

# Assessment of the Karnataka State Action Plan on Climate Change with a focus on water and agriculture sectors

Reflections from policy analysis and on-ground surveys highlighting  
current status and pathways to bridge implementation gaps



A report by Centre for Environment Education with support from Hanns-Seidel-Stiftung India



# Acknowledgement & Credits

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# Executive Summary

Climate change is the most widespread, rapid, and intensifying phenomena of the 21st century. Extreme weather events such as heat waves, cyclones, floods and heavy precipitation have become more intense and frequent throughout the world. A temperature increase of 2.7°C to 4.3°C by the 2080s, precipitation level rise of 6-8% and sea level rise of 88 cm by 2100 will likely occur in India as per the projections of the IPCC 2007 report.

Such a scenario is an emerging threat for an ecologically sensitive, developing and agrarian economy such as India and will likely threaten the survival and livelihood of rural communities dependent on agriculture and its allied sectors. The Government of India proposed a National Action Plan on Climate Change (NAPCC) in 2008 to mitigate climate change consequences on a national scale. The government encouraged individual states to draft their state action plans to complement the missions laid out in the national plan whilst prioritizing their local needs. As a result, The Karnataka State Action Plan on Climate Change (KSAPCC) was formulated. The document defined 200 actions of which 31 were tagged as priority action points. The present study focuses on policy implementation in the agriculture and water sector with an emphasis on four action points in both the sectors.

The primary aim of this research study is to strengthen the efficiency of the KSAPCC, particularly in the Sustainable Agriculture and Integrated Water Resource sectors by reflecting on the implementation challenges, policy and communication gaps with an added emphasis on stakeholder engagement. The study was carried out by interviewing stakeholders in the Karnataka and Uttar Kannada region. Key stakeholders included water and agriculture government line departments, knowledge partners, grassroot partners and farmers groups. An open-ended questionnaire was designed to gather insights on these key research questions:

- What are the major factors influencing efficiency of effective implementation of KSAPCC within the water and agricultural sector?
- What are the actions announced in the KSAPCC specifically for integrated water resources and sustainable agriculture?
- What are the ways to improve engagement of multiple stakeholders and NGOs for better understanding of the focus sectors as well as KSAPCC implementation?
- What policy approaches could be designed for better implementation and communication of insights gained from the study to policymakers for better implementation?

The KSAPCC is a fundamental policy document focusing on climate change at the state level, however, the next phase of this plan is under development. The policy analysis and synthesis of qualitative surveys reflect progress but also showcase the underlying gaps in the development and implementation of the KSAPCC. Important factors in effective policy implementation such as stakeholder engagement, allocation of funds were not fully taken into consideration while designing the state level policy. A deeper review of the policy document suggests that action points lack precision and hence suffer from proper allocation of funds. Farmers need to be sensitized about climate change on a large scale to build climate resilience. Lastly, the study revealed a gap of over a decade in the revision and scientific approach of the KSAPCC, making the policy document less relevant to current climate scenarios.

The study concludes with recommendations for effective implementation of the Karnataka State Action Plan on Climate Change such as strengthening stakeholder engagement and public participation, enhanced scientific approach, effective decision making and coordination, capacity building, improved fiscal management, and promoting widespread education on climate change.

# Introduction

Human activity is causing the climate emergency to accelerate at an unprecedented rate. The effects of climate change are visible in every region across the world. Extreme weather events such as heat waves, cyclones and heavy rains have become more intense and frequent since the 1950s as a result of anthropogenic activity. Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the Earth's climate system, increasing the likelihood of severe, pervasive and irreversible impacts on people and ecosystems. The Intergovernmental Panel on Climate Change AR6 report states that all climate models indicate a high likelihood for climate extremities such as droughts, tropical cyclones, wildfires and heavy rainfall by the end of the century. This will be further exacerbated by frequent pluvial floods and erratic rainfall patterns in the South Asian region (IPCC 2021: Summary for Policymakers).

As a result of increased scientific understanding, a growing number of impacts and more and more possibilities for low-cost/cost-effective/affordable, increased political and economic discussions on climate change were observed at the beginning of the 21st century. The push by international policy dialogue is towards climate action at a global, national and subnational level. Limiting climate change requires substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks (Kumar, 2018). Climate policy requires planning and action for implementation. The mode of achieving rapid and sustainable climate action is through science-based targets, realistic and participative implementation and monitoring as highlighted by UNEP (UNEP, 2021).

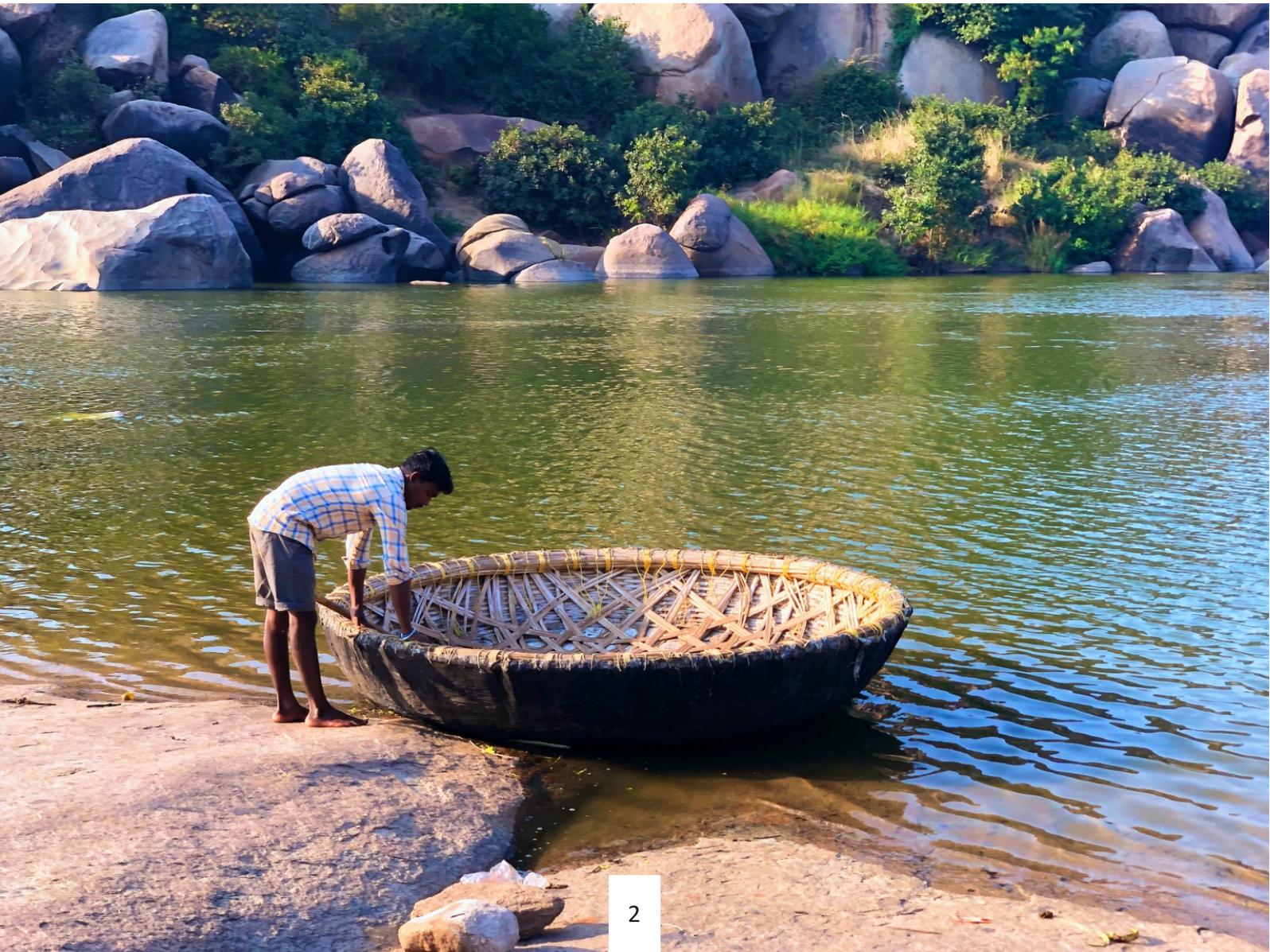
Assessments carried out by the IPCC highlighted that countries mostly affected by climate change would be agrarian dominated, eco-sensitive economies in the global south. This group comprises mainly developing and emerging economies. Here the inadequacies of infrastructure, low education and income levels, lessen the choices that can be exercised (also known as adaptive capacity). In addition, slower response mechanisms of these nations are compounding their natural vulnerabilities (EMPRI & TERI, 2013). Their resilience is lower but needs to be built.

Most governments acknowledge the need for rapid action and are increasingly adopting national programmes for climate change mitigation. Under the Paris Agreement of 2015, all countries are supposed to regularly (all 5 years) develop, submit and implement their so-called Nationally Determined Contributions (NDCs), including amongst others mitigation and resilience-building measures. The recent IPCC WGI AR6 report suggests that the Paris goal of limiting global warming to 1.5°C compared to pre-industrial levels is still in reach if early action is taken globally. Within climate change adaptation, agriculture, followed by water draws maximum global effort, research, action, and funding for meeting challenges towards human survival. The challenges are enumerated by sector specific studies, highlighted in action plans developed by individual countries (Singh and Schwarz, 2020; Rohilla et al, 2017; CST, 2014).

According to the scenarios of the IPCC report of 2007, a temperature increase of 2.7°C to 4.3°C by the 2080s, precipitation level rise of 6-8% and sea level rise of 88 cm by 2100 are likely in India

(IPCC, 2007). Such a scenario would have a perceptible consequence for the livelihood and survival of rural communities dependent on agriculture and allied sectors - even for cities. Projected trends in climate change pose a looming threat for an ecologically sensitive, developing and largely agrarian country like India. To counteract such projections and promote economic and inclusive growth, the government of India introduced the National Action Plan on Climate Change (NAPCC) in 2008. India was one of the world's first countries to propose a comprehensive policy instrument to mitigate climate change and adapt to its impacts in the form of the NAPCC. It sets out the pursuit of development goals that offer growth with long-term 'climate change co-benefits'. Through eight sectoral missions the NAPCC focuses on key sectors impacted by or impacting climate change, including agriculture, water, forestry, energy and urban planning. (EMPRI & TERI, 2013).

The states play a crucial role in the implementation of the NAPCC. The State Action Plan on Climate Change (SAPCC) is a framework of action for implementing the missions laid by the NAPCC and aligning them with the effects of climate change in each state of India. The plans outline the state's strategies for a range of sectors, including proposed actions and, in some cases, a timeline and budget for each. The rationale for the formation of the SAPCC was to decentralise action beyond the eight missions of the NAPCC, particularly given that many subjects covered especially those like water and agriculture are actually state subjects. The Centre developed a "Common Framework Document," with the assistance of some donor agencies, to guide this process, stressing that it be participatory, build capacity, develop a vulnerability assessment, and draw on experts and donors for guidance and support. A number of states embarked on an ambitious plan formulation process. (Dubash and Jogesh, 2014)

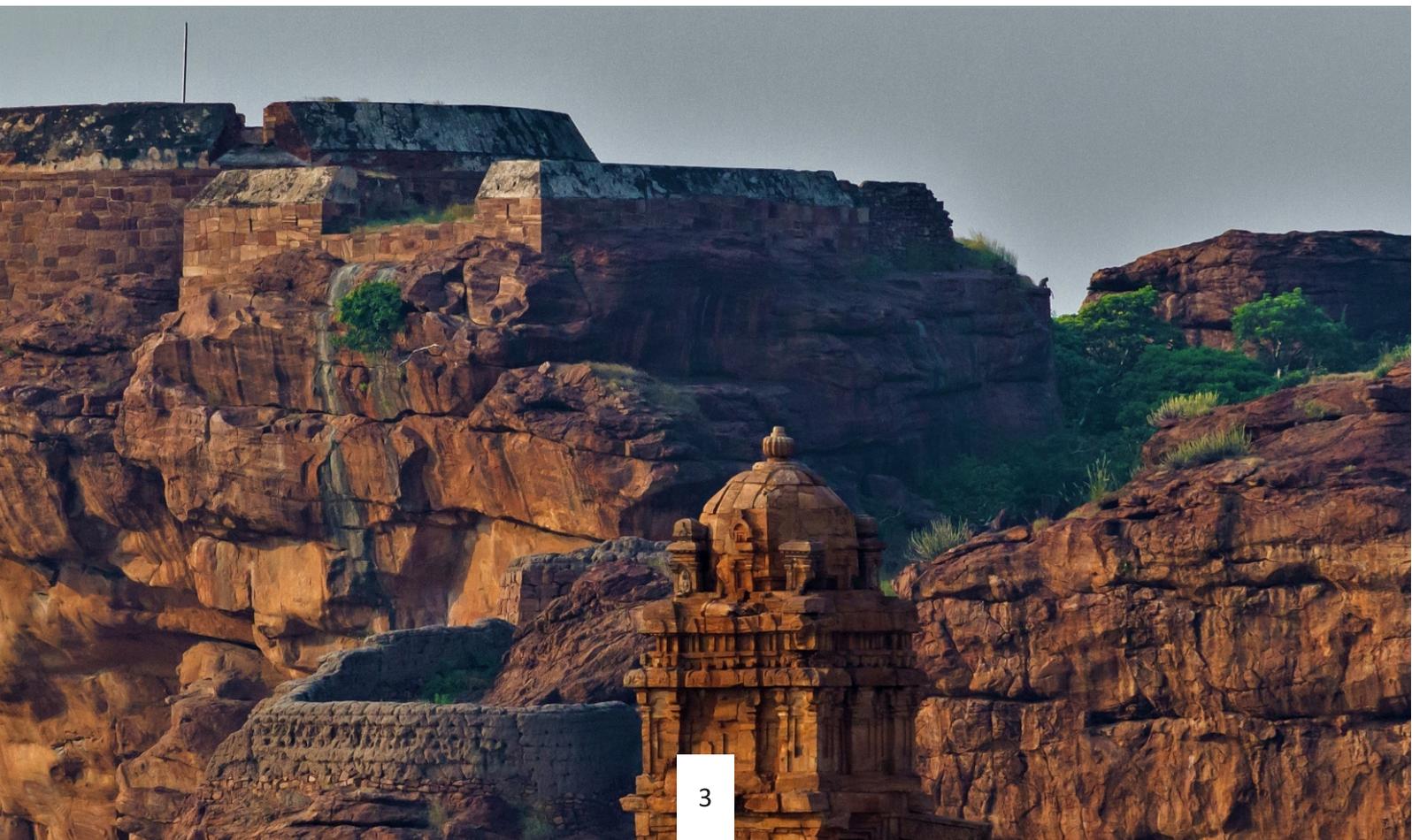


# The Karnataka State Action Plan on Climate Change

In June 2009, the Government of Karnataka organised a Co-ordination Committee to oversee the adoption of the NAPCC at the State Level. It mandated the preparation of The Karnataka State Action Plan on Climate Change (KSAPCC) to the Environmental Management & Policy Research Institute (EMPRI) and The Energy and Resources Institute (TERI), with the first assessment resubmitted in December 2013. The KSAPCC focuses on those sectors that are important to the local economy and livelihoods, such as agriculture, water, biodiversity, health, transport, energy, industries, urban development and forestry. The KSAPCC was the first policy document to tackle climate change on state level in Karnataka. It laid the ground for crucial mitigation and adaptation action. Currently, the revision of the KSAPCC is in process.

Based on climate research and scenarios cited between 2004 to 2011, the KSAPCC identified scope for immediate actions. The document defined 200 actions of which 31 were tagged as priorities or entry points. It established sector wise target areas with determined action points. The implementation mechanism, determination of interventions and emerging trends in each section are based on missions identified in NAPCC. In order to achieve sector wise implementation the document relays departments responsible for implementation and allocation of funds. The bulk of implementation lies with the government departments at state level for individual action points, as well as allocation of funds for each target area and action point for five years beginning from 2012 till 2017.

For the first attempt, the action plan has covered sectors of importance such as agriculture and water. However, the action plan documents are at a nascent stage, their effectiveness unmeasured, and way forward lacking in the document. The present study investigates the effectiveness of KSAPCC from a stakeholder engagement perspective, particularly for strengthening the core sector of agriculture and water for future effective action.



## The Agricultural and Water Landscape

Karnataka is divided into ten agro-climatic zones and observes three growing seasons. Agriculture contributes 28.6% to the state's Gross State Domestic Product (GSDP). Almost 65% of the geographical area of the state is under cultivation and agriculture accounts for more than 50% of the state's workforce (EMPRI & TERI, 2013). Among these, kharif, the monsoon season lasting from July to October, accounts for 70% of the annual food grain and oilseed production. An overall increase in production and yield of major crops such as paddy, maize, and sugarcane has been observed over the last decade. The introduction of these high yielding varieties has progressively reduced the cultivation of traditional varieties of crops such as banana, mango and vegetables in the state. The related loss of agricultural biodiversity is a serious concern. Droughts affect agricultural production in the state to a great extent, so do floods, to which especially kharif crops are prone. Agriculture is highly vulnerable to climate change because of its wide exposure to increasing temperature, precipitation change, pests and diseases. Studies suggest that a number of districts may become vulnerable with respect to crops presently grown. Likewise opportunities emerge in terms of improving cultivation conditions for certain crops in certain areas. However, a net decline of 2.5% in agricultural production has been predicted by a recent study over the next two to five decades with a major reduction in coastal regions. (EMPRI & TERI, 2013)



The KSAPCC document has identified climatic, technical and social challenges in the agriculture sector with respect to agriculture yield especially for dryland agricultural practices, theft of irrigation pipes, energy efficiency at farm level, agriculture and horticultural biodiversity. The Government of Karnataka has a broad and efficient policy framework to support agriculture and allied sectors. The Government of India also supports the state government through financial and technical support. Co-existence of policy framework by the state and initiatives led at the national level have provided opportunities for climate risk assessment and increased the resilience of the agrarian sector and its dependents. This is demonstrated in the KSAPCC document through programs and policies such as *Karnataka Agriculture Policy, High yielding varieties programme* which covers various integrated programs, *National Food Security Mission, Rashtriya Krishi Vikas Yojna, Bhoo Chetna, National Horticulture Mission, Sujala Watershed Programs, Schemes on Micro-irrigation*, as well as *initiatives promoting organic farming*.

The state of Karnataka has seven river basins and receives a total of 236 billion m<sup>3</sup> of water every year, 92% of it through rainfall. Around 47% is 'lost' through evapotranspiration and another 46% flows into the Arabian Sea, into Andhra Pradesh and Tamil Nadu. Karnataka meets its requirement from the remainder of about 7.5% paired with groundwater. There are nearly 37,000 tanks and lakes with a water spread area of 6.9 lakh hectare and more than 20,000 irrigation tanks. (EMPRI & TERI, 2013).

For Integrated Water Resource Management, the *Karnataka State Water Policy, 2002* has established a framework for projects such as *Rainwater Harvesting, Irrigation, Groundwater Protection, Water Resources Management, Sewage Management and Municipal Water Supply*. However, Karnataka is deprived of limited water resources and rapid conservation mechanisms need to be adopted as per KSAPCC to meet the rising demand of water due to population, urbanisation, rapid industrialisation, and increasing incomes (EMPRI & TERI, 2013) - as well as climate change. Therefore, KSAPCC has laid out emerging intervention areas to assess the quality and quantity of water in the state. Intervention areas include assessments such as:

- Conducting spatial and temporal assessments of water availability for micro-watersheds and analyse trends using models such as Surface Water Assessment Tool (SWAT).
- Setting up dedicated facilities with advanced computing systems to make predictions for water resources.
- Conducting GIS based aquifer studies for assessing recharge possibilities; Conducting assessments on reducing evaporation losses within water storage structures, wastelands, fallow lands, agriculture lands through usage of mulches, canal lining etc.
- Conducting pilot studies to explore augmentation of water resources from flood water.
- Conducting studies on efficient crop water utilisation and pressure irrigation methods.
- Measurement of flows of major irrigation canals for accounting losses and improving efficiency; Regulating the use of bore wells
- Considering a policy on water metering for bulk consumers of groundwater
- Formulating a legal provision in by-laws of local bodies for water conservation (EMPRI & TERI, 2013)

# About this Study

This research study aims to strengthen the efficiency of the Karnataka State Action Plan on Climate Change (KSAPCC) with a particular focus on Sustainable Agriculture and Integrated Water Resource Sector, through reflecting the implementation challenges as well as policy and communication gaps - especially focusing on stakeholder involvement. The study also seeks inputs from the state government functionaries and other stakeholders including representatives from water and agriculture departments, grassroot organizations, knowledge partners and farmer groups, while drawing lessons in the form of recommendations for planning of capacity-building and educational interventions to be carried out by CEE in the next two years.

Lastly, this study aims to highlight potential gaps in the policy implementation of the KSAPCC which could act as a limitation for effective implementation of priority action points.

The study report has been developed based on qualitative surveys as well as policy assessments, and provides recommendations for further improvements, implementation of policies by multiple stakeholders such as government officials, policy makers, civil society and farmers. For this, deeper insights were gained on the challenges faced especially by farmers about the on-ground implementation of the action points mentioned in the state level climate change policy, in the sustainable agriculture and integrated water resource sectors.

## Objectives

The main objective of this study is to understand policy, education and research interventions in the field of climate change with an emphasis on Sustainable Agriculture and Integrated Water Resource Management that could complement or strengthen state level programmes under KSAPCC. It intends to recognize policy and implementation level actions regarding water resources and sustainable agriculture, highlights issues with policy gaps, suggests ways for strengthening linkages and explores opportunities for possible areas of intervention.

Further, this study aims to investigate opportunities for improving availability and utilisation of water resources for sustainable agriculture with climate change linkages which could be implemented within the KSAPCC. Lastly, this study would also help identify and establish partnerships with stakeholders for implementing the aforementioned objectives, and develop Information-Education-Communication strategies for communicating the outcomes as a way forward as well as developing a two year plan to address potential policy as well as education improvements identified by the study.

## Key Research Questions

Based on its objectives, the key research questions for the study are as follows:

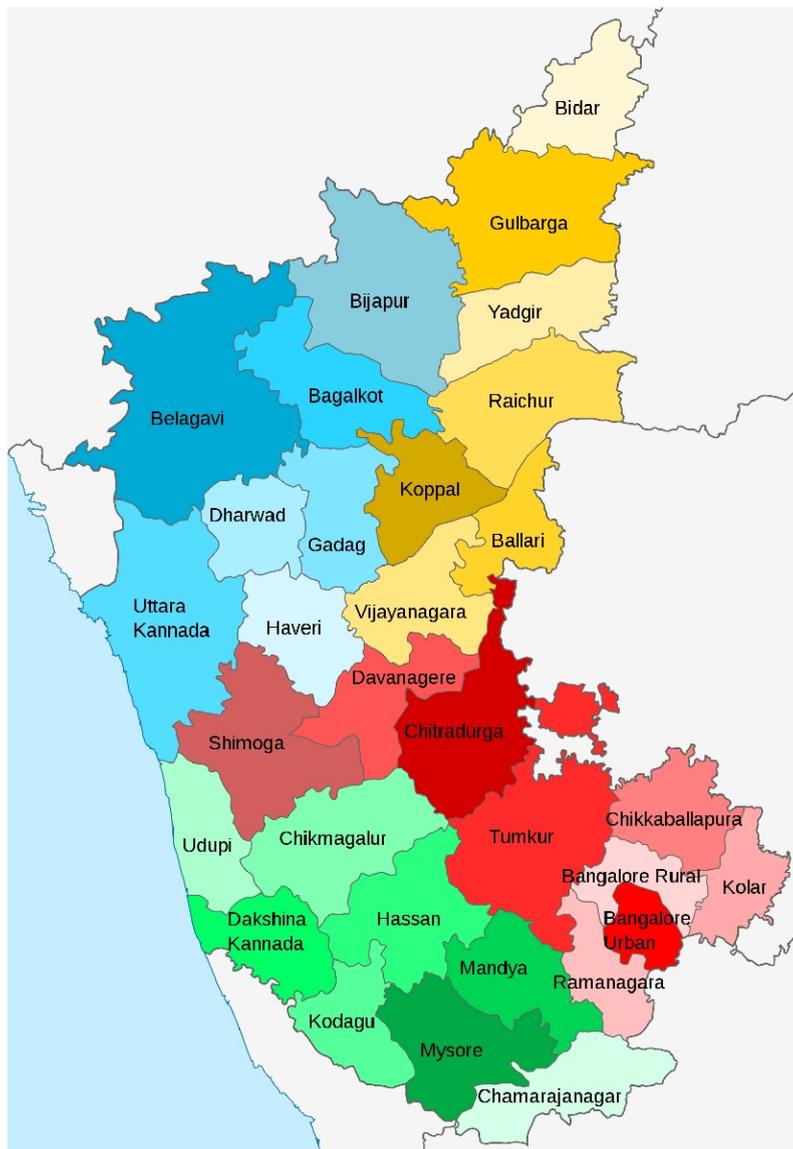
- What are the major factors influencing efficiency of effective implementation of KSAPCC within the water and agricultural sector?
- What are the actions announced in the KSAPCC specifically for integrated water resources and sustainable agriculture?

- What are the ways to improve engagement of multiple stakeholders and NGOs for better understanding of the focus sectors as well as KSAPCC implementation?  
What policy approaches could be designed for better implementation and communication of insights gained from the study to policymakers for better implementation?



## Study Area

Flanked by the Arabian Sea, Karnataka is a coastal state in the south west of India. It is the eighth largest Indian state by size and the ninth by population. While the Western Ghats account for a bulk of the state's forest cover, over 77 per cent of its geographical area is arid or semi-arid. Much of this is concentrated in North Karnataka. Karnataka is also the third most urbanised state in the country and water availability is a major concern (Jogesh and Dubash, 2014). The climate of Karnataka State varies from very humid rainy monsoonal climate in the West Coast, the ghats and mainland areas to semiarid warm dry climate on the east. There is a large variation in precipitation with higher amounts in the Western Ghats reducing towards the eastern plains (Irrigation in Karnataka, n.d.)

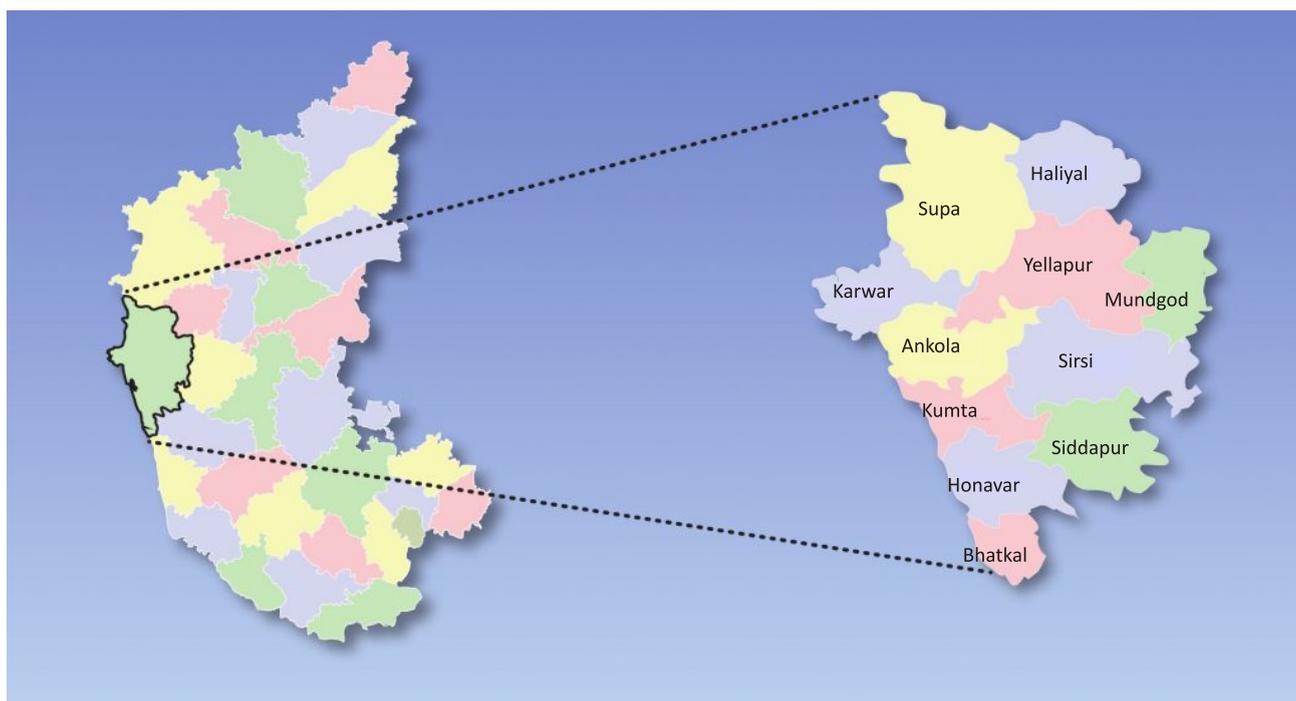


**Fig 1. Karnataka State Map- District wise**

*Source: Navyik (Wikimedia)*

The study includes surveys of stakeholders from government line departments as well as Farmers group of Uttar Kannada through focus group discussions. The region has lately been drought prone although it generally experiences a good annual rainfall. This was one of the major reasons to take up this region as a study area. Farmers are facing drought every year in the summer season and lack of water storage management is affecting their agricultural practices. The city of Karwar is the administrative headquarters of the district. Karwar, Ankola, Kumta, Honnavar, Bhatkal, Sirsi, Siddapur, Yellapur, Mundgod, Haliyal and Supa are the taluks of the Uttara Kannada District. The main geographical feature of the district is the Western Ghats of Sahyadri range, which runs from the south through the district. Moisture-bearing winds come from the west, the yearly rainfall average is 3,000 mm (120 inch) on the coast, and as high as 5,000 mm (200 inch) on the west-facing slopes of the Sahyadris, which receive as little as 1,000 mm (39 inch) annually. Eighty percent of the district area consists of forest land. The Uttara Kannada district agro-climatic divisions include the Coastal plain (consisting of Karwar, Ankola, Kumta, Honnavar and Bhatkal taluks) and Malenadu (consisting of Sirsi, Siddapur, Yellapur, Haliyal, Joida and Mundgod taluks).

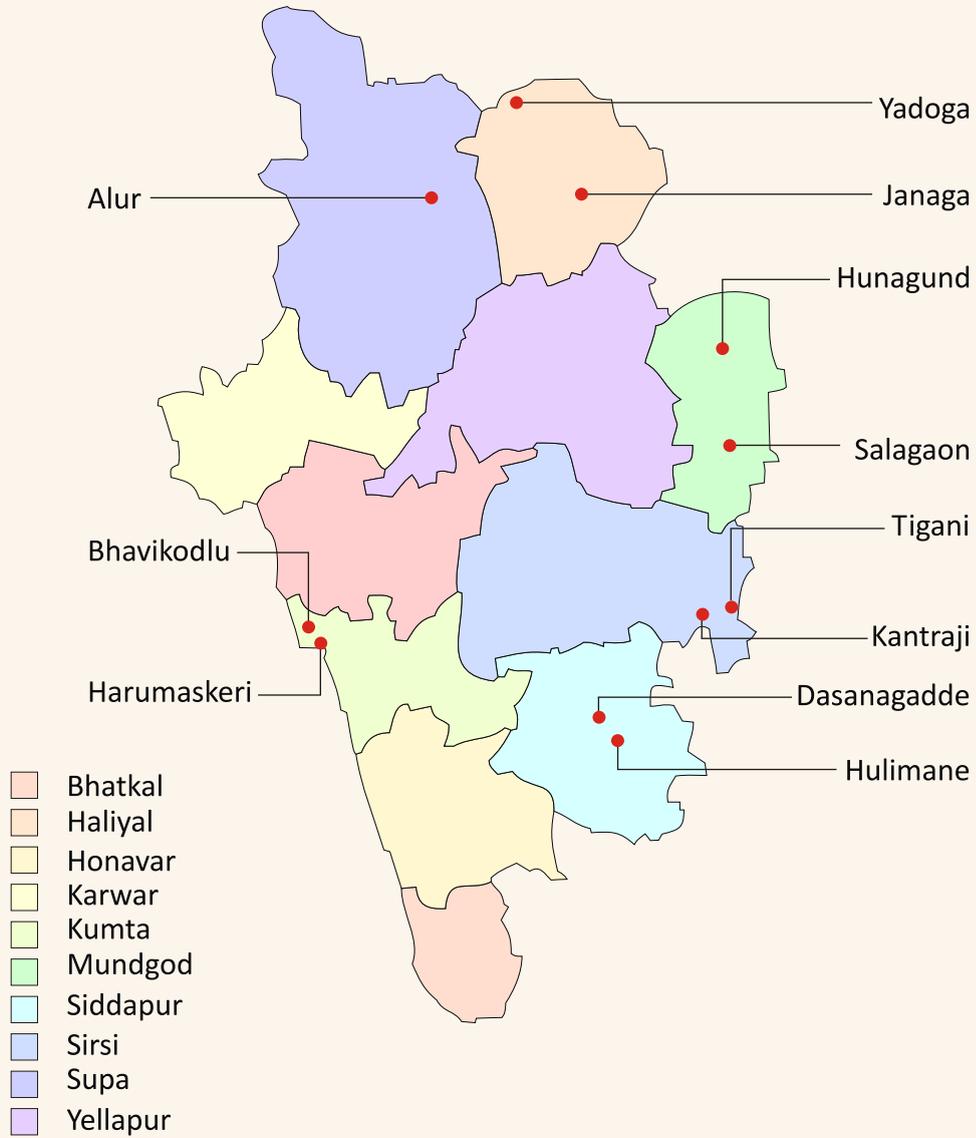
In Uttara Kannada district the study has covered six taluks and eleven villages. Namely the taluks are- Haliyal, Supa, Siddapur, Sirsi, Kumta and Mundgod. The villages covered under the study in six taluks are - Janaga and Yadoga (Haliyal tq); Alur (Supa tq); Dasanagadde and Hulimane (Siddapur tq); Tigani and Kantraji (Sirsi tq); Bhavikodlu and Harumaskeri (Kumta tq); Hunagund and Salagaon (Mundgod tq).



**Fig 2.** A map showing selected study area Uttara Kannada district, Karnataka State

*Source: [www.theflagpost.in](http://www.theflagpost.in)*

# Uttara Kannada District Map



**Fig 3.** Above map showing the data collection points from the selected eleven villages in six taluks of Uttara Kannada district

# Methodology

The methodology of this study is two-fold: desk study of public documents including the KSAPCC, and on-site research with qualitative data collection in semi structured interviews. Data collection for the research study was undertaken by developing and distributing an open-ended questionnaire (refer Annexure I) to all respondents. The survey aimed to find the insight gaps of the Karnataka State Action Plan on Climate Change and garner prospective policy recommendations for effective implementation of the State Action Plan. The respondent's interview was divided into categories such as Key Informants Interview (includes Knowledge Partners, Grassroot Partners, and Government line Departments) and Farmer's Group Discussion (For Farmer Groups). The survey covered responses from 11 Key Informant Interviews and 10 Focus Group Discussions. The questionnaire consisted of two phases of questions, the first phase focused on key research questions aimed to understand the current gaps in policy implementation and future improvements to be considered in the KSAPCC report. In the second phase, various questions were asked to the respondents from each group in both categories to understand their role, amplify overall knowledge-sharing, and understand the risks and challenges in the policy planning, implementation and execution on the ground level. All interviews were held during the period of August to October in 2021.

The key informant interviews were conducted with people who were involved in policy implementation and planning, research institutions, and grass-root NGOs. Interviews were conducted with different individual stakeholders under 3 different categories- Knowledge Partners, Grassroot Partners and Government line department.

## Key Informant Interviews

**Knowledge Partners:** For knowledge partners, interviews were conducted in virtual mode due to the COVID-19 lockdown. Individuals from various research institutions were interviewed for the study. The institutes covered include Indian Institution of Science (IISc), Centre for Policy Research (CPR), Centre for Sustainable Development (CSD), The Energy and Resource Institution (TERI), Ashoka Trust for Research in Ecology and the Environment (ATREE) and Divecha Centre for Climate Change (IISc). These research institutions were identified for their experience in climate change-related research projects and contributions at a policy level to combat climate change issues nationally.

Centre for Environment Education also organised a **Knowledge Sharing Forum** where experts and luminaries from different fields of education, water and agriculture were invited to give their inputs on findings of this study collated through the surveys. Their insights and recommendations were also taken into consideration while preparing for this study.

**Grassroot Partners:** For Grassroot partners, an in-person interview was conducted with the Managing Director of Manuvikasa Organization (Sirsi), to find out insights into community interaction between farmers and grassroots partners. The said person was identified for their long-term experience in working on lake rejuvenation and livelihood programmes for farmers in the selected study area.

**Government Line Departments in Water and Agriculture:** For government line departments, an electronic mode of interview (via Email) was conducted to know the present policies working on the ground and to understand the challenges in policy implementation and planning from the government view.

### **Focus Group Discussions**

The focus group discussion mode of the survey was conducted with farmer groups in the selected 11 villages of Uttara Kannada district. The Farmer's Group selection was made based on five different categories that are - Small Farmers Group, Big Farmers Group, Men Farmers Group, Women Farmers Group, and Marginal Farmers Group.



# Analysis and Discussions

The Karnataka State Action Plan on Climate Change encompasses a total of 200 actions of which 31 are tagged as priority or entry points on climate change for the state, spread across multiple categories including implementation, data management, research and development as well as policy intervention; and covering a range of sectors. Out of these 31 priority actions, 4 from the agricultural sector and 4 from the water sector fall under the scope of this study ( See Table 1). A more detailed analysis of these sector-specific action points and reflections from the qualitative surveys have been provided in the following sections.

**Table 1. Priority Action Points for Agriculture and Water Sector**

Reference #	Sector	Priority Action Points
2	Agriculture	Establishing a State Level Policy body for devising cropping shifts
3	Agriculture	Promotion of Dry land farming
4	Agriculture	Rendering theft of sprinkler pipes unviable
5	Agriculture	Creation of a market for indigenous agricultural crops
9	Water	Enforcement of Karnataka Groundwater Act
10	Water	Creation of Policy body for restricting groundwater use
11	Water	Introduction of a groundwater cess
14	Water	Revision of pricing policy for irrigation water

*Source: EMPRI & TERI, 2013*

## Agriculture

According to multiple key informant interviews and focus group discussions, the policies working on-ground with respect to agriculture sector are National Food Security Mission, Rashtriya Krishi Vikas Yojana as well as Bhoo Chetna, which was completed in 2017 but its major technical core - micronutrient adoption has been continued through soil enrichment programs. Other than these, few policies such as the Bhoo samruddhi programme, and Krishi Bhagya Yojana are also being implemented according to the surveys conducted for the study.

The KSAPCC mentions increasing crop yield production by promoting shifting cropping patterns in agriculture through *Establishing a State Level Policy body* for devising cropping shifts -action point 2 in agriculture (Table 1). However, subsidies supporting farming lack mechanisms for shifting cropping patterns in line with the projected climatic shifts across agro-climatic zones. Therefore *shifting cropping patterns* may be a potential strategy to adapt to climate change and combat the impacts of the same. As temperature and rainfall change with climate, the agro-climatic features of a particular zone might become favourable for a new crop or may adversely affect the survival of existing crops. Under such a scenario, shifting cropping patterns would help in sustaining agricultural activities.(EMPRI & TERI, 2013). The study reveals that even though the farmer groups mention shifting to millet due to drought conditions for the last three years, they are almost unaware of the necessity of changing their cropping patterns and therefore quite reluctant- especially until extremely necessary. The assessment found that this is due to the fact that most of the farmers are unaware of the *reasons* behind the importance to shift cropping patterns as well as government schemes and policies that could benefit them. As per various policymakers and interviewees, it was also observed that there are no proper prediction systems in place for cropping patterns which supports the earlier statement. Use of artificial intelligence and Drone Camera with GIS technology could be adopted for predicting weather patterns and later communicating to farmers about cropping patterns as suggested by a Knowledge partner.

Direct Seeded Rice (DSR) method of paddy cultivation is recommended by one of the policymakers to save water and reduce methane gas emission from paddy fields. Approximately 1.5 lakh hectares of paddy is grown through DSR method in Karnataka. Majority of the farmers are also shifting crops from Paddy to Sugarcane farming to get a higher production rate due to sufficient marketing values. The farmers also accepted that they have shifted crop cultivation patterns from water intensive crops to less water intensive crops from the last ten years, like shifting from growing sugarcane to maize.

The KSAPCC document addresses the need to *promote dry land farming*, since it could become a successful technique to address the issue of water scarcity, fodder un-availability especially in northern water-stressed Karnataka region. The policy has the capacity to guide the farmers towards a reliable source of income in rural communities, largely dependent on agriculture for their income, hence dry land farming in Karnataka has been identified as one of the entry points needing immediate action (EMPRI & TERI, 2013) The study, however, shows that the farmers are not aware of any scheme pertaining to this, which also falls under the National Mission on Sustainable Agriculture.

One of the important priority points mentioned in the KSAPCC document was *theft of sprinkler pipes in agriculture*. The expansion of micro-irrigation is also hampered by security concerns of distribution pipes. This is mentioned to be tackled through eradication of the market for stolen pipes through redistribution of existing subsidies on micro irrigation to bring farmer's net cost of distribution of pipes below the black market cost. The farmers group in FGDs revealed the need for sprinkler and drip irrigation due to extreme drought-like conditions they faced especially during the years of 2015-18. While the acute water shortage has led the farmers to implement drip/sprinkler irrigation methods in their farms, it was also observed that they are not aware of any scheme related to this action point.

One of the action points also states *creation of a market for indigenous agricultural crops*. Indigenous resilient varieties of crops such as maize, rice, sorghum require interventions to safeguard their conservation. These indigenous varieties need attention not only to conserve gene pool but also to combat climate change impact (EMPRI & TERI, 2013). However, after interviewing farmers, it was observed that farmers were largely unaware of the importance of cultivating indigenous climate resilient crops as they continue to grow indigenous crops which are water intensive, such as sugarcane.



## Water

The policy analysis reveals that Karnataka State Water Policy and Mahatma Gandhi National Rural Employment Guarantee Scheme outlined in the KSAPCC are being implemented on the ground. The latter scheme ensures livelihood and food security by providing unskilled work to people through creation of sustainable assets in the rural areas, and is also being implemented for the farmers of the agricultural sector.

Other than these, according to the conducted surveys, policies and schemes like Rejuvenation of rivers, Infiltration wells, Kere Sanjeevani, Karnataka Integrated Sustainable Water Resources Management & Investment Program (KISWRMIP), Atal Bhujal Yojana and Suvarna Krishi Honda programme are implemented. Also, as per the Government-line departments, for Integrated Water Resource Management, Watershed development scheme for rainwater development, Rainwater regulation for ground water recharge with rain water in urban bodies, Inter basin water transfer link for transferring water from surplus basins to deficit basins, and Regulation schemes regarding ground water extraction for various sectoral use such as, domestic, irrigation and industrial, are being implemented.

As for the 4 priority action points considered for the study, the KSAPCC document mentions policy interventions of the *Enforcement of Karnataka Groundwater Act* as a priority action point under conservation of water resources. Ground water continues to be one of the major sources of water supply in many rural and urban areas. There is a mention of over-extraction of groundwater resources, especially in 35 overexploited and 3 critical Talukas. Groundwater has been indiscriminately used in the state with the extraction levels exceeding 100 per cent in many regions (EMPRI & TERI, 2013). The study findings reveal that the farmers group are largely benefitted through the Krishi Honda programme implemented by the state government which helps them store rainwater from draining away and recharge groundwater to mitigate drought conditions.

In the agriculture sector, surface irrigation sources and traditionally used tanks have lost the cadence of irrigation potential due to various reasons and there has been a shift on the development of groundwater based irrigation that has also led a way for intensive multi season agriculture. Thus, the groundwater withdrawal is far in excess of recharge leading to declining water levels and increasing pumping costs (EMPRI & TERI, 2013). This could also be addressed through introduction of *groundwater cess*, which is also one of the priority action points of the KSAPCC. There is vast potential for collection of rainwater for productive use, groundwater recharge and temporary storage in water bodies in order to reduce the irrigation dependency on groundwater, which was 45% during 2013, remains to be utilised (EMPRI & TERI 2013). The groundwater fund created through collection of this cess is planned to finance groundwater recharge schemes proposed by private and public project proponents. The study finding reveals that Advanced Centre for Integrated Water Resources Management (ACIWRM), a think tank to government's Water Resources Department (WRD), designed a new approach for groundwater management in partnership with people, Gram Panchayat and Civil Society organizations to prepare a Gram-Panchayat water security plan.

The key informant interviews reveal implementation of regulation schemes regarding ground water extraction for various sectoral uses such as domestic, irrigation and industrial. The Karnataka

Groundwater Act 2011 is vital for protection of groundwater resources as it considers necessary to bring a general legislation to control the indiscriminate exploitation of ground water especially in the notified areas of the state, yet the survey reveals no such scheme in practice. There was also mention of the *Creation of Policy body for restricting groundwater use*, but its current status is unknown to the policymakers. However, the knowledge partners suggested implementation of schemes that could effectively include scientific evidence for better utilisation of groundwater resources like converting dry borewells into groundwater recharging pits for groundwater table levels to improve, as well as surface water remediation at contaminated sites to improve groundwater quality.

One of the priority action points of the plan is the *Revision of pricing policy for irrigation water*. Low priced irrigation water is a substantial impediment for investment in water infrastructure and sustainable resource utilisation and management. But the farmers were unaware of any such pricing policy for irrigation water.



## Key Challenges in implementation

**1. Awareness amongst farmers:** A larger part of the farming community is unaware about climate change and its impacts, and thus have limited knowledge about the necessity of optimum water utilisation for growing crops with maximum production, as well as shifting of cropping patterns and dry land farming practice. This ultimately becomes a major obstacle to cope with the negative impacts of climate change.

***“Government/panchayat officials should educate farmers in our village about shifting cultivation in every farm land based on the resource availability which will help everyone to grow different crops with coordination at the same time without any competition. Proper information about the schemes/policy from government officials, committee members or from panchayat officers should be made available for maximum benefits.”***

*-Big Farmer Group-1, Uttara Kannada, Mundgod, Salagaon*

***“Efforts have been made by NGOs such as Manuvikasa in organizing programmes to increase livelihood and farm yield.”***

*Women Farmers Group-2, Uttara Kannada, Siddapur, Dasanagadde*

***“We have witnessed an increase in temperature over the decades which has led to an increase of disease and pest attacks on crops.”***

*-Marginal Farmer Group-2, Uttara Kannada, Siddapur, Hulimane*

The focus group discussions highlighted that the farmers have not been able to benefit from the State Government schemes due to limited information on these schemes to its beneficiaries.

**2. Stakeholder engagement:** The KSAPCC document shows limited engagement of stakeholders across policy interventions and subsequent outreach mechanisms. The farmers' group stated that they have been benefiting from the implemented Central Government schemes, however they also believe that the State schemes have mostly reached out to farmers of specific caste categories and hence those were not benefited by all the farmers.

There are policy level and on-ground challenges mentioned in the KSAPCC for the agriculture and water resources sector, but most of these issues were not reflected in the interviews and FGDs, seemingly because of the gaps in communication attempts to translate policy as well as climate relevant knowledge into actions.

***“Schemes introduced in the action plan are not communicated to farmers properly so programmes & knowledge-sharing related to climate change should be published/telecasted in newspapers/news to increase capacity building of farmers.”***

*-Dr. T.V. Ramachandra, Scientist EWRG, CES, Indian Institute of Science (IISc)*

***“If the government guides us we can adopt changes in farming methods.”***

*-Small Farmers Group-2, Uttara Kannada, Sirsi, Kantraji*

**3. Inter-departmental coordination and communication :** As a cross-cutting issue, climate change needs to be addressed jointly by major government line departments. The policy does not recommend mechanisms for coordination among departments and joint implementation of activities. Also, many action plan elements are too generic and are not in tandem with the implementation activities of the key departments.

***“Panchayat officers should provide proper guidance to farmers about policies and schemes implemented from both central and state governments.”***

*-Small Farmers Group-1, Uttara Kannada, Sirsi, Tigani*

***“Farmers are scared to adopt newer agricultural practices due to fear of less yield and productivity. Government should take the NGO's opinion before planning the action plan and also include their views and recommendations into it.”***

*-Ganapati Bhat, Managing Trustee, Manuvikasa*

***“Panchayat Raj level programmes and climate change cell should be introduced in every taluka and village to bring awareness amongst individuals about current issues and predictions related to climate change.”***

*-Dr. Shrinivas Badiger, Associate Professor,  
Ashoka Trust for Research in Ecology and the Environment (ATREE).*

**4. Budgetary allocation :** According to the information from the KIs and FGDs the budget allocated for the policies are not aligned with the time-frame and are mostly expended towards administrative purposes and awareness raising.

Additionally, price rates for labour, hybrid seeds and chemical fertilizers have increased drastically which had a huge impact on the farmers' income. The farmers also brought up the issue of the schemes benefitting only the farmers who have their own farm lands but those who have their lands under revenue/forest department have not been able to take advantage of these schemes.

***“We face financial constraints due to an increase in the price of labour charge, seeds and chemical fertilizers. We need a reduction of hybrid seed price in the market through some schemes. Currently, livelihood programmes are organized quarterly in a year by Manuvikasa, followed by entrepreneurship and skills development programmes.”***

*-Women Farmers Group-1, Uttara Kannada, Dandeli, Alur*

***“We have shifted from organic farming to chemical farming to increase crop production and counteract increase in pest attacks resulting in decreased soil fertility in our farm lands. We require knowledge sharing from panchayats and other government agencies to find out schemes applicable to us and avail State Government schemes. We need a reduction in seed rate and increase in crop prices in the market through any policy/scheme/committee from the government.”***

*-Men Farmer Group -1, Uttara Kannada, Haliyal, Janaga*

***“Schemes implemented in future should avoid category wise benefits and make it general so that every farmer will be benefited from the schemes.”***

*-Big Farmer Group-2, Uttara Kannada, Mundgod, Hunagund*

**5. Resource constraints and uncertainty :** Few farmers are getting benefited from Central Government schemes i.e., P M Kisan Samman Nidhi, etc. According to the FGDs, the beneficiary numbers from State sponsored schemes is almost negligible. Financial issues have been increasing from the past ten years due to increase in price of agricultural resources.

***“We need Farmer Producer Organizations (FPOs) for regulating prices of vegetables when they reach the market with guidance and assistance from NGOs or Government.”***

*- Marginal Farmers Group-1, Uttara Kannada, Kumta, Bhavikodlu and Harumaskeri*

***“We have experienced acute water shortages from 2016-2018 which led to zero yield in our farmland. Villagers also require life insurance schemes in case of death due to wildlife attack / tree collapse whilst working in farms.”***

*-Women Farmers Group-2, Uttara Kannada, Siddapur, Dasanagadde*

## Conclusion

The Karnataka State Action Plan on Climate Change is the first ever plan which establishes a comprehensive roadmap to tackle the issues of climate change in the state through provision of a scientific framework, while also outlining various challenges and highlighting feasible action points to be implemented by various sectors.

The policy analysis and synthesis of 21 qualitative surveys reflect underlying gaps in development and implementation of the state action plan. The KSAPCC (2013) was the first of its kind and understandably shows shortcomings in planning due to limited data available on climate change observations and scenarios for Karnataka and limited capacity in local climate policy making. The challenges mostly occur because important factors in effective policy implementation were not fully taken into consideration while designing the state level policy. As per the study's focus, this majorly includes participation of public, civil society and other stakeholders during the formulation of policies, lower allocation of funds and awareness level among farmers pertaining to government policies as well as climate change impacts mainly due to reluctance of uncertainty among farmers to adopt new methods and technologies in farming. Other policy gaps have emerged from limited coordination and convergence with various departments during the time of formation of the KSAPCC. These challenges should be addressed by the current development of the second phase KSAPCC.

Furthermore, the deeper review of the KSAPCC document shows that certain action points are too generic and not precise to allocate proper funds for its implementation. There is also a lack of understanding amongst farmers regarding climate change and thus changing rainfall patterns. For example, one of the action points states creation of a market for indigenous agricultural crops, but elaboration according to the agro-climatic zones and climate scenarios is a necessity. This lack of awareness results in the farmers not easily accepting the new schemes and policies drawn by the government.

Interestingly, it was also noted that of all the Central and State government schemes implemented, almost all the farmers benefited from Central government schemes, while a lot of State government schemes are beneficial only to a specific caste category of the farmers in the village. It is in the farmers' interest that the category wise benefits are removed in future and that all schemes are made generally beneficial to every farmer.

The study also identifies the gap of over a decade in the revision and scientific approach of the KSAPCC, with most policies having the implementation duration of 2 to 5 years, making it necessary for the state government to revise and review the action plan for necessary assessments from time to time.

# Recommendations

## Strengthen stakeholder engagement and public participation

- Participatory approaches should be encouraged, through effective stakeholder engagement from the development stage of the policies and plans, to enhance ownership amongst the stakeholders as well as ensure effective on-ground implementation. Conducting public hearings or consultations to take reviews from the beneficiary group before planning in detail and implementing the policy.
- Strengthening interlinkages between government line departments at district level, as well as with that of the Gram Panchayats. This is extremely essential for increasing the efficacy of the KSAPCC's water and agriculture priorities.

## Enhanced scientific approach to build resilience

- Closing the research gaps needed at both local and state level to tackle the challenges of climate change in the agriculture and IWRM sectors, in accordance with the recent climate variabilities in Karnataka as well as latest IPCC report and 1.5 degree warming.
- Promoting exchange on local scientific information and traditional knowledge to inform the farmers about suitable cropping patterns as per the changing climatic conditions, taking into account farmers' perception and cognition processes. This could be done via seasonal advisories and weather forecasts through mobile-based tools, community radio and community-level drives.
- Creating proper prediction systems for cropping patterns, coupled with water budgeting and water security planning exercises at the local level, could prove helpful in crop selection and could thereby increase the overall yield.
- Implementation of schemes that can effectively include scientific evidence for better utilisation of surface and groundwater resources like for example, converting the dry borewells into ground water recharging pits so that ground water table levels could be improved and could be used sustainably.
- Installation of digital ground water level and quality monitoring system.

## Strengthened decision making and coordination

- Mainstreaming the state climate action plan into major activities of the departments has the potential to make an impactful difference, especially in context to the speedy implementation of the KSAPCC.

- Promotion of bottom-up approaches within the policy formulation process helps to build on the experience and knowledge of local stakeholders and people, improving transparency, stakeholder participation, successful and cost-effective implementation of solutions.
- Creating coherence between divisions handling closely linked climate-vulnerable sectors like water and agriculture, to implement coherent implementation and action on the ground.
- Climate change schemes with specific sectoral linkages are required to be revisited, reflecting on the current climate stresses and building on the past achievements of the action plan.
- Setting-up mechanisms for the periodic review of the action plan and measurement of the progress made, at least every three years.
- Further ensuring a decentralised integrated watershed management approach for sustaining rain water and rejuvenating the lakes and ponds in Karnataka.
- Providing focus on policies related to less water intensive crops and proper utilisation of water resources, especially in water-stressed areas.

### Capacity building and education

- Developing Gram Panchayats into key information and resource centres for providing proper guidance to farmers about water as well as agriculture-related policies and schemes implemented by both central and state governments.
- Capacity building of farmers on climate-resilient technology, e.g. micro irrigation and sprinkler irrigation through sensor based monitoring systems to promote better utilisation of water resources.
- Fostering interaction with farmers and departments, probably through Water User Cooperative Societies (WUCS) that interact with the department agencies on a regular basis.
- Enhancement of knowledge and skills related to comprehending climate change impacts and locally-led adaptation methods need to be offered to the farming community, with supportive mechanisms for better implementation of coping mechanisms.



## Improved financial mechanism

- Proper budget allocation and guidelines for reorienting existing funds in the relevant departments for the effective implementation of the action plan for each sector and in line with the specific time-frames of the plan, with considerations from the departments responsible for the scheme implementation.
- Financial support to farmers in times of high labour prices and increasing costs for hybrid seeds as well as chemical fertilizers, especially considering the uncertainty related to climate.



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## Annexure I: Questionnaire

### Key Informant Interviews (Common for all KIIs)

1. What are, in your view, the most important policies in action/implementation of KSAPCC on climate change, water and agriculture? OR What is the implementation level of action of various schemes and policies in the water and agriculture sector?
2. What is the most successful policy/scheme implemented in the sustainable agriculture sector in the last 5 years?
3. Who are the beneficiaries of the successfully implemented policy schemes? Why do you think these schemes have achieved a higher success rate?
4. Have the successfully implemented schemes achieved participation of women in implementation, if yes, how?
5. What do you think are the challenges in implementing remaining policies? (Ask for certain specific example, try to get insights on policy itself and on-ground implementation)
6. What could be the approach/steps/measures/line of communication for achieving a better policy framework and implementation for the Karnataka action plan?
7. The study mentions coastal, north eastern Karnataka, and Western Ghats as most impacted by Climate Change, within these regions, which districts, taluks or blocks, villages would you say, is most impacted (most vulnerable ones) or achieved least implementation success? Any successful initiatives which you could highlight in these areas? Any recommendations for future action?
8. Could you mention or facilitate establishing contact with ground partners and key resource people within agriculture and water government line departments, NGOs working on ground and researchers within Karnataka?

### Government line departments-Agriculture

1. Apart from National food security mission, Rasthriya Krishi Vikas Yojana, Bhoochetna, Insurance schemes, which recent schemes should be included in revised version of KSAPCC as per your opinion?
2. Do you think the allied field of horticulture, watershed development, organic farming, fisheries, animal husbandry have been sufficiently represented and implemented? If not, how could this be improved?
3. Livestock amount to 20.2% of Karnataka's GHG emissions. Is there any scheme/policy for this?

4. How has organic farming been integrated for implementing Climate change measures in Karnataka? The report mentions there is no large-scale expansion of the 'State level organic farming mission (2008)' programme. Do you think that holds true on the ground?
5. Are there any dry land farming practices adopted in Karnataka in line with Climate change?
6. What is the departmental integration achieved within the priority area of dryland farming and agroforestry for matters of improved carbon sequestration, tillage techniques, in-situ conservation and inputs from international research?



7. KSAPCC talks about risk management and insurance in agriculture. What are the major risks as per your experience in the sector?
8. Are there any prediction systems in place for cropping patterns that could help cope with the climate change uncertainties?
9. How would you expect stronger stakeholder integration being a benefit for policy making and implementation of KSAPCC in future?

### **Government line departments-Water**

1. The irrigation dependency on groundwater (at present 45%) could be reduced through effective use of rainwater collection which according to the KSAPCC reports have a vast potential but yet remains to be utilised. What could be the reason?
2. What are the potential for improving utilisation of surface and groundwater resources, for sustainable agriculture with climate change linkage within the Action Plan?
3. Some of the key identified areas within water resources are rainwater harvesting, water resource management, ground water demand and pressure from agriculture, etc. Is there any estimated rate of success for the areas? If yes, how much? Could the list of areas be further improved?
4. How has the water resource database helped in achieving implementation goals and target points within the KSAPCC?
5. Could you shed some light on promotion of citizen and state action for sustainable water consumption, conservation and augmentation, basin wide approaches for integrated water resources management. What do you feel has worked and what hasn't worked?
6. How would you expect stronger stakeholder integration being a benefit for policy making and implementation of KSAPCC in future?

### **Knowledge partners**

1. What are the key research recommendations which should be included to strengthen the action plan from Karnataka, India or International research?
2. How would you expect stronger stakeholder integration being a benefit for policy making and implementation of KSAPCC in future?

### **Grassroot partners**

1. Could you please provide a brief profile of your organization, motivation, focus areas and regional presence in Karnataka?
2. What are the challenges you face when interacting with government line departments and farmers for implementing schemes for Karnataka's agriculture and water issues?

3. Do you find participation of women and girls in the conversation around climate change, agriculture, and water while working on ground?
4. How do you achieve successful implementation of various schemes on ground?
5. How would you expect stronger stakeholder integration being a benefit for policy making and implementation of KSAPCC in future?

### **Focus Group Discussions**

1. What crops are you growing? What are the allied agricultural activities in your farms?
2. What climatic and weather conditions have you seen change over the decades?
3. What are the changes in crop production at your farms in the last ten years or so?
4. What is/are the source of water for your fields? How often have you heard about climate change? Do your kids talk about it? What does Climate change mean to you?
5. Do you face acute water shortages? What are the other challenges you face?
6. These are the schemes implemented- Which do you find beneficial?
7. Have there been any efforts to organize farmers for increased livelihood and farm yields? What are the other reasons for such organizations?
8. What changes have you seen which would help fight climate change in the last (say) last few years (1 to 10 years)?
9. Are you aware about KSAPCC and its importance?
10. Would you like to be consulted on the KSAPCC? How? If yes, what would you like to say?

## Annexure II: Expert and Farmers Acknowledgement

We would like to thank all the experts who participated in the study and provided their invaluable inputs.

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