SURVIVING CLIMATE CHANGE

AN APPROACH TO PLANNING AND IMPLEMENTATION OF CLIMATE CHANGE ADAPTATION IN RURAL AREAS OF INDIA

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Nature Protects if She is Protected

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SURVIVING
CLIMATE CHANGE
CCA-RAI

Climate Change Adaptation in Rural Areas of India (CCA-RAI) project attempts to strengthen adaptative capacities at district and village level by infusing best science of future weather projection and socio-economic reality of a particular location. While the project adds value to implementation of State Action Plans on Climate Change (SAPCC) by building capacity to local governance system, communities at the village level remain the biggest focus to gather local knowledge and make the exercise inclusive.

The CCA-RAI project was funded by the German Federal Ministry for Economic Cooperation and Development (BMZ), and was implemented by GIZ India, in partnership with Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India and state nodal agencies on climate change in four states: Himachal Pradesh, Punjab, Tamil Nadu and Telangana.

STATE PARTNERS

THERE WAS A TIME WHEN CLIMATE CHANGE WAS A SERIOUS THREAT IN THE FUTURE. THAT TIME IS GONE. THE FUTURE IS HERE AND NOW.

CONTENTS

CLIMATE CHANGE AND RURAL INDIA

Of the 196 countries in the World, India has been ranked the most vulnerable to adverse impacts of climate change. There are two key reasons for it. Climate change is leading to increasing intensity as well as frequency of natural disasters. This has led to destruction of lives, livelihoods and property at scales not witnessed before. In 2016 alone, India lost 2,119 human lives and over US $21 billion (₹1613 hundred crores) worth of property due to such disasters. Nearly two-thirds of India is drought prone, 12 percent is flood prone, and 8 percent is susceptible to cyclones. As the intensity and frequency of natural disasters increases, more people will become physically vulnerable to such extreme weather episodes.

The other reason for India's high vulnerability to climate change: More than half of India's workforce is dependent on agriculture to earn a living. Even without climate change at play, agriculture and the agrarian economy is directly impacted by patterns of changes in weather and natural systems. Such as, how and when it rains, how and when temperatures rise and fall. Lives of two-thirds of the population in rural India fares better or worse, going by how these patterns play out.

Global warming has altered these patterns, intensified the variations and set in many irreversible changes. The average citizen finds it hard to grapple with, to comprehend and adjust to these rapid and unprecedented changes. This is impairing livelihoods, incomes and jobs built based on the rural economy - agriculture, forestry, tourism, animal husbandry and fisheries.

Expectedly, the poor and those socially and historically vulnerable, women and children in particular, are expected to suffer the greatest consequences of these threats to economic stability. As those who have historically faced a development deficit will suffer more, it will also increase the gender disparity in Indian society. Those on the margin of economic sustenance will face a higher risk of pauperisation. Migration under distress will increase as the vulnerable try to escape the increased uncertainty in the rural economy for work and jobs elsewhere.

The government already runs a slew of programmes to provide a social security net and develop economic opportunities for the historically disadvantaged. But, it is now tasked to create a safety net, not just accounting for past development deficit but also to counter future vulnerability.

The government's challenge is double-fold. To enable citizens prosper, live better, it either builds or helps build basic infrastructure such as energy and water supply. But, these too are being jeopardized by climate change. The two forms of power generation that India largely depends upon are hydropower and thermal power. These are also dependent on a steady supply of water. Climate Change has brought uncertainty and risks to these basic utilities as the water systems get hit by climate change.

This is the time for citizens and the government to not only overcome past economic disadvantages and deficits but to do so in a manner that secures them against shocks from the climate-insecure present and future as well. Adapt now to make sure the development gains India makes today are not discounted by climate change impacts.

WELLBEING OF AN AGRARIAN RURAL INDIA COMPLETELY DEPENDS ON WEATHER PATTERN AND WATER AVAILABILITY

THE PLAN TO ADAPT, SO FAR

India does have a response to climate change today. This includes plans and commitments to adapt to inevitable climate change. India has committed to do so internationally as well as drawn up plans for doing so within domestic policy making.

India's international commitments emerge out of two global pacts which was agreed to under the United Nations Framework Convention on Climate Change (UNFCCC); the Cancun Agreement it signed up to in 2010 and then the Paris Agreement in 2015.

India has maintained all along that while the country puts its best foot forward in the global fight against climate change and moves on a path of sustainable development, it's key national priorities remain ensuring poverty eradication. In doing so, India has made the Sustainable Development Goals (SDGs) a route to its development trajectory.

At home, it first developed the National Action Plan on Climate Change (NAPCC) in 2008. This was the Union government's first structured response to climate change. It used the co-beneift approach. Simply put, it meant India will take measures that promote growth and development and at the same time address the climate change challenge.

The NAPCC identified eight National Missions. Five of these related to adaptation, two to reducing emissions and one focused on increasing the scientific understanding within the country on climate change and its impacts.

This framework was then elaborated upon in 2009. After a decision by the Prime Minister's Council on Climate Change, states were tasked to develop their action plans in conformity with the national framework - the State Action Plans on Climate Change (SAPCC). The plans have both, adaptation and emission reduction actions to be undertaken at the state level.

INDIA'S FIGHT AGAINST CLIMATE CHANGE IS GUIDED BY NATIONAL AND STATE ACTION PLANS. THESE PLANS PROMOTE CLIMATE RESILIENT ECONOMIC GROWTH AND DEVELOPMENT

The SAPCCs describe in detail the impact of climate change, the needs for adaptation and the potential for reducing emissions at the state level. The SAPCCs also chart out the financing and capacity building needs to implement the desired actions.

The plans have been kept amenable to improvement and improvisation as India's understanding on climate change, and the different ways of addressing it evolves.

The SAPCCs are the first step towards decentralisation and effective implementation of India's climate actions. They have percolated down the imperative to act on climate change down to critical state-level actors within the government. They have also shown how and why addressing climate change cannot be compartmentalised only within the 'environment' department alone. The message they send is clear. Addressing climate change is a shared objective of all segments of the state government which carry out development enhancing activities.

ACCELERATING ADAPTATION NOW

Today, NAPCC and SAPCC serve as the guiding document to mainstream climate change concerns in sectoral plans and policies both at national and state level. To do so, it is incumbent now to make the policies work through more granular prescriptions and plans. These are best evolved from and implemented at a more granular level of democracy - districts, and even deeper at times at sub-district levels.

This is a logical step ahead for two reasons. The impacts of large climate change forces play out differently against different socio-economic and environmental backgrounds. These background conditions can vary substantially at sub-state levels. Secondly, the delivery of development and infrastructure augmenting programmes is mostly channeled through district and sub-district authorities and agencies. India - the Centre and the states put together - make a massive public investment in these programmes year after year.

These investments are to be protected against impacts of climate change in the mid and long-term. That is one big part of what is termed as 'adaptation' in climate jargon. A canal planned today should not only be built on experience of how the source river has flown in the past. It has to be built to serve the people even as climate change alters the behaviour of rivers in the present and future. Or, the development dividend of existing levels of public investment would be eroded as climate change impacts intensify.

Adaptation, therefore, is two fold parallel process. First, departing from the existing process of using historical data to plan the future development, we need to take the help of evolving climate science to project the future scenario and plan our future.

Second, we must tweak, alter, adjust and adapt existing public investments into socio-economic and infrastructural plan to outlast the impacts of climate change - protect what the country is already investing in building a better and more empowered society. This adaptation work has to be done now and urgently. The impacts of climate change are already taking place as the country invests towards its future growth. Secure these investments. In addition, top it up with additional investments which spur new innovative plans, programmes, technologies and schemes, that can in turn helps citizens become climate and economically-secure.

This accelerated adaptation efforts can only be meaningful if plans are based on scientific projection of vulnerability in the future.

IT MAKES EMINENT SENSE TO TURN EVERY DEVELOPMENT PROJECT IN RURAL INDIA TO BE ADAPTATIVE.

PROJECTING THE FUTURE

When we invest in and for the future, we need to be able to predict it. We cannot tell what exactly lies in the future. But it is now possible to make projections of the future using the best of scientific and socio-economic evidence available. It is possible to do so at scales that matter, scales at which adaptation actions have to be tuned and implemented. We can model to predict how the temperature and rainfall regimes will change as greenhouse gas emissions grow. This provides us a good sense of water availability in the future. However, just knowing annual averages of temperature and rainfall does not help an agrarian rural society. Only minute details of the data can help make use of information. These models provide details like variations in maximum and minimum temperatures over seasons, rainfall amount over seasons and most importantly identify number of rainy days through the year. Knowing these details will help plan rainwater harvesting methods for intense rain at specific times of the year.

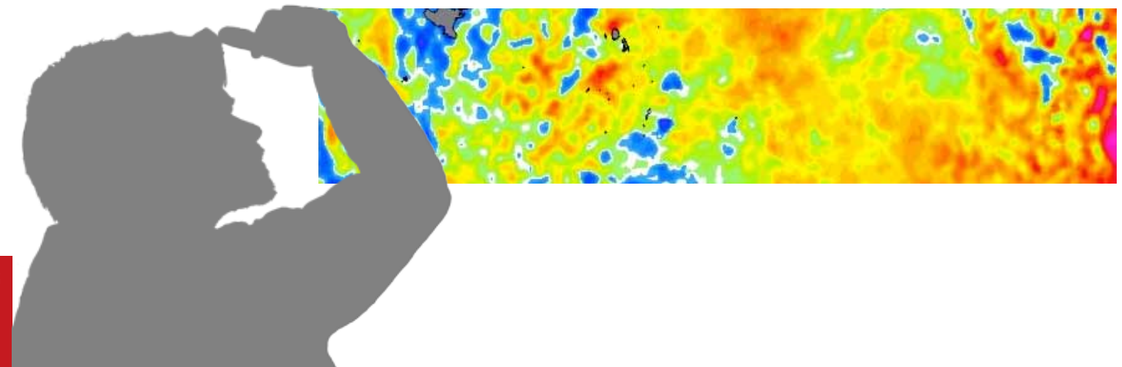
Running these variables through specific eco-regions gives an estimation on the flow, moisture content and groundwater recharge of the area. This helps in mapping a water availability index for the future in a specific region.

Seen through socio-economic parameters of specific region, water availability can help project future climate vulnerabilities based on the region's primary livelihood source, infrastructure and current coping capacity.

This in turn, provides us a good basis to predict the future socio-economic profiles of a region. From these profiles, one can measure and project how vulnerable a district would be to both physical and socio-economic impacts of climate change. The vulnerability assessment is done by factoring into each district's current capacity to cope against impacts of climate change. For example, it is possible to project how vulnerable groundwater, public health systems, livestock, forests and agricultural productivity would become in a district with climate change. It is possible to extrapolate from this how incomes of people in a district would alter and how social dynamics, such as migration and gender disparities would play out as a consequence.

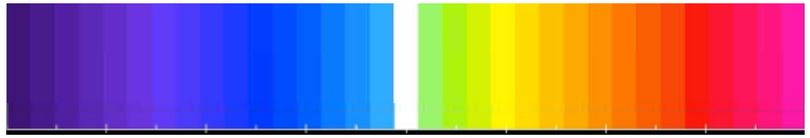
The projections are done using mathematical models. The models are done for different future emission scenarios and are calculated for a mid century and end of century timelines. This provides a high level of confidence to decision-makers who draw plans to integrate adaptation into development programmes. The results of the modelling is today available in terms of forms that decision-makers understand and can act upon. Integrated Natural Resource Management (INRM), a knowledge partner of this project calculated district-wise future weather scenario for four pilot states.

KNOWING ANNUAL AVERAGE OF WEATHER VARIABLES DOES NOT HELP. AGRICULTURE IS A COMPLEX ACTIVITY AND DEPENDS ON MINUTE DETAILS OF TEMPERATURE AND RAINFALL



LOOKING AT 2050

ASSUMING LOW EMISSION SCENARIO



HIMACHAL PRADESH

- Mean annual maximum temperature to increase by about 1.4°c
- Mean annual minimum temperature to increase by about 1.4°c
- Mean annual rainfall is to decrease marginally by about 5.9%
- Number of rainy days will decrease

PUNJAB

- Mean annual maximum temperature to increase by about 1.2°c
- Mean annual minimum temperature to increase by about 1.3°c
- Mean annual rainfall to increase by 5.4%
- Number of rainy days will increase

TAMIL NADU

- Mean annual maximum temperature to increase by about 1.0°C
- Mean annual minimum temperature to increase by about 1.2°C
- Mean annual rainfall to increase marginally by about 4.4%
- Number of rainy days will decrease

TELANGANA

- Mean annual maximum temperature is to increase by about 1.4°C
- Mean annual minimum temperature is to increase by about 1.4°C
- Mean annual rainfall is to decrease marginally by about 2.2%
- Number of rainy days will decrease

A STEADY DECREASE IN NUMBER OF RAINY DAYS MEANS MORE INTENSE RAINFALL. THIS THROWS A CHALLENGE TO WATER MANAGEMENT AS MORE WATER NEEDS TO BE HARVESTED IN LESS AMOUNT OF TIME

FINANCING ADAPTATION

Climate change cannot be addressed while governance operates from silos. The government has already begun to converge financial resources and integrate schemes across departments to deliver on its development agenda.

This convergence of resources across schemes and plans of different government agencies has a multiplier effect. It improves the productivity of investments made in social infrastructure. Dovetailing adaptation imperatives at the time of making these convergence plans ensures these public investments are climate-proof and continue to deliver social good in both short and long term as well. Weaving adaptation needs into existing programmes also helps find more common-grounds for convergence and effective use of public resources.

For example, if plans for improving access to water or other inputs to farmers are matched with how farming is adapting to changing weather patterns, quite expectedly, this would lead to money being spent better. Schemes like Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) have been tweaked already to deliver on other social infrastructure priorities. Therefore, convergence of resources across schemes and plans of different government agencies brings about a multiplier effect to the productivity of investments.

The unlocked potential from convergence around adaptation is set to be augmented in coming years as Central and state governments increase financial support to both development imperatives and adaptation needs. Given the urgent need for extensive adaptation projects, the need for finance is high. But if we look closely, adaptation is essentially creating climate-proof development projects. It makes eminent sense then to look at the existing basket of district and village development plans, existing schemes, and realign them towards adaptation. This will intensify the adaptation effort as well as make funds available from existing budgetary provisions.

In cases where there are new transformative projects that are not covered by existing schemes, there are specific adaptation funds available nationally and internationally. A National Adaptation Fund has been set up to support implementation of concrete adaptation projects under SAPCCs. India is also actively tapping the international funds to this end, such as the Adaptation Fund (AF) and the Green Climate Fund (GCF) under the UNFCCC and Global Environmental Facility (GEF). These international funds are expected to grow and so will the monies India can access from them in time.

LEVERAGING EXISTING DEVELOPMENT FINANCE IS THE BEST WAY TO ACCELERATE ADAPTATION. THIS CAN BE THE BEST WAY TO MAKE ALL PUBLIC INVESTMENTS CLIMATE-PROOF

BIG TICKET ADAPTATION FINANCE

NATIONAL FUNDS

NATIONAL CLEAN ENERGY FUND (NCEF)

NCEF is currently inoperative

CLIMATE CHANGE ACTION PROGRAMME (CCAP)

CCAP is a central scheme in place since 2014 at a total cost of ₹290 crores for duration of five years. It aims at creating and strengthening the scientific and analytical capacity for assessment of climate change in India, and climate change governance.

NATIONAL ADAPTATION FUND ON CLIMATE CHANGE (NAFCC)

NAFCC meets the costs of concrete adaptation activities, interventions, or climate resilient technology transfer not covered by the schemes of State or national government. Till 2018, NAFCC has used ₹660.72 crores. An additional outlay of ₹364 crores is to be spent till 2020.

NATIONALLY, NAFCC HAS APPROVED 30 PROJECTS WITH AN OUTLAY OF US $111.4 MILLION (₹847 CRORES).

INTERNATIONAL FUNDS

GREEN CLIMATE FUND (GCF)

GCF is available for adaptation programmes ready for scaling up and for transformation to low-emission and climate-resilient development, with minimum to none environmental and social risks and impacts. The programme must promote gender inclusion and equality. Submission should be made to the National Bank for Agriculture and Rural Development (NABARD).

ADAPTATION FUND (AF)

AF requires project proposal(s) to focus on development for extreme climate vulnerabilities and adaptation while addressing gender equality and inclusion. Proposal(s) or concepts can be directly submitted to NABARD up to three times a year.

INTERNATIONNALY, AF CLEARED 6 PROJECTS IN INDIA WITH A BUDGET OF US $9.86 MILLION (₹75 CRORES) WHILE GCF COMMITTED US $178.4 MILLION (₹1356 CRORES) FOR 5 PROJECTS

MONITORING IMPLEMENTATION

To attract new investments into adaptation and to ensure existing converged resources are efficiently utilised, states need to have a framework that monitors, evaluates the 'adaptation dividend' on each rupee spent.

The existing monitoring and evaluation systems that only measure development and social benefits from programmes and schemes is not enough. An effective monitoring and evaluation system oriented to measure the adaptation dividend increases accountability, provides evidence-based proof of delivery and identifies gaps to fill, which in turn attracts more investments geared specifically towards adaptation, both from the public and private sector.

CCA-RAI STEPS IN

An adaptation initiative was deployed in four states. Telangana, Tamil Nadu, Punjab and Himachal Pradesh piloted an approach to climate-proof their public investments and development programmes for the future. This was being done under the Climate Change Adaptation in Rural Areas of India (CCA-RAI) project.

CCA-RAI worked with state nodal agencies on how to embed climate change priorities from the SAPCCs into policies and programmes at sub-national level. The project used a multi-pronged approach to facilitate policy guidance and help create an enabling environment to promote climate action. This helped climate-proof current public investments and in turn found new ways to adapt that may not be part of existing development frame.

The project's guidance and support was based on scientific and economic evidence. CCA-RAI helped strengthen both human and institutional capacity, triggered climate finance readiness and promoted climate-friendly technologies.

The project found the entry points and built the case for action. It piloted such cases to understand implementation challenges and provided proof of how these actions climate-proof public investments. Throughout this process, inception, implementation to monitoring, it took along all stakeholders and ensured their active engagement.

CCA-RAI was able to deliver well at the sub-national level as GIZ India has been working on adaptation at the National level with the Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India (focal point for climate change issues in India), since 2009. This has played a critical role in the evolution of SAPCCs by state governments as well. This approach brings in knowledge from the best of experiences internationally. The project's understanding of the challenges and needs at national, state and sub-national scales ensured a rich knowledge base and experience to help governments climate-proof their development plans and deliver the adaptation measures till the last mile.

In the four states of Telangana, Tamil Nadu, Punjab and Himachal Pradesh, CCA-RAI has carried out state, district and sub-district level vulnerability assessments. This has helped build integrated plans for adaptation that identify actions, find convergence zones, identify financing opportunities, build capacities to deliver and establish adaptation-oriented monitoring mechanisms.

In doing so, the project has established and run pilots in the four states, at both community level and at institutional levels.

IN HIMACHAL PRADESH

All major economic activities in the state are directly dependent on the availability of water and temperature regime hence, climate change plays an important role in the well-being of the state. Changes in snowfall, and glacier behaviour greatly affect water availability across the state. An analysis of 63 years (1951-2013) of data showed that annual maximum and minimum temperatures have been increasing in Himachal Pradesh. The vulnerability assessment predicts a definite decrease in annual rainfall for the state. More importantly, there is a strong trend towards the decrease in the number of rainy days, resulting in the annual rain for the state falling on fewer days. This implies more intense rainfall, increasing the possibility of flash floods, enhanced soil erosion, and landslides.

The CCA-RAI project intervened in the district of Bilaspur in Himachal Pradesh to set up a pilot adaptation project. The pilot project helped to develop sustainable water management strategies in gram panchayat of Kandrour. The project worked with a local partner, CTRAN Consulting. The panchayat suffered from erratic rainfall, frequent droughts, crop failure, and high erosion. The farmers in the gram panchayat lived with high dependence on money lenders for credit, high productivity loss and poor crop production.

The project, converged resources from existing programmes such as National Rural Drinking Water Program, Integrated Watershed Management Programme and Pradhan Mantri Krishi Sinchayee Yojana (PMKSY).

Under the project, check dams, sunken ponds, farm ponds were built, baolis (traditional water harvesting structures) rejuvenated and roof top water harvesting structures brought in. Efficient Irrigation practices through promotion of lift irrigation, community tanks, sprinkler irrigation and drip irrigation were introduced. This enhanced water conservation in the gram panchayat.

Plantation in slope areas of species like, Senegalia Catechu (Khair), Callistemon Flavovirens (Cheel) or Phanera Variegata (Kachnar) were grown for soil conservation.

Agricultural practices including vegetable cultivation in poly-houses and crop diversification were further introduced. Poly-houses allow crops to be grown under a favourable, controlled environment where temperature, humidity, soil media, disease control, irrigation and other agronomical conditions are controlled throughout the season irrespective of the environment outside.

The project has thus helped enhanced crop productivity, irrigation efficiency and improvement in crop planning, including promotion of climate resilient crop varieties.

A renovated traditional stepwell

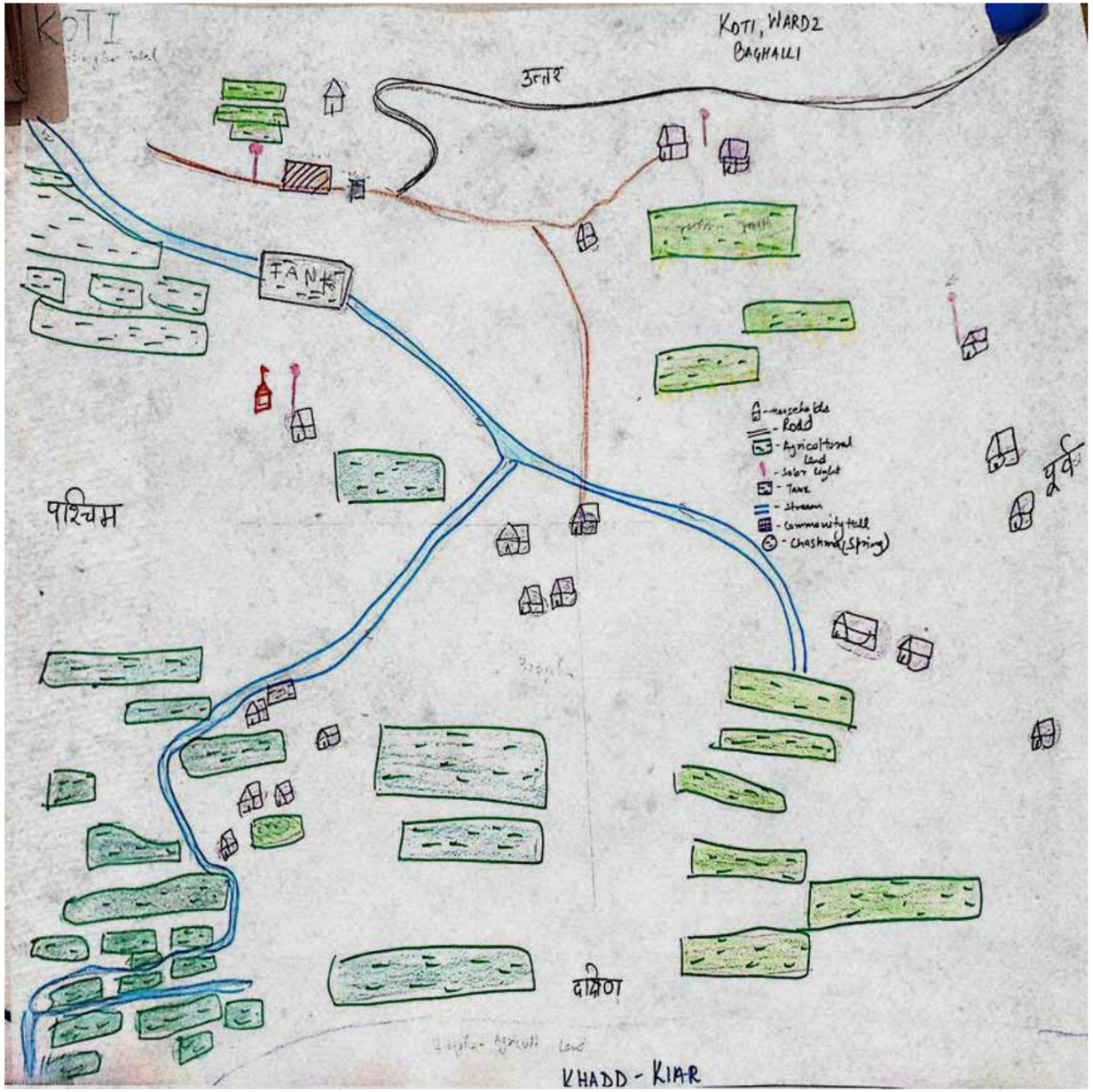
Bell peppers growing in a subsidised polyhouse

ECO-VILLAGE IN HIMACHAL PRADESH

The state government had a plan to set up eco-villages, and needed a detailed plan and mobilisation of finance to implement it. The CCA-RAI helped set up eco-villages in Baghalai and Janjheli villages in Shimla and Mandi districts respectively. Apart from the detailed plans, the project galvanised and converged existing finances from multiple relevant schemes to fund the project to test the practicality of this approach.

Community participation was at the core of this project. A climate resilient water security plan was prepared for identified spring-sheds and these were rejuvenated through the landscape approach. Alongside rooftop rainwater harvesting, wastewater treatment, water conservation practices for irrigation and revival of traditional water resources was stepped up. On one hand organic farming, farm produce management practices and crop diversification was intensified. On the other hand, plantations in forest area, community afforestation programmes and reduction in forest fires led to both enhanced forest productivity and increased ecological services for the community. The pilot helped people adopt biogas, use solar heaters, lights and solar fencing. Source segregation, composting, reuse and recycling of goods and materials and vermicomposting of biodegradable waste was also introduced. The success of the pilot showed the potential to scale-up this convergence model of accelerated adaptation across the state.

Villagers in a planning meeting



BENEFICIARIES

- 120 households in Baghalli village, Dhamun panchayat of Mashobra Block, Shimla district
- 292 households in Janjheli village of Seraj Block, Mandi district

SOURCE OF FINANCE

- MGNREGA
- Forest Dept.
- Agriculture Dept.
- Soil Water Conservation Dept.
- Horticulture Dept.
- DEST Fund
- HIMURJA
- Eco-village Scheme
- Panchayat
- National Food Security Mission

₹2,24,37,000

IN PUNJAB

The vulnerability assessment of Punjab showed that the monsoon rains experienced during the months of June, July, August, and September were likely to increase from 4 per cent to 12.5 per cent. But, a decrease in rainy days would make rainfall intense thereby increasing surface run-off. Moreover, groundwater recharge was expected to go down in most of the districts. The rising temperatures would also lead to a need for more irrigation for crops. The state was already suffering from a challenge of excessive ground-water use for cultivation, which would get worse with climate change.

The CCA-RAI undertook pilot project in collaboration with local partner, Vasudha Foundation. The pilots were run in Patiala and Moga districts. Vulnerability assessment showed that the districts faced rising temperatures and extreme rainfall events. The annual precipitation was projected to increase by 13.3-21.5% by 2050, resulting in significant increased risks of flooding and loss of excess water due to increased runoffs.

The unregulated use of groundwater for irrigation had made people in the districts economically vulnerable, insecure and sensitive to climatic shocks that are likely to occur in the future.

Water stress, therefore is the primary impact of the existing wheat-rice crop cycle, brought about mainly by rice cultivation in the Kharif season. Farmers are reluctant to shift away from rice cultivation since they are assured of market linkages.

Additionally, in collaboration with Punjab Agriculture University (PAU), the project created a farmer's network in Punjab to strengthen a platform which amplified the voices of conservation farmers. The platform ensured farmers get up-to-date advisories based on local farming systems and related weather forecasts, to enable them to take timely corrective measures.

The pilot therefore supported farmers in taking up Direct Seeded Rice (DSR) through intensive interaction and provided them with technical knowledge and extension support. Around 1000 acres of land have been converted to DSR by now. Support was also provided through Lucky Seeders, a tractor mounted sowing machine, which helps in practicing DSR. Farmers who adopted DSR reported at least 20-30% reduction in water use with no change in income. In fact, an increase of 35 to 38 % in the paddy yield in the DSR sown area was observed. Using extension services support and sharing of knowledge, the project supported crop residue management. The pilot was able to show that a nominal incentive of ₹2,000 per acre would be adequate for farmers to shift over to a more water-efficient rice cultivation practice like DSR resulting in substantial savings of the consumption of electricity and build overall resilience.

To help offset straw burning and the air pollution stress it causes over seasons, the pilot also helped promote the Happy Seeder machine. This is tractor-mounted and cuts rice straw. Simultaneously the machine sows wheat into the bare soil, and deposits the straw over the sown area as mulch helping increase soil fertility.

The project was able to build both community and institutional capacity to help adapt to climate change.

A Happy Seeder in operation to sow wheat as well as manage crop residue after harvesting rice

Lucky Seeder being used for DSR

IN TAMIL NADU

The vulnerability assessment done by CCA-RAI for Tamil Nadu showed that the mean maximum temperature would increase in all months in the state, with maximum increase of 1.6ºC in May. An increase of 12% of rainfall is expected during the South west monsoon, with almost no change in groundwater recharge. The state would also see a decrease in average rainfall during the North east monsoon in November and December, with a marginal increase in stream flow and expected reduction in groundwater recharge. The drought conditions in the state were to intensify. With a decrease in the number of rainy days, more intense rainfall was expected which could cause flash flood and soil erosion.

CCA-RAI joined hands with DHAN (Development of Humane Action) Foundation to lead pilots in Tiruvannamalai district in the state. In this district, agriculture is mostly dependent on groundwater resources like open wells, bore wells and traditional water storing structures like tanks. These structures are highly vulnerable to the impacts of climate change and extreme weather events like floods, droughts, and heavy rainfall. Siltation and encroachment continue to adversely affect the region. In addition, farmers had abandoned local varieties of paddy in favour of short duration hybrids that remained unsuitable to local climate and soil quality. Failure in agriculture subsequently led to forced migration as a coping mechanism.

The pilots projects dovetailed programmes such as Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) and MGNREGA in the district, working with several line departments to deliver climate-proofing adaptation actions from within the development trajectory.

The project helped treat the watershed in Jawadhu Hills to enhance soil fertility, reduce soil erosion and increase the water storage, with people's participation. Construction of redesigned percolation ponds, farm ponds and check dams for water conservation was undertaken and works were carried out to reduce soil erosion, soil salinity and hardening. Trees were planted in newer areas like in the field boundary and the ridge. Alongside, cultivation of traditional hardy crops like millets was promoted by providing processing and marketing support to generate continuous demand and improved income security for farmers.

Concerns on low return on investments for existing crops were addressed through context specific demonstrations like optimal seed rate and the right blend of mixed cropping.

This, the project was able to increase capacities of communities through entrepreneur skill development, which reduced migration from the region.

Planting groundnut in Jhawadu Hills in Tiruvannamalai

Harvesting small millets

IN TELANGANA

The state-level vulnerability assessment showed that by 2050, even if the growth of greenhouse emissions remains low, rainfall for the entire state would increase significantly for the month of July (34.6%), but would decrease for August and September. Surface run-off was expected to increase causing floods and reduced recharge of groundwater. Looking at specific districts, Adilabad was projected to experience a high temperature of 44ºC in May, an increase of 2.3ºC. Even the winter temperature of the state was expected to rise by 1.5ºC. Vulnerability due to a lack of water resources would reach extremely High for Hyderabad and Very High for Rangareddy.

Soil erosion, loss of soil, choice of unsuitable crops emerged as a reason behind low productivity leading to high vulnerability for farmers.

A pilot intervention was undertaken in Mahbubnagar (erstwhile combined) district to show how these climate vulnerabilities could be reduced to increase farmers' climate resilience and incomes. Environment Protection Training and Research Institute (EPTRI) was the regional partner for the pilot. Acute water shortage was observed across all the villages in the region. There was an increased incidence of diseases like Maruka at vegetative stage and pests like pod borer due to weather extremes. To add to this stress, most farmers in the region changed their cropping patterns, shifting to commercial crops such as cotton and paddy which required high inputs of water and not necessarily compatible with local soil and changing climatic conditions. The project responded to this situation and helped farmers move towards growing groundnut, a traditionally grown crop, over rice as a more productive and suitable crop. To enable farmers to do so, water-efficient sprinkler systems were introduced and a supply chain linkage was ensured so that farmers got appropriate remunerative prices for the groundnut. The project augmented water resources for agriculture through rain water harvesting, renovation of identified water bodies and activities such as digging up of soak pits close to bore wells for recharge. The project further ensured timely supply of short duration drought resilient red gram seeds and groundnut by promoting community seed banks and seed replacements. The pilot helped in reintroducing traditional crops, promoting improved soil-fertility management methods, and financing water-storage facilities. New techniques were demonstrated with proper training for the farmers on how to use them. This was applied to nine micro-watersheds with 13,000 farmers, half of them being women.

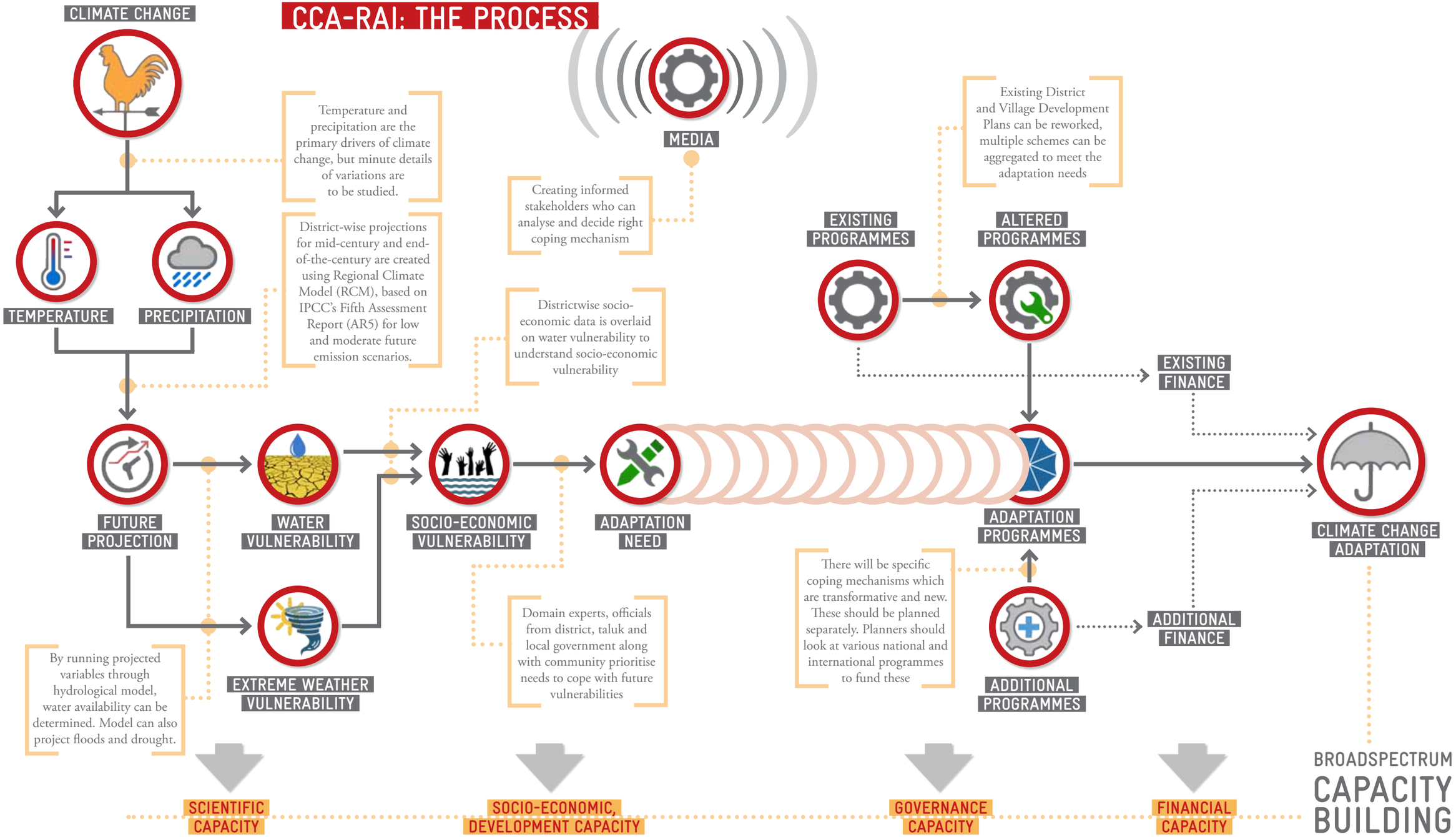
A pilot intervention in partnership with Modern Architects for Rural India (MARI) also helped introduce better water management techniques for communites in the region. Watersheds with appropriate slope, soil and rainfall conditions to enhance soil fertility were created. The pilot also reintroduced cultivation and consumption of climate-smart small millets which would also significantly reduce the cost of cultivation. Despite high temperatures and scanty rainfall conditions, the millets gave very profitable yields.

Harvesting groundnut

Villagers creating water harvesting structures

A farmer moved to cultibvating small millet from rice

CCA-RAI: THE PROCESS

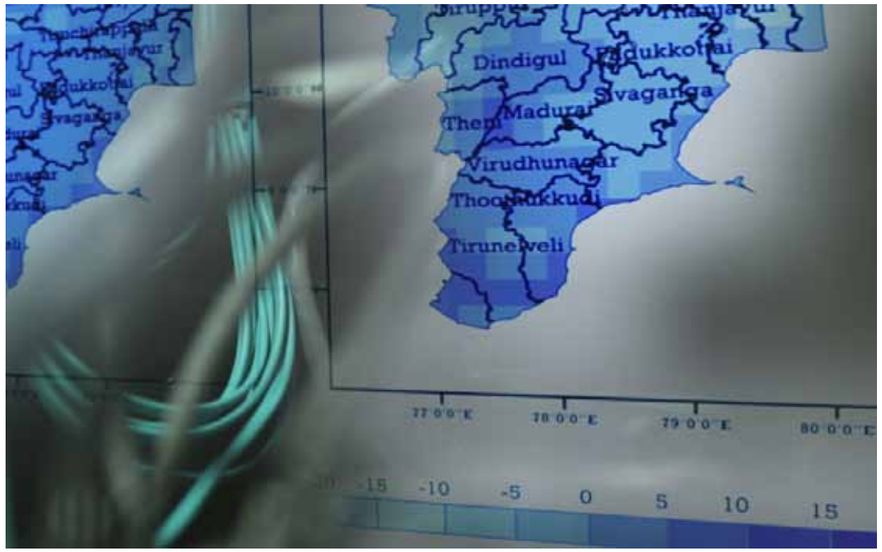


CLIMATE STUDIO

Planning adaptation and development strategies for the future requires projections of weather variables over a period of time. Data driven climate research becomes valuable. This research requires high performance computing to help predict climate models over different periods of time. In India, limited computing facilities means access to micro level climate change information is reduced which in turn hinders evidence based policy making and planning long-term adaptation strategies at all levels.

The project supported setting up of a state-of-the-art climate lab for driving climate research at the Centre for Climate Change and Disaster Mitigation (CCC&DM), Anna University, in Chennai. The lab will provide up to date climate projections and climate and vulnerability information for all states and union territories of India at national, state and district level. The data is computed for a mid-century and end of century projection.

This lab has already been identified as the nodal agency for knowledge management and capacity building on climate change. They are also mandated to conduct training programmes for assessing climate change impacts on various sectors such as water, agriculture, forestry, coastal, urban habitation, health and biodiversity. Very soon, this lab will build scientific capacity to support adaptation activities and also promote an active exchange of data and techniques between a network of institutions involved in climate studies.



AGRO-ADVISORY, ON THE GO

Agricultural production in India is highly sensitive to climate change. Farmers need a guiding platform for weather forecasts, timely advice about cropping practices and market price estimation to help reduce crop failure and yield reduction. CCA-RAI has developed a backbone IT system called Network for Information on Climate (Ex)Change (NICE). Through NICE, timely regularly updated information about climate change adaptation in the agriculturural sector is being created and disseminated.

This has ensured farmers get up-to-date advisories on local farming systems and related weather forecasts, and enable them to take timely corrective measures. The application also initiates a two-way flow of communication to generate a bigger database of localised information on climate change adaptation in agriculture. Furthering capacity building of stakeholders led to better understanding of and response to specific local needs around climate change adaptation.

A dedicated team was trained as ICT Community Resource Persons from land to lab. The main motive was to connect farmers to the university and government experts for addressing farmer specific challenges in agriculture. Advisories were disseminated through Voice SMS/ SMS/ Virtual posters, display boards and posters. Conventional Agriculture and Veterinary camps were organised in the selected villages. Focussed group discussions (FGDs) were facilitated by professionals to document various climate change vulnerabilities and identify adaptation options.

CAPACITY 360°

Climate Change is everyone's problem. To assure efficient use of public funds and government schemes, development planning must take climate change into account.

This project worked to create awareness about adaptation planning at all levels of governanace. Horizontally, it worked with all ministeries to create a unilateral approach to development planning taking into account climate change. In addition, the project also took into account all variables within the governement structure and worked with officials from national, state and district levels to ensure flawless dissemination of information.

- **SENIOR OFFICIALS**
  - 4 sensitisation workshops with secretaries, principal secretaries, directors of various line departments
  - 80 officials sensitised

SENSITIVE MESSENGERS

The bedrock of information dissemination in a robust society is good journalism. Good journalism across national, state and local levels multiplies information better than any other method of communication. Therefore, snsitising journalists communicating on climate change to latest science is important.

Creating awareness of multifaceted adaptation strategies is a way to help empower them and increase their analytical capability about the issue. Journalists have an ideal grasp on local issues and problems. A two-way flow of communication between them and researchers and experts will lead to quicker problem finding, solving and dissemination of information.

- **MEDIA**
  - 4 state level training workshops
  - 1 national training workshop
  - 1 media fellowship programme
  - 200 journalists from print, TV and web sensitised

WHAT DID WE LEARN

Mainstreaming Climate Change Adaptation (CCA) at the local level does not necessarily aim to execute central regulations. But the process can definitely be employed to inform evidence-based policy making at various levels. Mainstreaming CCA at the local level is the most important aspect as it can help local governments at a ganular level, to deal with economic implications which can hinder the process of achieving development goals.

It is important to identify the right entry point aligned to existing developmental objectives/ plans/strategies at the local level driven by the requirements of the community and targeted to a specific problem/sectoral issue. The aim should be effective delivery of public services and associated management of natural resources.

Local leadership or champions are crucial for building awareness on the need for mainstreaming CCA in ongoing and existing activities, driving adaptation action on ground and for ensuring sustainability of the interventions. It also depends on network participation and access to resources.

Use of external catalysts such as the call for integrating adaptation concerns in key sectors, described as priorities in NAPCC, SAPCC and NDC, as a starting point for any action on ground and engaging with relevant stakeholders

In some cases, like in MGNREGA, assured employment by building NRM projects can act both as an opportunity space, to mainstream CCA and act as a driver/incentive to promote adaptation action on ground to build natural capital.

Mainstreaming CCA being an iterative process can only be effective if the measures and approaches are accountable. This includes defining clear goals, benchmarks and performance metrics to demonstrate results to communities, government and non-government partners, and demonstrable cost-effectiveness

Last, but not the least. Success depends on intensive stakeholder engagement in identifying the community requirements and ownership. Stakeholder involvement works best when perspectives from diversified stakeholders like scientists, local decision-makers, most vulnerable community members are included at all levels of planning and implementation

CLIMATE CHANGE ADAPTATION

CCA-RAI was designed to strengthen the implementation of State Action Plan for Climate Change (SAPCC). Mainstreaming of adaptation became an integral part of the design while trying to accelerate adaptation with efficient use of available finance. Revised SAPCC will now embed 'mainstreaming'.

The story is not over. The enthusiasm from the communities, local governments and state nodal agencies has ensured the next phase of the programme, Climate Change Adaptation and Finance in Rural Areas of India (CAFRI), started in January 2020. It aims to improve India's NDC on adaptation with special focus on women's self-help groups and Farmer Producer Organisations.

CLIMATE CHANGE ADAPTATION IS A MULTI-DISCIPLINARY AND PARTICIPATORY EXERCISE.
THE CCA-RAI TEAM

■ IMPLEMENTED BY Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) Gmbh along with Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India

■ STATE NODAL PARTNERS Department of Environment, Science and Technology (DEST), Himachal Pradesh • Punjab State Council for Science and Technology (PSCST), Punjab • Department of Environment, Government of Tamil Nadu • Environment Protection Training and Research Institute (EPTRI), Telangana

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■ UNCOUNTED VILLAGERS, MEMBERS OF GRAM SABHAS AND PANCHAYATS, OFFICIALS AT BLOCKS, SUB-DIVISIONS AND DISTRICTS

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