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Report on
Review of Karnataka State Water Policy (2002) & Draft Karnataka State Water Policy-2016 in line with National Water Policy, 2012 in Context of Climate Change

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India Water Partnership

(GWP-India)

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Preface

The present study is the outcome of the need to review state water policies in line with the National Water Policy, 2012, in the context of climate change. This is in continuation of the similar studies which were completed for Bihar and Gujarat during 2014 and Tamil Nadu and Goa during 2015. Two new states taken up for review during 2016 were Odisha and Karnataka. These states were selected after due deliberation with the officials of the relevant Central Government agencies and other subject matter specialists. This report deals with Karnataka.

Apart from using information from secondary sources, the study team conducted wide ranging interactive sessions with individuals, government departments and other stakeholders at the state, district and panchayat levels followed by a State level Workshop to get suggestions for modifying the earlier version of the state water policy. The suggestions are in line with the National Water Policy, 2012, dealing with climate change. The study required considerable interactions with high level decision makers in the Government of Karnataka and other stakeholders. These were quite useful as can be seen from the desired outcome at the end of the report.

Veena Khanduri
Program Advisor

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Kamta Prasad
Project Director

Executive Summary

1. Background

The importance of water is too obvious to require any elaboration. But, water has been coming under increasing stress in recent years. This underlines the need for a suitably prepared water policy having a clearly defined perspective for providing guidance for managing water in a sustainable manner so as to ensure water security to all. It was in this context that a National Water Policy (NWP) for India was announced for the first time in 1987. It was revised in 2002 and then in 2012. Since water is viewed as a state subject in India, it is the state water policies which are of crucial importance for management of water resources. The States, however, have been lagging behind in this respect. There are only 14 states, which have announced their water policies so far. Many of these have not been updated despite changes in water resources scenario and socio economic set up. In view of this, India Water Partnership (IWP) developed a study project for reviewing state water policies and entrusted the task to the Institute for Resource Management and Economic Development (IRMED), Delhi. Two States of Bihar and Gujarat were taken up in 2014 and Tamil Nadu and Goa in 2015. The States of Karnataka and Odisha were taken up in 2016. This report deals with Karnataka.

The NWP 2012 lays a special emphasis on climate change. It makes an explicit mention of the need for "mitigation at micro level by enhancing the capabilities of community to adopt climate resilient technological options" (Paragraph 4.1). Hence, an enquiry at the micro level formed an integral part of this study.

Selection of the two states of Karnataka and Odisha was made on the basis of certain criteria which were evolved after considerable interaction of the India Water Partnership study team with senior officers in the Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India and the Central Water Commission, Government of India, which interact regularly with the senior officers of the States concerned with water resources.

2. Objective

Objective of the study was to review the Karnataka State Water Policy of 2002 and provide recommendations for modifying it in line with the National Water Policy, 2012

in the context of the ensuing climate change (involving awareness, preparedness, coping mechanism at the state level and down below).

3. Methodology

Firstly, the study involved collecting information from secondary sources such as the different versions of the National Water Policy, publications on water resources scenario of Karnataka and its State Water Policy 2002. Secondly, number of interactive meetings with senior government officers and other stakeholders of Karnataka. Meetings with state level officers took place in Bangalore on 6th and 7th September 2016, while those with district level officers in Tumakuru district of the state took place during 19th to 28th September 2016. Meetings with farmers of two villages of the district were also held on 23rd September 2016. Thirdly, State level multi-stakeholders workshop held in Bangalore on 16th November 2016 in which apart from other stakeholders, several senior officers of the Government of Karnataka concerned with water resources also participated. Further, five types of structured-cum-open-ended schedules were developed and administered one each to (i) the participants of the State level workshop, (ii) District level officers of (a) the Departments of Agriculture/ Horticulture and Krishi Vigyan Kendra (KVK) (b) Rural/Urban Water Supply Department, (c) other departments and (i) farmers of two villages of Tumakuru district of the State. Structured part of the schedules composed of questions related to awareness and preparedness about climate change and suggestions to counter its adverse effects. In addition, separate guide points were developed for conducting Focus Group Discussions with farmers in the two selected villages of Tumakuru district.

4. Water resources scenario of Karnataka

Karnataka is not well endowed with water resources. Rainfall is erratic and often deficient. Major part of the state suffers from water scarcity as well as drought. About 72 percent of agriculture is rain fed. There is limited scope for development of groundwater, which has already reached a high figure of 70 percent. And yet, much wastage of water takes place due to prevalence of flood irrigation. Increasing pollution of water is another problem. Further, grave implications arise due to impending climate change. Karnataka has laid great emphasis for a long time on creating storage capacity for water through reservoirs. It has also launched several watershed projects, ground water recharge schemes and promoted drip irrigation for management of water resources by the Government of Karnataka, however, it suffers from several deficiencies such as thin spread of investment, cost and time overruns, underutilization of irrigation

potential created, poor maintenance, inequitable distribution of irrigation, low irrigation rates, lack of effective coordination between different departments of the government of the State concerned with water resources, ineffectiveness of participatory irrigation management etc.

5. Karnataka State Water Policy 2002

It was in 2002 that Government of Karnataka announced its State Water Policy. The same policy has continued since then. The draft of a revised policy was presented by the Water Resources Department of the Government of Karnataka during the workshop on Karnataka State Water Policy organized by India Water Partnership in Bangalore on 16th November 2016. But, that was a preliminary draft which is yet to be approved by the government. Thus, it is the 2002 Policy which is in force.

As explained in paragraphs 2.2 and 2.3 of Chapter 2, the 2002 Policy has well defined objectives some of which are expressed in precise quantitative terms. Highest priority was assigned to drinking water followed by irrigation, hydropower, aquaculture, agro-industries, non-agricultural industries, navigation and other uses. A very distinguishing feature of the Policy lay in its explicit commitment to establish a system of water rights along with suitable enforcement mechanisms. Another special feature lays in providing a time frame for completion of several tasks. Many elements of the Policy are similar to those of the National Water Policy of 2012. But, the State Policy makes no reference to issues related to climate change which are featured very prominently in the National Water Policy 2012. There are several other important features of the National Water Policy 2012 which are also missing in the Karnataka State Water Policy of 2002. These have been pointed out in Section 2.3 of Chapter 2.

5.1 Findings and suggestions during state level interactions on 6th and 7th September 2016

The first series of interactive sessions of the study team with senior officers of the Government of Karnataka and a few water resources professionals/NGOs took place in Bangalore on 6th and 7th September 2016. The discussions revealed that (i) the inefficient system of flood irrigation continued to prevail in Karnataka; (ii) quantum of groundwater was not taken into account while making estimates of water availability in a basin; (iii) very little progress had been made towards IWRM; (iv) urban water supply system was characterized by huge losses for which there was no accountability; (v) there is no provision of water for livestock; and (vi) municipal solid waste was being thrown in water bodies showing the ineffectiveness of the existing laws to prevent water pollution.

The suggestions offered during the interactions were to develop local sources for augmenting water, to spread water literacy among farmers, to modify cropping pattern towards less water intensive crops, to provide more subsidy for micro irrigation, to fix accountability for loss of urban drinking water, to use 5 liter flush tanks, to ask industry to use only the treated sewage water through zero water discharge technique, to establish common effluent treatment plants, to provide water for cattle and to increase the green cover.

5.2 Awareness among district level officers and farmers about water policy and climate change

Enquiries made by the Study Team in Tumakuru district of the State revealed that farmers were not at all aware of the national as well as state water policies. Even many officers at the district level were also not aware of these policies. But, the situation was different as regards their awareness of climate change. They were aware not only of the phenomenon of climate change but also of some of the measures that can be taken to deal with its adverse effects. They also reported to have taken some of the measures and have given additional suggestions in this respect which are mentioned in Section 3.2 of Chapter 3 of the report.

5.3 State level multi-stakeholders Workshop in Bangalore

In order to get ideas and suggestions from a cross section of diverse stakeholders including officials of State Water Resources Department, leading experts, NGOs etc., a workshop on Karnataka State Water Policy with Special reference to Climate Change was organized by the Study Team at the Institute for Social and Economic Change, Bangalore on November 16, 2016. Dr. A Ravindra, I.A.S (Retd.), former Chief Secretary, Government of Karnataka was the Chief Guest during the Inaugural Session. There were two technical sessions besides the Inaugural and the Valedictory ones, in which most of the participants got an opportunity to express their viewpoints. Professor Kamta Prasad, the Project Director, IWP study and Workshop Coordinator, raised a number of issues in the beginning on which the views/ suggestions of the participants were solicited. Speaking on behalf of the Water Resources Department, Government of Karnataka, Dr. P.S. Rao, Director (Technical), ACIWRM, drew attention to salient features of the draft Karnataka State Water Policy of 2016 with particular reference to goals and strategies. While giving his presidential remarks, Dr. A Ravindra highlighted a number of policy issues related to Karnataka State Water Policy. The proceedings of the workshop have

been provided in Annexure B, while important highlights and policy inputs from the workshop have been provided Section 3.3 of Chapter 3.

5.4 Awareness level of workshop participants about water policies

An analysis of the responses given by the workshop participants in the schedules filled in by them indicates that there was greater awareness among them about the National Water Policy, 2012 than the Karnataka State Water Policy, 2002. The participants were, however aware of the law for regulation of ground water in Karnataka as well as of its non-enforcement.

5.5 Perceptions of workshop participants about awareness and preparedness with respect to climate change at district level and down below

As per the views of workshop participants, the extent of awareness about climate change was perceived to be not much at the district, block, village and town levels. It was even less with regard to preparedness.

5.6 Effects of climate change as perceived by the workshop participants and measures suggested to deal with them

Impact of climate change was perceived to be different in different types of areas. Agriculture and horticulture were perceived to suffer the most followed by drinking water, animal husbandry and fishery. The suggestions given by the workshop participants for dealing with climate change include water storages in various forms, demand management, improved water application methods and suitable water pricing. Additional suggestions given by them can be seen in Section 3.4 of Chapter 3.

5.7 The Outcome: Recommendations for Karnataka State Water Policy

A consolidated list of recommendations arranged under a few specific themes prepared by the IWP Study Team to be considered for inclusion in the revised version of the Karnataka State Water Policy was sent by email to the Principal Secretary, Water Resources Department, Government of Karnataka on 10th January 2017. Recommendations focused on points which are not prominently mentioned in the draft Karnataka State Water Policy, 2016 or those which require additional emphasis. The suggestions received during several rounds of interactions of the study team with officers and others in Karnataka as well as during the workshop held on 16th November

2016 were duly taken into account. The themes covered in the report include process of formulation of water policy, decentralized water governance, climate change, drinking water to all, water and agriculture, water and forests, controlling water pollution, ground water, development and management of water resources, database and public awareness.

The detailed report is given in the following pages.

Chapter 1

Introduction

1. Background and rationale

The importance of water is so obvious that it does not require much elaboration. It is the basic requirement for survival and growth of all types of living beings. Most cities and commercial centers as well as rural settlements have, therefore, grown in and around dependable sources of water. But, water in recent years has been coming under increasing stress due to such factors as growing population and changes in life style resulting in rise in per capita requirement for water. Hence, the need for managing water in a sustainable manner so as to ensure water security to all is being articulated throughout the world including India. It is being realized that efforts to develop and manage this crucial resource has to be guided by clearly defined perspectives, which should be known to all the water users. Water policy, which provides a framework of such perspectives, is, therefore, a very useful tool for optimum utilization of this precious resource.

Guided by such considerations, a National Water Policy for India was announced for the first time in September 1987. Thereafter, a revised version of the National Water Policy came out in 2002. And in 2012, the latest version of the National Water Policy was announced. A distinguishing new feature of the 2012 National Water Policy is the emphasis laid on the role of climate change in the context of water resources.

This was in recognition of the profound impact that climate change is now predicted to produce on socio-economic life of people. Water is a principal medium through which this impact would take place. Drawing attention to likely increase in the variability of water resources due to climate change and its effects on human health and livelihood, the National Water Policy of 2012 also suggests measures to deal with these factors. These include enhancing the capability of community to adopt climate resilient technological options, increasing water storages in their various forms including water harvesting and revival of traditional water bodies, better management of demand with available water by stakeholders' participation in land-soil-water management, etc.

Since water is viewed as a state subject in India, it is the state governments which have been playing a crucial role in the water sector in this country. It will, therefore, be more useful if the policy measures, which are included in the National Water Policy, are also reflected in the state level water policies.

Recognizing this need, the National Water Policy of 2012 ended up with the observation that "The State Water Policies may need to be drafted/revised in accordance with this policy keeping in mind the basic concerns and principles as also a unified national perspective".

- Only **14 States** have announced their State Water Policy starting from 1994.
- 2 Union Territories namely; **Daman & Diu and Dadra & Nagar Haveli** have adopted National Water Policy-2012.
- Remaining States/Union Territories are in the process of revising their water policies.
- **Himachal Pradesh** is the only State to bring out a revised water policy in 2013 by including climate change aspects in line with National Water

The States, however, have been lagging behind in this respect. There are only 14 states, which have announced their state water policies so far, while two Union Territories namely Daman & Diu and Dadra & Nagar Haveli have adopted the National Water Policy-2012. The remaining states are still in the process of formulating their state water policies, while some of the states are in the process of revising their earlier policies. The states of Tamil Nadu and Odisha were first to announce their state water policies in 1994 followed by U.P. in 1999, Goa in 2000, Chhattisgarh in 2001, Karnataka in 2002, Madhya Pradesh and Maharashtra in 2003, Himachal Pradesh in 2005, Andhra Pradesh and Kerala in 2008, Sikkim in 2009, Rajasthan in 2010 and Jharkhand in 2011. Odisha brought out revised state water policy in 2007. Himachal Pradesh is the another state to bring out a revised state water policy in 2013, which included climate change issues in line with the National Water Policy - 2012.

It is in this context that a study designed to a review of the state water policies in line with the National Water Policy 2012 with special reference to climate change was formulated in 2013 by India Water Partnership (IWP). The task was entrusted to the Institute for Resource Management and Economic Development (IRMED), Delhi. Studies were conducted for states of Bihar and Gujarat in 2014 and for Tamil Nadu and Goa in 2015. With the cooperation of the respective state governments, academic Institutions, NGOs etc. all the studies were completed within time. In 2016, a similar exercise was undertaken by IRMED for two more states of Odisha and Karnataka.

The selection of the two states was guided by the considerations that these should belong to different agro-climatic zones, be receptive and cooperative, have policies formulated quite early with respect to water related issues. Discussions were held with

the Central Government Departments/Agencies dealing with water resources such as Ministry of Water Resources, River Development & Ganga Rejuvenation and Central Water Commission (CWC). This report is based on the review of Karnataka State Water Policy (2002). With regard to climate change, which is an important part of the present study, **the National Water Policy 2012 had stressed the need for preparedness at the micro level.** According to it, "special emphasis should be given towards mitigation at micro level by enhancing the capabilities of community to adopt climate resilient technological options" (Para 4.1). Measures dealing with adverse effects of climate change will have better chances of success, if people and functionaries at the grassroots level are fully aware of these and are associated with the preparatory measures taken to mitigate these especially in rural areas, which are dependent on agriculture and allied activities. These in turn, are quite vulnerable because of their greater dependence on climate parameters.

2. Objective

The objective of the study is to review the Karnataka State Water Policy of 2002 and provide recommendations for modifying it in line with the National Water Policy 2012 in the context of the ensuing climate change (involving awareness, preparedness, coping mechanism at the state level and down below).

Climate change in different parts of the world including India is showing greater growing awareness; at micro level extent of awareness as well as perceptions to adverse effects of climate change is not seen with public and grass root functionaries. **Hence an enquiry at the micro level also forms a part of study.**

3. Methodology

An appropriate methodology was developed in the context of the above objective. Information was collected from both secondary and primary sources. **The first step** was to review the different versions of the National Water Policy as well as water policy of several states to prepare a tentative list of state specific issues for further deliberation with the stakeholders. Thereafter, background information on the salient features of water resources scenario and state water policy of Karnataka was collected and analyzed. This information, collected mainly from secondary sources, is presented and analyzed in Chapter 2.

As a second step, considerable discussion on issues pertaining to State Water Policy took place in groups as well as individually in Bangalore on 6th and 7th September, 2016 between the study team and state level senior officers of the Government of Karnataka and others including a few NGOs. The list of officers and other participants of the discussions is provided in **Annexure-A**. The purpose was not only to get viewpoints of

state level officers on issues related to state water policy, but also to motivate them to modify the earlier state water policy. The findings are presented in section 3.1 of Chapter 3.

Because of the negligible information on micro level situation available from secondary sources, the main reliance was placed on primary sources, mainly through survey by way of structured-cum-open ended schedules. **Five types** of schedules were developed and administered one each to (i) the participants of the state level workshop, (ii) district level officers of the departments of (a) Agriculture/ Horticulture and Krishi Vigyan Kendra (KVK) of Tumakuru district of the state (b) Rural/Urban Water Supply Department (c) other departments and (iii) farmers of the two selected villages of Tumakuru district. The structured part of the schedules comprised of questions related to awareness and preparedness about climate change and suggestions to counter the adverse effects of climate change. The copies of the schedules are provided in **Annexures C, D, E, F, G** of the report. In addition, there were Focus Group Discussions with farmers at village level for which separate guide points were developed **(Annexure – H).**

Enquiries were made at the district level and down below during 19th to 28th September, 2016 in a major drought prone district of Tumakuru, which was purposively selected for this purpose in consultation with state level officials. During this period, interactions were held with district level functionaries concerned with development and management of water resources as well as Krishi Vigyan Kendra (KVK). In addition , a structured schedule was also got filled in by the district heads of these departments covering aspects like awareness and strategies developed to deal with climate change related aspects. Interactions were also held with people's representatives, NGOs, Panchayats, Municipalities and public in two villages namely Karnakuppe of Balagere G.P. and Kadarnahalli of Arregujanahalli both under Tumakuru Taluka of Tumakuru district. Both the villages were water stressed and drought prone. The number of villagers participating in the interactive sessions was 20 in village Karnakuppe and 26 in village Kadarnahalli. Meeting in Karnakuppe village was held in the morning and that in Kadarnahalli village was held in the afternoon of 23rd September, 2016. Photographs of these meetings are provided in Section 3.2 of Chapter 3.The objective was to have a realistic picture of the micro level awareness about the national and state water policies and perceptions about effects of climate change. ***The findings and suggestions are presented in Section 3.2 of Chapter 3.***

Since water is every body's concern, it was considered important to get inputs from diverse sources. Hence, **the final step** was to hold a workshop having different types of stakeholders, such as senior officers of the state government, leading state level water

resources professionals, NGOs, farmers, women etc. The workshop was held in the conference hall of the Institute for Social and Economic Change (ISEC), Bangalore with the objective to review the draft of a revised version of Karnataka State Water Policy and give suggestions for incorporation in the same in the light of changes which had taken place in the water resource scenario as well as socio-economic and environmental condition since 2002. A copy of the proceedings of this workshop is enclosed in **Annexure B** while the suggestions are presented in section 3.3 of Chapter 3.

A schedule was also filled in by the participants of the workshop giving their perceptions, views and suggestions on issues related to climate change and state water policy. The findings and suggestions from workshop participants have been presented in Section 3.4 of Chapter 3.

Chapter 2

Water Resources Scenario and State Water Policy of Karnataka-2002

1. Water resource scenario of Karnataka

While formulating Water Policy of any state it would be useful if its water resource scenario is kept in view. Brief details of the scenario are, therefore, presented here.

The state of Karnataka is not well endowed with water resources. The annual average rainfall is about 1138 mm which, however, varies from 569 mm in east to 4029 mm in the west. Taking the state as a whole, about two third of its area receives less than 750 mm of rainfall. Moreover, rainfall is quite erratic and often deficient. The state has, of course, seven river systems viz. Krishna, Cauvery, Godavari, West Flowing Rivers, North Pennar, South Pennar and Palar, yielding 3418 TMC at 50% dependability and 2934 TMC at 75% dependability. But bulk of it (about 60%) namely 2022 TMC at 50% dependability and 1736 TMC at 75% dependability is contributed by the West Flowing Rivers, utilization of which is not easy because of difficulties in construction of large reservoirs in this area. Water available from rivers in the rest of the state is quite inadequate. As a result, a major part of the state suffers from water scarcity. It may be noted **that Karnataka is one of the most water scarce states in India** with the highest proportion of its area being drought prone. **Only about 28 percent of the cultivable area of the state is under irrigation while the remaining 72 percent is rain fed. Moreover, water scarcity is increasing rapidly** due to growth of population, urbanization etc. "Mysore heading for water crisis" was the caption of a news item published in The Hindu on 23rd March, 2004. It drew attention to the scarcity of drinking water in Mysore City and surrounding areas. This was unexpected for a district endowed with adequate water from rivers such as Cauvery, Kabini and Lakshmantritha. The situation may become more acute in future due to the impending climate change. Notwithstanding the above, **much wastage of water takes place due to prevalence of flood irrigation system in the state** even though the Karnataka State Water Policy of 2002 had advocated for its replacement by the more efficient warabandi system.

- **Karnataka is one of the most water scarce states in India with the highest proportion of its area being drought prone .**
- **Only about 28 percent of the cultivable area of the state is under irrigation and 72 percent is rain fed.**

Several of Karnataka Rivers are **interstate rivers. This puts some restrictions on their utilization within the state.** Another implication is that Karnataka is having many inter-state water disputes such as with Tamil Nadu regarding the Cauvery river, with Maharashtra regarding Ujjain project on the Godavari river, with Andhra Pradesh regarding Almatti Dam on river Krishna and Paragodi project on the Pennar river. Disputes related to rivers Krishna, Cauvery and Godavari have been referred to interstate water disputes tribunals also.

Being a water scarce and highly drought prone state, Karnataka has laid **great emphasis for a long time on creating storage capacity for water through reservoirs**. It had 6 out of the 65 reservoirs in the country as early as in 1900. By the year 2002, the number of reservoirs in Karnataka had gone up to 216. Karnataka has always been one of the leading states in India in terms of live storage capacity. As per data given in *Water and Related Statistics* of 2008, Karnataka share in storage capacity in the country was 12.12 percent next only to Maharashtra, whose share was 13.41%. Tungabhadra, Lingabhadra, Supa, Almatti, Bhadra, Krishna raja Sagara and Ghataprabha (Hidkal) are among the more important reservoirs of the state. But, as the state government has itself mentioned in its 2002 Water Policy statement, this expansion has been influenced mainly by the need to utilize its share of river waters. Complementary investments on canals and field channels have not been made. This suggests a need to reorient its development priorities with respect to water resources.

During the last three decades, there is a nationwide emphasis on participatory irrigation management in a formal sense. Karnataka, of course, has a long tradition of informal involvement of farmers in irrigation in its several parts. But, it was only in the 80's of the last century that a beginning was made with regard to the Participatory Irrigation Management (PIM) in a formal sense as in other states of the country. It started in the five command area development projects of Tungabhadra, Cauvery basin, Bhadra reservoir, Malaprabha & Ghataprabha and Upper Krishna and was gradually extended to several other parts of the state. Some changes in legislation have also been made through amendments to Irrigation Acts and Rules (such as the ordinance in June 2000 to amend the Karnataka Irrigation Act, 1957). But, as in many other states, **Participatory Irrigation Management (PIM) in the real sense has yet to take roots in Karnataka also.** How to do so is a real policy challenge.

The increasing demand for water has also led to considerable development of **ground water** in Karnataka. But, the **scenario in this respect is no longer favorable** since its overall state of development has already reached a high figure of 70 percent especially in districts such as Bangalore Urban, Bangalore Rural, Kolar, Tumakuru, and Chitradurga. There are several over exploited and critical talukas in the interior of North

and South Karnataka. Due to over exploitation, lakhs of dug wells have dried drown. Shallow bore wells have failed and yields in deep bore wells are declining apart from other adverse environmental effects. Agriculture has been the major user of ground water accounting for above 90 percent. In recent years, however, there is an increasing trend toward extracting ground water from villages near about Bangalore for use in construction of multistoried flats in Bangalore, thereby reducing water for agriculture. In order to augment availability of ground water, Government of India scheme of groundwater recharge (known as Dug well Recharge Scheme) is being implemented in over-exploited, critical and semi-critical talukas of Karnataka.

The state has also mandated to have Rain Water Harvesting (RWH) structures in all new buildings. Bangalore City Corporation has already incorporated mandatory RWH in its building bye-laws.

Karnataka has also launched **several major watershed projects.** A well-known project is the Participatory and Integrated Development of Watershed (PIDOW) in Gulbarga district, which was launched by the Government of Karnataka in 1983-84 in collaboration with MYRADA (Mysore Resettlement and Development Agency), an NGO and with financial assistance from Swiss Development Cooperation. This has been a successful project in which people's participation has played an important role. The Mittemari Watershed Project in the Kolar district of Karnataka, which was launched in 1984, was implemented by the line departments of agriculture, horticulture and forest in collaboration with the State University of Agricultural Sciences. The project resulted in greater crop diversification, higher cropping intensity, and improvement in the yields of major crops, income and employment. The small farmers also shared in the gains of this growth. Karnataka has also taken up a large number of projects under the Government of India's Integrated Watershed Management Programme (IWWP). The number of such projects was 430 covering an area of 19.19 Lakh ha. up to 2012-13. The districts of Tumakuru, Gurbanga, Belgaum, Shimoga and Chitradurga have been the leading districts in this respect, each having 20 projects or more. There are about 40 thousand minor irrigation works in the state. But siltation and inadequate maintenance have led to marked reduction in their storage capacity.

Increasing scarcity of water seems to have prompted the state government to put more **emphasis on drip irrigation in recent years.** A project to provide drip irrigation facility to 59000 acres in Hungund taluka of Bagalkot district is claimed to be Asia's biggest drip irrigation project by the state government. According to recent information provided by the state government (Times of India, June 14, 2016), a few other projects have also been launched to provide drip irrigation facility to farmers in Bagalkot, Koppal, Gadag and Bellary districts.

Increasing pollution of water resulting in deterioration of its quality is emerging as a major problem in Karnataka. As has been pointed out by Murugesha and Veerabhadrappa, "surface water bodies, particularly rivers and lakes, are highly polluted with increasing pollution load from agricultural discharge, industrial effluents and domestic waste. The project report on the Bio – Mapping of major rivers in Karnataka carried out by Karnataka State Pollution Control Board (KSPCB) in 2006-07 shows that there was a change in the environmental quality of Tunga, Bhadra and Tungabhadra rivers. This implies that rivers are the common dumping sources for untreated effluent release from various industries and municipal sewage. Mining industries involved in large scale mining of iron ore and other minerals have also inflicted water pollution through discharging tailings in Bellary, Chitradurga, Chikkamagalore, Tumakuru, Belgaum, Bagalkot and Bijapur districts." The existing laws have proved to be quite inadequate to deal with this problem. As was reported by a Karnataka government officer in the interactive meeting with the study team on 6th September 2016, as many as 35 criminal cases had been filed by the State Pollution Control Board. But the accused parties filed appeals in courts against the orders of the Board. Such appeal cases lingered on for years. Moreover, the effluent treatment plants established by the state government were reported to be not working effectively. Ground water too is also getting increasingly polluted with excess concentration of fluoride, arsenic, iron, nitrate and salinity. According to the authors cited above "About 64 of the 234 watersheds have serious water quality problems in the state as per the recent analysis of ground water samples by the Department of Mines and Geology". According to the information provided in the State Water Policy, 2002, groundwater of about 4500 villages was not fit for drinking due to high fluoride or iron content or brackishness. Chloride and nitrate are other contaminants. Deterioration in water quality has the effect of reducing the availability of water.

As mentioned by the State Government itself in its 2002 Water Policy statement, **the state of Karnataka is also afflicted with several well-known ills of the water sector** such as thin spread of investment over large number of irrigation projects, cost and time overruns, underutilization of irrigation potential created, inadequate attention paid to maintenance, lack of integration of irrigation services with agriculture services resulting in low agricultural yields, problems of land degradation due to excessive use of water, unauthorized use of irrigation water, inequitable distribution of water due to excess usage by farmers in the head reaches at the expense of legitimate share of tail-end farmers, and low irrigation rates. "Land development and agricultural extension have not kept pace with creation of irrigation potential" (State Water Policy 2002). Besides, there is very little coordination between different departments of the state government concerned with water resources.

2. Karnataka State Water Policy - 2002

The Government of Karnataka announced the Karnataka State Water Policy in 2002. This policy has continued since then. An attempt was underway during 2016 to prepare a revised version of this policy. A preliminary draft had been prepared by one of the wings of the Department of Water Resources, Government of Karnataka and the same was also presented during the workshop on 16th November 2016. But, the state government is yet to take a view on this. Hence, it is the 2002 policy document which holds the sway till now. Its features are discussed below.

The objectives of Karnataka State Water Policy 2002 are well defined at the outset. A remarkable feature is that **some of the objectives are spelled out in precise quantitative terms** such as (i) providing drinking water at the rate of 55 liters per person per day in rural areas, 70 liters per person per day in towns and 100 liters per person per day in city municipal council areas and 135 liters per person per day in city corporation areas. (ii) creating an ultimate irrigation potential of 45 lakh hectares under major, medium and minor irrigation projects, as well as facilitating creation of an additional irrigation potential of 16 lakh hectares by individual farmers using ground water. Other objectives comprise of improving performance of all water resources projects, raising productivity of irrigated agriculture by involving users in irrigation management, harnessing the hydropower potential of the state and providing a legislative, administrative and infrastructural environment, which will ensure fair, just and equitable distribution and utilization of the water resources of the state, to benefit all the people of the state.

Planning, development and management of water resources would be carried out **in an integrated manner for hydrological units such as a river basin or a sub-basin**. Conjunctive use of surface and ground water is indicated. Considerations related to water quality and environment is to be taken into account. **A demand management approach** was also advocated for solving issues pertaining to water resources allocation and planning. In drought prone and rained areas, extensive irrigation will be adopted so as to extend the benefits of irrigation to a large area. There was to be close integration of water use and land use policies so as to adopt an appropriate cropping pattern. **Water use efficiency was to be improved through promoting drip and sprinkler irrigation.**

Institutional arrangement for multi-sectorial planning of water resources was to be strengthened by **establishing a State Water Resources Board and a State Water Resources Data and Information Centre,** providing direct access to different water management units along with data sharing and exchange. Water

accounting and audit to be made mandatory. The Water Resources Department was to be restructured to improve its planning and management capabilities as well as to ensure transparency and accountability so as to help in raising efficiency of its operations. Emphasis also laid on community participation in water management. Training, research and development institutions in the water sector were to be restructured and strengthened.

The policy assigned **highest priority to drinking water** in allocation of water. Irrigation and multipurpose projects would invariably include a drinking water component. Other uses listed in order of priority were irrigation, hydropower, aquaculture, agro-industries, non-agricultural industries, navigation and other uses. The policy also laid down an order of priorities for incurring expenditure in respect of major and medium irrigation projects, giving first priority to completion of on-going and committed projects followed by promoting participatory irrigation management, O & M and repairs and modernization. Top priority was to be given to construction of canals and field channels in those irrigation projects where reservoirs were already completed. Necessary legal and institutional measures were to be taken and technical assistance to be provided **to promote and strengthen participatory irrigation management**. Steps were to be taken for rehabilitation of minor irrigation works as well as sub-systems of major and medium irrigation works. Agricultural productivity and income were to be improved by involving concerned government departments/agencies as well as NGOs.

A very distinguishing feature of the Karnataka State Water Policy lay in **its explicit commitment to establish a system of water rights along with suitable enforcement mechanisms.** For this purpose, water quotas for different sub- systems like distributary or minors were to be fixed and suitable information system on water resources to be developed. Action was also to be taken to improve governance by bringing transparency and accountability in administration and reducing corruption. Participation of private sector was to be encouraged. Another significant policy declaration was about **revision of water rates in a phased manner so as to cover at least the O&M charges of providing irrigation.** Health of the water bodies was to be improved by establishing a separate authority for removing and preventing encroachments in them by preventing unauthorized pumping/lifting/ siphoning of water from main canals, branch canals and distributaries and by reducing siltation of dams through soil conservation and afforestation measures.

Policy with respect to ground water comprised of periodic reassessment of ground water potential, regulation of its exploitation and taking up ground water recharge projects. A comprehensive coastal management plan was to be prepared. Water use efficiency was

to be improved. Rainwater harvesting and water conservation was to be encouraged. Water quality was to be maintained by protecting catchments of storages supplying water to urban areas from environmental degradation and industrial pollution and by treating effluents to acceptable standards before discharging them in natural streams. Private sector participation in establishing mini hydro schemes was to be encouraged. Training to be provided to government staff, farmers and other users of water. Close monitoring to identity bottlenecks and obviate time and cost overruns was to be undertaken. A special feature of the Karnataka State Water Policy 2002 lay in **providing a time frame for completion of several tasks.** For example, legal changes to be made within 12 months, on-going and committed water resource development projects to be completed by 2005, command area development works to be completed by 2006, rehabilitation and development of minor irrigation tanks to be completed within 10 years.

3. A critical review of the Karnataka State Water Policy, 2002

Several elements of the Karnataka State Water Policy, 2002 are similar to those of the National Water Policy, 2012. These include need for a basin approach and a master or integrated plan for development of water resources, need for augmentation of water resources and types of measures to be adopted for that purpose, concern on over-exploitation of ground water, introduction and strengthening of community participation in irrigation projects, controlling water pollution and improving water quality, emphasis on water conservation and water pricing, aspects related to good governance through transparent informed decision making, emphasis on managing demand for water, focus on access to a minimum quantity of potable water for essential health and hygiene to all the citizens, control of encroachments in water bodies, associating private sector in management and development of water resources and improvement in data collection, processing and dissemination, etc. It is not surprising to find these similarities since many of the policy measures included in the 2012 National Water Policy have been carried forward from the earlier versions of the national water policy as well as other policy pronouncements which might have been used as benchmark while formulating the Karnataka State Water Policy 2002.

What distinguish Karnataka State Water Policy 2002 from the state water policies of several states as well as the earlier versions of the National Water Policy are the **enunciation of objectives in precisely quantitative terms, spelling out detailed implications of assigning highest priority to drinking water, emphasis on a demand management approach for solving issues pertaining**

to water resources allocation and planning, an explicit commitment to establish a system of water rights along with suitable enforcement mechanism such as fixing water quotas for different sub-systems like distributary or minor, and **providing a time frame for completion of several tasks.**

As regards climate change related aspects, the National Water Policy-2012 has a separate section which states that coping strategies to be adopted to deal with the challenge of climate change. In addition, references to climate change are made at several places in the policy document. These throw light on water related impacts of climate change and the need to keep these impacts in mind while taking decisions related to planning and management of water resources. **The Karnataka State Water Policy-2002, however, makes no reference to climate change.** This is understandable that there was inadequate awareness of climate change related aspects during the period when the Karnataka State Water Policy-2002 was formulated.

There are some other important features of the National Water Policy 2012, which are also missing in the Karnataka State Water Policy, 2002. These include need for multi-disciplinary organizations for water resources, water including groundwater to be managed as a common pool community resource held by the state under public trust doctrine to be followed by modification of existing Acts, avoiding wastage of water, integrated watershed development activities, need for evolving benchmarks for water footprints and water audit to promote efficient use of water, preference for volumetric determination of water rates, planning and execution of all components of water resources projects to be taken up in a *pari-passu* manner, need for involving local community in preparing an action plan for dealing with flood/drought situations, better planning of projects with due emphasis on social and environmental aspects in consultation with project affected and beneficiary families along with concurrent monitoring, involvement of panchayats, municipalities etc. in planning of projects, simultaneous execution of urban water supply and sewage treatment schemes, need for a forum at the state level to evolve consensus among water users, etc. These inadequacies indicate the need for revising the Karnataka State Water Policy to make it in line with the National Water Policy of 2012.

Chapter 3

Findings and Suggestions from Primary Sources

1. Interactions with State Level Officers and others

The first interactive session of the Study Team with senior officers from different departments related to water resources of the Government of Karnataka and others was held in Bangalore on 6th September 2016. The study team interacted with senior officers of the Departments of Water Resources, Agriculture, Rural Drinking Water Supply, Environment and Ecology, State Pollution Control Board, Karnataka Urban Water Supply and Drainage Board and Ground Water Directorate, most of whom made valuable comments and suggestions. A few additional comments and suggestions were also received from Dr. Lingaraju, Shri Charanjivi Singh, IAS (Retd.) and Mr. M.D. Nadaf with whom the Project Director had separate discussions later on the same day as well as by the Principal Secretary Department of Water Resources and a few other very senior officers with whom the Project Director had a meeting on 7th September, 2016.

Annexure 3.1 provides a list of officers and others with whom interactions were held by the Study Team on 6th and 7th September 2016.

A view of interaction on 6th September, 2016

Aspects of the current scenario with respect to water resources in Karnataka which were highlighted during these discussions are summarized below.

1) **Flood irrigation continues to prevail in Karnataka even though the 2002 Karnataka State Water Policy had advocated for its replacement by the Warabandi system.**
2) The awards of the Tribunals did not take into account the quantum of ground water available in any basin. **Linkage of surface and ground water was not taken into account particularly** at the local level because of which one never got a true picture of water resources. **Very little progress had been made with regard to IWRM** especially at the micro level despite the establishment of an Advanced Centre for Integrated Water Resource Management supported by Asian Development Bank.
3) There was an increasing trend towards extracting ground water from villages near about Bangalore for exporting the same for use in multi-storied flats in Bangalore, thereby reducing the availability of water for agriculture.
4) The Karnataka State Government had raised the norms for rural water supply from 55 liters per capita per day as per State Water Policy-2002 to 70 liters and it might be raised further to 85 liters. Supply of drinking water for rural areas was easier if the source was surface water as compared to ground water. Priority to drinking water was accorded in the case of surface water since every reservoir had a drinking water quota. **There was considerable loss in the distribution system of water supplied for drinking and other domestic uses in urban areas, for which there is no accountability**.
5) While water for human beings was assigned priority, there was no provision for water for livestock.
6) **Municipal solid waste was being thrown in water bodies** resulting in water pollution. As many as 35 criminal cases had been filed by the State Pollution Control Board. But, the accused parties filed appeals in courts against the orders of the Board. Such appeal cases lingered on for years. Meanwhile the pollution went on unchecked. Thus, the existing laws were ineffective. The effluent treatment plants established by the Government of Karnataka were also not working effectively.

The suggestions for a revised version of the Karnataka State Water Policy that emerged during the discussions were as below:-

1) There is considerable scope for augmenting water through local schemes such as rain water harvesting, watershed development and river rejuvenation.
2) As most of water is utilized for irrigation, there is need for saving water in irrigation through spreading water literacy among farmers and bringing about **changes in cropping pattern towards less water intensive crops such as millets and ragi** through providing incentives to farmers such as price and marketing support.

3) Micro irrigation for sugarcane cultivation should receive more encouragement in terms of subsidy etc.
4) Accounting for urban drinking water should always be carried out by the Karnataka Urban Water Supply and Drainage Board.
5) In order to avoid wastage of water, a ban should be imposed on 7.5 to 10 liter flush tanks. In future only 5 liter flush tank should be allowed
6) **Provision for water for livestock should also be made** and this should be mentioned in the State Water Policy.
7) **Industry should be mandated to use only the treated sewage water** and it should use water through zero water discharge technique. Supervision in this respect should be exercised by the State Pollution Control Board. Small industries may, however, depend on common effluent treatment plants. Hence, each industrial estate should have common effluent treatments plants. This is a huge task. Hence, a beginning should be made at district level.
8) Discharge of untreated effluents in water bodies should stop in order to control water pollution. Municipal solid waste should not be thrown in water bodies. A system of rewards (in terms of grants etc.) and punishments may be initiated to persuade municipal committees to stop throwing of garbage in water bodies.
9) Emphasis should also be laid on growing of trees to increase the green cover.

It also came to be known that a revised draft of the Karnataka State Water Policy had been prepared quite recently. The Principal Secretary asked the concerned officer to send a copy of the same to the study team for their comments and suggestions before finalizing the document. [The Study Team received it in due course and circulated it to all the participants in the workshop, held on 16th November 2016).

2. Status assessment in a district

An initial step towards effectiveness of any policy lies in making the concerned people aware of it including its implications. It was in this context that the actual status of awareness about water policy and climate change among the concerned district level officials as well as farmers of two selected villages in the district was ascertained through primary survey in Tumakuru district of the state as per details provided in Chapter 1. The findings are presented below. It was pointed out by the district level officials that Tumakuru was a water stressed district which falls under the tail-end of Hemavathi Canal System with limited availability of water for irrigation from surface sources. Ground water development had already reached a stage of saturation, characterized by over exploitation in 3 talukas out of 10 in the district. Many of the bore wells had become dry.

IRMED Study Team interacting with the villagers of Karnakuppe

IRMED Study Team interacting with the villagers of Kadaranahalli

There was ban on installation of new borewells, but households invariably defied. Also there was ban on installation of new borewells, but households invariably defied it and went for installing bore wells even in over exploited areas. But, no punitive action was taken despite a provision for the same in the law. Tank irrigation was very popular in the district. There were over 8000 Minor Irrigation (MI) tanks each irrigating an area of over 40 hectares up to 2000 hectares. This was besides a very large number of panchayat managed tanks, each irrigating up 40 hectares. But, there had been no expansion of this source of irrigation in recent past in spite of the felt need of the villagers.

Awareness about National and State Water Policies at the District and Village level

No farmer out of the 46 interacted with in both the villages by the study Team was found to be aware of any of the two water policies (Karnataka Water Policy-2002 & National Water Policy-2012). This was also confirmed by the written responses of all the 12 farmers (six from each village) who filled in a schedule canvassed by the Study Team (Table 3.1). **Even many officers (12 nos.) at the district level,** excluding some of those in Water Resources Department, Agriculture and Krishi Vigyan Kendra (KVK), **were not aware of these policies.** (Table 3.1) In such a situation, it is not surprising that they had little idea about the contents of the two water policies with respect to climate change.

Awareness about climate change, its effects and coping measures

But, the situation was different as regards climate change. (Table 3.1) Farmers through various symptoms of variability of rainfall in terms of timeliness, quantity and space had realized that there was something wrong with the climate/weather condition. Nearly all of the interviewed farmers felt that the adverse effects would be very much on surface irrigation, urban drinking water, agriculture, horticulture and fodder.

(Table 3.2) Other significant effects expected by them were on ground water irrigation, fishery and animal husbandry. In view of their apprehension of scanty availability of water, they had started adopting some remedial measures, like bringing down area under long duration paddy, which consumes a lot of water. (Table 3.3) In its place, some farmers had started cultivating aerobic paddy of 100-110 days duration, developed by the University of Agricultural Sciences, Bangalore. This variety consumes 40% less water than the conventional variety of 135-145 days, while maintaining the productivity at the same level. Paddy was also being replaced by ragi (small millets) which requires very little or no water. Besides, many farmers were also using improved water application methods such as drip and sprinkler system for horticultural crops such as coconut and arecanut, the main horticulture crops in the district and also in agriculture. Water scarcity in the district had also led farmers to adopt various water conservation methods like storing of water in farm ponds and bunds and mulching for conservation of moisture etc.

As regards district level officers, most of them were aware of climate change and its adverse effects (Table 3.1). As per their perception, the effects would be very much on surface and ground water irrigation, urban and rural drinking water, agriculture, horticulture, animal husbandry. Opinion was divided as regards effect on drought management and fodder. (Table 3.2)

The Departments of Agriculture, Horticulture, Animal Husbandry and KVK had taken several measures to counter the adverse effects of climate change as listed below.

- Soil conservation, rain water harvesting.
- Advising farmers to go for mulching and use of micro irrigation.
- Creating awareness among farmers through training and demonstration on farmers' fields for crops like finger millets, red gram, groundnut, paddy, ragi, etc.
- Introducing drought resistant varieties of crops.
- Recommending specific crop varieties such as ML-365, and GPU-28 in case of finger millets, MAS-26 for paddy, GPBD-4 for groundnut.
- Awareness to save each and every drop of water.
- Increasing green cover area by encouraging area expansion programme of different perennial horticulture crops.
- Creation of water harvesting structures in farmers' fields.
- Establishment of Gosalas at various locations to store dry fodder for use during emergencies.
- Creating additional water sources for storing water for use by cattle.

Mitigation measures taken to counter the adverse effects of climate change as reported by farmers, with whom the study team interacted, were construction of farm bunds and growing of less water intensive crops like ragi in place of paddy and also of short duration crops like pulses. Other measures taken on a limited scale were construction of ponds, check dams and resorting to micro-irrigation.

Additional measures to deal with the challenge of climate change suggested by the district officials:

- Water use efficiency, should be enhanced.
- Weather forecast system should be improved.
- Further research on drought resistant crops.
- Afforestation on a massive scale.
- Small farmers should be encouraged to grow perennial economic crops.
- Awareness in educational institutions about conservation of water.
- Rejuvenate tube/bore wells and village tanks.
- Construct check dams in all water bodies.
- Use of recycled water by Industries.
- De-silting the existing water bodies to restore water to its original capacity.

Farmers too suggested the need for afforestation and de-silting of small tanks and ponds.

Table 3.1

Awareness about water polices and climate change

(Figures in number)

Awareness	District Level Officers			Village Level Farmers		
	Yes	No	Not Sure	Yes	No	Not Sure
Aware of National Water Policy-2012	7	5	-	-	12	-
Aware of State Water Policy-2002	8	4	-	-	12	-
Does state policy contain climate change related issues?	1	8	3		1	11
Whether aware that climate change would be posing problems for the water sector and thereby for agriculture?	12	-	-	12	-	-

Table 3.2
Perceived effects of climate change

(Responses in number)

Effects on	District Level				Village Level			
	Very Much	To some Extent	No Effect	No Idea	Very Much	To Some Extent	No Effect	No Idea
Surface Irrigation	12	-	-	-	12	-	-	-
Ground Water Irrigation	11	1	-	-	9	2	1	-
Drinking Water Rural	10	2	-	-	6	5	-	1
Drinking Water Urban	12	-	-	-	12	-	-	-
Drought Management	7	5	-	-	-	10	1	1
Agriculture	12	-	-	-	12	-	-	-
Fodder	8	4	-	-	10	1	1	-
Fishery	9	3	-	-	8	4	-	-
Horticulture	10	2	-		10	2	-	-
Animal husbandry	11	1	-	-	6	5	-	1

Table 3.3

Mitigation measures reported to be taken by farmers

(Number of responses)

Measures taken	No. of reporting cases
Construction of farm bunds	8
Construction of farm ponds	5
Construction of check dams	2
Growing less water intensive crops such as ragi in the place of paddy	8
Growing short duration crops like pulses	8
Creating new water bodies	3
Resorting to micro-irrigation to enhance water use efficiency	4

3. Issues and suggestions during the state level stakeholders' workshop

A workshop on Karnataka State Water Policy-2002 with special reference to Climate Change was organized by India Water Partnership at the Institute for Social and Economic Change, Bangalore on November 16, 2016. Dr. A Ravindra, I.A.S (Retd.), former Chief Secretary, Government of Karnataka was the Chief Guest during the inaugural session. Number of participants comprising of different types of stakeholders was 44. There were two technical sessions besides the inaugural and the valedictory ones, in which most of the participants got an opportunity to express their view points. The proceeding of the workshop is provided in **Annexure B.** Important highlights and policy inputs from the workshop are given below.

The Project Director, IWP study, raised a number of issues in the beginning on which the views/ suggestions of the participants were solicited. These related in particular to **raising of canal water use efficiency with a focus on incentives to farmers for saving water,** need for establishing water resources regulatory authority, proliferation and spillover of projects, measures for tackling the adverse effects of climate change in different parts of Karnataka, how to move from mere supply augmentation to demand management in the water sector, specific measures for promoting equity and environmental sustainability in management of water resources**,** how to make decentralized institutions like panchayats and municipalities effective partners in management of water resources, how to ensure supply of a fixed quantum of water for irrigation and drinking purposes, need for a well-documented regime of water rights, need for consolidation of state water laws into one legal document, how to develop a more reliable data system and to streamline and strengthen procedure for formulation and clearance of projects, how to ensure **evaluation of completed projects** by independent agencies, how to **make women a part of local level decision making process related to water**, need for awareness generation on water policy and climate change, need to involve academic institutions, civic societies and public in general in formulation of state water policy. The Project Director also indicated the gaps between the National Water Policy 2012 and draft of the revised version of the Karnataka State Water Policy 2016. He ended by calling upon participants to raise additional issues and give suggestions.

Speaking on behalf of the Water Resources Department, Government of Karnataka, Dr. P.S. Rao, Director (Technical), ACIWRM, drew attention to salient features of the draft Karnataka State Water Policy of 2016 with

particular reference to goals and strategies. The goals of the draft Karnataka State Water Policy 2016 explained by him, included (i) ensuring water security for the entire population, (ii) taking an integrated approach to managing water resources,

(iii) improving water governance, (iv) improving the efficiency and productivity of irrigation water and (v) improving the health of watersheds and water bodies. The strategies for the above, pointed out by him, included (i) enunciation of priorities for water use giving highest priority to domestic uses followed by irrigation, hydropower, ecology, industry and other uses; (ii) developing a state wide Karnataka Water Resources Information System; (iii) improving water resources planning and development; (iv) managing the state water infrastructure; (v) sharing the state's water resources between various sectors; (vi) modernizing irrigation; (vii) controlling rural, urban and industrial water supply and pollution; (viii) improving watersheds, rivers and environment; (ix) managing climate change, flood and drought and (x) encouraging community participation in water resources projects. He also underlined the need for reviewing institutional, legal and implementation aspects of the policy.

While giving his presidential remarks, Dr. A Ravindra, I.A.S (Retd.), former Chief Secretary, Government of Karnataka highlighted a number of policy issues related to Karnataka State Water Policy**.** He laid great stress on the need to **shift from the traditional supply side to demand side approach** since the availability of water was quite limited. He also underlined the important role of the **proper pricing of water**.

Dr. Ravindra said that the real problem in this respect, according to him, was how to persuade the politicians. He was not in favor of a permanent interstate water disputes tribunal as advocated in the National Water Policy 2012. He opined that **inter departmental coordination** was not taking place despite a plea being made for it for several years. He felt that skillful measures were needed to promote it. As regards IWRM, it was nowhere being implemented despite being a buzz word. He laid great emphasis on capacity building as well institution building. There should be **a training schedule for officers.** He ended his remarks by drawing attention to the need for an action plan as a part of the water policy document.

The subsequent two technical sessions were devoted exclusively to participants' comments and suggestions regarding Karnataka State Water Policy. The first technical session, which was held before lunch, was presided over by Dr. K. Subramanya, former Professor and Head of Department of Civil Engineering, IIT, Kanpur, while the second session, which was scheduled after the lunch, was presided over by Professor M.S Mohan, Professor of Civil Engineering, Indian Institute of Science, Bangalore.

Suggestions on the draft Karnataka State Water Policy 2016 made by the participants during the two technical sessions as well as those sent subsequently by them through email are summarized below. Some of these were raised by more than one participant.

1) The presentation of the draft policy needed to be improved substantially by avoiding repetitions, removing vagueness and generalities, reordering of ideas and editing the same. It would be helpful if the document had the same sequencing as in the National Water Policy 2012 so that a comparison could become easier.
2) Introduction to the policy should include how the existing State Water Policy of 2002 had been implemented, what was achieved and what was not achieved and why. It should also spell out the extent of achievement of IWRM from 2002 to 2016.
3) The draft was silent on the implementation mechanism. It should, therefore, also indicate the implementation mechanism along with an action plan for better compliance to realize actual ground level outcomes in conformity with policy expectations. Implementation phases and stages might be indicated. It should indicate how to fix responsibility for omissions and commissions so as to help in more responsible governance.
4) There must be an explicit mention in the draft policy document of the requirement of periodic performance review and evaluation of all major water resources projects in the state. Data base for this must be improved.
5) A time bound plan for improving coordination between different departments related to water should be incorporated in the policy. Data base of different departments should be reconciled and one data base should be used by all the concerned departments.
6) Education aspect, which was missing in the draft policy, should receive due attention.
7) Management of demand for water along with a few specific measures for the same like appropriate water pricing and cropping pattern should be assigned an important place in the policy.
8) Ecological agenda, economic growth and social justice should be linked. Self-designed water conservation policies should be encouraged and good customary practices incorporated.
9) In view of the great diversity that prevails in different parts of the state, there should not be a uniform or generalized approach for the whole state. Area specific policy e.g. for uplands, midlands, lowlands, coastal zones etc. should be formulated.
10) Auditing and accounting of water should be introduced.
11) Policy should indicate measures for involvement of stakeholders such as panchayats, municipalities, communities and women in planning and management of water resources at local levels including fighting with flood and drought. **Gujarat model of involvement of women in management of village level drinking water was recommended**.

12) There is need for good estimates of basin wise water availability and usage for proper implementation of policy. Groundwater, which is not a part of water balance accounting mechanism, even by the tribunals, should be considered for inclusion in estimates of water balance. Use of remote sensing for data generation should be promoted. There should be district wise aquifer mapping.
13) Aspects related to climate change should receive more emphasis in the policy. Studies on impact of climate change on water resources in different parts of Karnataka should be accorded high priority. Climate linked supply management system should be encouraged.
14) Groundwater needs to be seen more as a community resource and should be used specially for addressing drought. There was need for effective implementation of the Karnataka Groundwater Legislation Act of 2011.
15) Data based management should receive high priority specially for ground water and local water harvesting. Academic institutions should also be associated with the state government in collection of data.
16) Utilization of water in command areas should be improved.
17) Rejuvenation of tanks, lakes and other water bodies should be emphasized.
18) O & M and capacity building should receive very high priority.
19) Need for accelerating use of regenerated and recycled water.
20) The draft policy's attempt to have two sets of priorities for the same project, one under normal times and another at times of scarcity, may make a project ineffective/inefficient at all times. It should, therefore, be avoided.
21) Statement about priorities in water use (Section 3.1.1) should be modified on lines as laid down in the National Water Policy 2012.
22) Inter basin transfer of water should be considered purely on the basis of merits of each case after serious evaluation of the environmental, economic and social impacts of such transfers. Intra basin transfer of water within the state should also be emphasized.

4. Perceptions and views of workshop participants

During the workshop on Karnataka State Water Policy, held in Bangalore on 16th November 2016, a feedback schedule prepared by the Study Team was administered to 32 workshop participants. The filled in schedules throw light on the status of awareness of the workshop participants on National and State Water Policies, climate change as well as their perception of awareness of the above at district, block, village and town levels. The responses also include their suggestions for mitigation measures to be taken.

Participants' awareness about water policies and climate change

An analysis of the responses given by the workshop participants indicated that awareness among them was greater about the National Water Policy, 2012 than the Karnataka State Water Policy, 2002. Similarly, 67.5% participants (20 out of 32) knew that National Water Policy, 2012 contained aspects related to climate change. But only 37.5% (12 out of 32) were aware of provisions related to climate change in the State Water Policy. One can thus safely conclude that **there was inadequate awareness about State Water Policy even among the specialized group which was expected to be fully aware of this.** The respondents were, however, aware of the law for regulation of ground water in Karnataka as well of its non-enforcement. The details of the responses are given in Table 3.4.1 below.

Table 3.4.1

Participant's awareness about water policies and climate change

(Number of responses)

Awareness	Yes	No	No Response
Awareness about the National Water Policy, 2012	30	1	1
Awareness about provisions related to climate change in the National Water Policy, 2012	20	12	-
Awareness about the Karnataka State Water Policy, 2002	24	8	-
Awareness about provisions related to climate change in the State Water Policy	12	20	-
Is there a law for regulation of ground water in Karnataka?	25	4	3
If yes, is it being enforced?	5	21	6

Participants' perceptions on extent of awareness and preparedness at different levels.

The findings given in table 3.4.2 below indicate **that the extent of awareness about climate change was perceived to be not much, at all the four levels, while in respect of preparedness, it was even less.**

Table 3.4.2
Participants' perception on the extent of awareness and preparedness about climate change at different levels

(Number of responses)

Levels	Extent of awareness				Extent of preparedness			
	NIL	Not much	Adequate	No Response	NIL	Not much	Adequate	No Response
District	4	22	3	3	6	16	1	9
Block	10	17	1	4	13	9	-	10
Village	9	16	2	5	15	7	1	9
Town	9	17	2	4	13	9	-	10

Area specific impacts of climate change

Impact of climate change was perceived to be different in different types of areas. Flood prone areas would experience uneven rainfall in time and space whereas drought prone areas would witness scanty rainfall followed by dry spell. In either case, **agriculture and horticulture would suffer the most** followed by drinking water, animal husbandry and fishery. In such situations dominated by uncertainty, no farmer would like to make long term investment in farming. Specific viewpoints of workshop participants are given below.

- Quite a few participants felt that a comprehensive study was required to determine the extent of impacts of climate change on various sectors of the economy.
- Because of the expected variability in the availability of water due to climate change, agriculture, cattle rearing and fishery would be affected the most.
- There might be failure of crops due to higher intensity of drought and flash flood. This would add to the miseries of people dependent on agriculture.
- Climate change would impact greatly on water resources. This would have effect on Karnataka, which is an agrarian state.
- Excessive use of ground water in the face of inadequate replenishment due to scanty rainfall would result in deteriorating quality of ground water, which would be harmful for human and cattle health.

- Since water related impacts of climate change would be different on different sectors and activities, there was need for a policy to look into such aspects in an integrated manner.

Mitigation measures to deal with climate change.

The participants were requested to give their views on the mitigation measures to be taken to deal with the adverse effects of climate change. Their responses are given in Table 3.4.3 below. Increased water storages in various forms like ponds, tanks, reservoirs, demand management through growing less water intensive crops in drought prone areas, raising flood resistant crops in flood prone areas, use of improved water application methods to deal with water scarcity are some of the measures perceived to be very important to deal with the adverse effects of climate change. **It is noteworthy that water pricing is also considered to be a very appropriate instrument in making conservative use of water as perceived by the workshop participants.**

Table 3.4.3
Mitigation measures suggested dealing with climate change

(Number of responses)

Types of Mitigation Measures	Yes	No	No Response
Demand management i.e. replacing water intensive crops by less water intensive crops in drought prone areas and raising flood resistant crops in flood prone areas etc.	29	2	1
Switching over to short duration crops	29	2	1
Increased water storage in different forms	26	3	3
Switching over to Improved water application methods	31	-	1
Suitable water pricing	26	3	3

Other suggestions given by workshop participants

- Water use efficiency should be improved in all sectors, especially in agriculture, through appropriate devices,
- Provision for safe drinking water to all by strengthening village Water and Sanitation Committees, especially having majority of women members,
- Implementation of Ground Water Act, 2011 and Rules, 2012 on priority,

- Water budgeting at sub-watershed and Gram Panchayat levels,
- Community involvement to manage available water to the fullest extent in an equitable manner,
- Creating awareness is a prerequisite for effective management policy,
- Formation of tank users groups in line with Jala Samvardhana Yojana (JSY), a World Bank funded scheme,
- Afforestation for better environment and ecology as also to check soil erosion.
- Integrated approach through integration of activities of different stakeholders of the water sector. Necessary to ensure inter departmental coordination,
- Implementation of effective water laws,
- Educate farmers, Agriculture Extension Officers and common persons in water conservation and water use efficiency,
- Promote waste water treatment while encouraging waste water /recycled water use by Industries,
- Database of agencies in water sector should be brought under one roof,
- Emphasis should be laid on basin development and inter-basin transfer of water,
- Avoid flood irrigation,
- Regular maintenance of water bodies,
- Issues related to implementation of PMKSY should also be considered in the State Water Policy,
- Stakeholders' involvement in implementing the technologies developed by R & D Institutes,
- Conjunctive use of ground and surface water, and,
- Banning of mining & querying as also sand mining should be made mandatory.

Chapter 4

The Outcome

1. Recommendations for Karnataka State Water Policy made by the IWP Study Team

As mentioned in the preceding three Chapters above, that the IWP Study Team made a critical review of the existing Karnataka State Water Policy, 2002 vis-a-vis the National Water Policy, 2012 in the context of the current challenges being faced in the management of water resources in the state specially by the effects of climate change. The team received inputs and suggestions from several persons with whom it had interactions such as senior government officers, panchayats, municipalities and farmers etc. as mentioned in earlier chapters. A number of suggestions also came during the deliberations of the multi-stakeholders workshop held in Bangalore on 16th November, 2016 as well as in the schedules filled in by 32 workshop participants. Thereafter, the Study Team prepared a consolidated list of recommendations under different themes. These focused on points which are not prominently mentioned in the draft Karnataka State Water Policy 2016 or those which require additional emphasis. **The recommendations of the study team were sent by email to the Principal Secretary, Department of Water Resources, Government of Karnataka on 10th January 2017.** No feedback, however, was received till the preparation of this report.

Major recommendations of the study for Formulation of Water Policy

Following are the major recommendations of the study for formulation of new Karnataka State Water Policy in line with National Water Policy-2012:

General

The draft Karnataka State Water Policy 2016 needed to be improved substantially by avoiding repetitions, removing vagueness and generalities, reordering of paragraphs and editing the same. It would be helpful if the document had the same sequencing as in the National Water Policy 2012 so that a comparison could become easier.

Apart from providing a brief account of water resources scenario, **the State Water Policy should also throw light on socio-economic, institutional and**

management aspects. Socio-economic aspects should also be mentioned in the sections dealing with research and data.

Introduction to the policy should include **how the existing State Water Policy of 2002 had been implemented,** what was achieved, what was not achieved and why and what lessons are to be derived. It should also spell out the extent of achievement of IWRM from 2002 till date.

The draft is silent on the implementation mechanism. The Policy should, therefore, **also indicate the implementation mechanism along with an action plan** for better compliance to realize actual ground level outcomes in conformity with policy expectations. Implementation phases and stages might be indicated. It should indicate how to fix responsibility for omissions and commissions so as to help in more responsible governance.

The State Water Policy should be in line with the National Water Policy with regard to major thrusts and strategies. While revising, the existing gaps between the draft Karnataka State Water Policy 2016 and the National Water Policy 2012 should be abridged as far as possible.

In view of the great diversity that prevails in different parts of Karnataka, there should not be only a uniform or generalized approach for the state as a whole. **Area specific policy e.g. for uplands, midlands, lowlands, coastal zones etc. should also be formulated.**

Decentralized Water Governance

- There is need for community involvement for managing available water to the fullest extent in an equitable manner. Policy should, therefore, indicate **measures for involvement of grass root level stakeholders such as panchayats, municipalities, and communities** etc. in planning and management of water resources at local levels including fighting with flood and drought.
- Tank users groups in line with Jala Samvardhana Yojana (JSY), a World Bank funded scheme, should be formed.
- **In recognition of women being the primary users of water**, there should be adequate provisions for their participation in planning and management of water resources at local levels. This may be done by **establishing (if not established so far) by giving full authority to women dominated local water management committees.** ***Gujarat model of involvement of women in management of village level drinking water is recommended.***

- Stakeholders' involvement in implementing the technologies developed by R & D institutes should be encouraged.

Climate Change

- Aspects related to climate change should receive much more emphasis in the Policy. **Studies on impact of climate change on water resources in different parts of Karnataka should be accorded high priority.** Climate linked supply management system should be encouraged.
- **Weather forecast system should be improved.**
- There is a need to take up **massive programmes of awareness generation** among people at all levels about the adverse effects of climate change and how to involve community and enhance their coping capacity for mitigation measures to be taken to deal with these effects.
- High priority should be assigned to (i) **strengthening and creating adequate facilities for studies and research** on hydrological, hydro meteorological and geomorphologic aspects related to climate change within the Department of Water Resources, WALMI, universities and other institutions including creating new institutions; (ii) **modernizing and expanding instrumentation and measurement techniques and network** and (iii) revising existing **courses of studies,** creating **new subjects** and introducing **programmes** in Post-Graduate diplomas and degrees focusing on development and management of water resources.
- The water and climate change related departments of the Government of Karnataka **should have a common forum** which should meet at frequent intervals to take an integrated view of knowledge base and policy options. **Responsibility for this purpose may be assigned to the recently established Advanced Centre for Integrated Water Resources Management (ACIWRM) of Water Resources Department of the Government of Karnataka. This body may be suitably strengthened with a Chief Engineer level officer at its head and with a strong multi-disciplinary team.**

Drinking Water to All

- The commitment to provide adequate safe drinking water to all should always be fulfilled at all cost. Budgets of government department/agencies responsible for **providing drinking water should not be reduced** as a part of austerity measure.

- Adequate power and funds should be provided to **Village Water and Sanitation Committees,** which should have **a majority of women** members as in Gujarat.
- **Accounting for urban drinking water** should always be carried out by the Karnataka Urban Water Supply and Drainage Board.
- Provision for **Water for livestock should also have a place** in the new State Water Policy.

Water and Agriculture

- **Cropping pattern** and practices in water scarce areas should be oriented **towards less water intensive crops,** such as pulses, millets, ragi etc. Adequate measures for adoption of drought tolerant seed varieties by farmers should be taken. Emphasis should be laid on **dry farming and short duration crops** to escape stress of water. **Research on drought resistant crops** should be promoted on a massive scale. Less water consuming **traditional organic agricultural practices** should also be encouraged. But their productivity should be raised. For this purpose, more funds should be allocated for Research and Development.
- Karnataka must adopt more scientific ways of utilizing irrigation for agriculture such as increasing **adoption of rotational system of distribution of water. Conjunctive use of surface and ground water should be emphasized. Micro irrigation should be encouraged on a large scale. Attention should also be paid to rainfall water use efficiency.** Adequate incentives for the above should be provided.

Water and Forests

Waste land and forest should be included within the ambit of water policy**.** Adequate emphasis should be laid on **biodiversity conservation**. All the hills should be surveyed and covered with proper vegetation. **Afforestation on a massive scale** should be undertaken to increase the green cover for better environment and ecology as also to check soil erosion.

Controlling Water Pollution

- Control of river pollution should receive very high priority. Strategy for improving water quality should **focus more on controlling sources of contamination rather than treatment of the contaminated water. Discharge of untreated effluents in water bodies must stop** in order to control water pollution. There should be adequate measures to control or minimize the prevailing practice of dumping of solid

waste including gaseous industrial effluents in water courses/bodies/canals. **A system of rewards and punishments** in terms of grants etc. **may be initiated** to persuade municipal committees and industries etc. to stop dumping garbage in water bodies. Suitable **restrictions** should be imposed **on water pollution by mining & querying**. Action should also be taken against the adverse effects of **sand mining** on the river regime.

- **Role of Pollution Control Board in preventing water pollution should be strengthened by** suitable legal enactments such as reducing the excessive delay in disposing of pollution related cases. Penalty should be imposed on those polluting water in accordance with the **Polluter Pays Principle.**
- **Sewerage schemes should be executed along with urban water supply schemes.**
- There is a great need for accelerating the use of regenerated and recycled water. **Industry in particular should be mandated to use preferably the waste/recycled water** wherever available and it should utilize water through zero water discharge technique. Supervision in this respect should be exercised by the State Pollution Control Board. **Small industries may, however, depend on common effluent treatment plants.** Hence, each industrial estate should have common effluent treatments plants. This being a huge task, a beginning should be made from district level.

Ground Water

- **Groundwater** needs to be seen **more as a community resource** and should be used specially for addressing drought. There is a strong need for **effective implementation of the state's Ground Water Act, 2011 and Rules, 2012** on priority.
- Over exploitation of ground water in critical areas must be controlled. The Policy should indicate specific measures to be taken for regulating extraction of ground water in such areas. **Panchayats should be legally empowered and properly equipped with data and technical support to regulate extraction of ground water in such areas.**
- Recharging groundwater aquifer should receive increased emphasis.

Development and Management of Water Resources

- Greater emphasis should be laid on **capacity building** of field level Irrigation Officers as well as for Water Users Associations and farmers for effective and judicious use of canal water. **An annual training calendar** should be prepared and appropriate training facilities to be provided at different levels.

- Because of climate change, **more emphasis** should be laid on **storage of water** through constructing reservoirs including run off schemes, small storages and check dams along with catchment area treatment as well as through lakes, ponds and farm ponds, etc. **People's participation** in planning and management of **smaller schemes** is absolutely necessary for their success. **Funds available under MNREGA** may also be utilized for creation of smaller storages like ponds etc. Besides, there should be **optimum reservoir operation** of multipurpose projects. Stringent action should be taken **against encroachments** into catchment areas of water bodies.
- For augmenting water resources, emphasis should also be laid on local schemes such as **rain water harvesting, watershed development, check dams and rejuvenation of rivers,** lakes and other water bodies as well as through **de-silting** of existing water bodies to restore to their original capacity.
- There must be an explicit mention in the policy document of the requirement of **periodic performance review and evaluation** of all major water resources projects in the state. Data base for this must be improved.
- **There is need for integrated planning from river basin to sub-basin to watershed level as well as for integration of activities of different stakeholders** of the water sector. Hence, **a time bound plan for improving coordination between different departments related to water** should be incorporated in the policy. **A multidisciplinary cell for this purpose** should be created in the Water Resources Department, preferably within its recently created Advanced Centre for IWRM (ACIWRM). This center should be considerably strengthened by having experts from agriculture, economics environment, water law, social sciences, etc. apart from engineering and it should be **headed by Chief Engineer level officer**. **The services of this cell should also be utilized for better planning of projects which require interdisciplinary expertise.**
- **Management of Water demand** along with a few specific measures for the same like **appropriate water pricing and cropping pattern** should be assigned an important place in the policy. A massive programme of awareness generation may be launched to create public opinion and political climate in favor of the above measures.
- **Water budgeting, auditing and accounting** at sub-watershed and Gram Panchayat levels should be introduced on a pilot basis in a few districts, to be extended gradually to all the districts.
- Statement about **priorities in water use** (Section 3.1.1 of the draft policy) should be modified on lines as laid down in the National Water Policy 2012.
- **Inter basin transfer of water** should be considered purely on the basis of merits of each case after serious evaluation of the environmental, economic and social impacts of such transfers. Intra basin transfer of water within the state should also be emphasized.

- **Water use efficiency should be improved in all sectors,** especially in agriculture, through appropriate measures such as **fixing water prices** to cover the cost of water supplied, **spreading water literacy** among farmers, and orienting them towards **water saving cropping pattern.** In order to motivate farmers for this, arrangements should be made to provide **support prices and marketing support for crops like millets and ragi. Use of water in command areas** should be improved. **Micro irrigation** should receive more encouragement. **Capacity building** should receive very high priority. **Flood irrigation should be replaced by Warabandi system**. Further, **regular maintenance** of all water bodies is required. **Adequate funds for this purpose should be made available.**
- **Conjunctive use of ground and surface water** should be promoted wherever possible
- Implementation of **water laws** should be emphasized.
- In order to reduce wastage of water for domestic use, a ban should be imposed on 7.5 to 10 liter flush tanks. In **future only 5 liter flush tanks** should be allowed.

Database

- **Ground water, which is not a part of water balance accounting mechanism, even by the tribunals, should be considered for inclusion in estimates of water balance.**

` Data based management should receive high priority. One needs good estimates of **basin wise water availability and usage** for proper implementation of policy. **Data** is needed for better planning of **ground water** and **local water harvesting**. **Academic institutions** should also be associated with the state government **for collection of data. Use of remote sensing** for data generation should be promoted. There should be **district wise aquifer mapping. Data base of different departments should be reconciled** and one data base should be used by all the concerned departments. **Reconciliation may be taken over by the interdepartmental coordination cell.**

Public Awareness

- Creating awareness is a pre-requisite for effective water management. Awareness about water conservation and water use efficiency should be generated in **educational institutions** as well as among farmers, agriculture extension

officers and public in general. This may be done through electronic and print media, campaigns, posters, street plays, road shows and training etc.

- **Education aspect,** which is missing in the draft policy, should receive due attention.
- After formulation, **printed copies of the State Water Policy should be made readily available at the level of village, Panchayat, Block, educational institutions, libraries and other public places.**

Chapter 5

Conclusions

1. Backdrop

The present study is the outcome of the need to review state water policies in line with the National Water Policy, 2012, in the context of climate change

Its objective was to review the draft of Karnataka State Water Policy-2016 as well Karnataka Water Policy-2002 so as to provide the suggestions to modify or include the sections or sub sections in the context of the ensuing climate change in the draft State Water Policy-2016, involving awareness, preparedness, coping mechanism at the state level and down below.

The study relied mainly on primary sources for collecting the required data and information since not much information was available from secondary sources. For this purpose, the Study Team conducted wide ranging interactive sessions with government departments and other stakeholders at the state, district and panchayat levels including farmers followed by a state level workshop to get suggestions for modifying the earlier state water policy of 2002. There was a continuous dialogue between the Study Team and the state government during process of the study.

2. The Process

Selection of the state of Karnataka for the study was made on the basis of certain criteria which were evolved after considerable discussion of the Study Team with knowledgeable experts in the Ministry of Water Resources, River Development & Ganga Rejuvenation and the Central Water Commission, Government of India. A critical review of Karnataka State Water policy, 2002, was made with respect to the water resources scenario of the state as well as the National Water Policy, 2012. Considerable discussion on issues pertaining to Karnataka State Water Policy took place in Bangalore on September 6 and 7, 2016 between the Study Team and state level senior officers of Water Resources and other relevant departments of Government of Karnataka as well as a few other stakeholders. This was followed by interaction of the Study Team with relevant district level and other officers, Panchayat representatives, Krishi Vigyan Kendra and farmers in two villages of Tumakuru district of the state from September 19 to 28, 2016. Finally, a

multi-stakeholders workshop on Karnataka State Water Policy attended by 44 participants was held on 16th November, 2016 at Institute for Social and Economic Change (ISEC), Bangalore. Findings of the schedules filled in by the participants of the workshop, giving their perceptions, views and suggestions on issues related to climate change and water policy, were processed and analyzed.

3. The Outcome

A set of recommendations related to the Karnataka State Water Policy was prepared by the Study Team to be considered for inclusion in the revised version of the Karnataka State Water Policy. **This was sent by E-mail on 10th January 2016 to the Principal Secretary, Department of Water Resources, Government of Karnataka.** The recommendations include the suggestions received during the several interactive sessions with government officers and others in Karnataka as well as those made by the participants in the workshop held in Bangalore on 16th November, 2016 and on the basis of the schedules filled in by them were sent subsequently by the Project Director. These also include the suggestions of the Study Team. The aspects covered in the recommendations include **process of formulation of water policy, decentralized water governance, climate change, drinking water to all, water and agriculture, water and forest, controlling water pollution, ground water, development and management of water resources, public awareness and data base**. In order, to avoid duplication only those points are included which are not found in the existing State Water Policy document or where more emphasis is needed.

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Annexure-A

List of officers and others with whom the Study Team had interactions in Bangalore on 6th and 7th September 2016

1) Shri Rakesh Singh, IAS, Principal Secretary, Water Resources Department, Government of Karnataka, Bangalore
2) Shri Gurupadswamy, KES, Secretary, Water Resources Department, Government of Karnataka, Bangalore
3) Shri Anil Kumar, Deputy Secretary, Water Resources Department, Government of Karnataka, Bangalore
4) Shri Y.S. Patil, PS to Water Resources Minister, Government of Karnataka, Bangalore
5) Shri H.S. Prakash Kumar, Chief Engineer, Rural Drinking Water Supply Department, Government of Karnataka, Bangalore
6) Shri Madhav, Superintending Engineer and Registrar Advanced Centre for Integrated Water Resource Management (ACIWRM), Government of Karnataka, Bangalore
7) Shri Vijaya Kumar, Special Director, Environment & Ecology Department, Government of Karnataka, Bangalore
8) Dr. Kumaraswamy, CEO, State Pollution Control Board, Government of Karnataka, Bangalore
9) Shri S.N. Dinesh, Superintending Engineer, Karnataka Urban Water Supply & Drainage Board, Government of Karnataka, Bangalore
10) Shri C Vidyananda, Joint Director, Department of Agriculture, Government of Karnataka, Bangalore
11) Lalitha Reddy, Joint Director, Department of Agriculture, Government of Karnataka, Bangalore
12) Smt Sanna Boramma, Additional Director, Ground Water Directorate, Government of Karnataka, Bangalore
13) Smt M. Jagadeshwari, Geologist, Ground Water Directorate, Government of Karnataka, Bangalore
14) Shri Charanjivi Singh, IAS (Retd.), Additional Chief Secretary (Retd.), Government of Karnataka, Bangalore
15) Dr. Y. Lingaraju, Art of Living Foundation, Kumudavathi River Rejuvenation, Bangalore
16) Mr. M.D. Nadaf, Secretary, Centre for Environment, Agriculture Development & Training, Bangalore
17) Shri Suhas M. Thakurdesai, Project Director, WAPCOS Ltd., Bangalore
18) Dr. M.G. Chandrakanth, Director, Institute for Social and Economic Change, Nagarabhavi, Bangalore
19) Dr. H.K. Ramaraju, Professor of Civil, Environmental Engineering. SJB Institute of Technology, Bangalore and a member of IWP

Annexure-B

Proceedings of the GWP-IWP sponsored workshop on "Karnataka State Water Policy with special reference to climate change" Venue: Institute for Social and Economic Change, Bangalore (16th November, 2016)

A State level workshop was organized by India Water Partnership with the support of Institute for Resource Management and Economic Development, Delhi in collaboration with Institute for Social and Economic Change, Bangalore, the workshop was attended by 44 participants of different backgrounds as per list attached.

Number of participants comprising of different types of stakeholders was 44 as per list attached at the end of this annexure. Water Resources Department of the Government of Karnataka was well represented by several officers, which included the Secretary, Dept. of Water Resources. The Principal Secretary, however, could not come due to his sudden engagements with the Chief Minister. Other relevant departments of Government of Karnataka such as Agriculture, Natural Disaster Monitoring Centre, Forest, Environment and Ecology, were also represented by senior officers. Besides, representatives from Central Water Commission and Central Ground Water Board of Government of India, a number of eminent experts from water resources engineering, economics, agriculture, social sciences, environment as well as one farmer and a few female members also participated. There were two technical sessions besides the inaugural and the valedictory ones.

The inaugural session started with a welcome address by Dr. M.G. Chandrakanth, Director, Institute for Social and Economic Change (ISEC), Bangalore. Thereafter, Professor Kamta Prasad, Project Director, IWP study and Workshop Coordinator, provided a brief historical background of the national and state water policies including the Karnataka State Water Policy. He underlined the need for a review of the existing Karnataka Water Policy in view of several changes in water resource scenario and socio-economic situation, which had taken place since 2002, when the Karnataka State Water Policy was announced. Thereafter, he raised a number of issues on which the views/ suggestions of the participants were solicited. These are mentioned in paragraph 3.3 of Chapter 3.

Shri R.K. Jain, Chief Engineer, Central Water Commission, Government of India who was the next speaker, gave a Key Note address in which he dwelt upon the salient

features of the National Water Policy, 2012 drawing special attention to changes made in it as compared to the earlier National Water Policy of 2002. This was followed by another keynote presentation on the draft Karnataka State Water Policy of 2016 by Dr. P.S. Rao, Director (Technical), ACIWRM, Water Resources Department, Government of Karnataka. He drew attention to salient features of the draft policy with particular reference to goals and strategies. These are summarized in Section 3.3 of Chapter 3.

Thereafter, Dr. A Ravindra, IAS (Retd.), former Chief Secretary, Government of Karnataka, who was the Chief Guest during the inaugural session, gave his presidential remarks. He highlighted a number of policy issues related to Karnataka State Water Policy, which are mentioned in Section 3.3 of Chapter 3.

The inaugural session ended with a vote of thanks by Dr. Veena Khanduri, Executive Secretary, India Water Partnership. She thanked the dignitaries sitting on the Dias as well as all the participants for sparing their time to join the workshop.

On the Dias: From Left to Right
Veena Khanduri, R.K. Jain, M.G. Chandrakanth, A. Ravindra, Kamta Prasad, Gurupadswamy, P.S. Rao & Madhava.

The subsequent two technical sessions were devoted exclusively to participant's comments and suggestions regarding Karnataka State Water Policy. The first technical session, which was held before lunch, was presided over by Dr. K. Subramanya, former Professor and Head of Department of Civil Engineering, IIT, Kanpur, while the second session, which was scheduled after the lunch, was presided over by Professor M.S Mohan, Professor of Civil Engineering, Indian Institute of Science, Bangalore.

A view of the Workshop participants

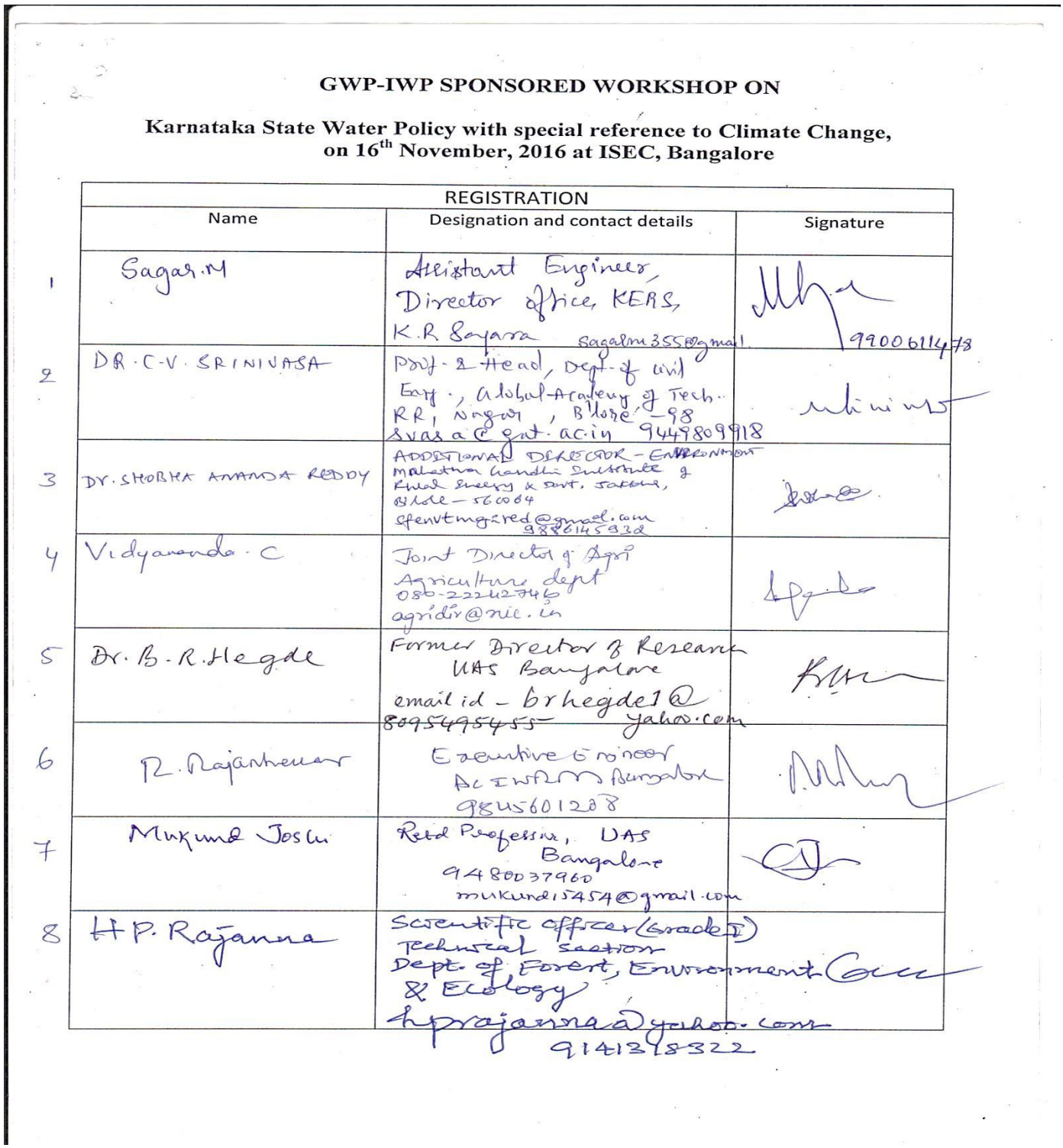
These technical sessions were so conducted that almost all the participants got an opportunity to express their viewpoints. As result, several comments and suggestions on the draft Karnataka State Water Policy were recevied. The main highlights have been summarised in Section 3.3 of Chapter 3.

The workshop ended with Professor Kamta Prasad thanking the participants for their very

fruitful participation. He acknowledged that several good ideas and suggestions had been made by them. He also requested them to send additional suggestions, if any, by email to him within a week so that these could also be taken into account while finalising the recommendations to be submitted by the Study Team to the Water Resource Department of the Government of Karntaka. A few such emails were received subsequently by the Study Team from some of the participants. Their contents have also been taken into account while preparing a list of suggestions made by the participants and mentioned in Section 3.3 of Chapter 3.

Appendix

Scanned copy of Registration sheet for workshop



GWP-IWP SPONSORED WORKSHOP ON

Karnataka State Water Policy with special reference to Climate Change, on 16th November, 2016 at ISEC, Bangalore

REGISTRATION

	Name	Designation and contact details	Signature
1	Sagar.M	Assistant Engineer, Director office, KERS, K.R Sagara sagarm355@gmail. 9900611478	
2	DR.C-V.SRINIVASA	Prof & Head, Dept of Civil Engg., Global Academy of Tech. RR, Nagar, Blore-98 Svas a@gat.ac.in 9449809918	
3	DR.SHOBHA ANANDA REDDY	ADDITIONAL DIRECTOR - ENVIRONMENT Mahatma Gandhi Institute of Rural Energy & Dvt. Jakkur, Bglde-560064 dfenvtmgired@gmail.com 9886145932	
4	Vidyananda.C	Joint Director of Agri Agriculture dept 080-22242745 agridir@nic.in	
5	Dr.B.R.Hegde	Former Director of Research UAS Bangalore email id - brhegde1@ 8095495455 yahoo.com	
6	R.Rajantheeran	Executive Engineer AC INFRA Bangalore 9845601208	
7	Mukund Joshi	Retd Professor, UAS Bangalore 9480037960 mukund15454@gmail.com	
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Annexure-C

Review of Karnataka State Water Policy in the Context of Climate Change
Schedule for Workshop Participants

1. Name and contact details of the respondent

2. Before being contacted for this Workshop, were you aware of the National Water Policy, 2012?
   Yes No
3. If yes, were you aware of the provisions related to climate change?
   Yes No
4. Were you also aware about Karnataka state having a water policy?
   Yes No
5. If yes, were you aware whether the state policy contained any provision dealing with climate change related issues?
   Yes No

6. Is there a Law for Regulation of Groundwater in Karnataka?
   Yes No
7. If yes, is it being enforced satisfactorily?
   Yes No

8. What is the extent of **awareness** and **preparedness** with respect to impacts of Climate Change related to water resources at local levels (District, Block, Village and Town). Please tick:

	Extent of awareness:			**Extent of Preparedness**		
Levels	Nil	Not Much	Adequate	Nil	Not Much	Adequate
District	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

Block	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Village	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Town	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

9. Please indicate how the water related impacts of climate change will be different on different activities like agriculture, cattle rearing, fishery, industry etc. in your state?

10. Do you think that replacing water intensive crops such as Paddy, Sugarcane etc. by less water consuming crops like Ragi, Pulses and Oilseeds would be one of the coping measures to deal with the impact of climate change?

    Yes No

11. If yes, to what extent farmers in Karnataka are following this practice?

    a) To a great extent b) To some extent c) Not at all d) No idea

12. Do you think that drinking water would be very much affected due to climate change?

    Yes No

13. Do you agree that increased water storage in various forms i.e., soil moisture, pond, ground water, small and large dams will help to mitigate the effect of climate change?

    Yes No

14. Do you think that demand management i.e. growing less water intensive crops in drought prone areas in Karnataka will reduce the effect of climate change?
    Yes No

15. Do you think that improved water application methods such as use of sprinkler or drip irrigation and / or rescheduling of crop activities will help in mitigation of climate change related impacts?
    Yes No

16. Water pricing is a tool for dealing with water scarcity which is expected to increase due to climate change. In view of this, do you think that suitable water pricing will have greater role in future in mitigating the adverse effects of climate change?
    Yes No

17. What are the other appropriate coping strategies that you may suggest for your state?

    1.
    2.
    3.

Signature of the respondent

Annexure-D

Review of Karnataka State Water Policy in the Context of Climate Change

Schedule to be canvassed level at the level of department of Agriculture, Horticulture and Krishi Vigyan Kendra (KVK).

Respondent: KVK, Department of Agriculture/Animal Husbandry (Please tick)

Name of District : District :

Name, Designation and contact details of the official :

1. Are you aware about of National Water Policy, 2012?

Yes No

2. Does your state have state a water policy? If yes, in which year was it announced?

Yes No

3. If yes, does it contain climate change related issues?

Yes No Not sure

4. Are you aware that Climate Change due to global warming is going to pose a serious threat for water resources sector and thereby to agricultural activities?

Yes No

5. If yes, What mitigation measures are taken by your agency to counter the adverse effect of climate change?

6. Are these measure adequate?

Yes No Not sure

7. Have you developed appropriate crop varieties for adoption by farmers in anticipation of climate change?

Yes No Not sure

8. If yes, what are these varieties?

9. Have you also carried out field demonstrations of these varieties on farmers fields?

Yes No

10. If yes, what crops have been demonstrated?

11. Did farmers follow the advice given by you?

Yes No

12. If no, why?

13. This being a chronically drought prone district, the effects of climate change is likely to be much more. In view of these, what crop varieties have you recommended, for adaption by farmers?

14. Do farmers follow your advice?

Yes No

15. If no, why?

16. In view of higher probability of crop failure due to climate change, do you suggest adaption of crop insurance by farmers?

Yes No

17. If yes, is there any good scheme for crop insurance?

Yes No

18. If yes, what has been the response of the farmers

(i) Favourable (ii) Indifferent (iii) Unfavourable

19. If no, why?

20. Do you suggest for adaption of improved water application methods (drip or sprinkler irrigation) to enhance water use efficiency?

Yes No

21. If yes, do farmers follow your suggestions?

Yes No

22. If no, why?

23. What additional measures do you think should be taken to minimize the adverse effect of climate change on agriculture?

24. Any other suggestion you would like to give.

Annexure-E

Review of Karnataka State Water Policy in the Context of Climate Change

Schedule to be canvassed at the level of rural/urban water supply departments/ agencies at the district.

Name of the district: State:

Name and contact details of government department/agency

1. Are you aware of the National Water Policy, 2012?
   Yes No
2. Are you aware of the State water policy?
   Yes No
3. If yes, in which year was it announced?

4. Has it any provision related to climate change?
   Yes No Not sure
5. Have you attended any seminars, workshops, training programmes etc. related to climate change during the past 5 Years?
   Yes No
6. Are you aware that Climate change due to global warming is going to pose a serious threat for water resources sector?
   Yes No

7. If yes, how much of the following are likely to be affected?

Source	Very much	To some extent	No effect	No idea
Surface irrigation				
Groundwater irrigation				
Drinking water, rural				
Drinking water, urban				
Drought Management				
Agriculture				
Fodder				
Fishery				
Horticulture				
Animal Husbandry				
Other (specify)				

8. Has your state/ agency adopted climate change resilient technological option to counter the adverse effects of climate change?

   Yes No

9. If yes, what are these?

10. Tumkur district being water stressed district, the situation gets worse due to variability in the availability of water in space and time due to climate change. To face this challenge, what contingency measures have you taken to restore the normalcy? Are these adequate(tick)?

a) Creation of new water bodies

Yes No

b) If yes, is it (i) Adequate (ii) Inadequate

c) Increase water storage capacity in the existing water bodies

Yes No

d) If yes (i) Adequate (ii) Inadequate

e) Plugging of leakages in the pipelines/replacement of old pipeline

Yes No

f) If yes (i) Adequate (ii) Inadequate

g) Other options (Specify)

Yes No

h) If yes (i) Adequate (ii) Inadequate

11. What additional measures should be taken to minimize the effect of climate change in your area?

Annexure-F

Review of Karnataka State Water Policy in the Context of Climate Change
Schedule to be canvassed at the level of other departments/ agencies at the district

Name of the district: State:

Name and contact details of government department/agency

1 Are you aware of the National Water Policy, 2012?

Yes No

2 Are you aware of the state water policy?

Yes No

3 If yes, in which year was it announced?

4 Has it any provision related to climate change?

Yes No Not sure

5 Have you attended any seminars, workshop, training programmes etc. related to climate change during the past 5 Years?

Yes No

6 Are you aware that Climate change due to global warming is going to pose a serious threat for water resources sector?

Yes No

7 If yes, how much of the following are likely to be affected?

Source	Very much	To some extent	No effect	No idea
Surface irrigation				
Groundwater irrigation				
Drinking water, rural				
Drinking water, urban				
Drought Management				
Agriculture				
Fodder				
Fishery				
Horticulture				
Animal Husbandry				
Other (specify)				

8 Has your state/ agency adopted climate change resilient technological option to counter the adverse effects of climate change?

Yes No

9 If yes, what measures are being taken? Are these adequate?

Measures	Adequate	Not adequate
1.		
2.		

10 What additional measures should be taken to minimize the effect of climate change in your area?

Annexure-G

Review of Karnataka State Water Policy in the Context of Climate Change

Schedule to be canvassed at the level of farmer.

Name of the farmer: Village:

Name of Panchayat : Block:

Name of District : State:

1. Are you aware of the National Water Policy 2012?

Yes No

2. Are you aware of the state water policy? In which year was it announced?

Yes No

3. If yes, has it any provision related to climate change?

Yes No No idea

4. Are you aware that climate change due to global warming is going to pose a serious threat for water resources sector?

Yes No No idea

5. Do you know that climate change has adverse effect on agriculture and allied activites.

Yes No No idea

6. If yes, are you aware of coping measures?

Yes No

7. Has there been any demonstration on your/neighbour's farm in respect of new crop varieties/applications?

Yes No

8. If yes, (i) Name of varieties (ii) Name of applications

9. If yes to question 7, are you satisfied with the outcome?

Yes No

10. If no to question 7, would you like to have one such activity on your farm?

Yes No

11. How much of the following are likely to be affected?

Source	Very much	To some extent	No effect	No idea
Surface irrigation				
Groundwater irrigation				
Drinking water rural				
Drinking water urban				
Drought Management				
Agriculture				
Fodder				
Fishery				
Horticulture				
Animal Husbandry				
Others (Specify)				

12. Have you adopted any climate change related coping measures such as storing of water in various forms, re-scheduling of crop activities such as growing crops which need less of water, early/ late sowing of crop to escape water stress etc. to counter the adverse effects of climate change?

Yes No

13. Are you aware of improved water application methods such as drip or sprinkler irrigation?

Yes No

14. If yes, are you adopting such methods?

Yes No

15. Have you modified your crop and other activities to overcome the adverse effect of climate?

Yes No

16. If yes, what measures are being taken? Are these adequate?

Measures	Adequate	Not adequate
a)		
b)		
c)		

17. What additional measures should be taken to minimize the effect of climate change in your area?

Annexure-H

Review of Karnataka State Water Policy in the Context of Climate Change

Guide points for discussion with the villagers

a. Awareness about National Water Policy, 2012.
b. Awareness about State Water Policy.
c. Awareness about climate change.
d. Its effect on
    i. Agriculture and allied activities.
    ii. Drinking water
e. Coping strategy
    i. Agriculture and allied activities
    ii. Drinking water