of mitigation benefits and they could also be aligned with the Nationally Determined Contributions (NDC).

<b>Adaptation Thematic area</b>	<b>Agriculture</b>
<b>Potential project</b>	Promotion of climate resilient agriculture practices for improving crop production, livestock and fisheries coupled with insurance products for increasing resilience of farmers
<b>Potential financing instrument</b>	<b>Hybrid instrument involving</b> <ul style="list-style-type: none"> <li>• Crediting mechanism (for generation of carbon credits / mitigation outcomes)</li> <li>• CSR funds (Raising upfront capital)</li> <li>• Insurance (Reducing risk of crop failure)</li> </ul>
<b>Benefits</b>	<ul style="list-style-type: none"> <li>• Building adaptive capacities of the community through capacity building as well as increasing resilience of farmers in case of disasters</li> <li>• Reduce emissions through reduced fertilizer use and reduced fuel used for tillage</li> </ul>
<b>Reference case studies</b>	<ul style="list-style-type: none"> <li>• ITC NRM initiative</li> <li>• SRI Nepal</li> <li>• Malawi Weather Index</li> </ul>

<b>Adaptation Thematic area</b>	<b>Water</b>
<b>Potential project</b>	Promotion of micro-irrigation practices using energy efficient pumps (including solar based) to increase crop yield as well as to reduce water consumption through reduced water withdrawal
<b>Potential financing instrument</b>	<b>Hybrid instrument involving</b> <ul style="list-style-type: none"> <li>• Crediting mechanism (for generation of carbon credits / mitigation outcomes)</li> <li>• Green Bonds (Raising upfront capital)</li> <li>• Microfinance (Providing credit facilities)</li> <li>• Insurance (Reducing risk of crop failure)</li> </ul>

<b>Benefits</b>	<ul style="list-style-type: none"> <li>• Emissions reduction from reduced pumping operations for water withdrawal</li> <li>• Improved groundwater level across the area of operation</li> </ul>
<b>Reference case studies</b>	<ul style="list-style-type: none"> <li>• RBL-GCPF</li> <li>• SRI Nepal</li> <li>• Malawi Weather Index</li> </ul>

<b>Adaptation Thematic area</b>	Coastal management
<b>Potential project</b>	Coastal area development through plantations (including mangroves) and integrated fish farming
<b>Potential financing instrument</b>	<b>Hybrid instrument involving</b> <ul style="list-style-type: none"> <li>• Crediting mechanism (for generation of carbon credits / mitigation outcomes)</li> <li>• CSR funds (Raising capital)</li> <li>• Crowd funding (Raising capital)</li> </ul>
<b>Benefits</b>	<ul style="list-style-type: none"> <li>• Flood prevention in the coastal areas</li> <li>• Reduction of sea water intrusion</li> <li>• Carbon sequestration from plantation activities</li> </ul>
<b>Reference case studies</b>	<ul style="list-style-type: none"> <li>• Peru Agroforestry</li> <li>• SRI Nepal</li> </ul>







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# Annexure

# Annex 1 - Pilot Ready Innovative Climate Finance Instruments

Based on the detailed analysis of the financial instruments being used across the world, three instruments were developed for the Indian context. These instruments can be employed to mobilise investment for adaptation action in different sectors. The section below elaborates on these financial instruments.

## a) Methane Emission Reduction by Adjusted Water Management Practice in Rice Cultivation

### Summary

Rice is a staple food for the Indian population. The conventional system of rice cultivation utilises large quantities of water for irrigation. It also contributes directly to GHG emissions primarily in the form of methane (CH<sub>4</sub>). In view of the growing climatic variability, water intensive cultivation, and increasing scarcity of natural resources, it has become essential to implement adjusted water management practices of rice cultivation. Such practices not only contribute to water savings, they also result in reduction of CH<sub>4</sub> emissions.

This proposed project has been designed as a results-based financing tool to generate revenue through trading of carbon credits. Areas where methods like SRI, Direct Seeded Rice (DSR) are being practised will be targeted. Overlaying upon the existing work being carried out to promote such methods, a Programme of Activities (PoA) will be created and registered with either the Clean Development Mechanism (CDM) or a voluntary standard like the Gold Standard (GS), Verified Carbon Standard (VCS), etc. In order to implement the above project, upfront costs will be borne by a private entity. The carbon credits would not only validate the mitigation benefits of the project but would also validate socio-economic co-benefits in the form of increased adaptive capacities. The revenue generated from the trading of carbon credits will be shared between the private entity and the farmers/ farmer producer organisations (FPOs).

### Introduction

In recent decades, climate change has impacted both natural and human ecosystems across the world. Climate change impacts such as irregular monsoon, recurring drought, increased frequency of floods and extreme heat waves are severely affecting biodiversity, ecological systems, coral reef, wetlands, forests and food production.

As per numerous scientific estimates, past and future emissions of GHGs will continue to cause changes in the climate system, increasing the likelihood of impacts on ecosystems as well as economies. The latest assessment of IPCC indicates that global warming of approximately 1.0°C has already been witnessed due to anthropogenic GHG emissions. It is also projected that the temperature rise will likely reach 1.5°C between 2030 and 2052, if it continues to increase at the current rate (IPCC, 2018).

The agriculture sector is heavily dependent on the vagaries of climate change. Agricultural output is vulnerable to change in climatic variables like increase in temperature and change in precipitation patterns, rising intensity and frequency of extreme weather events, and water availability. The performance of agriculture sector has a direct bearing on food supplies and food security.

Impacts of climate variability are being witnessed in the Indian agriculture sector. An assessment of impact of climate change on the productivity of major crops has shown a variable rate of change

in agriculture production, including losses in some crops due to climate change. For example, the yields of maize and sorghum in Western Ghats is likely to be reduced by 50% (INCCA, 2010). Apart from climatic variability, the Indian agriculture is also facing challenges in the form of increased competition for land, water, and labour from non-agricultural sectors. Keeping this in mind, it is essential to implement and upscale adaptation strategies.

### **Adjusted Water Management Practices**

India is one the leading producers of rice in the world. It is the major source of food after wheat and meets 43% of the calorie requirement of more than two-thirds of our population. In India, it is cultivated on an area of 43.4 million hectares with a total production of 104.32 million tonnes during 2015-16 (MOSPI, 2018).

The conventional system of rice cultivation involves transplanting germinated seedlings of paddy in a flooded field. This method uses large quantity of water for irrigation. It has been reported that water upto 5,000 litres is used to produce 1 kg of rice (Kaur & Singh, 2017). Growing climatic variability coupled with current water intensive practices of cultivation, and increasing scarcity of resources like water, labour, and fuel climate necessitates the application of adjusted water management practices in rice fields. These include techniques like the SRI, DSR, and other practices that maintain intermittent flooded conditions in the field.

SRI is an agro-ecological methodology for increasing the productivity of irrigated rice by changing the management of plants, soil, water and nutrients. In SRI, younger seedlings of rice are transplanted into the field, and water is managed carefully to maintain non-flooded aerobic soil conditions. In DSR, rice seed is sown and sprouted directly on the field.

### **Climate Benefits**

Food production in India is largely dependent on irrigated water. As mentioned earlier, climate change and variability will have significant impact on the availability of water resources, enhancing competition for water use among different sectors including agriculture. In such a scenario, these practices become more relevant as it results in water savings.

Agriculture contributes in the emission of GHGs, particularly CO<sub>2</sub>, CH<sub>4</sub> and nitrous oxide (N<sub>2</sub>O), contributing to global warming. Rice production systems are primarily responsible for the emissions of CH<sub>4</sub> and N<sub>2</sub>O. The conventional method of flooding rice culture with puddling and transplanting is considered one of the major sources of CH<sub>4</sub> emissions. It accounts for 10-20% of total global annual CH<sub>4</sub> emissions. Adjusted water management practices contribute to climate mitigation by reducing CH<sub>4</sub> emissions.

### **Instrument Description**

Adjusted water management practices are being promoted extensively in the country as a part of several programmes and initiatives. For example, NABARD has been promoting the uptake of SRI among farmers under the ambit of Umbrella Programme on Natural Resource Management (UPNRM). Technical and financial assistance was provided to the farmers to promote the method of SRI cultivation.

### **Programme of Activities**

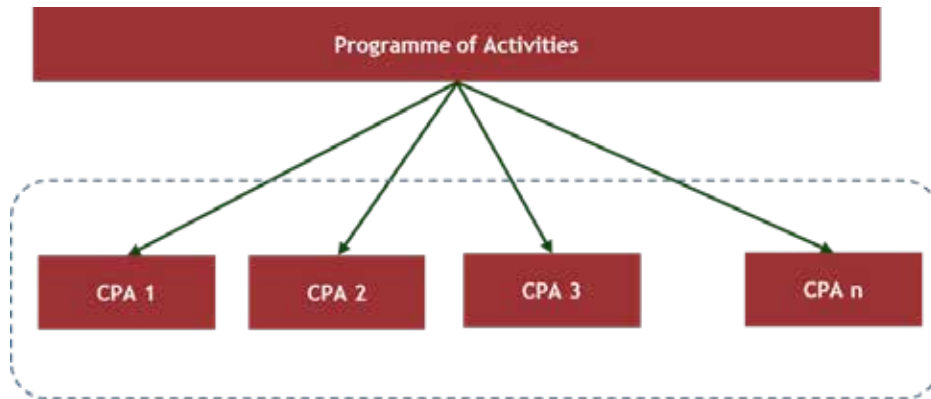
Programme of Activities was introduced under the ambit of CDM to reduce the transaction cost of project registration and expand the mechanism's applicability to micro project activities.

By definition, a PoA is considered a voluntary coordinated action by a private or public entity, which coordinates and implements any policy/measure or stated goal (i.e. incentive schemes and voluntary programmes), which leads to GHG emission reductions or increase in net GHG

removals by sinks, that are additional to any that would occur in the absence of the PoA, via an unlimited number of CDM programme activities (CPA). These individual activities can be considered in aggregate, without requiring each CPA to undergo individual registration and issuance process. A PoA is coordinated or managed by a private or public coordinating entity (CME) and doesn't necessarily achieve GHG reductions itself, but rather promotes others to do so. The structure of a PoA along with its CPAs is depicted in Figure 2.

PoA development opportunities are also available in voluntary markets which are not regulated by the Kyoto Protocol or the UNFCCC.

Figure 16: Structure of a PoA along with its CPAs



The current project aims to build upon such initiatives. This project has been designed as a results-based financing tool to generate revenue through trading of carbon offsets in the carbon markets. The project will involve creation of a PoA which will be registered through CDM or a voluntary mechanism like the GS, VCS, etc. In the project, ~1% of the total land under rice cultivation in the country is being targeted. While mitigating the emissions, the project also aims to improve the adaptive capacities of the farmers. The key benefits of the project are summarised in the Table 7 below:

Table 7: Benefits of the Project (Instrument 1)

Climate Benefits	Socio-economic Benefits
<ul style="list-style-type: none"> <li>Reduction in CH<sub>4</sub> emissions</li> <li>Reduced utilisation of water for irrigation</li> </ul>	<ul style="list-style-type: none"> <li>Increased yield of rice</li> <li>Reduced cost of cultivation</li> <li>Increased income of farmers</li> </ul>

## Stakeholders

The key stakeholders involved in the project are mentioned below:

- Coordinating and Managing Entity (CME):** PoA will be coordinated by a CME. The CME should either be well versed with the process of CDM/voluntary markets and its technicalities, or be supported externally with such expertise.
- Farmer Producer Organisations:** Collectivisation of farmers, especially small and marginal farmers are being promoted in the country to address the challenges faced like access to investments, technology, inputs and markets. FPOs will be included as CPAs/ Voluntary Programme Activities (VPAs) in the proposed PoA.
- Farmers:** This will include farmers who have adopted any of the adjusted water management methods.



- **Validator/Verifier:** All emission reductions generated under the programme must be monitored, reported and verified. Third party reviewer would create a monitoring plan, review the CPAs/ VPAs, and submit the monitoring report to either CDM/ voluntary mechanism for the issue of carbon credits.

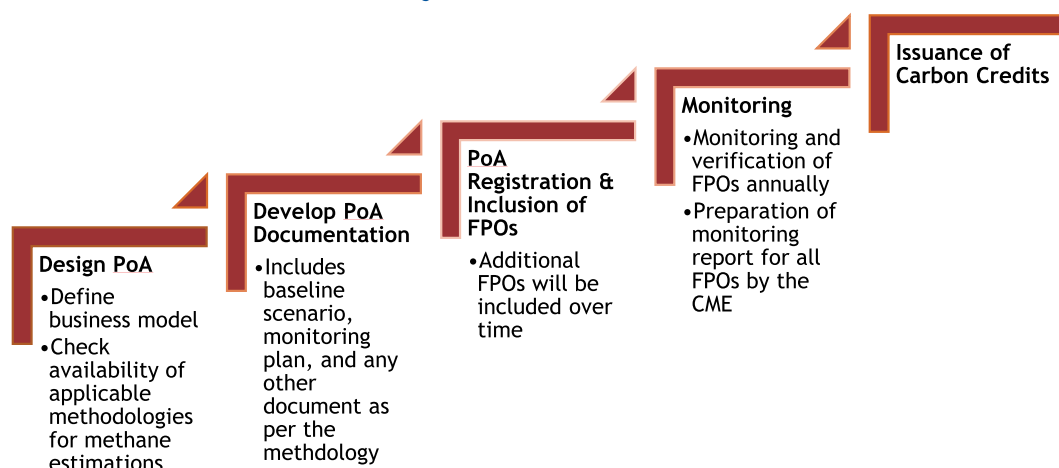
Details of tasks proposed to be conducted by the stakeholders are mentioned in Table 8 below:

**Table 8: Role of Stakeholders in the Project (Instrument 1)**

Stakeholders	Tasks
Coordinating and Managing Entity	<ul style="list-style-type: none"> <li>• Design the PoA</li> <li>• Preparation of documentation for the registration of PoA, either in-house or through a consultant</li> <li>• Obtain letters of approval and authorisation from the CDM/ voluntary mechanism</li> <li>• Coordinate with validators/verifiers for monitoring and verification</li> <li>• Coordinate the issue of carbon credits</li> <li>• Responsible for carbon trading</li> </ul>
Farmer Producer Organisations	<ul style="list-style-type: none"> <li>• Create awareness about adjusted water management practices and build capacities of farmers</li> <li>• Support farmers in accessing information, resources, and technology as well as investment.</li> </ul>
Farmers	<ul style="list-style-type: none"> <li>• Cultivate rice using adjusted water management practices</li> </ul>
Validator/Verifier	<ul style="list-style-type: none"> <li>• Create a plan for monitoring and review</li> <li>• Conduct monitoring based on a selected methodology</li> <li>• Prepare and submit the monitoring report to CDM /voluntary mechanism for issuance of carbon credits.</li> </ul>

The PoA process is shown in Figure 17:

**Figure 17: Process of PoA**



The project timeline has been provided in Table 9 below:

**Table 9: Project Timeline (Instrument 1)**

Validation and Registration of PoA	15 months
Inclusion of FPOs in PoA in the First Year	1 month
Monitoring (Occurs after 1 year of registration/ inclusion)	2 months
Issuance of Carbon Credits	1 month
Crediting Period	10 years

The development of this programme requires the application of an approved methodology for baseline setting and monitoring. The AMS-III.AU small-scale methodology on methane emission reduction by adjusted water management practices under the CDM can be used for developing the PoA. This methodology can also be used for standards like VCS and Gold Standard (UNFCCC, 2014). The methodology includes projects such as:

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

The Cool Farm Methodology can also be used. This methodology is based on the cool farm tool for accounting of emission reductions for agricultural commodities along the production and supply chain. It can also be used for calculating emissions from livestock products (The Gold Standard, 2016).

For the financial analysis and calculation of emission reduction estimates, it has been assumed that the farmers are practicing SRI method of rice cultivation. Assuming a linear growth in the area covered, the summary of computed emission reduction estimates is mentioned below:

**Table 10: Emission Reduction Estimates**

S. No.	Area (in hectares)	ER estimate (tCO <sub>2</sub> e)
1	10,000	21,600
2	53,333	1,15,200
3	96,667	2,08,800
4	1,40,000	3,02,400
5	1,83,333	3,96,000
6	2,26,667	4,89,600
7	2,70,000	5,83,200
8	3,13,333	6,76,800
9	3,56,667	7,70,400
10	4,00,000	8,64,000

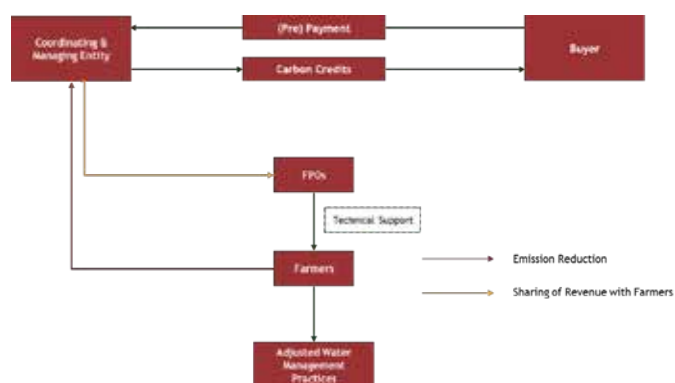
## Potential Financing Model

In the current model, it has been assumed that the CME is a commercial entity which will bear the investment costs. However, CME can also avail grants from Government entities/ corporates/ foundations to partially/ fully cover the investment costs.

Typical investment costs will include:

- PoA management costs;
- Consultancy fees for preparation of relevant documentation (such as the Project Design Document (PDD) and the Monitoring Report (MR) for CDM);
- Baseline and project data monitoring costs;
- Fee for the validation and verification; and
- Registration and issuance fees.

**Figure 18: Potential Financing Model (Instrument 1)**



CME can outsource the activity of preparation of PoA documentation. The documentation preparation, monitoring costs, and auditor fees are not linked to the emissions reduction estimates. However, the registration and issuance fees are a direct function of a project's emissions reduction potential. The registration fee is paid at the time of the request for registration (once only), or at the time of first issuance of carbon credits in case payment of the registration fee is deferred.

If the project is developed as a CDM project, there is no registration fee if estimated emission reduction is less than 15,000 tonnes of CO<sub>2</sub>. For projects with more than 15,000 tonnes estimated emission reduction, USD 0.10 per certified emission reduction (CER) for the first 15,000 tCO<sub>2</sub>e, and USD 0.20 per CER thereafter is charged as registration fee. In case of VCS, the registration fee is charged at USD 0.10 per estimated annual volume of emissions reduction; capped at USD 10,000. The registration fee is credited toward future issuance levies. The VCS issuance levy is computed for each issuance event at USD 0.10 per Verified Carbon Unit (VCU) for the first 1 million VCUs.

The cash inflow will come from the sale of carbon credits. CME will be responsible for the identification of potential buyers and trading of carbon credits. The project developer may solicit advance payments from the future buyer of carbon credits. The price of the credits can either be fixed or floating. The revenue generated in this case can be used for covering the upfront investment costs. The other scenario is that part of the credits may be sold upfront, and part may be sold after the issue of credits. The revenue generated will be shared in an equitable and transparent way among the CME and farmers.

The assumptions for financial analysis have been mentioned in Table 11 below:

**Table 11: Assumptions for Financial Analysis (Instrument 1)**

S. No.	Particular	Unit	Quantity	Source
1	Area covered in 10 years	Hectares	400,000	Assumption: ~1% of the total area under rice cultivation
2	Cultivation period	Day/year	120	
2	Emission factor of CO <sub>2</sub> e	kgCH <sub>4</sub> /ha/day	0.72	(UNFCCC, 2014)
3	Global Warming Potential of CH <sub>4</sub>		25	(IPCC, 2006)
4	Average price of credit issued against CO <sub>2</sub> e	USD	2.4/tonne of CO <sub>2</sub> e	<a href="https://www.forest-trends.org/wp-content/uploads/2018/09/VCM-Q1-Report_Full-Version-2.pdf">https://www.forest-trends.org/wp-content/uploads/2018/09/VCM-Q1-Report_Full-Version-2.pdf</a>

Estimates of cash inflow and outflow has been carried out with reasonable assumptions to determine the Net Present Value (NPV)

**Table 12: Summary of Financial Analysis (Instrument 1)**

Description	Price (in USD)	Remark
PoA Management Cost	61,100	Project management cost per year
Registration Cost	Nil for estimated carbon credit <15,000.  Over 15,000 estimated carbon credit: USD 0.10 per CER for the first 15,000 tonnes of CO <sub>2</sub> equivalent, and USD 0.20 per CER thereafter.  USD 0.10 per estimated annual volume of emissions reduction; capped at USD 10,000 in case of VCS	-
Monitoring Cost for Baseline Survey	15,000	Assumed
Consultancy Fee	25,000 USD in the first year and 15,000 USD thereafter	Preparation of project documentation
Verification	15,000	Assumed fees per year
Issuance fee	0.10 per carbon credit for the first 15,000 tCO <sub>2</sub> e, and USD 0.20 per carbon credit thereafter (first year's issuance fee adjusted against registration fee)	-
Discount rate	4%	Assumed

An analysis was also conducted to ascertain the minimum land area and price of carbon required for a positive cash flow (net present value).

**Table 13: Analysis of Minimum Land Area and Carbon Price for Financially Sustainable Project (Instrument 1)**

Land Area (Hectare)	Price of Carbon (USD/ tCO <sub>2</sub> e)
10,000	10.1
50,000	2.2
100,000	1.5
400,000	0.8

From the above analysis, it can be ascertained that at current rates of carbon, minimum of 50,000 hectares of land should be covered under the project for it to be financially sustainable.

While the above financial analysis has been done keeping SRI in mind, this model is applicable to other adjusted water management practices as well.

#### Regulatory Approvals and Policy Support

Adjusted water management practices are being promoted by the Government of India as a part of the National Mission for Sustainable Agriculture. The proposed project will supplement the efforts of the Central Government.

Regulatory approval from the Government of India will be required if the PoA is developed under CDM. However, this is not required if the voluntary route is adopted. The voluntary standards don't require letter of approval of the host country in their process for registration and issuance.

## Conclusion

Based on the above analysis, the following can be concluded:

- The proposed project will not only contribute to GHG abatement, it would also help in increasing the adaptive capacities of farmers owing to increased yield and incomes.
- The PoA can be registered under either under CDM or voluntary standards depending upon the capacities of the private entity. In either scenario, the project has sound financials and will be a good investment for a private player. Further scaling up of the project over time and geography would generate more revenue for the private entity and farmers.

## b) Integrated Project for Biogas Generation, Organic Farming and Livelihood Development

### Summary

Agriculture, with its allied sectors, is the largest source of livelihoods in India. Around 70% of the rural households depend primarily on agriculture for their livelihoods. India is one of the largest producers of rice, wheat, sugarcane, groundnut, vegetables, fruit, and cotton. India also has the highest population of livestock in the world, comprising of cattle, buffaloes, sheep, goat, pigs, and poultry. However, the farmers are vulnerable to the projected climatic variations including extreme temperatures, change in precipitation patterns etc. Keeping this in mind, the pilot project aims to strengthen their resilience by diversifying their livelihoods and increasing their incomes.

In the current project, it is proposed to install 100 household biogas digesters with an individual capacity of 2m<sup>3</sup>. This will result in household savings since they will no longer have to purchase fuelwood or liquified petroleum gas (LPG). Apart from biogas, financial support will also be provided to the beneficiaries to practice organic vegetable farming and purchase cattle. The slurry produced from biogas can be converted to vermicompost and applied in the fields replacing chemical fertilisers/pesticides. Surplus vermicompost can also be sold in the market, generating additional income for the households.

In order to implement the pilot, loans will be provided to the households for construction of biogas digestors, purchase of cattle and organic farming. Majority of the capital cost of biogas will be covered from a central Government subsidy. Capacity building and project management costs will be borne by a private company.

### Introduction

Agriculture and its allied sectors are the source of livelihoods for the majority of rural population in the country. 70% of its rural households still depend primarily on agriculture for their livelihood, with 82% of farmers being small and marginal. At present, India is the second largest producer of rice, wheat, sugarcane, cotton, groundnuts, vegetables and fruits, accounting for 10.9% and 8.6% of the world fruit and vegetable production, respectively. India also ranks first in the world in milk production and total livestock population. The national population of livestock, comprising mainly of cattle, buffaloes, sheep, goat, pigs and poultry was reported to be 512 million in 2012. Cattle comprises of 37.28% of the livestock population. The total cattle population in the country is 0.19 million (Department of Animal Husbandry, Dairying and Fisheries, 2012).

However, the farmers are highly vulnerable to the projected impacts of climate change, including increase in temperature and change in precipitation patterns, rising intensity and frequency of extreme weather events and water availability. Therefore, it is essential to strengthen the resilience of the farmers by diversifying their livelihoods and increasing their incomes.

### **Biogas Generation**

Increase in cattle population over the years has led to generation of enormous amount of waste. This waste not only causes air pollution, but also contributes to atmospheric and ground water contamination. It also contributes to generation of GHG like CH<sub>4</sub> and N<sub>2</sub>O. These emissions are generated by burning of cattle dung cakes or standing cattle dung. The total CH<sub>4</sub> emissions from livestock manure in India is 130.60 gigagram in 2010 (Ministry of Environment, Forest and Climate Change, 2015). The cattle dung is often dumped in heaps in most villages, this leads to a whole host of health concerns, and can also contaminate any nearby water sources. In view of the growing impacts of climate change and on public health, it has become essential to implement measures for proper disposal and utilisation of cattle dung.

Conversion of dung to biogas through the process of anaerobic digestion is an appropriate method for utilisation of dung. In this process, the dung is degraded by microbial action, transforming it into biogas. Biogas is a mixture of CH<sub>4</sub> (50–75%), carbon dioxide (25–50%), and some other gases like hydrogen sulphide and ammonia. It has been estimated that 1 kg of cattle dung mixed with an equal quantity of water, and with a total hydration retention time of 55 – 60 days, when maintained at an ambient temperature of 24 – 26°C yields 35-40 litres of biogas. Owing to the large numbers of livestock population, India has a high biogas generation potential. Researchers have calculated the generation potential from manure of cattle and buffalo as 258,300 million m<sup>3</sup> per year (Kaur, Brar, & Kothari, 2017). The generated biogas can be used for cooking purposes in place of firewood and LPG.

Conversion of cattle dung into biogas has strong climate change co-benefits including the mitigation of methane emissions generated from burning fuelwood and dung cakes. The slurry generated can be used as organic manure in the fields, substituting/supplementing chemical fertilisers. This can improve the soil health and increase agricultural yields in the longer run.

### **Organic Farming**

Agriculture, in current times, is dependent on the use of high yielding varieties of seeds, fertilisers and pesticides for food production. However, such resource intensive practices have been responsible for a plethora of environment problems like declining productivity and soil fertility, environmental pollution, and health hazards in human beings. Cost of cultivation has also increased due to high input costs, declining the net income of farmers. As a result, organic farming is gaining popularity as an alternative to conventional agricultural practices. As per the Food and Agriculture Organisation, organic farming is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. This is accomplished by using on-farm agronomic, biological, and mechanical methods in exclusion of all synthetic off-farm inputs.

The benefits of organic farming are many-fold. It improves soil health, reduces the need for use of fertilisers and pesticides and in the long run, it is expected that crop yields will also increase.

### **Climate Benefits**

The project will provide a number of co-benefits including diversification of revenue streams of beneficiaries, increasing their incomes, and making them more resilient. It has been anticipated that the incomes of beneficiaries will increase due to sale of milk from cattle, reduced cost of cultivation (owing to use of slurry as manure replacing/ supplementing fertilisers) and sale of slurry/ vermicompost. The use of biogas as cooking fuel will also help the households save money that would have otherwise been spent of LPG or fuelwood. For those households that collect wood for cooking fuel, the use of biogas will reduce the drudgery of women and allow them to spend those hours on an economically productive activity. The project will also mitigate a whole host of health issues stemming from the dumping of cattle dung in villages.

The slurry generated during biogas generation can also be used by farmers to replace/supplement fertilisers/pesticides. Utilisation of slurry as organic manure increases soil organic content and improves soil health.

### Instrument Description

In this pilot project, it is proposed to provide access to smoke-free kitchens through the installation of 2m<sup>3</sup> biogas digesters in 100 rural households. Household biogas units will collect cow dung from cattle sheds, mix it with water and channel it into fermentation pits. The resulting gas will be fed directly to the farmer's household to provide energy for cooking. The slurry produced by the digester can be converted into vermicompost and applied in the farms as manure, replacing/supplementing chemical fertilisers and pesticides. They can also generate additional income by selling the surplus vermicompost in the market. The capital cost for the project will be paid for using a blended finance approach where 60% of the capital cost will be covered under a Government subsidy, and the remaining 40% will be split between the households and a loan by a financial entity. In the current pilot, it is proposed to involve the District Central Co-operative Banks (DCCB).

The project also aimed to promote sustainable livelihood activities in rural areas and ensure regular income for the households. In order to achieve this objective, DCCB will provide financial support will to the households for the following activities:

- Purchase of cattle
- Cover the input costs for organic farming

This would result in increased incomes of households through milk production and sale. The cattle dung will also be used as input for biogas generation.

In order to effectively implement the project, it is critical to build the capacities of the local communities on the operation and maintenance of the household digestors as well as organic cultivation techniques. Capacity building and exposure visits will be conducted for the beneficiaries in order to familiarise them with biogas units and their use, and to show them the benefits of installing biogas digestors and organic cultivation. CSR funds of a private company can be used for capacity building activities as well as overall project management.

The key benefits of this pilot have been summarised in the table 14 below:

**Table 14: Benefits of the Project (Instrument 2)**

Climate Benefits	Socio-economic Benefits
<ul style="list-style-type: none"> <li>• Slurry developed during biogas generation can be used as organic manure in the fields, reducing the use of fertilisers and improving the soil health</li> <li>• Mitigation of CH<sub>4</sub> emissions generated from burning cow dung cakes or standing cow dung</li> <li>• Avoided CO<sub>2</sub> emissions from burning of fuelwood or other biomass used as cooking fuel</li> <li>• Strengthened resilience of farmers</li> </ul>	<ul style="list-style-type: none"> <li>• Reduced cost of cultivation for farmers</li> <li>• Increased income of the local community</li> <li>• Reduction in dependence of the local community on fuelwood and LPG.</li> <li>• Reduced drudgery of women</li> <li>• Improved health and hygiene through disposal of cattle manure</li> <li>• Financial inclusion of beneficiaries</li> </ul>

### Location

Before the start of implementation, a cluster of villages would need to be selected for the pilot. Different districts can be selected to ensure geographical spread. The broad parameters for selection of locations are mentioned in table 15:

**Table 15: Parameters for Selection of Locations (Instrument 2)**

Socio-economic Criteria	Other Criteria
<ul style="list-style-type: none"> <li>Population of the local community</li> <li>Age</li> <li>Education levels</li> <li>Income levels</li> <li>Sources of income</li> <li>Gender ratio</li> <li>Number of farmers</li> <li>Number of cattle per household</li> </ul>	<ul style="list-style-type: none"> <li>Biogas generation potential</li> <li>Availability of land for establishment of plants</li> <li>Availability of technology providers</li> <li>Availability of labour</li> <li>Fuel currently used for cooking purposes</li> <li>Prevalence of agriculture in the area</li> <li>Land-holdings of farmers</li> </ul>

The possibility of implementation of project in states like Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, Maharashtra, Gujarat, Bihar, West Bengal, etc. can be explored. On one hand, these states have high biogas generation potential (Kaur, Brar, & Kothari, 2017). On the other hand, agriculture is the primary livelihood activity of a major section of the population in rural areas.

### Stakeholders

The key stakeholders involved in the project are mentioned below:

- **Private sector company** responsible for 100% of the awareness generation, capacity building and project management costs through CSR funds;
- **Central Government through the Ministry of New and Renewable Energy** responsible for providing 60% of the capital cost of biogas through a subsidy;
- **DCCB** responsible for providing loans to the beneficiaries under the project; and
- **Farmers and families** as the project beneficiaries and providing 20% of the capital cost of biogas, the labour needed for the construction of the digesters and availing loans for purchase of cattle and organic farming.

Details of tasks proposed to be conducted by the stakeholders are mentioned in Table 16 below:

**Table 16: Role of Stakeholders in the Project (Instrument 2)**

Stakeholders	Tasks
Central Government through the Ministry of New and Renewable Energy	<ul style="list-style-type: none"> <li>Provide a subsidy of INR 9,000 for each household biogas digester</li> </ul>
Private sector company	<ul style="list-style-type: none"> <li>Selection of locations for project implementation</li> <li>Mobilise local community in order to identify potential beneficiaries</li> <li>Conduct awareness generation and capacity building for the entire project</li> <li>Facilitate the subsidy the process on behalf of the project beneficiaries</li> <li>Supervise the construction of the digesters</li> <li>Facilitate market linkages for the sale of vermicompost/slurry</li> <li>Routine monitoring of the pilot project</li> </ul>
DCCB	<ul style="list-style-type: none"> <li>Provide loans to beneficiaries for construction of biogas, purchase of cattle and organic farming</li> </ul>



Farmers/ Families	<ul style="list-style-type: none"> <li>• Provide labour for construction of the digesters</li> <li>• Provide INR 3,000 for the capital cost of each digester</li> <li>• Purchase cattle</li> <li>• Supply cattle dung for the biogas and slurry</li> <li>• Responsible for operation and maintenance</li> <li>• Prepare vermicompost from dry slurry</li> <li>• Sell vermicompost and milk for additional income</li> <li>• Practice organic farming</li> </ul>
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The project timeline has been provided in Table 17 below:

**Table 17: Project Timeline (Instrument 2)**

Identification of project location	2 months
Awareness generation and capacity building	4 months
Construction of 100 household digesters	3 months
Implementation of other livelihood activities	6 months
Monitoring period	12 months

#### Potential Financing Model

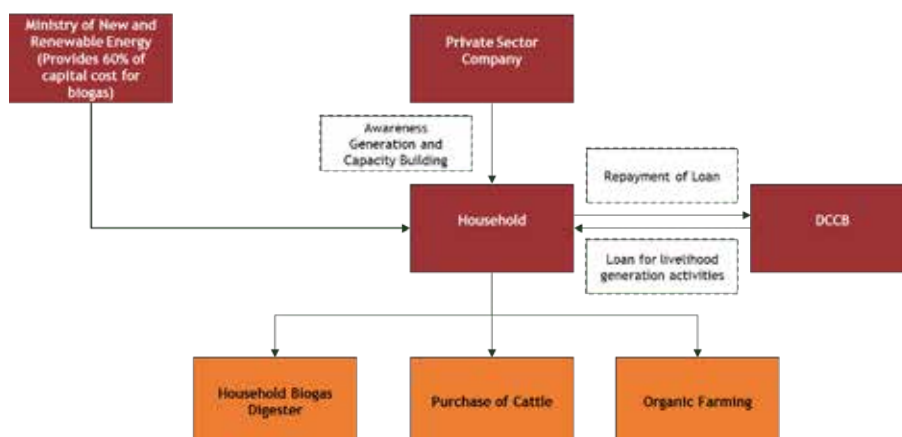
In the current model, it has been proposed that the project be implemented by a private sector company. The organisation will be responsible for identifying potential project locations and putting in place the project framework. Once the project location and 100 beneficiary households have been identified, the company will be responsible for facilitating financial support from DCCB and access to the Central Government subsidy. The company will also connect the households to technology providers and installers and oversee the construction of the digesters. It will bear all the costs associated with awareness generation and capacity building in order to facilitate the project.

DCCB would provide loan to the beneficiaries for the construction of the household digesters, purchase of cattle and organic farming.

MNRE will provide a subsidy of INR 9,000 for each household digester.

The 100 beneficiary households will provide 20% of the capital cost of biogas and labour during construction. They will also be responsible for the operation and maintenance of the digester including the collection of the biogas and the dry slurry, which would be used for vermicomposting. The households will also be responsible for the purchase of cattle, organic cultivation, and sale of surplus vermicompost in the local market. The potential financing model has been illustrated in Figure 19.

Figure 19: Potential Financing Mode (Instrument 2)



### Financial Analysis

The assumptions for financial analysis have been mentioned in Table 18 below:

Table 18: Assumptions for Financial Analysis (Instrument 2)

Line Item	Unit	Quantity	Source
<b>Biogas</b>			
Capacity per household digester	m <sup>3</sup>	2	-
Total number of households in the project	Number	100	-
Capital cost for one household digester	INR	15,000	<a href="file:///H:/TTC/GIZ%20Climate%20Change/Climate%20Finance%20Instruments/VISstfIFsYFpWhBWXunzdNTOdUUIhRdpjLYETewrjwW7SYSpH6ellY.pdf">file:///H:/TTC/GIZ%20Climate%20Change/Climate%20Finance%20Instruments/VISstfIFsYFpWhBWXunzdNTOdUUIhRdpjLYETewrjwW7SYSpH6ellY.pdf</a>
Fresh dung needed per m <sup>3</sup> per day	kg	25	<a href="http://web.iitd.ac.in/~vkvijay/BDTC%20National%20Training%20Program%203-5%20March%202017%20Presentations.pdf">http://web.iitd.ac.in/~vkvijay/BDTC%20National%20Training%20Program%203-5%20March%202017%20Presentations.pdf</a>
Total operating days per year	Days	365	
Total dung needed per household digester per year	kg	18,250	
Fresh dung needed for the entire project per year	kg	18,25,000	
Percentage of dry slurry produced from the collected manure	%	60%	<a href="https://www.cse.iitb.ac.in/~sohoni/pastTDSL/BiogasOptions.pdf">https://www.cse.iitb.ac.in/~sohoni/pastTDSL/BiogasOptions.pdf</a>
Quantity of dry slurry produced by one household digester per year	kg	10,950	

Percentage of vermicompost produced from dry slurry	%	60%	
Quantity of vermicompost produced by one household digester per year	kg	6,570	<a href="https://www.cse.iitb.ac.in/~sohoni/pastTDSL/BiogasOptions.pdf">https://www.cse.iitb.ac.in/~sohoni/pastTDSL/BiogasOptions.pdf</a>
Central Government subsidy per household digester	INR	9,000	<a href="https://mnre.gov.in/biogas">https://mnre.gov.in/biogas</a>
Price of one household digester after subsidy	INR	6,000	
Loan required for one household digester after subsidy	INR	3,000	
Total loan required for household digesters	INR	3,00,000	
Cost of capacity building and awareness generation for 100 households	INR	25,00,000	Assumption
Household contribution for each digester	INR	3,000	
Total contribution from households to the project cost	INR	3,00,000	
Total subsidy contribution to project cost	INR	9,00,000	
Fuelwood consumption per household per day	kg	25	<a href="https://www.cse.iitb.ac.in/~sohoni/pastTDSL/BiogasOptions.pdf">https://www.cse.iitb.ac.in/~sohoni/pastTDSL/BiogasOptions.pdf</a>
Annual fuelwood consumption per household	kg	9,125	
Cost per kg of fuelwood	INR	2	<a href="https://www.cse.iitb.ac.in/~sohoni/pastTDSL/BiogasOptions.pdf">https://www.cse.iitb.ac.in/~sohoni/pastTDSL/BiogasOptions.pdf</a>
Total annual savings per household from avoided fuelwood cost	INR	18,250	
Total biogas generation capacity per household digester per day	m <sup>3</sup>	730	
Losses @ 20%	m <sup>3</sup>	146	
Total annual biogas generation per household digester	m <sup>3</sup>	584	
Amount of biogas in terms of LPG	kg	251	<a href="http://web.iitd.ac.in/~vkvijay/BDTC%20National%20Training%20Program%203-5%20March%202017%20Presentations.pdf">http://web.iitd.ac.in/~vkvijay/BDTC%20National%20Training%20Program%203-5%20March%202017%20Presentations.pdf</a>

Price of 1 kg of LPG	INR	66	Because cost of 1 cylinder of 14.2 kg is INR 942- <a href="https://www.iocl.com/Products/Indanegas.aspx">https://www.iocl.com/Products/Indanegas.aspx</a>
Total savings per household from avoided LPG cost	INR	16,659	
Total annual financial benefits per household from the sale of vermicompost avoided fuel cost (Fuelwood substitution)	INR	18,250	
<b>Purchase of Cattle</b>			
Price of cow	INR	45,000	<a href="http://www.ccari.res.in/dss/cow.html">http://www.ccari.res.in/dss/cow.html</a>
Milk yield	L/day	15	<a href="http://www.agritech.tnau.ac.in/animal_husbandry/animhus_cattle.html">http://www.agritech.tnau.ac.in/animal_husbandry/animhus_cattle.html</a>
Loan amount for 1 cow	INR	36,000	Proposed
Household contribution for 1 cow	INR	9,000	
Price of milk	INR/Litre	28	<a href="https://www.business-standard.com/article/markets/milk-prices-likely-to-climb-after-a-long-lull-may-rise-by-rs-2-4-a-litre-119010300057_1.html">https://www.business-standard.com/article/markets/milk-prices-likely-to-climb-after-a-long-lull-may-rise-by-rs-2-4-a-litre-119010300057_1.html</a>
Total milk production in 1 year	Litre	3,600	Assuming 8 months of lactation period
Revenue from sale of milk in 1 year	INR	1,00,800	
Total loan amount	INR	36,00,000	
Total revenue	INR	1,00,80,000	
<b>Organic Farming</b>			
<i>Baseline</i>			
Cost of cultivation (Tomato crop)	INR/Hectare	61,000	<a href="http://agritech.tnau.ac.in/horticulture/horti_cost%20of%20cultivation.html">http://agritech.tnau.ac.in/horticulture/horti_cost%20of%20cultivation.html</a>
Field preparation	INR/Hectare	6,000	
Planting/sowing	INR/Hectare	7,000	
Weeding	INR/Hectare	10,000	
Pesticides	INR/Hectare	12,000	
Fertilizers	INR/Hectare	8,000	
Wages	INR/Hectare	13,000	
Staking, transport and other expenses	INR/Hectare	5,000	
Expected yield	MT/Hectare	50	
Net income	INR	39,000	

<i>Organic Farming</i>			
Cost of cultivation (Tomato crop)	INR/Hectare	41,000	Vermicompost produced from biogas plants to be used for cultivation
Cost of field preparation	INR/Hectare	6,000	
Cost of planting/sowing	INR/Hectare	7,000	
Weeding	INR/Hectare	10,000	
Wages	INR/Hectare	13,000	
Staking, transport and other expenses	INR/Hectare	5,000	
Expected yield	MT/Hectare	50	Yield increase has not been accounted in calculation
Net income	INR	59,000	
Loan amount for 1 household	INR	12,000	
Total loan amount	INR	12,00,000	
Total income	INR	59,00,000	

Analysis was also conducted to ascertain the financial viability of the project. The project was found to be financially sustainable due to the inclusion of revenue generating activities.

### Scale-up Potential

The project can be replicated in other Indian districts, where fuel wood is the primary source of cooking fuels, and where livelihoods are dependent primarily on agriculture and allied activities. Currently, DCCBs have been involved in the project. The project will result in the financial inclusion of the beneficiaries. It will build the confidence of the beneficiaries in formal banking systems. As the project is financially sustainable, the chances of non-repayment of loans is also minimal. Once the pilot is implemented successfully and the results disseminated, commercial banks can be involved during scale-up. However, training and capacity building of the beneficiaries is essential for successful implementation and scale-up.

### Regulatory Approvals and Policy Support

This project leverages upon an existing Central Government subsidy and the private company will have to support the households in applying for the subsidy. Aside from this, there no other regulatory hurdles for the project. The project will also contribute towards to the Government's push to increase the coverage of organic farming and biogas generation, as well as reducing the dependence on subsidised LPG which is done at a huge cost to the exchequer. Such initiatives will also contribute in achieving the Government of India's vision of doubling farmer's income in the country by 2021-22.

### Conclusion

Based on the above analysis, the following can be concluded:

- The proposed project will help in improving the adaptive capacities of the local communities through improvement of their health and incomes, as well as reduction in the drudgery of women. As the same time, it helps in the mitigation of GHG emissions.
- A blended financing model (loan and grant) can be used to implement the project. Households can be expected to bear the capital cost of biogas. However, the analysis shows that the project

is profitable and generates annual return for the households through the sale of milk, reduced cost of cultivation, increased crop yields, and reduction in the use of LPG.

- The project can be scaled-up over geographies where the population of livestock is high, and the livelihoods are dependent on agriculture and allied activities.

## **c) Promotion of Solar Irrigation through 'Water as a Service' Model**

### **Summary**

Livelihoods of the majority of the population in rural areas is dependent on agriculture. Access to reliable and affordable irrigation is essential to increase the agricultural productivity required to meet the rising demand of food production. This is also necessary for the farmers to adapt to the impacts of climate change. In India, water pumping for irrigation is generally dependent rainfall. Keeping in mind the projected climate variations in the future, it is essential to expand the irrigation cover in the country. Against this backdrop, solar irrigation is emerging as a suitable option. High capital cost of solar pumps and lack of awareness amongst farmers on the technology are some of the barriers to the adoption of solar irrigation.

Keeping this in mind, this project proposes to deploy 'water as a service' model in off-grid and rain-fed areas to promote the adoption of solar pumps. A project management agency will be responsible for the procurement and installation of solar pumps in villages. Government subsidy will be leveraged by the agency. Further, the agency will avail loan from any financial entity for the remaining capital expenditure. A service charge would be levied on the farmers on the basis of quantity of water utilised. The revenue generated from this would be used by the agency for meeting the maintenance cost of solar PV and pumps, and repayment of loan.

### **Introduction**

Agriculture is the single largest employer in the world, sustaining the livelihoods of about 40% of the world's population (United Nations, 2015). In India, it provides livelihood to more than 50% of the rural population. At the same time, it is essential for ensuring food security of the population. One of the biggest bottlenecks in increasing agricultural productivity in the country is the lack of reliable access to irrigation. 48% of the net sown area in the country is rain-fed and relies on seasonal rains to provide moisture to crops (Ministry of Agriculture and Farmers Welfare, 2016).

Food demand is rising rapidly in the country due to the growing population. This coupled with climatic variations like unreliable precipitation patterns and extreme temperatures imposes pressures on agricultural productivity in the country. There is a need to significantly expand the irrigation cover to meet the rising food demand. Therefore, provision of energy to ensure access to irrigation in a sustainable and resource efficient manner is the need of the hour. Solar irrigation is becoming a viable option for farmers. They provide more secure and reliable access to water and contribute in improving the livelihoods of the farmers.

### **Solar Irrigation**

Solar water pumping is based on photovoltaic (PV) technology, which converts solar energy into electrical energy to run a direct current (DC) or alternating current (AC) motor-based water pump. Solar pumps enable the use of water sources ranging from ground water, surface water, to wells. A solar powered irrigation pump consists of one or more solar panels, a pump, electronic controls or a controller device to operate the pump, the required hardware, and in some cases other items like inverters, batteries, etc. These pumps are available in multiple configurations ranging from 1 HP to 5 HP and higher. Solar pumps don't require any fuel (diesel, kerosene, etc.) or electricity to operate. Since these pumps are not dependent on electricity, they are not affected by power cuts, low voltage, single phase problems, etc. They can be installed even in remote areas where electricity is not available, and any other fuel is difficult and/or expensive to procure.

Central and State Governments are promoting the adoption of solar pumps for irrigation through subsidies. Central Government is also in a process of formulating a new scheme named 'Kisan Urja Suraksha evam Utthaan Mahabhiyan' (KUSUM) to promote installation of off-grid solar water pumps. However, only 142,000 pumps were deployed till November 2017 against the target of 1 million pumps by 2021. High upfront capital costs of the pumps, provision of heavily subsidized electricity in some states, requirement of maintenance support and lack of awareness on the benefits of solar powered irrigation are some of the barriers to its adoption.

### **Climate Benefits**

Irrigation is among the measures that can improve yields, reduce vulnerability to changing rainfall patterns and enable multiple cropping patterns (FAO, 2011). As mentioned earlier, 48% of the net sown area in India is dependent on monsoons. Climate change and variability will have significant impact on precipitation in the future. Solar irrigation will not only help in expanding the irrigation cover. It will also help the farmers in adapting to the impacts of climatic variabilities.

Apart from expanding the irrigation cover, solar irrigation will also contribute to decoupling of growth in irrigated land areas from fossil fuel use and GHG emissions. A study indicates a potential reduction in GHG emissions per unit of energy used for water pumping (CO<sub>2</sub>eq/kWh) of 95 – 97% as compared to pumps operated with grid electricity and 97 – 98% as compared to diesel pumps (FAO, 2018).

### **Instrument Description**

In the current project, it has been proposed to install solar pumps in 1,000 villages and implement 'water as a service' model. A solution provider/project management agency would bear the capital expenditure of the solar pumps and would charge the farmers, organised into water user groups based on the quantum of water delivered. The agency would also be responsible for the operation and maintenance of the pumps. One of the pre-conditions for the implementation of this project is that the farmers sharing the pump either need to have their land adjacent to the solar pump, or within the catchment area which the pump can cater to. The water user groups will manage the irrigation and collect fee from the beneficiaries.

Subsidy for the installation of solar pumps in the villages would be provided by the Central and State Government. The agency can seek financial support in the form of loans/ grants from banks, non-banking financial institutions, or any private organisation for the meeting the remaining capital expenditure. In this business model, farmers will not be required to bear the investment costs for solar pumps, making it an attractive proposition for them. They will pay a nominal fee for the water utilised for irrigation.

Implementation of this project in off-grid and rain-fed areas will result in expansion of irrigation cover in the country and reduce the dependence of farmers on rainfall for irrigation. Use of pumps, coupled with efficient agricultural practices, such as growing high-value crops along with staple foods, intercropping, multi-cropping, etc. will help increase the crop yields. According to an estimate, installation of a solar pump in Uttar Pradesh resulted in increased crop yields by 30%<sup>17</sup>, in turn increasing their incomes. The key benefits of the project are summarized in table 19 below:

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17 <http://www.oorjasolutions.org/csr-solar-pump-1>

**Table 19: Benefits of the Project (Instrument 3)**

Climate Benefits	Socio-economic Benefits
<ul style="list-style-type: none"> <li>• Expansion in irrigation cover</li> <li>• Enhanced crop resilience and food security</li> <li>• Reduced dependence on monsoon and diesel pumps for irrigation</li> <li>• Reduction in GHG emissions</li> </ul>	<ul style="list-style-type: none"> <li>• Improved crop yields</li> <li>• More income generating opportunities for farmers by complementing staple foods with high-value crops</li> <li>• Increased income of farmers</li> </ul>

**Location**

Before the start of the implementation of the pilot, project locations are required to be finalised. The broad parameters for selection of locations are mentioned below:

**Table 20: Parameters for Selection of Project Locations (Instrument 3)**

Socio-economic Criteria	Other Criteria
<ul style="list-style-type: none"> <li>• Number of farmers</li> <li>• Size of farms</li> <li>• Education levels</li> <li>• Income levels (small and marginal farmers/ medium to big farmers)</li> </ul>	<ul style="list-style-type: none"> <li>• Unirrigated net sown area</li> <li>• Farmer’s attitude towards adopting new technologies</li> <li>• Potential of capacity utilisation of solar pumps</li> <li>• Depth of groundwater</li> </ul>

**Stakeholders**

The key stakeholders involved in the project are mentioned below:

- **Project management agency** responsible for installation of solar pumps in villages;
- **Central Government through the Ministry of New and Renewable Energy** responsible for providing 30% of the capital cost of solar pumps through a subsidy;
- **State Government** responsible for providing 30% of the capital cost of solar pumps through a subsidy;
- **Financial entity** providing loans to the project management agency for meeting 40% of the capital cost;
- **Service provider** of solar pumping systems;
- **Farmers** (organised into water user groups) at the project locations.

Details of tasks proposed to be conducted by the stakeholders are mentioned in Table 20 below:

**Table 21: Role of Stakeholders in the Project (Instrument 3)**

Stakeholders	Tasks
Project Management Agency	<ul style="list-style-type: none"> <li>• Selection of locations</li> <li>• Mobilise local community into water user groups</li> <li>• Installation of solar pumps</li> <li>• Maintenance of solar pumps</li> <li>• Periodic monitoring of the project</li> <li>• Levy fees for utilisation of water</li> <li>• Training and capacity building of farmers</li> </ul>
Financial Entity	<ul style="list-style-type: none"> <li>• Provide loan to the project management agency</li> </ul>



Farmers/ Water User Groups	<ul style="list-style-type: none"> <li>• Use the solar pumping systems for irrigation</li> <li>• Pay a service charge to the project management agency on the basis of water quantity utilised</li> </ul>
Service Provider	<ul style="list-style-type: none"> <li>• Provide solar pumping systems</li> <li>• Provide maintenance support</li> </ul>

The project timeline has been provided in Table 22 below:

**Table 22: Project Timeline (Instrument 3)**

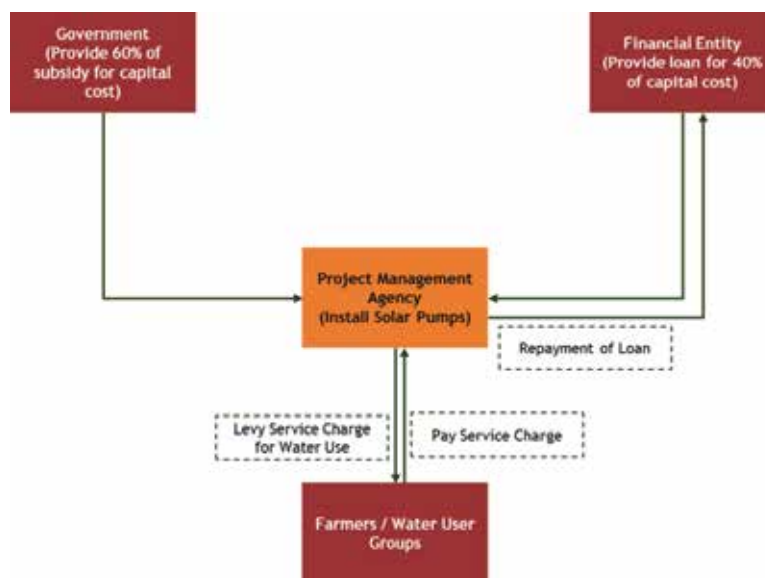
Identification of project locations	2 months
Mobilisation of farmers into water user groups	1 months
Procurement and installation of solar water pumps	3 months
Monitoring period	12 months

### Potential Financing Model

In the current model, it has been proposed that the project be implemented by project management agency. The agency will be responsible for identifying potential project locations and putting in place the project framework. Once the project location and beneficiaries have been identified, the company will be responsible for accessing the Government subsidy (30% from Central Government and 30% from State Government under the KUSUM scheme). It has been proposed that the agency will seek a loan from a financial entity for meeting 40% of the capital expenditure. The agency will levy a fee of INR 70 per hour from the farmers in the water user groups for water. It can also levy a higher charge for farmers who have not joined any water user groups.

The potential financing model is explained in Figure 21.

**Figure 20: Potential Financing Model (Instrument 3)**



An operator from the water user group in the village would keep track of the usage of the solar pump and levy a service charge based on the quantity of water delivered to various members. The revenue generated through the service charge would be used for repayment of loan by the project management agency and meeting the maintenance costs.

### Financial Analysis

The assumptions for financial analysis have been mentioned in Table 23 below:

**Table 23: Assumptions for Financial Analysis (Instrument 3)**

Line Item	Unit	Quantity	Source
Total number of villages to be covered in project	Number	1,000	Proposed
Power of solar water AC pump	HP	2	<a href="https://www.indiamart.com/proddetail/2-hp-solar-water-pumping-system-18891434297.html">https://www.indiamart.com/proddetail/2-hp-solar-water-pumping-system-18891434297.html</a>
Capacity of solar panels	W	1,700	
Capital cost for 2 HP solar water pump (with structure and complete accessories)	INR	1,55,000	
Number of pumps in 1 village	Number	1	
Total financing required meeting capital cost in 500 Villages	INR	15,50,00,000	
Central Government Subsidy	INR	46,500	30% under KUSUM Scheme ( <a href="https://mnre.gov.in/sites/default/files/webform/notices/NoticeInvitingCommentsonGuidelines.pdf">https://mnre.gov.in/sites/default/files/webform/notices/NoticeInvitingCommentsonGuidelines.pdf</a> )
State Government Subsidy	INR	46,500	
Loan Availed by Project management agency for 1 village	INR	62,000	Beneficiary will take loan for this purpose
Total contribution from Loan in 500 villages	INR	6,20,00,000	
Hours of operation per year (6 hours * 100 days)	Hours	600	
Service charge for water	INR/ Hour	70	<a href="https://mnre.gov.in/file-manager/akshay-urja/june-2018/Images/28-31.pdf">https://mnre.gov.in/file-manager/akshay-urja/june-2018/Images/28-31.pdf</a>
Potential income from 1 village	INR	42,000	
Annual cost of maintenance and repair	INR	2,000	
Net rental income	INR	40,000	(Potential Income - Maintenance Cost)
Net Income	INR	4,00,00,000	

Estimates of cash inflow and outflow has been carried out with reasonable assumptions to determine the NPV and profitability of the project. According to the financial analysis, the project has a payback period of 4.66 years.

#### Regulatory Approvals & Policy Support

The project will contribute towards Central and State Governments' push to promote the use of solar power among farmers. This project leverages upon the proposed Government subsidy and the project management agency will avail subsidies under the KUSUM scheme. Aside from this, there no other regulatory hurdles for the project.

## Conclusion

Based on the above analysis, the following can be concluded:

- The proposed project will help in expanding the irrigation cover in the country and reduce the dependency of farmers on monsoons for irrigation.
- The project management agency can seek loans from any financial entity or CSR grants from private companies for the implementation of the project. However, the analysis shows that the project is profitable and generates annual returns for the agency.
- Technology demonstration and capacity building of the farmers is also essential for the successful implementation of the project.
- Currently, it is proposed to implement the project in rain-fed and off-grid areas. In later stages, the project can be further scaled-up in areas where electricity is highly subsidised. During the scale-up, DISCOMs will bear the investment costs for solar pumps.

## Annex 2 – Adaptation Projects Funded by NAFCC

S. No.	States	Title of the Project	Sectoral/ Thematic Focus	Project Beneficiaries	Benefits
<b>2015-16</b>					
1	Punjab	Towards Climate Resilient Livestock Production System in Punjab	Agriculture & Allied Sector- Animal Husbandry	Small and Marginal Farmers with 5-15 dairy animals	<ol style="list-style-type: none"> <li>1. Increased and sustainable livestock production</li> <li>2. Timely detection and control of animal and zoonotic disease</li> </ol>
2	Odisha	Conserve water through management of runoff in river basin to reduce vulnerability and enhance resilience for traditional livelihood in Nuapada district	Water Resource Conservation and Management	Households along the Jonk River Basin of Nuapada	<ol style="list-style-type: none"> <li>1. Water conservation through check dam construction</li> <li>2. Water management through deployment of drip and sprinkler irrigation system</li> <li>3. Efficient use of water through deployment of Solar pumping system</li> <li>4. Introduction of fishery in farm ponds</li> </ol>

S. No.	States	Title of the Project	Sectoral/ Thematic Focus	Project Beneficiaries	Benefits
3	Himachal Pradesh	Sustainable Livelihoods of agriculture – dependent Rural communities in drought prone district of Himachal Pradesh through climate smart solutions.	Climate Smart Agriculture	Small & Marginal Farmers	<ol style="list-style-type: none"> <li>1. Promotion of sustainable agriculture</li> <li>2. Natural water conservation</li> <li>3. Livelihood diversification</li> <li>4. Fodder security</li> <li>5. Financial inclusion through weather based insurance</li> </ol>
4	Puducherry	Integrated Surface Water Management for Climate Resilient Agriculture through Rejuvenation of Traditional Tanks	Water Conservation & Management	Residents of North Western part of Puducherry	<ol style="list-style-type: none"> <li>1. Irrigation tank rejuvenation</li> <li>2. Increase in green cover</li> <li>3. Increased ground water level</li> <li>4. Better crop yield</li> </ol>
5	Manipur	Model Carbon Positive Eco-Village in Phayeng of Manipur	Eco-Village	Households of Phayeng village	<ol style="list-style-type: none"> <li>1. Rainwater Channelisation</li> <li>2. Agriculture practice in terrace slope</li> <li>3. Promotion of renewable energy</li> <li>4. Development of ecotourism</li> <li>5. Weather insurance under financial inclusion programme</li> </ol>
6	Kerala	Promotion of integrated farming system of 34 Kaipad in coastal wetlands of North Kerala	Coastline Wetland Management	Households of the project area	<ol style="list-style-type: none"> <li>1. Rotational farming</li> <li>2. Climate resilient varieties of Pokkali/ Kaipad paddy</li> <li>3. Increased employment generation</li> </ol>

S. No.	States	Title of the Project	Sectoral/ Thematic Focus	Project Beneficiaries	Benefits
7	Tamil Nadu	Management and rehabilitation of coastal habitats and biodiversity for climate Change Adaptation and Sustainable Livelihood in Gulf of Mannar, Tamil Nadu, India	Coastline Protection	Fishermen in 23 villages of Tuticorin District	<ol style="list-style-type: none"> <li>1. Improved coral cover, fish diversity, rejuvenation of degraded habitats, carbon sink</li> <li>2. Revenue generation opportunity for fishermen and women SHGs</li> <li>3. Community engagement in coastal resource conservation</li> </ol>
8	Chhattisgarh	Climate Adaptation Strategies in Wetlands along Mahanadi River Catchment areas in Chhattisgarh	Wetland Ecosystem Conservation	<ol style="list-style-type: none"> <li>1. Farmers</li> <li>2. Wetland dependent communities</li> </ol>	<ol style="list-style-type: none"> <li>1. Afforestation</li> <li>2. Climate smart agricultural practices</li> <li>3. Water conservation</li> <li>4. Better healthcare facilities and sanitation</li> </ol>
9	Jammu & Kashmir	Climate Resilient Sustainable Agriculture in Rain – Fed Farming (Kandi) Areas of Jammu & Kashmi	Agriculture	Families of Small and Marginal Farmers	<ol style="list-style-type: none"> <li>1. Higher yield of crops like rice, maize and wheat</li> <li>2. Water conservation</li> <li>3. Soil moisture retention</li> </ol>
10	Telangana	Resilient Agricultural Households through Adaptation to Climate Change in Mahbubnagar district, Telangana	Agriculture	Farming Households	<ol style="list-style-type: none"> <li>1. Capacity building through workshops</li> <li>2. Increase in crop yield and household income</li> <li>3. Seasonal climate forecasts and weather based agro advisories.</li> </ol>

S. No.	States	Title of the Project	Sectoral/ Thematic Focus	Project Beneficiaries	Benefits
11	Meghalaya	Spring-shed development works for rejuvenation of springs for climate resilient development in the water stressed areas of Meghalaya	Water Conservation and Management	Community	<ol style="list-style-type: none"> <li>1. Improvement in food and water security</li> <li>2. Afforestation</li> <li>3. Fodder development</li> </ol>
12	Mizoram	Sustainable Agriculture Development through Expansion, Enhancement and Modelling in the state of Mizoram	Agriculture	Farmers	<ol style="list-style-type: none"> <li>1. Restoration/ renovation of household/ community tanks</li> <li>2. Promotion of farm mechanization through custom hiring centers</li> <li>3. Soil health improvement</li> </ol>
<b>2016-17</b>					
1	Andhra Pradesh	Climate Resilient interventions in Dairy Sector in coastal and Arid areas in Andhra Pradesh.	Agriculture & Allied Sector – Livestock	<ol style="list-style-type: none"> <li>1. Small &amp; Marginal Farmers</li> <li>2. Rural Youth</li> </ol>	<ol style="list-style-type: none"> <li>1. Better livestock productivity</li> <li>2. Better income prospects</li> <li>3. Improved infrastructure</li> </ol>
2	Madhya Pradesh	Increasing Adaptive Capacity to Climate Change through developing climate-Smart Villages in Select Vulnerable Districts of Madhya Pradesh	Agriculture	<ol style="list-style-type: none"> <li>1. Households of Marginalised Farmers</li> <li>2. Farmers Through Training and Capacity Building</li> </ol>	<ol style="list-style-type: none"> <li>1. Nutrient Management</li> <li>2. Water Conservation</li> <li>3. Better agricultural productivity</li> <li>4. ICT based weather advisory</li> </ol>
3	Karnataka	Conservation and Management of Indigenous varieties of livestock (Cattle and Sheep) in the Wake of Climate Change in Karnataka.	Agriculture & Allied Sector – Livestock	1. Livestock Bearing Farmers	<ol style="list-style-type: none"> <li>1. Conserve indigenous varieties of livestock</li> <li>2. Fodder Management</li> <li>3. Promotion of renewable energy through installation of 3 solar units 10KW each</li> </ol>

S. No.	States	Title of the Project	Sectoral/ Thematic Focus	Project Beneficiaries	Benefits
4	Haryana	Scaling-up Resilient Agriculture Practices towards Climate Smart Villages in Haryana	Climate Smart Villages	1. Families of Small & Marginal Farmers	1. Improving adaptive capacity of rural community through climate resilient agriculture interventions
5	Assam	Management of Ecosystem of Kaziranga National Park by creating Climate Resilient Livelihood for Vulnerable Communities through Organic farming and pond based Pisciculture	Forest Ecosystem	1. Community Members	1. Improvement in biodiversity 2. Pond based pisciculture activities 3. Rejuvenation of water reservoirs
6	West Bengal	Rain Water harvesting and sustainable water supply to the hilly areas in Darjeeling adaptive measures climate change impacts	Water	1. BPL Families	1. Ground water recharge 2. Improved water supply 3. Enhanced savings due to avoidance of water purchase due to water stress
7	Maharashtra	Efficient water management and agriculture technology adoption for climate adaptive and resilient farming system in 51 villages of Nundurbar and Buldhana districts of Maharashtra	Agriculture/ Water	1. Farmers, Women & Landless Individuals organized as SHG	1. Diversification of income sources 2. Water conservation

S. No.	States	Title of the Project	Sectoral/ Thematic Focus	Project Beneficiaries	Benefits
8	Sikkim	Addressing Climate Change vulnerability of Water Sector at Gram Panchayat Level in drought prone areas of Sikkim.	Water	1. Inhabitants of South & West Districts	<ol style="list-style-type: none"> <li>1. Better infrastructure creation</li> <li>2. Reduced economic loss in unplanned pipe repair works</li> <li>3. Community participation in water conservation</li> </ol>
9	Gujarat	Climate Change adaptation for Natural Resource Dependent communities in Kachchh, Gujarat.	Water/ Agriculture/ Forest/ Coastal Area	1. Agriculture, Coastal Fishing and Pastoral Communities	<ol style="list-style-type: none"> <li>1. Water security</li> <li>2. Grassland conservation</li> <li>3. Livelihood security</li> </ol>
<b>2017-18</b>					
1	Rajasthan	MukhyaMantri Jal Swavlamban Abhiyaan for Climate Change Adaptation and Water Harvesting in Arthuna, Anandpuri and Sajjangarh blocks of District Banswara	Water Conservation	Community	<ol style="list-style-type: none"> <li>1. Increase in crop production</li> <li>2. Safe drinking water availability</li> <li>3. Enhanced green cover</li> </ol>
2	Bihar	Scaling up Climate Smart Agriculture through Mainstreaming Climate Smart Villages in Bihar	Agriculture	Farming Community	<ol style="list-style-type: none"> <li>1. Enhanced income</li> <li>2. Better farm yield</li> <li>3. Reduced stress on natural and water resources</li> </ol>
3	Uttar Pradesh	Ecosystem service-based adaptation to Climate Change in Bundelkhand region of Uttar Pradesh, India	Forestry	<ol style="list-style-type: none"> <li>1. Farmers</li> <li>2. Members of JFC</li> <li>3. Villages in 4 Forest Divisions of Bundelkhand Region</li> </ol>	<ol style="list-style-type: none"> <li>1. Water Conservation</li> <li>2. Diversified income and employment generation from agro-forestry activities</li> <li>3. Better infrastructure creation</li> </ol>



S. No.	States	Title of the Project	Sectoral/ Thematic Focus	Project Beneficiaries	Benefits
4	Jharkhand	Enhancing climate resilience of forests and its depending communities in two landscapes of Jharkhand	Forestry	1. 48 Villages of Patratu and Narayanpur block 2. Forest dependent communities	1. Increased resilience of communities 2. Water conservation 3. Enhanced soil and moisture conservation 4. Promotion of renewable energy
5	Nagaland	Gene Pool conservation of Indigenous Rice Varieties under traditional integrated rotational farming system (Jhum Optimization) for promoting livelihood and food security as climate change adaptation strategy in Nagaland	Agriculture	1. Farmers	1. Enhanced soil productivity 2. Increased production in Jhum areas 3. Propagation of indigenous rice varieties and traditional varieties of cereals, millets, pulses, fruits and vegetables 4. Enhanced access to markets for indigenous and organic products 5. Enhanced capacities of Jhum dependent communities
6	Punjab, Haryana, Uttar Pradesh and Rajasthan	Climate resilience building in rural areas through crop residue management	Agriculture	1. Farmers	1. Management of crop residue 2. Improvement of soil fertility 3. Enhanced income of farmers

Source: NABARD

## Annex 3 – Adaptation Projects Funded by MDBs

Agency	Project Title	Sector/ Thematic Focus	Fund Allocation	Fund Type
Adaptation Fund	Conservation and Management of Coastal Resources as a Potential Adaptation Strategy for Sea Level Rise	Coastal Resource Management	US\$0.69 million	Grant
	Enhancing Adaptive Capacity and Increasing Resilience of Small and Marginal Farmers in Purulia and Bankura Districts of West Bengal	Agriculture	US\$2.51 million	Grant
	Building Adaptive Capacities of Small Inland Fishers for Climate Resilience and Livelihood Security in Madhya Pradesh	Food Security	US\$1.79 million	Grant
	Climate Proofing of Watershed Development Projects in the States of Rajasthan and Tamil Nadu	Water Management	US\$1.34 million	Grant
	Climate Smart Actions and Strategies in North Western Himalayan Region for Sustainable Livelihoods of Agriculture-Dependent Hill Communities	Agriculture	US\$0.97 million	Grant
	Building Adaptive Capacities of Communities, Livelihoods and Ecological Security in the Kanha-Pench Corridor of Madhya Pradesh	Ecosystem Conservation	US\$2.55 million	Grant
Green Climate Fund (GCF)	Ground Water Recharge and Solar Micro Irrigation to Ensure Food Security and Enhance Resilience in Vulnerable Tribal Areas of Odisha	Food and Water Security	US\$34.4 million (out of US\$166.3 million)	Grant
Global Environment Facility (GEF) – Phase 5	Climate Resilient Coastal Protection and Management in India	Coastal Management	US\$2 million (out of US\$80 million)	Grant
	Developing effective multiple use management framework for conserving biodiversity in the Mountain Landscapes of the High Ranges, Western Ghats	Ecosystem Conservation	US\$7 million (out of US\$30 million)	Grant
	Sustainable Livelihoods and Adaptation to Climate Change	Agriculture/ Allied/ Forestry	US\$8 million (out of US\$52.2 million)	Grant

Agency	Project Title	Sector/ Thematic Focus	Fund Allocation	Fund Type
	Ecosystems Service Improvement Project	Ecosystem Management	US\$24.64 million (out of US\$132 million)	Grant
	Integrated Management of Wetland Biodiversity and Ecosystem Services for Water and Food Security	Food and Water Security	US\$4.6 million (out of US\$20.4 million)	Grant
Asian Development Bank (ADB)	Climate Adaptation in Vennar Sub-basin in Cauvery Delta Project	Natural Resource Management	US\$100 million (out of US\$144 million)	Loan







