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Select Tools and Approaches for Climate Risk Assessments in India

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List of Acronyms

- CAM: Climate Change Adaptation and Mitigation
- CAFRI: Climat e Adaptation and Finance in Rural India
- COP: Conference of the Parties
- CRA: Climate Risk Assessment
- CRM: Climate Risk Management
- CRST: Climate Resilience and Sustainability Tool
- CWRM: Centre for Water Resource Management
- FPO: Farmer Producer Organisations
- ICEM: International Centre for Environmental Management
- ICRI: Innovative Climate Risk Insurance
- MGNREGS: Mahatma Gandhi National Rural Employment Guarantee Scheme
- MoHFW: Ministry of Health and Family Welfare
- MoRD: Ministry of Rural Development
- NAPCC: National Action Plan on Climate Change
- NAPCCHH: National Action Plan on Climate Change and Human Health
- NCfDC: National Centre for Disease Control
- NCDC: National Cooperative Development Corporation
- NDC: Nationally Determined Contributions
- PIA: Project Implementing Agencies
- PRA: Participatory Rural Appraisal (PRA/RRA)
- RCP: Representative Concentration Pathway
- RRA: Rapid Rural Appraisal
- SAPCC: State Action Plan on Climate Change
- SDG: Sustainable Development Goals
- TDF: Tribal Development Fund
- TERI: The Energy and Resources Institute
- UNFCCC: United Nations Framework Convention on Climate Change
- WASCA: Water Security and Climate Adaptation
- WDF: Watershed Development Fund

Introduction

Climate change is recognized as a key global and national challenge by the Government of India. The Hon. PM Shri. Narendra Modi announced during COP26 of the UNFCCC in Glasgow (2021) that India is targeting to achieve net zero carbon emissions by 2070. The Central and State Governments spearhead the implementation of a multitude of programs and schemes in diverse sectors, and it is imperative to mainstream climate aspects in all these sectors. Projected climate changes are expected to lead among other things to an increase in temperatures, a change in precipitation, a rise in sea level, and an increase in extreme climate events. Understanding the risks of climate change is therefore essential for prioritizing and planning appropriate adaptation and mitigation measures to address the risks.

One key area which provides the basis for all such actions is **Climate Risk Assessments (CRA)**. CRAs build the foundation for comprehensive Climate Risk Management (CRM) by identifying the nature and extent to which climate change and its impacts may harm a country, region, sector, or community. Quantifying and assessing climate risk, i.e., the result of the interaction of vulnerability, exposure, and hazard, is important to support decision-making and forward-looking planning. Thus, the identification of current and future key risks and impacts on people, assets and ecosystems can help to allocate resources accordingly, to design adaptation policies and projects for reducing vulnerability and risk, and to establish a baseline against which the success of adaptation policies and actions can be monitored.

Today CRA is a standard practice adopted not just within the scope of the National and State Action Plans on Climate Change (NAPCC and SAPCC) but is being progressively encouraged to be considered to evaluate ongoing and new schemes and activities, including at district, block as well as panchayat levels. This helps the agencies to be better equipped to understand and map risks posed to a sector or within a specific geographical boundary, and design and implement activities.

As a German federal enterprise, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH is a global service provider in the field of international cooperation for sustainable development. The GIZ India projects under the **Environment, Climate Change and Biodiversity Cluster** are using several CRA tools to address the implementation of India's Nationally Determined Contribution (NDC) on climate adaptation and mitigation. In general, the cluster is working in the field of Climate Change and Circular Economy, Agriculture, Natural Resource Management and Agroecology as well as Biodiversity. The core areas of work are advisory

services for partners, capacity development, advisory on suitable techniques and technologies, development of financial instruments and co-creation of knowledge. The projects under this are supporting communities, public and private institutions to improve and conserve natural resources, minimize risks from climate change and enhance rural livelihoods. Here, CRA tools are particularly valuable in obtaining needs- and evidence-based planning for adaptation initiatives and a climate-sensitive design.

Various frameworks, approaches, tools, and methods have been applied to conduct CRA, based on the defined scope of the activity. There is neither a specific common methodology, nor standards or proposed directions on CRA prescribed in the Indian context. In light of the above background, and based on consultations with The Ministry of Environment, Forest and Climate Change (MoEFCC), state level climate change nodal agencies, various experts as well as a diverse set of experiences with the implementation of different tools and approaches for CRA, a need has been identified to develop a clear understanding of CRA applications in India. This knowledge product is intended to present how CRA methods and approaches can be diverse (depending on the context) and to showcase experiences and approaches used by GIZ India's Environment, Climate Change and Biodiversity cluster.

Climate Risk Assessment Framework

(6-Step Approach)

Description of approach:
The 6-step climate risk assessment (CRA) methodology developed by the Global Programme on Risk Assessment and Management for Adaptation to Climate Change (Loss & Damage) provides practitioners and decision-makers with a flexible guidance on how to conduct risk assessments and how to translate the assessment into a suitable mix of measures appropriate to their respective context. The tool is characterized by the estimation of risk tolerance levels of the concerned system (e.g., vulnerable households) and the identification of a smart mix of risk management measures (e.g., climate change adaptation and disaster risk reduction measures including risk finance and insurance schemes). Afterwards the results are integrated into a climate risk management framework that encompasses monitoring and evaluation and supports continuous learning. Stakeholders can decide to use their own or external CRA methods according to their needs.

The format of assessment is a guideline. Primary and secondary data is required.
The tool considers non-economic losses and damages beyond the evaluation of economic losses and damages.

Reason(s) for development and application of the tool:
The methodology has been developed with analysts and stakeholders with the objective of producing relevant and useful information that is required for climate risk management planning and implementation. Various methods exist to assess risks and their underlying drivers. However, current approaches are not sufficiently comprehensive since they do not account for the various drivers and dimensions of risks, which can vary strongly according to specific contexts, and are often insufficiently responsive to the various demands of policy and practice.

Sectors covered: Not sector-specific

Regions covered: Not region-specific

Participatory implementation:
The tool is focused on a participatory approach for sourcing information. Various methods and flexible applications of participatory elements are possible including stakeholder consultations and interviews, field surveys, focus groups on risk perception and expert-based assessments.

Approach applicable for the entire spectrum of climate-related hazards and impacts:
Yes. Assessment of climate risks triggered by the entire spectrum of hazards from slow onset processes to extreme weather events.

Key actors involved in the approach:
Stakeholders in the risk assessment process and overall decision-makers.

Where/how has it been applied:
The tool has been applied in Tanzania and India. In Tanzania it was applied at national and local levels (Lake Rukwa) in the face of drought risk to make integrated water resources management climate resilient. In India, climate change risks were assessed in coastal and mountainous regions that are especially vulnerable, with a focus on rural livelihoods and critical infrastructure to inform state-level climate risk management practitioners on climate adaptation and disaster risk reduction measures.

What kind of benefits evolved from the approach:
First evidence has been created via applications in Tanzania and India, where the approach has shown its benefits for political processes such as National Adaptation Plans.

Lessons learned:

- Future changes in vulnerability and exposure are characterised by high levels of uncertainty. While general trends in population and economic growth can provide some insights, projecting future economic development at the block- or village-level, and what this means for levels of exposure and vulnerability in India, becomes challenging. For example, unexpected changes in political, institutional, or economic contexts could have large implications for vulnerability and exposure.

- Importance of considering both slow onset and rapid onset events. This recognises that a farming community may face highest levels of risk when exposed to both prolonged effects of rising temperature causing related crop diseases, and regular catastrophic flooding.

- The framework reinforces the need to build combined response strategies (slow and rapid onset events) that cut across boundaries of climate change adaptation and disaster risk management.

Climate Risk & Adaptation Management Tool

Description of approach:
The Climate Risk and Adaptation Management Tool is based on a robust methodological framework and provides a rapid assessment that links climate risks of different NABARD funds with adaptation options. The tool development was supported by the CAFRI NABARD project and can be currently used for the Watershed Development Fund (WDF) and Tribal Development Fund (TDF) only as it is customized for those funds. It builds on the IPCC-AR5 concepts of risk and vulnerability. Modeled data such as Representative Concentration Pathway (RCP) 4.5 and 8.5 are used to project the increase in annual maximum temperature and change in annual precipitation (relative to baseline and mid-century). Building on a multi-hazard risk and vulnerability analysis, the tool links the climate risk rating for specific indicators with prioritized adaptation options. To make the tool context specific, a basket of customized and appropriate indicators was selected tailoring the tool to the WDF and TDF project context. The tool is customized separately for WDF and TDF as contexts, sensitivities to hazard and adaptive capacity differ.

The indicator-based approach is using both quantitative and qualitative indicators for climate and socioeconomic data. Qualitative indicators as additional indicators for sensitivity and adaptive capacity are designed to capture local context. Information related to different indicators of hazard, exposure, adaptive capacity, and sensitivity is required. While the qualitative data are mainly primary data, the quantitative data consist mostly of secondary data. The approach is very flexible and additional indicators can be included if necessary. No economic analysis is conducted. The assessment form is a report about the risk adoption options.

Reason(s) for development and application of the tool?
The majority of Project Implementing Agencies (PIAs) engaged in designing of WDF & TDF projects lacks expertise in applying approaches for climate risk assessment and identifying adaptation measures to integrate climate proofing aspects in project design. As access and analysis of climate data is difficult for PIAs, an easy-to-use tool with inbuilt data in backend will help them to assess climate risks and determine adaptation measures.

Sectors covered:
Agriculture, Horticulture. The tool is context specific to WDF and TDF projects.

Regions covered:
Not region-specific, but specifically applicable to states where district-level data are available and inbuilt in the tool. Currently, data from two states (Odisha and Himachal Pradesh) are integrated into

the tool. Application to all the Indian states can be planned.

Participatory implementation:
The tool includes a basket of additional indicators designed to accommodate qualitative data generated from Participatory/Rapid Rural Appraisal (PRA/RRA) making it more relevant for the local context.

Approach applicable for the entire spectrum of climate-related hazards and impacts:
Yes. The approach covers a range of hazard indicators such as annual maximum temperature, annual precipitation, water stress and flood score.

Key actors involved in the approach:
Key actors are PIAs engaged in development and implementation of TDF and WDF projects of NABARD. Main users of the tool are PIAs and NABARD. BIRD as a training institute of NABARD can play a major role in the capacity development of tool users. Experts are involved in the development and piloting of the tool and design of a training module.

Where/how has it been applied:
The tool is being piloted in Odisha and Himachal Pradesh to integrate climate proofing aspects in TDF and WDF projects. Subsequently, the written proposal is submitted by PIAs to NABARD for funding. The tool will be used by PIAs engaged in WDF/TDF proposal development to assess climate risk and identify adaptation measures, as well as by NABARD and in the NABARD environment.

What kind of benefits evolved from the approach:
Currently in the pilot phase.

Lessons learned:

- The tool provides user-friendly steps to assess climate risk and generate adaptation measures to priority project interventions.
- State-State-specific or district data necessary and no universal source for all states available.
- Initially experts need to fill in data for different indicators in the backend of the tool. A protocol for data updating is required.
- Capacity building is required for agencies to implement and update the tool. A training module is planned as agencies are interested.
- The approach is very context specific.

Climate Expert Tool

Adaptation to Climate Change with Farmer Producer Organisations

Approach description:
The Climate Expert Tool is a climate risk management approach developed by GIZ. It entails a 4-step approach and working materials that help companies analyse climate change impacts, risks, and opportunities as well as to conduct a cost-benefit analysis and to identify adaptation measures and strategies. The GIZ project, CAFRI NABARD, customized the tool for Farmer Producer Organisations (FPOs) in India. This allows FPOs and supporting agencies to assess and analyse all relevant information on climate change impacts and determine and prioritise climate risks for developing an adaptation strategy that fits the characteristics of the FPO. Subsequently, FPOs can adapt their business models to incorporate climate risks and budget their activities accordingly.

The 4-step assessment tool is available in easy-to-use Excel based worksheets. The form of assessment is a business plan. Both economic and non-economic losses are incorporated. Primary and secondary data are required. Data about costs is based on the past and current situation.

Reason(s) for development and application of the tool:
A proper identification process of climate change adaptation techniques requires an appropriate assessment process. Identification of climate risks and hazards experienced by farmers and translation into a business strategy is necessary.

Sector(s) covered:
Agriculture, specifically for FPOs

Regions covered:
Pan India, i.e., it can be applied nationwide, as it is based on experiential data from farmers which are captured in participatory workshops. The collected information is verified against existing scientific data.

Participatory implementation:
The tool is focused on a participatory approach for sourcing information. This includes group activities of stakeholders used during the assessment period through a one-day climate risk assessment workshop, e.g., focus group discussions, use of charts to pose simple questions on climate change and impact, to capture relevant information in writing from the participants for respective sheets. Assessment is done for one FPO at a time with at least 5-6 FPO members present.

Approach applicable for the entire spectrum of climate-related hazards and impacts:
Yes. Assessment of climate risks triggered by the entire spectrum of hazards from slow onset processes to extreme weather events.

Key actors involved in the approach:
FPOs are the main key actors. Experts are involved in the tools' development and piloting. Currently, BIRD and NABARD are the main users. A manual for the tool also enables NGOs helping FPOs with adaptation planning and implication, agricultural groups, and self-help groups to implement the tool. NGOs can further develop or implement only certain parts of the tool. Potentially, FPOs and supporting-NGOs may become the tools' ideal users.

Where/how has it been applied:
The assessment is used by individual FPOs. Currently, the tool is being piloted in 19 FPOs across 6 states in different versions of the tool (Bihar, Himachal Pradesh, Madhya Pradesh, Haryana, Gujarat, Maharashtra).

Benefits evolved from the approach:
Implementation of the tool has started but is not completed yet. However, the direct effect on most FPO members is expected to be substantial.
Due to the improvement of local value chains, indirect effects are also expected to be considerably high. To date, it is estimated that 30,000 people have benefited directly and even many more indirectly.

Lessons learned:

- Insights into a particular business are provided, more information beyond that business entity is needed for the results to be extrapolated to the entire value chain/product.

- Farmers have difficulties translating climate hazards into loss and damage. FPOs as key agricultural actors can help in collecting and making hard data accessible as well as improving financial inclusion of climate change impacts as they can bring climate resilience into discussion. By doing so, FPOs can help build capacity and climate-proof their FPO agribusiness value chains, as well as develop resilient livelihoods.

- Farmers cooperate better on potential climate change adaptation when the arguments for adaptation stem from a business perspective rather than a social perspective.

Climate Resilience & Sustainability Tool

(CRST) for Climate Adaptation Monitoring of CWRM Planning Under MGNREGS

Description of approach:

The Climate Resilience and Sustainability Tool (CRST) was developed by GIZ as part of the project Water Security and Climate Adaptation (WASCA). WASCA works to enhance water resource management through an integrated approach at the national, state, and local level with regard to water security and climate adaptation in rural areas. GIZ under WASCA developed the Composite Water Resource Management (CWRM) framework for specific planning at the local level (Gram Panchayat, GP). Data generated from GP-level planning using the CWRM framework serves as inputs to CRST. CRST was designed based on WASCA's implementation work in two districts in the state of Tamil Nadu and focuses on activities under the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) of the Ministry of Rural Development (MoRD), GOI. The objective of CRST is to integrate climate aspects in GP level planning by providing decision makers with village level information and a tool for prioritizing work (key water actions) and finances considering climate vulnerability. Ultimately, CRST is used to monitor whether India's NDCs are being sufficiently achieved under MGNREGA. Further it supports helping map the SDGs.

CRST is indicator based and conducts a climate vulnerability index assessment for GP as well as a comprehensive impact and risk assessment for three sectors – socioeconomic, water and agriculture. The focus is on vulnerability, and no losses and damage are calculated. The approach is quantitative and requires primary (fieldwork) and secondary (census) data during the planning process. The type of assessment is a guideline that identifies the sectors and GP most at risk based on the collected data. Once key water measures and vulnerabilities have been identified, the next step is field verification.

Reason(s) for development and application of the tool?

CRST addresses the issue of a lack of a resource assessment tool on GP level. CRST was developed to analyse the MGNREGA scheme as its activities support, among other things, natural resource management in rural areas. CRST will help understand how the program supports related issues by identifying key water action points and vulnerabilities, as well as maladaptation.

Sectors covered:

Agriculture, water, socioeconomics in relation to climate change.

Regions covered:
Tamil Nadu, after the pilot phase it will be fine-tuned for various agro climatic zones, then a nationwide scale up is planned.

Participatory elements included:
Yes, the tool includes field verification by different stakeholders such as government actors, engineers, or local leaders.

Approach applicable for the entire spectrum of climate-related hazards and impacts:
Extreme weather events are covered; however, climate extremity data is only used for adaptation planning.

Key actors involved in the approach: MoRD, rural development agencies, local leaders, local people, various scientific experts.

Where/how has it been applied:
Currently piloted in two districts in Tamil Nadu – Tiruvannamalai and Ramanathapuram. After the pilot phase, the guideline will be submitted to MoRD. Ultimately, a nationwide scale up is planned.

What kind of benefits evolved from the approach:
Implementation of the tool has started but is not completed yet. However, the insights drawn from CRST will help to gain perspective on adaptation necessities and issues and to prioritize those sectors, GP, and individuals at risk. Moreover, it supports in identifying and reducing maladaptation practices.

Lessons learned:

- The Data comes from various sectors, so extensive data processing is required.
- The amount of data must be carefully managed to achieve good results, especially when filling in the primary data.
- Secondary data easily accessible.

Climate Risk Assessment & Management of Ramsar Sites in India

Description of approach:
The overall process for this assessment followed the steps of the CAM (Climate Change Adaptation and Mitigation) method that has been developed by ICEM (International Centre for Environmental Management) as a flexible methodology to climate change adaptation and mitigation planning and implementation. The CAM method combines a range of assessment and planning tools based on international best practices. In the case of the Ramsar sites (wetlands of international importance) in India, the aim was to integrate the CAM tools into the regular Ramsar site management planning cycle.

The method provides a disciplined framework for systematically ordering and ranking the many climate change factors, their impacts and adaptation responses. It is best used as a priority setting process for mainstreaming climate change in site management even in situations of scarce resources and limited information. The CAM approach integrates a long-term perspective into the assessment by quantifying the past and future hydro-climatic conditions for the Ramsar sites and landscapes surrounding them as the basis for characterising climate change threats, and as the foundation for vulnerability assessments and adaptation planning.

The type of assessment is a comprehensive risk assessment and adaptation planning. The format is a guidance document on climate risk assessment for Ramsar site managers in India and climate risk assessment reports for four pilot project sites. The guideline sets out a simple and flexible process with supporting tools which can accommodate varying inputs of scientific evidence and expert judgements as well as community experience and knowledge. The assessment did not include primary surveys of the natural assets. Data was derived from previous investigations, reports, and management plans as well as stakeholder input.

Reason(s) for development and application of the tool?
The guidance document describes a practical approach to integrate climate change risks and adaptation options into the management of wetlands in India, which has been lacking so far.

Sectors covered:
Wetland, primary focus of the assessments was the natural ecosystems and their services and uses associated with each Ramsar site: (1) Physical infrastructures that determine and protect the wetland character, (2) Key habitats and keystone species that define the wetland ecosystem, (3) Ecosystem services important for local people using the Ramsar site.

Regions covered:
Four Ramsar sites across India: (1) Renuka wetland and (2) Pong Dam Lake in Himachal Pradesh, (3) Bhitarkanika Mangroves in Odisha, (4) Point Calimere Wildlife and Bird Sanctuary in Tamil Nadu.

Participatory elements included:
Field missions, stakeholder consultations and one-on-one meetings with wetland management staff, and other stakeholders during the whole assessment and adaptation exploring process. Stakeholder workshops e.g., capacity building.

Approach applicable for the entire spectrum of climate-related hazards and impacts:
Yes. Approach applicable to all climate risks from slow onset processes to extreme weather events. Included are e.g., temperature, rainfall, sea level rise and upper catchment flash flood.

Key actors involved in the approach:
Ramsar site managers (District Forest Department), District level line departments (for e.g., Water Resources, Fisheries, Agriculture, Tourism), Local communities, State Wetland Authority, MoEFCC, GIZ project "Wetlands management for biodiversity and climate protection".

Where/how has it been applied:
Implementation has started but is not completed yet. The climate risk guidance document is intended for use by the Ramsar site managers with close involvement of local stakeholders and relevant sector agencies whose actions affect the condition of the sites.

What kind of benefits evolved from the approach:
Not applicable as of now. The four project sites are managed based on an integrated management plan incorporating the climate risks, being developed under the Wetlands project.

Lessons learned:

- Importance of useful forms of communication of climate and hydrological information for specific sectors or communities

- Challenges for Ramsar site managers whose mandate is restricted to site boundaries. Also, Ramsar management plans need to identify influences outside the site boundaries which require adaptation actions by others – and then to seek government support in promoting dialogue with relevant public and private sector actors

- Suggesting adaptation measures in line with management planning cycle. Adaptation measures were categorised into immediate (< 1 year), short term (over next 2 years) and long term (over 10 years).

Health Vulnerability & Risk Assessment

Description of approach:
The approach is developed in cooperation with the Ministry of Health and Family Welfare (MoHFW), the National Centre for Disease Control (NCDC), and TERI. The purpose is to conduct a multi-dimensional indicator-based assessment to give a hazard-specific ranking of all Indian districts based on their vulnerability of climate change to health. The assessment with its easy-to-use color-coded spatial maps will inform health, climate professionals and policy makers of health and allied sectors on health vulnerabilities to climate change. This can serve as a basis for decision making on the extent of region-specific health risks and for planning adaptation strategies, policy interventions and institutional restructuring. Ultimately, it will contribute to strengthening the resilience of the health sector to climate change and climate-related health problems.

Two vulnerability assessments are conducted – one baseline and one forward looking assessment. A mixture of quantitative and qualitative data is used, with secondary data being the main source. The form of the assessment is a report. No loss components as such are included. Recommendations for adaptation measures are provided.

The development of the tool is structured as follows: (1) Development of 6 groups of health indicators through literature research e.g., several indicators on heat stress, waterborne diseases, extreme weather illness and air pollution, (2) Indicator-based assessment of hazard-specific health vulnerability and risk mapping at national-level, (3) Development of a Vulnerability Index to rank and categorize all the districts, (4) Pilot testing the framework in selected villages to conduct participatory health vulnerability and risk assessment for health and allied sectors, (5) Development of knowledge products e.g., training modules, and capacity building exercise.

Reason(s) for development and application of the tool:
Health is receiving increasing attention in the face of climate change, and in current State Action Plans on Climate Change (SAPCCs) it is more prominent than ever due to the growing impacts, such as heat stress and other weather-related health problems. Given the lack of data and information, there is a need to assess the vulnerability of the current health sector to climate change in India and identify health-related risks and socio-economic drivers of vulnerability at the national level and sub-national in the context of climate change impacts.

Sectors covered:
Health and allied sectors with a focus on infrastructure such as hospitals, as well as agriculture to include a nutritional perspective.

Regions covered:
Nationwide with a focus on three hotspots (yet to be determined).
Participatory Implementation: The tool is focused on a participatory approach for sourcing information such as stakeholder interviews or field level questionnaires.

Approach applicable for the entire spectrum of climate-related hazards and impacts:
Yes. The assessment of climate risks is triggered by the entire spectrum of hazards from slow onset processes to extreme weather events.

Key actors involved in the approach:
MoHFW, NCDC, TERI, and various stakeholders for identifying priorities, hotspots, indicators e.g., Malaria Research Institute, Nutrition institute, PHFI and IIT Delhi.

Where/how has it been applied:
The implementation of the approach has started but is not completed yet. Once results have been obtained, these will be shared with MoHFW and NCDC for consideration in their future actions. It will contribute to the implementation of the National Action Plan on Climate Change and Human Health (NAPCCHH).

What kind of benefits evolved from the approach:
The development of the tool started quite recently at the beginning of 2022. Therefore, it is still in progress, however, district level impacts are expected.

Lessons learned:
- Indicator development is challenging as health covers multiple sectors.
- In absence of practical models and lack of data, using future climate scenarios with other socio-economic data to understand future vulnerability and impacts is challenging.

Remote Sensing Technology Tool to Assess Climate Related Crop Losses

Description of approach:
Increased variance in yields due to changing cropping patterns, crop calendars, productivity, and overall production in the agricultural sector. Documenting it in a scientific manner covering large areas of farmland is difficult. Remote sensing technology-based assessments help in capturing some of these effects in a transparent and timely manner. The technology is used to cover large swathes of agricultural land to estimate area and yield information and forecast production. Wider applications of the remote sensing-based area and yield assessment include among other areas crop insurance, disaster mapping and loss assessment as well as mapping of water bodies for irrigation management.

The approach is index-based and economic losses are incorporated. It requires quantitative information and the usage of historical data and yield information. Information is derived from European and Indian cloud-free satellite data. Moreover, all remote sensing data are stored, processed, and analysed on a cloud platform. The field data collected by mobile phones are sent to the cloud over a mobile or Wi-Fi network. This provides users with timely, detailed, and accurate information. Products of this approach include crop area, crop yield and crop seasonality maps. In Tamil Nadu state, the GIZ's Innovative Climate Risk Insurance (ICRI) project intends to leverage the use of remote sensing for better monitoring and assessment of agriculture disaster events; aid the existing crop insurance programme with reporting and data services; create a water resource information system, for better monitoring, response and decision making.

Reason(s) for development and application of the tool?
Traditional loss assessment methodologies were time-consuming, costly, and inefficient. Remote sensing offers faster, transparent, and more accurate information related to area and yield losses.

Sectors covered: Agriculture

Regions covered:
Depends on the extent of a particular crop area coverage, so far remote sensing is more amenable to crops that are grown by multiple farmers covering a large area, typically food crops like rice and wheat. Currently, the project is active in the state of Tamil Nadu, India.

Participatory implementation:
The tool is focused on a participatory approach for sourcing information. This requires intensive fieldwork in the early stages of refinement of the remote sensing methodology. Capacity-building measures are required in terms of training government officials and farmers on the

role, usage, and application of remote sensing-based information.

Approach applicable for the entire spectrum of climate-related hazards and impacts:
Yes. Assessment of climate risks triggered by the entire spectrum of hazards from slow-onset processes (e.g., droughts) to extreme weather events (e.g., cyclones or floods).

Key actors involved in the approach:
State government, universities e.g., Tamil Nadu Agriculture University, insurers, and farmers.

Where/how has it been applied:
Inputs from remote sensing will be used by the state department of agriculture for crop loss assessment in terms of insurance, and also in terms of mobilising relief material during and after a natural disaster. It is currently being trialled in Tamil Nadu, with Himachal Pradesh planned for the coming years.

What kind of benefits evolved from the approach:
Improved availability of actionable information for planning food security, implementing crop insurance programmes, and disaster relief.

Lessons learned:

- Status quo approaches are very resistant, advocacy for remote sensing approach is challenging.

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