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Report on
Review of Odisha State Water Policy (2007) in line with National Water Policy, 2012 in Context of Climate Change

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C O N T E N T S

Preface

The present study has been undertaken in the context of the need to review State water policies in line with the National Water Policy- 2012, with particular reference to climate change. This is in continuation of 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 knowledgeable persons. This report deals with Odisha.

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 level followed by a State level workshop to receive suggestions for modifying the earlier version of the Odisha State Water Policy (2007). The suggestions offered by the study team are in line with the National Water Policy-2012.

The study required desk research, interactions with high level decision makers in the Government of Odisha and other stakeholders, field visit to selected Bolangir district (a major drought prone district of Odisha) from June 23 to July 1, 2016, followed by a State level workshop at Nabakrushna Choudhary Centre for Development Studies, Bhubaneswar on 16th December, 2016. These were quite fruitful and helpful in completion of the study.

This could be possible due to help and cooperation received in abundance from a large number of individuals and institutions as mentioned in the Acknowledgement below.

Veena Khanduri
Program Advisor

Acknowledgement

Support and cooperation for the study team was received from a very large number of individuals and institutions, as referred to in the report. These include those with whom interactions took place and those who participated in the workshop held in Bhubaneswar. All of them deserve our thanks.

Special thanks are due to the Secretary, Ministry of Water Resources, River Development & Ganga Rejuvenation, Government of India for issuing the letter of introduction to the Government of Odisha for providing help and cooperation to the study team as and when required for smooth conduct of this study.

We thank the Principal Secretary and other senior officers of the Department of Water Resources, Government Odisha for the support provided by them at the initial stages of the study. We are especially thankful to Professor Binayak Rath, former Vice-Chancellor, Utkal University, Bhubaneswar, Professor Sudhakar Panda, former Chairman, State Finance Commission, Government of Odisha, Shri R.D. Rao, Project Manager, WAPCOS, Bhubaneswar, and Shri Tapan K. Padhi, Convener, Eastern India Zonal Water Partnership, Bhubaneswar for providing advice and support at different stages of the study.

We also thank Shri. A.K. Nayak, Chief Engineer, Mahanadi and Eastern Rivers Organization, CWC, Govt. of India, Bhubaneshwar, and Shri D.P. Pati, Regional Director, South Eastern Region, Central Ground Water Board, Government of India, Bhubaneswar for their participation in the discussion in the interactive meeting on 30th May, 2016.

We also acknowledge with thanks the support received from Prof. Srijit Mishra, Director, Nabakrushna Chaudhary Centre for Development Studies (NCDS), Bhubaneswar for collaborating with India Water Partnership study team for holding the workshop in NCDS and for providing all possible help and cooperation.

Our special thanks go to India Water Partnership (IWP) for sponsoring the study. Dr. Veena Khanduri, Executive Secretary-cum-Country Coordinator, IWP and Shri Mangla Rai, Research Associate IWP, provided the needed support and cooperation at every stage during the course of the study.

Last but not the least, we offer our sincere thanks to Shri D. Routray and other members of the study team for the hard labor they have put in for undertaking this study successfully.

Kamta Prasad
Project Director

Executive Summary

1. Background

Water is crucial for the sustenance of mankind on Earth. However, unprecedented rise in population along with an increase in per capita demand for water is putting undue pressure on its limited stock. In such a scenario, sustainable management and development of this crucial resource becomes extremely important. It is in this context that a National Water Policy (NWP) was formulated for the first time in India in 1987. This was subsequently revised in 2002 and then further in 2012. NWP 2012 highlights major concerns related to climate change and its adverse effects on various facets of the economy.

As water is a state subject in India, therefore the states were advised as per the NWP-2012 to prepare or revise their water policies. But the states have been lagging behind in this regard as only about a half of them have announced their water policies since 1987 and most of them have not been revised since their formulation. It is in this context that India Water Partnership initiated a study for reviewing water policies of two states of Odisha and Karnataka in 2016 and entrusted it to the Institute for Resource Management and Economic Development (IRMED), Delhi. IRMED has done similar studies for Bihar and Gujarat during 2014 and Tamil Nadu and Goa in 2015.

NWP-2012 emphasizes on mitigating the effects of climate change at micro level by enhancing the capabilities of the communities to be resilient to it. Hence, an enquiry of the preparedness to deal with effect of climate change at the micro level forms an integral part of the study.

The selection of the two States for this study was guided by the considerations that these states should belong to different agro-climatic zones, be receptive and cooperative, have policies formulated quite early. This criteria was evolved after interactions with concerned officers of the Central Government departments/agencies dealing with water resources such as Ministry of Water Resources, River Development and Ganga Rejuvenation and the Central Water Commission (CWC), a statutory body under Ministry of Water Resources, River Development and Ganga Rejuvenation.

This report deals with review of the State Water Policy of Odisha.

2. Objective

Objective of the study was to review the Odisha State Water Policy of 2007 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

Information on water resources scenario in the State and regulatory mechanism was collected from both secondary and primary sources. The secondary sources include different versions of the National Water Policy, publications on water resources scenario of Odisha and its State Water Policy. The primary sources include (i) interactive sessions and focused group discussions with the state level senior government officers, (ii) discussions, based on schedules, with district level officers and farmers of two villages in Bolangir district of Odisha, and (iii) state level multi-stakeholders workshop organized by the study team at Bhubaneswar.

Five types of structured-cum-open ended schedules were canvassed one each for (i) the participants of the state level workshop, (ii) district level officers of (a) Departments of Agriculture/ Horticulture and Krishi Vigyan Kendra (KVK), (b) Rural/Urban Water Supply Department, (c) other departments and (iii) farmers of two villages of Bolangir district as provided in Annexures C, D, E, F, G of the report. In addition, there were Focused Group Discussions at village level for which separate guide points were developed (Annexure H).

4. Water Resources Scenario of Odisha

The State has an annual average rainfall of about 1500 mm but it is highly uneven as half of it is concentrated in the two months of July and August. Having about 85.89 bcm of surface water, the State has about 11 percent of the water resources of the country whereas it has only 4 percent of the country's population (2001 population census). The per capita availability of water in 2001 was estimated to be 3359 cm and is estimated to decline to 2218 cm by 2051 with a steady deterioration of water quality.

Mahanadi is one of the most important rivers flowing through the State. It is an interstate river with a basin area of 65,628 Km^2 in Odisha which constitutes 42.15% of the total geographical area of the State. Other important rivers are Brahmani and Baitarani having basin areas of 22,516 & 13,482 Km^2 in Odisha which constitute 14% and 8.66% respectively of the total area of the State. Odisha has developed a State Water Plan for the period covering up to 2051 when the population of the State is expected to stabilize.

River water in the state is harnessed by constructing several dams of which the Hirakund dam on the river Mahanadi is the biggest. However, capacity of these reservoirs has been significantly reduced due to rapid sedimentation over the years. The reduced capacity of the reservoirs as well as increased per capita demand of water has led to an increased dependence on groundwater.

Also, as Odisha has a coastline of 476.6 Km, the state has to face the problem of sea bank erosion which makes it highly susceptible to different types of disaster such as flood, drought and cyclone.

Some of the other water management issues in the state are: low canal water use efficiency, increasing water pollution especially due to mining industries, over exploitation of groundwater, excessive use of water by the agriculture sector because of cultivation of water intensive crops, neglect of maintenance and difficulties in coordination among different government departments dealing with water.

5. Odisha State Water Policy (2007)

Odisha brought out its first water policy in 1994, following the announcement of the National Water Policy of 1987. It revised its policy in 2007 after the revised version of the National Policy came out in 2002. Since then, Odisha is continuing with its State Water Policy of 2007.

As per Odisha State Water Policy 2007, the order of priority for allocation of water is similar to the one advocated in the National Water Policy of 2002, except that it gives second position to ecology as against fourth position in the National Policy.

As in the National Policy 2002, the Odisha Policy 2007 also regards a hydrological unit, such as a basin or sub basin as the unit for development and management of water resources.

The Policy advocates several laudable measures for better management of water resources as well as for providing adequate and safe drinking water for both human being and cattle. It also emphasizes on inter area equity. The Policy pleads for taking into account the requirement of environmental flow in the river as a mandatory consideration. Necessary measures for management of flood and saline ingress and catchment area treatment have been indicated. It has also been recommended in the policy to strengthen the Participatory Irrigation Management.

6. A critical review of Odisha State Water Policy, 2007

Measures for management of water resources emphasized in Odisha State Water Policy, 2007 (OSWP-2017) are mostly similar to those mentioned in NWP 2012 except few. Several measures spelt out in the (OSWP-2017) are also similar to those of the National

Water Policy, 2012. These include need for a basin approach, integrated plan for development of water resources, concern on over-exploitation of ground water, strengthening community participation in irrigation projects, controlling water pollution, adoption of improved water application devices, emphasis on water conservation, water pricing, data collection, processing and dissemination etc. However, the OSWP-2017 does not mention setting up of multi-disciplinary units, rotational water distribution system to sub-serve the objective of equity and efficiency ensuring appropriate role of women in management of water resources, shift toward demand management, evolving benchmarks for water foot prints and water audit to promote efficient use of water, public participation in flood management, simultaneous execution of urban water supply and sewage treatment schemes etc. on which the National Water Policy-2017 lays considerable emphasis.

Also, climate change and its effect on water resources has been given significant importance in NWP 2012; however, there is no mention of it in OSWP-2017 as climate change is a relatively new concept in environment science and its impact at micro level still needs to be understood in detail.

7. Interactions with State Level Officers and Other stakeholders

As part of the study, the first interactive session of the study team was held on 30th May, 2016 with senior officers of the Department of Water Resources, Government of Odisha which revealed that no attempts were being made by the Department for revising the State Water Policy-2007 owing to the constant changes in the socio-political scenario of the State which in turn affects the water resources management in the state.

During the session, the Principal Secretary, Department of Water Resources of Government of Odisha drew attention to a few key problems facing management of water resources in the state which should be taken into account while revising the state water policy. He also gave a few suggestions for the same. It was decided in the meeting that the draft of a revised version of Odisha State Water Policy would be prepared by the Department by the end of June 2016.

8. Awareness at the District and Village Level

An analysis of the district and village level information collected by the study team in Bolangir district of the state indicated that there is not much awareness among the villagers/ farmers regarding the water policies.

However, 3/4th of the district level officers were aware about the national and state water policies as well as their contents in terms of provisions for dealing with climate change related aspects.

9. State level multi-stakeholders workshop at Bhubaneswar

A State level multi-stakeholders workshop on Odisha State Water Policy was organized by the study team on December 16, 2016 at Nabakrushna Choudhary Centre for Development Studies, (NCDS) Bhubaneswar. It was inaugurated by Shri Gokul Chandra Pati I.A.S (Retd.), former Chief Secretary, Government of Odisha. Dr. B.P. Das, former Engineer-in-Chief, Department of Water Resources, Government of Odisha presided over the Inaugural Session. There were two technical sessions during which most of the participants gave their suggestions for revision of Odisha State Water Policy (2007). The list of suggestions is provided in Section 3.3 of Chapter 3.

10. The Outcome: Recommendations for Odisha State Water Policy

The Study Team made a critical review of the current challenges in the management of water resources in Odisha, especially those expected from the ensuing climate change. Suggestions received during the State level multi-stakeholder workshop were taken into account while formulating the recommendations to be submitted to the Principal Secretary, Department of Water Resources, Government of Odisha to be considered for inclusion in the revised version of the State Water Policy.

Listed below are the major recommendations for revising the Odisha State Water Policy:

- The State Water Policy should be in line with the National Water Policy-2012 with regard to major thrust areas and strategies.
- Decentralized approach to water management should be given priority while revising the State Water Policy.
- Provision of area specific policies for different regions of the basin.
- Multi-stakeholder approach should be adopted for water resource management advocating the judicious use of water.
- Integration of agricultural and water policies of the State to address the inter-linkages between the two.
- Need for evolving benchmarks for water footprints and water audit including groundwater, to promote efficient use of water.
- Higher priority should be allotted to river pollution, groundwater recharge and drinking water rights for all communities along with increased emphasis on demand side management of water.
- Improvement in infrastructure for water management is required for better implementation of policies.
- Proper emphasis should be given on 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.
- Water to be viewed as a common pool community resource held by the State under public trust doctrine.

- Studies should be conducted to understand the impact of climate change on water resources in the State and mitigation measures which can be adopted to minimize its impact.
- Inclusion of wasteland and forest within the ambit of water policy of the State.
- Sewerage schemes should be executed along with urban water supply schemes.
- Focus on generating awareness about impact of climate change and building capacity to mitigate its adverse impacts.
- Ensure higher women participation in drinking water supply management by an increased representation in drinking Water and Sanitation committees at village level.
- Adoption of improved irrigation methods and focus on incorporating less water intensive and drought resistant varieties of crops.
- Establishing a government forum for climate change related department to enhance knowledge base and discuss alternate policy options.
- Feasibility of interlinking of rivers (both interstate and intrastate) for augmenting availability of water in water deficient areas should be examined and pursued vigorously.

On completion of the study, a consolidated list of recommendations grouped under different themes was prepared by the Study Team focusing on points which are not prominently mentioned in the Odisha State Water Policy 2007 or those which require additional emphasis. The recommendations were sent by email to the Principal Secretary, Department of Water Resources, Government of Odisha on 9th January 2016 to be considered while revising the State Water Policy.

Chapter 1

Introduction

1.1 Background and Rationale

National Water Policy (NWP) for India was announced for the first time in September 1987, with subsequent revisions in 2002 and the latest in 2012. NWP-2012 emphasizes on the impact of climate change on water resources. This was in recognition of the profound impact that climate change is expected to produce with water being the principal medium through which this impact would take place. Drawing attention to the likely increase in the variability of water resources due to climate change and consequently, its effects on human health and livelihood, the NWP-2012 also suggests strategies to deal with them at National as well as community level.

As stated in NWP-2012, "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". As **Water is a state subject in India, it becomes imperative that the principles enunciated in NWP 2012 are also reflected in the state water policies to retain uniformity in ensuring sustainable management of water resources.**

However, there has been an unwarranted delay in the process of adopting principles enunciated in NWP 2012 by the States in their respective water polices. So far, only 14 states have announced their Water Policies among which only two Union Territories (UTs) have aligned themselves with NWP 2012 (namely Daman & Diu, and Dadra & Nagar Haveli). The remaining states/UTs are either in the process of formulating their state water policies or revising it in accordance with NWP 2012.

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 other state to bring out a revised state water policy in 2013, which included climate change also in line with the National Water Policy of 2012.

It is in this context, India Water Partnership (IWP) formulated a study in 2013 to review state water policies with special reference to climate change in line with the National Water Policy-2012 and entrusted the task to Institute for Resource Management and

Economic Development, Delhi. Studies were conducted for states of Bihar and Gujarat in 2014 and for Tamil Nadu and Goa in 2015. In 2016, a similar exercise was undertaken by IRMED for two more states i.e. Odisha and Karnataka.

The selection of the two states was guided by the considerations of existing policies, different agro-climatic zones. Discussions were held with the Central Government Departments/Agencies dealing with water resources such as Ministry of Water Resources, River Development and Ganga Rejuvenation and the Central Water Commission (CWC). This report deals with a review of the State Water Policy of Odisha.

As mentioned earlier, the present study is concerned with a review of water policies of the two states in the context of climate change. **With regard to climate change, the National Water Policy 2012** states that, "***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). Therefore, it is essential for people and functionaries at the grass-root level especially those engaged in agriculture and allied activities to be aware of the adverse impacts of climate change and be equipped to mitigate its impacts.

While there is growing literature on the overall dimensions of climate change and its probable effects in different parts of the world including India, **there are limited studies available on the extent of awareness and preparedness at micro level to mitigate its effect. Hence, an enquiry at the micro level also formed a part of this study.**

1.2 Objective

The objective of the study was to review the Odisha State Water Policy-2007 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).

1.3 Methodology

An appropriate methodology was developed in the context of the above objectives. Information was collected from both secondary and primary sources. Review of different versions of the National Water Policy as well as water policy of several states was carried out to prepare a tentative list of state specific issues for further deliberation with the stakeholders. Also, salient features of water resources scenario and state water policy of Odisha were critically analyzed to identify the gaps in its management as mentioned in Chapter 2 of the study.

Also, Multi-stakeholder consultations including state level senior officers of the Government of Odisha, academic institutions, research organizations, and non-profit organizations were held

at several levels. The list of officers from government and other agencies who participated in the discussions is provided in **Annexure-A**. The purpose of these consultations was to arrive at more inclusive decisions regarding the proposed revisions in the State Water Policy. The findings are presented in section 3.1 of Chapter 3.

In order to collect information on awareness about water policy and climate change among senior officials and functionaries at the grass-root level, **five types** of schedules were developed and administered one each to (i) the participants of the state level workshop, (ii) the district level officers of Bolangir district (a) departments of Agriculture/ Horticulture and Krishi Vigyan Kendra (KVK) (b) Rural/Urban Water Supply Department (c) other departments and (iii) farmers of the two villages of Bolangir 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 schedules are provided in **Annexures C, D, E, F, G** of the report. In addition, there were Focus Group Discussions with villagers at village level for which separate guide points were developed **(Annexure-H).**

After consultation with numerous stakeholders (such as development officials and Krishi Vigyan Kendra), Bolangir was chosen as the representative district for the study due to the frequent occurrence of droughts in this region. Interactions were also held with people's representatives, NGOs, Panchayats, Municipalities and general public in two villages namely Banabahal in block Puintala and Kareldhua in block Saintala of Bolangir district. The villages were selected on the premise that both these villages were water stressed and drought prone. 20 farmers in village Banabahal and 29 in village Kareldhua participated in the workshops organized in the two villages respectively. The findings and suggestions are presented in Section 3.2 of Chapter 3.

Lastly a State Level workshop was held at Nabakrushna Choudhary Centre for Development Studies, Bhubaneswar on 16th December 2016 with the objective to review the existing Odisha State Water Policy, 2007 and give suggestions for its revision in the light of changes which have taken place since then in water management scenario at both National and State level. Copy of the proceedings of the workshop is enclosed in **Annexure-B** and the suggestions are presented in section 3.3 of Chapter 3.

Chapter 2

Water Resources Scenario and State Water Policy of Odisha

2.1 Water Resources Scenario of Odisha

In order to review the Water Policy of the state, it is necessary to have an understanding of the status of its water resources scenario. Hence, information on salient features of the water resources scenario of Odisha was collected and is presented below. This is mainly based on published sources supplemented somewhat by a few observations of the Principal Secretary, Department of Water Resources, Government of Odisha during his interaction with the study team on 30th May, 2016 as well as those of participants of the workshop held on 16th December 2016.

Odisha, which emerged as a separate state in April 1936, has a diverse landscape comprising of river valleys, coastal plains, mountainous areas, watersheds, springs, lakes and forest cover of varying density. 65% of the population of the state is dependent on agriculture. Therefore, management and development of water resources holds paramount importance in a state like Odisha.

Rainfall- The state receives an annual average rainfall of about 1500 mm which is highly uneven in its occurrence as half of it is concentrated in the two months of July and August. Having about 85.89 bcm of surface water, the state has about 11 percent of the water resources of the country whereas it has only 4 percent of the country's population as per 2001 census. Hence, the estimated per capita availability of water in 2001 was 3359 cm. However, this water availability is estimated to decline to 2218 cm by 2051 with a steady deterioration of water quality.

Rivers and other surface water bodies- Odisha has several interstate rivers of which Mahanadi is the most important river as it flows through several districts of the state. The state has developed a State Water Plan for up to 2051 when the population of the state is expected to stabilize.

Interstate River	Basin Area (km2)	Drainage Area in Odisha (%)
Mahanadi	65,628	42.15
Brahmani	22,516	14.00
Baitarani	13,482	8.66
Subarnarekha	2,983	1.92

Other rivers which flow through the State are Kolab, Indravati, Vansadhara and Rushikulya.

Government of Odisha has recently adopted basin approach to deal with water challenges of the State.

Due to its river drainage pattern, Odisha holds significant influence in the proposed national programme of inter-linking of rivers. The scheme of linking of the surplus river basins of Mahanadi of Odisha and Godavari of Telengana to the deficit basins of Krishna, Pennar, Cauvery and Vagai down below is the most important part of the various proposals for inter-basin transfer of water under the Peninsular Rivers Development Component of the National Perspective Plan. However, the Government of Odisha is not much inclined towards this proposal. Hence, the extent to which this proposal remains somewhat uncertain at the moment.

River water in the State has been harnessed by constructing **large number of dams** of which the Hirakud dam on Mahanadi is the biggest. Hirakud was built in 1950s and came into operation in 1958. Other dams were constructed later on, especially during 1970s. The following table provides information on storage area of some of the most important dams of Odisha.

Name of the Dam	**Storage Area (Km^2)**
Hirakud	743
Rengali	414
Balimela	194
Upper Kolab	113
Indravati	110
Jaleput	91

Source: *Water Resources of Odisha by B.K. Pati, Regional Centre for Development Cooperation, Bhubaneswar*

However, there has been significant reduction in the storage capacity of these dams due to rapid sedimentation. The aggregate live storage capacity of seven major and 38 medium reservoirs has declined from 1.43 million hectare meter (m.ha.m) in 2006 to 1.12 m.ha.m in 2015 i.e. a decline of 20% of the average total storage capacity of the reservoirs *(The Hindu, 28th March, 2016)*. The decline has been more prominent in case of Rengali, Indravati and Salandi reservoirs. The live storage capacity of Salandi dam declined from 71.24 percent to 12.47 percent during 2006-2015. In the case of medium reservoirs, the aggregate live storage capacity declined from 63.72 percent in 2006 to 38.10 percent in 2015. If this trend continues, then it is estimated that some of the medium reservoirs might become dead in near future.

Irrigation- In order to provide a legal framework for participation of water users in irrigation management, Odisha passed the Orissa Pani Panchayat Act, 2002 and Orissa Pani Panchayat Rules 2003. However, most of the Pani Panchyats could not deliver on

their agendas except a few such as Pani Panchyats formed under Sunei Irrigation Project.

Odisha has a coastline of 476.6 Km, covering districts of Balasore, Bhadrak, Kendrapara, Jagatsinghpur, Puri and Ganjam. Consequently the state has to face the problem of sea bank erosion. Besides, Odisha has a major wetland as Chilka lake and largest brackish lagoon. There are a few small lakes also in the state.

Despite having 6.73 lakh hectares of inland fresh water area, 4.18 lakh hectares of brackish water area and considerable coastal area, fishery is not a major livelihood option for the people in the state. The share of fishery in state GDP has hovered around one percent only.

During recent years, there has been a tremendous **increase in dependence on groundwater** in the state. Over extraction of groundwater in the State has led to decline in the water table at several places as well as deterioration of the overall water quality. This indeed is a matter of grave concern as about 80% of rural population of Odisha now depends on ground water for drinking and domestic purposes.

Odisha is **highly susceptible to different types of natural disasters such as floods, droughts and cyclones**. Odisha is one of the severely flood affected states of the country. According to reports by Rashtriya Barh Ayog (the most authoritative body on the subject of flood in India), 10.34 percent of the geographical area of the state is flood prone. Construction of embankment has been the principal measure adopted by the government to deal with the problem of floods.

Between 1955 to 2008, there were 28 years of flood, 19 years of drought and 7 years of cyclone including the super cyclone of 1999 *(B.K. Pati, Regional Centre for Development Cooperation)*. The districts of Kalahandi, Bolangir and Koraput are known for experiencing severe droughts at frequent intervals. At times, flood and drought occur in the same year due to changes in rainfall pattern. There may be flood in coastal plains while drought in the upper terrains. The districts of Balasore, Bhadrak, Kendrapara, Jagatsinghpur, Puri and Ganjam are principally hit by cyclones.

In view of its topography and water scarcity in several parts, Odisha has been developing its watersheds. As many as 234 projects were undertaken by the State in its Integrated Watershed Management Programme (IWMP, 2012-13). These were mainly in Kandhamal, Mayurbhanj, Nuapada, Sundargarh, Kalahandi, Koraput, Keonjhar, Rayagada and Nabarangapur districts of the state.

Critical review of the State water resources led to identification of the following gaps in its management: low canal water use efficiency, increasing water pollution specially due to mining and industries, increasing over exploitation of ground water, over-drawl of water by agriculture sector due to increasing cultivation of water intensive crops, even water guzzling crops, gross neglect on maintenance of assets created, which, therefore, tend to deteriorate and become less productive, little attention paid to

capacity building for irrigation field staff as well as farmers, negligible interaction of engineers with farmers, and difficulties in coordination among different government departments dealing with water. Interaction of the study team with Odisha Government officers dealing with drinking water revealed that drinking water does not get any priority in actual practice in the state even though it has been assigned the highest priority in the national as well as state water policy.

2.2 Odisha State Water Policy, 2007

Odisha announced its Water Policy in 1994 and further revised it in 2007 following the announcement of the National Water Policy-1987 and its subsequent revision in 2002 respectively.

Highlights of Odisha State Water Policy 2007 are:

- The order of priority for allocation of water is similar to the one advocated in the National Water Policy 2002, except that it gives second position to ecology as against fourth position in the National Policy.
- As in the National Water Policy of 2002, the Odisha Water Policy 2007 also regards a hydrological unit, such as a basin, or sub basin as the unit for development and management of water resources.
- The policy envisages formation of Odisha Water Planning Organization under Engineer-in-chief, Water Resources Department of the Government of Odisha to prepare macro level multi-sectoral river basin plans.
- Formation of River basin organizations (RBOs) with multi stakeholder representation for planning and management of water resources of different basins.
- **Water augmentation measures** as provided in the policy include all possible solutions i.e. major, medium and minor projects including intra-state inter basin transfer of water as well as traditional systems of irrigation.
- The policy lays emphasis on conservation of water, improvement in irrigation efficiency, promotion of drip and sprinkler irrigation, selective lining of conveyance system, recycling and reuse of treated effluents, development of field channels, drainage improvement measures and hydropower generation by projects of all sizes, large, medium and small.
- It aims to minimize time and cost over-runs through appropriate systems of monitoring and to establish a modern hydrological information system for collection, processing, archiving and dissemination of water related data.
- **The policy indicates necessary measures for adequate and safe drinking water for both human beings and livestock.**
- It emphasizes on 'sustainable' harnessing of ground water with adequate attention to its quality.
- It also provides for periodical assessment of the ground water potential on a scientific basis in every block.

- The policy advocates concerted efforts for proper management of watersheds.
- **The policy intends to promote inter area equity** by giving more attention to districts and blocks having irrigation coverage below the state average.
- The policy envisages that projects should target to benefit the disadvantaged sections of the society, but no specific measures has been indicated for this purpose.
- **The policy pleads for taking into account the requirement of environmental flow in the river as a mandatory consideration.**
- The policy provides for protection of Wetlands like lakes etc.
- "**Polluters must pay**" principle should be adopted to address water quality issues.
- **Policies for flood management** include preparation of a Master Plan for this purpose for each flood prone area of the basins, protection of embankments, provision of adequate flood cushion in reservoirs wherever feasible, **overriding consideration to flood control in reservoir regulation policy even at the cost of some irrigation or power benefits** and increased emphasis on flood forecasting and warning, flood plain zoning and flood proofing.
- **Management of saline ingress in coastal areas** to be done through construction of sluices and embankments, maintaining low flows in rivers in normal monsoon period, preventing over exploitation of ground water in coastal areas and encouraging suitable shelter-belt plantation.
- The Odisha Water Policy also aims at **strengthening Participatory Irrigation Management by developing a time bound program for transfer of operation and management of all irrigation projects to farmer's organizations and continuing the support system of capacity building and financial assistance**.
- The policy recognizes that the state needs to explore the possibility of establishing a regulatory authority for fixing water rates to achieve the policy objective of full recovery of O & M charges from the beneficiaries.
- There is a provision for differential water rates for different categories of uses. Further, norms would be established for ensuring water rights commensurate with water rates.

2.3 A critical review of Odisha State Water Policy, 2007 in line with NWP-2012

Odisha State Water Policy 2007 is in line with principles laid out for water management and governance in NWP 2002. However, there are a few principle differences in the approach that the two policies adopt towards water management. NWP 2002 advocates setting up of multi-disciplinary units, rotational water distribution system to sub serve the objective of equity and ensuring appropriate role for women in management of water resources whereas these aspects have not been given enough importance in Odisha SWP 2007.

As NWP 2002 was used as the benchmark for NWP 2012, several elements of NWP 2012 are reflected in Odisha State Water Policy 2007 such as 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 over 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, adoption of improved water application devices, water pricing and improvement in data collection, processing and dissemination, etc.

Climate change is a relatively new phenomenon and thus only finds its mention in NWP 2012. The policy recognizes the importance of the impacts of climate change on water resources as it discusses about the need to keep these impacts in mind while taking decisions related to planning and management of water resources. It also mentions coping strategies to be adopted to deal with the climate change challenges.

However, a few other important features of the National Water Policy, 2012 are missing in the Odisha State Water Policy of 2007. These include aspects related to good governance through transparent informed decision making, need for multi-disciplinary organizations for water resources, water including ground water 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, emphasis on managing demand for water through changes in cropping pattern, avoiding wastage of water, focus on access to a minimum quantity of potable water for essential health and hygiene to all the citizens, 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, control of encroachments in water bodies, 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 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, associating private sector in public private partnership mode etc.

The above mentioned inadequacies indicate the need for revising the Odisha State Water Policy, 2007 so as to make it in line with the National Water Policy of 2012.

Chapter 3

Findings and Suggestions from Primary Sources

3.1 Interactions with State Level Officers and other stakeholders

The first interactive session of the study team with senior officers of the Department of Water Resources, Government of Odisha held on 30th May, 2016 in Bhubaneswar revealed that no attempt had been or was being made by the Department of Water Resources for revision of the earlier state water policy of 2007. But the need for a review came to be highlighted during the interaction. This was due to several changes in the water resources scenario as well as socio-political set up of Odisha which had taken place since the policy of 2007 was announced. Aspects mentioned included role of climate change, focus on IWRM, rapid loss of live storage capacity of reservoirs in recent years due to heavy siltation, low canal water use efficiency, increasing water pollution specially due to mining and industrial activities, over-exploitation of ground water, changing socio-political environment characterized by people's awareness of their rights to water, role of women, gradual empowerment of panchayati raj institutions, rising people's aspirations as well as several issues arising out of the implementation of the Odisha State Water Policy of 2007.

During the discussion, the Principal Secretary, Department of Water resources, Government of Odisha drew attention to several problems which should be taken into account while preparing a draft of the revised policy. These included **over-drawl of water by agriculture sector due to increasing cultivation of water intensive, even water guzzling crops** which takes place even during periods of drought, **low canal water use efficiency, negligible interaction of engineers with farmers, gross neglect of maintenance of assets created** which, therefore, tend to deteriorate and become less productive, **difficulties faced in coordination among different government departments dealing with water, little attention paid to capacity building for government staff as well as farmers etc.** He, therefore, pleaded for restricting use of water by agriculture, change in cropping pattern towards less water intensive crops, focus on water use efficiency, better interaction of irrigation engineers with farmers so as to optimize the benefits from canals, greater emphasis on capacity development for field staff as well as for Pani Panchayats, review of trade-offs between different water uses and allocation of more funds for maintenance. He informed that Odisha government had gone ahead in initiating basin approach in Baitarni-Brahmani basin with the support of CSRO, Australia, and that it proposed to do so for Rushikulya river basin with World Bank Support and even Mahanadi with DFID support.

The interactive session ended with a decision to prepare tentative draft of a revised version of Odisha State Water Policy preferably before the end of June, 2016. In order to prepare this draft, a committee of senior officers of the department with the Special Secretary as the Coordinator was constituted.

A subsequent meeting of the study team held on the same date with the Engineer-in-Chief and Chief Engineer, Rural Water and Sanitation, Government of Odisha **revealed that drinking water never got any priority in actual practice in the state** even though it had been assigned the highest priority in the national as well as state water policy. They suggested that **every dam should have an earmarked outlet for drinking water** as had been done in the Hirakud dam constructed about 50 years ago. They also pointed out that about 40 percent of reservoir capacity in Maharashtra is reserved for drinking water supply.

Interaction of the study team with a few NGOs highlighted problems like **increasing pollution of water by industries, rivers becoming dry during lean season and soil erosion.** The NGOs suggested the **need for awareness generation and mobilization of the public on water related issues, people's right to water, role of local water harvesting projects, protection of traditional water bodies like lakes etc. and that policy should be known to public and maintaining a minimum flow in rivers even during the lean season.**

Interaction of the study team with the Vice-Chancellor and two senior faculty members of Orissa University of Agriculture and Technology (OUAT), Bhubaneswar, indicated the need for a relook at cropping pattern and irrigation practices followed in Odisha.

3.2 Status assessment in a district

As mentioned in Chapter 1, interaction was held with officers and public during June-July, 2016 in Bolangir district of the state to obtain information about awareness of local level functionaries and public with regard to National and State Water Policies and also about climate change. The officers interacted with included several heads of the department at the district level having a stake in water resources development and management such as Agriculture, Horticulture, Animal Husbandry, Fishery, Irrigation, Drinking Water, Krishi Vigyan Kendra and the like. A structured schedule was also got filled in by each of the district heads of the departments, covering aspects like awareness and strategies developed to deal with climate change related issues etc. Interaction with the public took place in the two selected villages

Farmers of Kareldhua village, interacting with IWP Study Team

Farmers of Banabahal village, interacting with IWP Study Team

mentioned in Chapter 1. Findings are presented below.

An analysis of the district and village level information collected by the Study Team and presented in the table below indicates that, as expected, awareness of officers about national and state water policies as well as their contents in terms of provisions for dealing with climate change related aspects, was better than that of farmers. The table, however, also shows that **about a good number of officers at district level were not aware of any of the two water policies. And a sizeable number of them were not aware whether the state policy had contained any climate change related aspects.** As the table shows, **awareness among farmers was very poor**. All of them were ignorant of the national water policy. Most of the respondents of either category were, however, aware that climate change would be a problem for agriculture. This is further supported by facts presented subsequently.

Awareness about National and State Water Policies at district and village levels

(Number of Responses)

Awareness of	**District level**		**Village level**		
	Yes	**No**	**Yes**	**No**	**No idea**
National Water Policy	12	4	-	13	-
State Water policy	11	5	7	6	-
Year in which State Policy announced	11	5	N.A.	N.A.	N.A.
Does the State Policy contain climate change related aspects?	9	7	1	2	10
Is climate change a problem for agriculture?	16	-	10	1	2

Total no. of observations at the district level 16. *Total no. of observations at the village level 13.*

Information was also collected about the views of the officers as well as farmers on their perception of the effects of climate change. Their responses, presented in table below, indicate that the maximum effect is perceived to be on agriculture and irrigation. Other significant effects are on urban drinking water and fishery.

Perceived Effects of Climate Change as reported by district level officers as also farmers at the village level

Effect on	**Response of district level officers**				**Response of village level farmers**			
	Very Much	**To Some Extent**	**No Effect**	**No Idea**	**Very Much**	**To Some Extent**	**No Effect**	**No Idea**
Surface irrigation	10	1	-	-	13	-	-	-
Ground water irrigation	5	6	-	-	1	12	-	-
Drinking water (Rural)	6	5	-	-	1	11	1	-
Drinking water (Urban)	9	2	-	-	13	-	-	-

Drought situation	6	5	-	-	-	9	4	-
Agriculture	10	1	-	-	13	-	-	-
Fodder	6	5	-	-	N.A.	N.A.	N.A.	N.A.
Fishery	8	3	-	-	13	-	-	-
Horticulture	6	5	-	-	9	4	-	-
Animal Husbandry	4	6	-	-	N.A.	N.A.	N.A.	N.A.
Others	1	-	-	-	-	-	-	-

Total no. of responses at the district Level-11 *Total no. of responses at village level-13*

As reported by district level officers, coping measures taken by the government agencies to deal with the challenge of climate change were concerned with agriculture and local water resources. Specific measures reported to have been taken are mentioned below.

- Popularizing short duration and less water intensive varieties of paddy crop like Sahabhagi and DRR-44 as well as other crops such as pulses/oil seeds, cow pea, bajra, maize, MP cherry etc. in place of more water intensive paddy.
- Promoting cultivation of vegetables
- Advocating changes in cropping practices like early sowing of paddy to avoid periods of water stress, adopting inter cropping/mixed cropping system, promoting crop diversification, mulching to preserve soil moisture and seeding under low cost poly houses.
- Promotion of suitable varieties under protected cultivation in crops like chilly variety-Daya, capsicum variety-Indira.
- Augmentation of local water resources as well as better water management through conservation of rain water, storage of rain water as lifesaving irrigation, on farm water harvesting structures, construction of more number of farm ponds and efficient use of irrigation water by applying appropriate irrigation tools. The Department of Agriculture and Krishi Vigyan Kendra also recommended the following crop varieties to farmers in the light of climate change.

  - ✓ Early variety paddy such as Khandagiri, Parijat, Naveen, Sahabhagi, Jaldidhan-80 days, Vandana – 90 days, Jyotimayee-95 days, Sahabhagi-110 days, Mandakini-100 days.
  - ✓ Medium variety paddy such as MTU-1001, MTU-1010, Surendra, Lalat.
  - ✓ Late variety paddy such as Pratikghya, pooja, MTU-7029.
  - ✓ Pulses - Arhar variety - Asha, Green gram variety-Tarm.
  - ✓ Horticulture Crops - Mango, Guava and Pomegranate.

These agencies also claimed to have carried out farm level demonstrations for the following crops.

1) Short duration paddy
2) Crop inside poly house, set net house etc., crops like capsicum, broccoli, cherry, tomato etc.

3) Paddy variety Sahabhagi, Mandakini, Brinjal, Green Gram, Arhar, Groundnut, Cauliflower, Pomegranate, Chilly, Tomato, Cowpea, Bajra, MP Cherry, Fodder variety like Maize, Hybrid Napier, Congo, Signal, Gwnie, Para

Additional suggestions for mitigating the adverse effects of climate change given by officers as well as farmers are mentioned below.

- Stop deforestation and increase plant population. Forest fires should be prevented specially during summer. Afforestation should be undertaken in all barren and fallow lands
- Waste land should be developed by growing drought resistant fodder, plants and crops.
- Subsidy should be provided for protected cultivation of vegetables.
- Soil erosion resistant crops like green gram, black gram, cowpea etc. should be promoted.
- There should be crop insurance to cover the risks of farmers from damage to crops due to natural and other calamities.
- Organic farming should be promoted.
- Moisture should be conserved by digging water storing pits in 10% of crop fields.
- Water conservation should be promoted through lining of irrigation channels, drip irrigation and use of solar energy to reduce CO_2 norm.
- Rainwater harvesting for ground water recharge should be encouraged.
- Water use efficiency should be improved through adoption of drip and sprinkler irrigation specially in the case of crops like banana, watermelon, tomato, green gram etc.
- Mass awareness should be created through electronic and print media, road play and training etc. on optimal use of available water and for checking misuse from broken/existing checkpoints and also to change the mindset of farmers.

3.3 Issues and suggestions during the state level stakeholders workshop

A well-attended multi-stakeholder's workshop on Odisha State Water Policy was organized by the Study Team on December 16, 2016 at Nabakrushna Choudhary Centre for Development Studies, (NCDS) Bhubaneswar. It was inaugurated by Shri Gokul Chandra Pati IAS (Retd.), former Chief Secretary, Government of Odisha. Dr. B.P. Das, former Engineer-in-Chief, Department of Water Resources, Government of Odisha presided over the inaugural session. There were two technical sessions during which most of the participants gave their suggestions on Odisha State Water Policy. The issues and suggestions are presented below while the proceedings of the workshop are in **Annexure B**.

Several issues for deliberation during the workshop were raised in the beginning by Professor Kamta Prasad, the workshop coordinator. These included **increase in canal water use efficiency with a focus on incentives to farmers and lower bureaucracy 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 Odisha, how to **move from mere supply augmentation to demand management in the water sector, specific measures for promoting equity, efficiency 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 to community based associations, 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 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. Professor Prasad also presented a comparative picture of National Water Policy, 2012 and Odisha State Water Policy, 2007 indicating both similarities and dissimilarities. He ended by calling upon participants to raise additional issues and give suggestions.

Shri Gokul Chandra Pati, in his inaugural address, drew attention to some important features of land and water scenario in Odisha. Thereafter, he gave a few suggestions to be considered for inclusion in the revised version of the Odisha State Water Policy. Citing his experience as a former Chief Secretary of the state, he underlined the **need for more scientific use of water in agriculture,** the major user of water. He suggested that emphasis should be laid on rotational system of irrigation in place of the prevailing flood irrigation system. He highlighted the point that the use of rotational system did not require much investment. Two other suggestions pertaining to use of water in agriculture made by him related to the need for effective communication between departments of agriculture and water resources of the Government of Odisha and changing the measurement of agricultural productivity from per unit of land to per unit of water. He was in favor of assigning **higher importance to watershed management approach**, even higher than that to canal irrigation. Watershed approach should be adopted in forest areas also. Finally, he laid great stress on **conjunctive use of surface and ground water.** The presidential address by Dr. B.P. Das focused on raising productivity of irrigation and developing fisheries. Drawing attention to wastage of water due to the prevailing practice of flood irrigation, he pleaded that the water should be supplied only when it was needed. This led him to recommend **demand management.**

The suggestions offered by the participants as well as the sessions chairpersons during the two technical sessions are summarized below. These also include a few suggestions sent subsequently through email by some of them. Some of the suggestions were made by more than one participants.

1) Revision of the old water policy should be preceded by its critical review with respect to its achievements and failures and reasons thereof. The State Water Policy should also contain a plan of action indicating how the goals would be achieved.

2) State Water Policy should be in line with the National Water Policy with regard to major thrusts and strategies. The existing gaps between the Odisha State Water Policy, 2007 and the National Water Policy, 2012 should be abridged as far as possible.
3) An area based approach should be adopted to take care of marked diversity that prevails within Odisha. Problems of rain fed areas in particular should receive due attention.
4) Interlink ages between water, agriculture and forestry should be emphasized. Hence, there should be integration between water policy and agricultural policy.
5) Right to water should be emphasized and made statutory. A water centric approach to planning and development should be initiated.
6) There is need to generate mass awareness on how not to overuse water and how not to pollute water. A mobile app may be created for awareness generation.
7) Adequate emphasis should be laid on people's participation and involvement in management of water resources. Pani Panchayats should be strengthened. But care should be taken to restrict the undue interference of local influential people.
8) There should be coordination between all the stakeholders of water such as water resource engineers, researchers and managers of water.
9) There should be an in-built system of periodic evaluation of irrigation projects. Some third party independent of the government may be assigned this task.
10) Need for assured supply of water. Quantity wise allocation was needed for water for (i) food, (ii) people and (iii) nature. Industry should also receive due priority as in Maharashtra and Chhattisgarh.
11) Adequate attention should be paid to maintenance aspect which has remained neglected so far.
12) Because of climate change, more emphasis should be laid on storage of water through constructing reservoirs along with catchment area treatment as well as through lakes, ponds and farm ponds. Huge funds available under MNREGA may also be utilized for smaller storages like ponds etc. Besides, there should be optimum reservoir operation of multipurpose projects.
13) Ground water exploitation should be regulated. The Policy document should indicate the measures to be taken in this respect. Special attention may be paid to participatory ground water management.
14) More emphasis should be laid on extensive irrigation rather than intensive irrigation.
15) There should be more scientific ways of using water for agriculture such as adoption of rotational system of distribution of water for irrigation. 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.
16) Lining of the canal system was needed in certain areas but not needed in areas where people were deriving benefits due to seepage through rise in ground water level.
17) Odisha should adopt appropriate pricing mechanism for water so as to promote its judicious use. In order to facilitate this, Odisha must establish a water regulatory authority without any further delay. Volumetric water pricing as recommended in the National Water Policy was, however, not suitable for Odisha. The suitability of using opportunity cost of water should be examined. Demand management must receive high priority.

18) Adequate emphasis should be laid on biodiversity conservation. All the hills should be surveyed and covered with proper vegetation. Watershed approach in hilly and forest areas should be promoted by seeking the cooperation of Forest Department.
19) There should be more emphasis on water conservation including that by industry. Waste water should be reused for kitchen gardening and farming. Wastage of water due to leakage of pipes should be taken care of by appropriate action by the concerned government department along with attitudinal change. Conveyance losses of water should be reduced. A system of water audit should start.
20) There is need for real time data on crops. Odisha should collect and provide data on water use efficiency and on real irrigation needs. District wise requirements of water should be estimated. Knowledge about committed and non-committed flows of rivers water was needed.
21) There is need for integrated planning from river basin to sub-basin to watershed level. While doing so, both surface and ground water should be taken into account to prepare estimates of water balance at different levels.
22) Strategy for improving the quality of water should focus more on controlling sources of contamination rather than treatment of the contaminated water. Water logging should also be controlled to reduce their adverse effects on public health.
23) Feasibility of interlinking of rivers for augmenting availability of water should be examined.
24) Proper emphasis should be placed on conservation of river. There should be checks on encroachments and diversions of rivers.
25) Proper attention should be paid to promotion of water education in Odisha.

3.4 Perceptions and views of workshop participants

As mentioned earlier, during the workshop on 16th December 2016 held at Bhubaneswar, 39 participants responded through a schedule prepared by the Study Team seeking information regarding a few aspects related to water policy and climate change. An analysis of the filled in schedules provides illuminating information.

Awareness about National and State Water Policies was found to be quite high among the respondents. But with respect to provisions in the State Water Policy to deal with climate change related issues, only 22 out of 39 participants i.e. about 56% were found to be aware of the real situation, i.e. the State Policy did not contain any provision pertaining to climate change. The remaining participants, however, were not sure about the exact position. The participants views were also sought to find out if there was any legislation in the state to regulate the use of ground water. In response, **only 19 participants gave the correct reply** that there was no such law in the state while the remaining 20 were not sure about it. **Lack of awareness among water resource professionals about such vital issues leaves much to be desired.** The details of the responses are given as under.

Table 3.4.1
Participants awareness about water policies and climate change

No. of Responses

Awareness of participants	Yes	No	Not Sure
Awareness of the National Water Policy, 2012	35	4	-
Awareness of provisions related to climate change in the National Water Policy	29	9	1
Awareness about the Odisha State Water Policy 2007	36	3	-
Awareness of provisions related to climate change in the Odisha State Water Policy 2007	-	17	22
Is there any law for regulation of ground water in Odisha?	-	19	20

Information was also collected regarding the extent of awareness and preparedness with respect to the impacts of climate change related to water resources at local levels (District, Block, Village and Town) as perceived by the workshop participants. A review of the data provided in Table 3.4.2 below indicates that **awareness was not much at all the four levels of district, block, village and town. The extent of preparedness was perceived to be still lower at all the four levels.** The situation was worst at the village level with respect to both awareness and preparedness.

Table 3.4.2
Participants perception on the extent of awareness and preparedness at different levels.

Levels	Extent of Awareness			Extent of Preparedness		
	NIL	Not Much	Adequate	NIL	Not Much	Adequate
District	5	29	3	7	26	1
Block	11	23	2	16	18	-
Village	20	13	-	24	15	-
Town	10	21	5	12	20	2

Most of the participants (32 out of 39) felt that **drinking water would be very much affected by climate change induced water scarcity.** Only 6 felt otherwise, while one did not respond to this question. **Other water related impacts of climate change mentioned by them were the following.**

- There might be uncomfortable scenarios, especially in low-lying coastal areas since rise of temperature would lead to rise of sea water.
- Flood prone areas would become more vulnerable.
- Drought prone areas might face dry days.
- Agriculture productivity might decline. Crops during kharif might face more submergence thereby reducing crop yield. In rain fed areas, crop yields would decline due to scarcity of water.
- Claim of industry for water would increase resulting in pressure for reducing the availability in agriculture.

- Cattle rearing & pisiculture development would be adversely affected in flood prone, rain fed and saline ingress areas.
- Extreme events are likely to increase. Frequency of natural calamities like flood and drought would increase thereby adversely affecting livelihood.
- Rise of temperature would also lead to degradation of forests, which would reduce the storage capacity causing flood/drought.

The mitigation measures suggested by the workshop participants to deal with the adverse effects of climate change are presented in Table 3.4.3 below. These are on expected lines. Increased water storages, shift towards less water consuming crops, better water application methods are well accepted methods for dealing with water scarcity. **What deserves special mention is the response that suitable water pricing should have greater role in future in mitigating the adverse effects of climate change.**

Table 3.4.3
Mitigation measures suggested to deal with climate change

(No. of Responses)

Perceptions of workshop participants	Yes	No
Do you think that increased water storage in different forms will help to mitigate climate change related impacts?	34	4
Do you think that demand management i.e. growing less water intensive crops will reduce the effects of climate change?	32	4
Do you think that improved water application methods will help in mitigation of climate change related impacts?	35	4
Do you think that suitable water pricing will have a greater role in mitigating the adverse effects of climate change?	24	6

Other suggestions given by the workshop participants in their written responses to the schedule, for mitigating the adverse effects of climate change, are as below.

Other suggestions given by workshop participants.

- Awareness to be created about climate change and the impending shortage of water.
- Appropriate pricing of water to check its misuse.
- Emphasis should be given on small hydro generation.
- Run off schemes or small storage schemes may be considered.
- Improved method of conservation of water by better conveyance system.
- Encourage greenery, water conservation, and use residual waste water.
- Control of river pollution.
- Concurrent evaluation of existing irrigation projects so that water use efficiency improves.
- Inter departmental co-ordination with demarcated responsibilities while maintaining coordination between Research and Practice.

- Promote conjunctive use of surface and ground water.
- Emphasis to be given on cultivation of pulses, tuber crops, millets, vegetables and Horticulture crops.
- Creation of a multidisciplinary database with provision for data updation for effective change analysis.
- Area specific integration plan ensuring benefit to all stakeholders, by way of providing water security for every village.
- Introduction of "Warabandi" system of water application for irrigated crops.
- Climate resilient cropping pattern need to be evolved for the state.
- Inter cropping of Maize-Horse gram, Mustard-Black gram-Arhar, Paddy-Pulses, Vegetables, Oilseeds, Black gram - Mustard -Green Gram and Plantation of fruit bearing trees.
- Catchment area treatment of major, medium & minor irrigation projects.
- Integrated watershed management programme, massive afforestation in upper reaches of catchment, soil & water conservation, water harvesting for effective utilization of rain water to mitigate drought with people's participation.
- Integrated watershed development programme where 60-65% funds may be used for infrastructure for harnessing water for livelihood activities.
- Proper water budgeting for irrigation projects.
- In forest areas, watershed should also be implemented through watershed development mission with collaboration of forest Department or permission from Forest Department should be obtained.
- Proper bunding of vast tracks of unbunded wastelands in catchment area.
- Recycle and reuse of treated water of local bodies and industrial waste.
- Construction of check dams in major rivers and store surplus water in the river bed for use during lean period.
- Recharging groundwater aquifer through rain water harvesting structures.
- Promoting use of flood/drought tolerant seed varieties among farmers.
- Capacity building of Pani Panchayats/Water user's associations for effective and judicious use of canal water and safety of dams.
- Incentives for efficient use and disincentives for wastage of water.
- Restore coastal ecology, control over exploitation of groundwater in coastal track to reduce saline ingress.
- Inter/Intra basin transfer of water.
- Increasing water use efficiency, through adoption of improved water application methods.
- Preservation of wetland.
- Adoption of system of on-farm, rain water harvesting on uplands and also in delta irrigation project.

Chapter-4

The Outcome

Recommendations for Odisha State Water Policy made by India Water Partnerhip Study Team

The Study Team made a critical review of the existing Odisha State Water Policy of 2007 with reference to the current challenges being faced in the management of water resources in the state specially those expected from the ensuring climate change as symbolized by the National Water Policy, 2012. It took into account a range of suggestions received during its interactions with senior state and district level officers, panchayats, municipalities and farmers etc. as mentioned in earlier chapters. Further, suggestions came during the deliberations of the multi-stakeholders workshop held in Bhubaneswar on 16th December, 2016 as well as in the schedules filled in by 39 workshop participants.

A consolidated list of recommendations grouped under different themes was prepared by the Study Team focusing on points which are not prominently mentioned in the Odisha State Water Policy 2007 or those which require additional emphasis. The following recommendations were sent by email to the Principal Secretary, Department of Water Resources, Government of Odisha on 9th January 2016 to be considered while revising the State Water Policy.

Process of Formulation of Water Policy

- 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.
- There should be a provision for periodic updating and revision of the State Water Policy, for which a time frame should be specified.

- Revision of the old policy should be preceded by **its critical review with respect to its achievements and failures and reasons thereof.** The State Water Policy should also contain **a plan of action** indicating how the goals would be achieved.
- 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 Odisha State Water Policy 2007 and the National Water Policy 2012 should be abridged as far as possible.
- **An area based approach should be adopted** to take care of marked diversity that prevails within Odisha. Problems of rain fed areas in particular should receive due attention. There should be **multi-stakeholders meetings in different areas before the State Water Policy is finalized** and all stakeholders role should be clearly specified in the Policy.
- In view of close interlink age between water and agriculture, there should be **integration between water policy and agricultural policy.**

Decentralized Water Governance

- **Greater stress should be laid on decentralization of water governance within the overall framework of the doctrine of public trust** to create a feeling of community ownership and involvement in management of water resources. Adequate emphasis should therefore be laid on people's participation and involvement in management of water resources. **Role of panchayats and municipalities** in the supply and management of water and maintenance of water bodies at local levels as well as in preventing water pollution should be much enhanced. **Pani Panchayats should be strengthened.** But care should be taken to restrict the undue interference of local influential people.
- **Women are the primary users of water**. Hence, there should be **adequate provisions for women participation in management of water at local levels.** This may be done by establishing (if not established so far) and giving full authority to women dominated local water management committees.

Climate Change

- There is a need for **a thorough vulnerability analysis of climate change** and its impact on various sectors of the state's economy.
- **The adequacy of** existing irrigation and flood management **projects** as well as flood and drought management **policies should be reviewed** to take care of likely impacts of climate change such as expected increase in sediment load due to higher intensity of floods.
- 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 as well as post-graduate diplomas and degrees focusing on development and management of water resources.

- 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 to deal with these effects.
- The **different departments** of the state government, whose works are related to water and climate change, **should have a common forum** which should meet at frequent intervals to take an integrated view of knowledge base and policy options. For this purpose, the Department of Water Resources should have an effective cell headed by a Chief Engineer level officer.
- Climate resilient cropping pattern need to be evolved for the state.

Drinking Water to All

- The rights of users of water should be recognized. Hence, **the right to water should be guaranteed through law specially to the marginalized and vulnerable** such as Dalit's, Tribal, Nomads and differentially abled persons. **Safe drinking water, defined clearly in quantitative and qualitative terms, must be made accessible within a reasonable distance from places of abode and work so as to assure adequate water for everybody.**
- **Every dam should have an earmarked outlet for drinking water** as had been done in the case of the Hirakud Dam.
- Proper attention should also be paid to the **water needs of cattle** by making specific provisions for the same in the State Water Policy.

Water and Agriculture

- Odisha must adopt **more scientific ways of utilizing canal water for agriculture** such as 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.**
- **Cropping pattern** and practices in water scarce areas should be oriented **towards less water intensive crops.** Emphasis in such areas should be laid on pulses, tuber crops, millets, vegetables and horticulture crops as well as on **inter cropping** of maize-horse gram, mustard-black gram-arhar, paddy-pulses, vegetables, oilseeds, black gram - mustard -green gram etc. Adequate measures for adoption of **flood/drought tolerant seed varieties** by farmers should be taken. **Soil erosion resistant crops** like green gram, black gram, cowpea etc. should be promoted. Emphasis should be laid on **dry farming and short duration crops** to escape stress

of water. Less water consuming traditional organic agricultural practices need to be encouraged while ensuring higher productivity. For this purpose, more funds may be allocated for Research and Development.

- More emphasis should be laid on extensive rather than intensive irrigation in areas suffering from scarcity of **water.**
- Moisture should be conserved by digging water storing pits in 10% of crop fields.
- Water logging should be controlled to reduce its adverse effects on public health.

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.**
- **Forest cover should be increased** through new plantations and controlling deforestation. Forest fires should be prevented specially during summer. **Afforestation should be undertaken in all the barren and fallow lands. Watershed approach in hilly and forest areas** should be promoted in cooperation with the Forest Department.
- Waste land should also be developed by growing **drought resistant fodder, plants and crops.**
- There is need for proper bunding of vast tracks of unbunded wastelands in catchment areas.

Controlling Water Pollution

- **Control of river pollution should receive very high priority. Strategy for improving the quality of water should focus more on controlling sources of contamination rather than treatment of the contaminated water.** For this purpose, 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.
- Municipal and industrial waste water, which spoil the quality of water in natural nallas & rivers, should be properly treated and **incentives should be provided to motivate the public to use the recycled water for such uses like** car washing, gardening, toilet flushing, etc.
- **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.**

Ground Water

- **Exploitation of ground water in over exploited and critical areas must be controlled.** The Policy document 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.**

- Attention should also be paid to **control over exploitation of ground water in coastal areas** in order to reduce saline ingress.
- **Ground water in drought prone areas should be kept primarily as a reserve for drought management.**
- **Recharging groundwater** aquifer should receive increased emphasis.

Development and Management of Water Resources

- There is need for **integrated planning from river basin to sub-basin to watershed level.** While doing so, availability of both surface and ground water should be taken into account to prepare estimates of water balance 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. **Funds available under MNREGA may also be utilized for smaller storages like ponds etc.** Besides, there should be optimum reservoir operation of multipurpose projects. At the same time, adequate measures should be taken **to deal with the serious problem of siltation in dams**. Stringent action should be taken **against encroachments into catchment areas of water bodies.**
- **High priority should be assigned to demand management for water** because of the limited scope for augmenting its supply. In order to provide incentives for efficient use and disincentives for wastage of water, Odisha should **adopt appropriate pricing mechanism for water** so as to promote its judicious use. This is needed specially to deal with the emerging problem of increasing water scarcity due to climate change. In order to facilitate this, Odisha must **establish a water regulatory authority** without any further delay. The suitability of using opportunity cost of water should be examined. **Cropping pattern should be oriented towards less water intensive crops.** For this purpose, the required minimum support price policy and marketing support should be provided.
- Water use efficiency should also be increased through improved water application methods such as **drip and sprinkler irrigation** specially in the case of crops like banana, watermelon, tomato, green gram etc.
- There should be an **in-built system of concurrent as well as periodic post facto evaluation** of major and medium irrigation projects to raise their efficiency levels. Some **third party, independent of the government,** may be assigned this task.
- Greater attention should be paid to **maintenance** of all types of existing water bodies such as dams, canals, tanks, ponds etc. **More funds should be provided** for this purpose.
- Special efforts should be made to evolve **time bound viable mechanisms to enhance coordination between different government departments concerned with water** as well as between other stakeholders of water such as water resource engineers, researchers and farmers.
- Greater emphasis should be laid on **capacity building of field level irrigation officers** as well as for **Pani Panchayats/Water Users Associations and farmers** for

effective and judicious use of canal water. **An annual training calendar** should be worked out and appropriate training facilities provided at different levels.

- There is need for assured supply of water to different sectors. Quantity wise allocation of water is needed for (i) food, (ii) people and (iii) nature. Industry should also receive due priority as in Maharashtra and Chhattisgarh.
- Lining of the canal system is needed in certain areas but not needed in areas where people are deriving benefits due to seepage through rise in ground water level.
- There should be **more emphasis on water conservation** including that by industries. Waste water should be reused for kitchen gardening and farming. Wastage of water due to leakage of pipes should be taken care of by appropriate action by the concerned government department while facilitating **appropriate changes in the mindset of users** also. Conveyance losses of water should be reduced. **A system of water audit should start.**
- Feasibility of **interlinking of rivers (both interstate and intrastate)** for augmenting availability of water in water deficient areas should be examined and pursued vigorously.
- Proper emphasis should be placed on conservation of river. There should be **checks on encroachments and diversions of rivers.**
- Emphasis should be laid on **small hydro generation.**
- **Rainwater harvesting** for effective utilization of rain water to mitigate drought should be promoted **with people's participation.**
- **Integrated watershed development programme,** where 60-65% funds may be used for infrastructure to harness water for livelihood activities, should receive high priority.

Data Base

- There is need for real time **data on crops.** Odisha should collect and provide **data on water use efficiency** and on **real irrigation needs. District wise requirements of water** should be estimated. Knowledge about **committed and non-committed flows of rivers** water was needed.
- A satisfactory **mechanism for synchronization and validation of data from various sources on** the status of water and irrigated area within the state as well as data on the relevant socio-economic aspects should be created.
- **A multidisciplinary database** with provision for data updating should be created.

Public Awareness

- Proper attention should be paid to **promotion of water education in Odisha**. Efforts should be made to improve awareness level in schools and other educational institutions about the importance of water and need for its conservation.
- There is need to **sensitize and educate stakeholders on better water use practices** as well as on **critical aspects related to water** such as rainwater harvesting, cropping pattern, crop rotation and ground water recharge, etc.

- After formulation, **the 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.
- There is need to **generate mass awareness on how not to overuse or waste water and how not to pollute water.** This may be done through electronic and print media, campaigns, posters, displays, road shows and training etc. **A mobile app** may also be created for this purpose.

Chapter – 5

Conclusions

5.1 Backdrop

In view of the important role of states in developing and managing water resources in India, there is a strong need to review state water policies specially in the context of the emerging challenge of climate change. The present study is the outcome of this need for the state of Odisha. Its objective is to review the Odisha State Water Policy, 2007 so as to give 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. The study relied mainly on primary sources for required data and information since information from secondary sources was not adequate. For this purpose, the study team conducted wide ranging interactive sessions with government departments and other stakeholders at the state, district and panchayat levels followed by a state level workshop to get suggestions for modifying the existing State Water Policy of 2007.

5.2 The Process

The selection of this state for the proposed study was based on certain parameters evolved after considerable discussion of the Study Team with central government departments/ agencies dealing with water resources such as the Ministry of Water Resources, G.R and R.D and the Central Water Commission. A critical review of Odisha State Water policy, 2007, was made with respect to the water resources scenario of the state as well as the National Water Policy, 2012. A series of discussion on issues pertaining to Odisha State Water Policy took place in Bhubaneswar between the study team and state level senior officers of Water Resources Department of Government of Odisha as well as other stakeholders on May 30, 2016. Interaction also took place between the Study Team and the concerned district level and other officers, Panchayat representatives, Krishi Vigyan Kendra and general public in two villages of Bolangir district of the state from June 23 to July 1, 2016. Finally, a multi-stakeholders workshop on Odisha State Water Policy attended by 58 participants was held on 16th December, 2016 at Nabakrushna Choudhary Centre for Development Studies (NCDS), Bhubaneswar. Findings from the predesigned schedules filled in by 39 participants of the workshop, giving their perceptions, views and suggestions on issues related to climate change and water policy, were processed and are presented in Chapter 3. The major recommendations emerging from different sources including those of the Study Team were finalized and are presented in Chapter 4.

5.3 The Outcome

A set of recommendations prepared by the study team to be considered for inclusion in the revised version of Odisha State Water Policy was sent by E-mail to the Principal Secretary, Department of Water Resources, Government of Odisha on 9th January, 2016. However, there was no response from the government till the date. The recommendations include the suggestions made by the participants in the workshop held in Bhubaneswar on 16th December, 2016 as well as in the schedules filled in by 39 of them and also those sent subsequently to the Project Director by emails. These also include the suggestions of the Study Team. The aspects covered by the recommendations include water policy formulation process, 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, data base and public awareness. In order to avoid duplication, only those points are included which are not in the existing State Water Policy document or where more emphasis is needed.

Annexure-A

List of Senior officers participated in the discussion on 30th May, 2016

Shri Pradeep Kumar Jena, IAS	Principal Secretary, Dept. of Water Resources (DoWR), Govt. of Odisha (GoO, Bhubanseswar
Shri Santosh Kumar Pattanayak	Engineer –in-Chief cum - Spl.-Secretary, DoWR, Govt. of Odisha (GoO, Bhubaneswar
Prof. Kamta Prasad	Chairman, Institute for Resource Management and Economic Development, Delhi
Shri T.K. Padhi	Coordinator, Eastern Zonal Water partnership, Bhubaneswar
Shri A.K. Nayak	Chief Engineer, MERO, CWC, Government of India, Bhubaneswar
Shri A.K. Pradhan	Director (Monitoring), CWC, Govt. of India,

	Bhubaneswar
Shri K.P. Acharya	Chief Engineer, Project Planning, Formulation and Investigation, DoWR, Govt. of Odisha, Bhubaneswar
Shri S.K. Jain	Chief Engineer, Minor Irrigation, Govt. of Odisha, Bhubaneswar
Shri T.D. Sahoo	Engineer in Chief, Planning and Design, DoWR, Govt. of Odisha, Bhubaneswar
Shri D.P. Pati	Regional Director, CGWB, Govt. of India, South Eastern Region, Bhubaneswar
Dr. Binayak Rath	Former Vice-Chancellor, Utkal University Bhubaneswar
Shri A.K. Mohanthy	Chief Engineer, Odisha Water Planning Organization, Govt. of Odisha, Bhubaneswar
Shri P.K. Nanda	Superintending Engineer (Monitoring and Evaluation), DoWR, Govt. of Odisha, Bhubaneswar
Shri Bhagban Sahu	Engineer in Chief, Rural Water and Sanitation, Govt. of Odisha, Bhubaneswar
Shri Dilip Pradhan	Chief Engineer, Sanitation, Govt. of Odisha, Bhubaneswar
Shri Ashok Meena IAS,	Special Secretary, General Administration, Govt. of Odisha, Bhubaneswar
Mrs. Prativa Das	Right to Water, NGO, Bhubaneswar
Shri Ramesh Chandra Das	Mohima Dharma, Gabesana Pratisthan, NGO, Bhubaneswar
Shri Pradeep Mohapatra,	Team Leader

	Udyama, NGO, Bhubaneswar
Shri Manas Ranjan Mishra	NGO, Bhubaneswar
Shri Antaryami Rath	Arun Institute of Rural Affairs, Mahimagadi, District Dhenkanal, Odisha
Prof. Surendranath Pashupalak	Vice-chancellor, Orissa University of Agriculture and Technology, (OUAT) Bhubaneswar
Prof J.M.L Gulati	College of Agriculture, Orissa University of Agriculture and Technology (OUAT), Bhubaneswar
Dr. B. C. Sahoo	Department of Soil and Water Conservation Engineering, (OUAT), Bhubaneswar

Annexure-B

Proceedings of the Workshop on Odisha State Water Policy held on 16th December, 2016 at Bhubaneswar

A multi-stakeholders workshop on Odisha State Water Policy with special reference to climate change was organized by IRMED in Bhubaneswar on 16th December, 2016. It was held in the Seminar Hall of the Nabakrushna Choudhary Centre for Development Studies (NCDS), Jayadev Vihar, Bhubaneswar-751013. This Centre, which is owned jointly by the Government of India and the Government of Odisha, also collaborated with IRMED for organizing the workshop. There were 58 participants, who represented diverse interests and expertise such as officers from the Central Water Commission and Central Ground Water Board of the Government of India, several retired Engineers in-Chief as well as Chief Engineers of the Department of Water Resources, Government of Odisha, a few serving as well as retired officers from other departments of the

Government of Odisha, leading NGOs, noted economists and women. The list of participants is given at the end. Officers from the Department of Water Resources, Government of Odisha, however, did not attend, even though invited and expected. The list of 58 participants is provided at the end of this Annexure.

The workshop started at the scheduled time of 10:30 AM with a welcome address by Dr. Srijit Mishra, Director, NCDS. Thereafter, Professor Kamta Prasad, Chairman IRMED and workshop coordinator provided the background information. He gave a genesis of IWP study on review of state water policy of which the workshop was an integral part. He also mentioned about similar workshops held in Bihar, Gujarat, Tamil Nadu , Goa and Karnataka. He concluded his introductory remarks by pointing out several issues on which he requested the workshop participants to offer their suggestions. These are provided in Section 3.3 of Chapter 3. Professor Prasad's introductory remarks were followed by a keynote presentation on the National Water Policy (NWP) 2012 by Dr. Naresh Kumar, Chief Engineer, Basin Planning, Central Water Commission, Government of India, New Delhi. Dr. Kumar not only presented the main highlights of the NWP 2012

Project Director replying to queries raised by participants.

but also dwelt upon a few measures taken by the Government of India towards implementation of the policy. Thereafter, Prof. Joygopal Jena, Professor and Head of the Department of Civil Engineering, Gandhi Institute of Technological Advancement, Bhubaneswar, delivered his keynote address on Odisha State Water Policy 2007. He threw light on salient features of this policy in the context of water resources scenario of the state. This was followed by the inaugural address delivered by Shri Gokul Chandra Pati, IAS (Retd.), former Chief Secretary, Government of Odisha. After dwelling briefly on the socio economic and water resource scenario of Odisha, he gave several suggestions related to water policy which are included in Section 3.3 of Chapter 3. The presidential remarks were made by Dr. B.P. Das, former Engineer-in-Chief, Departmental of Water Resources, Government of Odisha, Bhubaneswar. The suggestions made by him are also mentioned in Section 3.3 of Chapter 3. The inaugural session concluded with a vote of thanks by Shri R.D. Rao, Project Manager, WAPCOS Ltd., Bhubaneswar.

Shri R.D. Rao giving vote thanks in the Workshop

There was a tea break after the inaugural session following which the first technical session took place. This was presided over by Dr. S.K. Ambast, Director, ICAR-Indian Institute of Water Management, Bhubaneswar. The second technical session, held after the lunch break, was presided over by Professor Sudhakar Panda, Professor (Retd.) Utkal University, Bhubaneshwar and former Chairman, Odisha Sate Finance Commission , Government of Odisha and Smt. Prativa Das, a water right activist, Bhubaneswar. Both the sessions witnessed an intensive and fruitful discussion on the Odisha State Water Policy, 2007 in which almost every participant spoke and gave suggestions which are summarized in Section 3.3 of Chapter 3. The workshop concluded with the valedictory session chaired jointly by Prof. Kamta Prasad, the workshop coordinator and Shri Tapan K. Padhi, Convener, Eastern India Water Partnership, Bhubaneswar. Professor Prasad thanked the participants for sparing their time and taking an active part during the deliberations of the workshop.

He also requested them to send their additional suggestions, if any, by email to him latest by 23rd December 2016 (A few suggestions by email were also received). He informed the mailers that the study team would review the suggestions and submit its recommendations to the Department of Water Resources, Government of Odisha at the earliest possible.

A view of the Workshop

List of Participants in the Workshop on Odisha State Water Policy held on 16th December 2016 at NCDS, Bhubaneswar

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Appendix

Scanned copy of list of registration sheets

GWP-IWP SPONSORED WORKSHOP ON

Odisha State Water Policy with special reference to Climate Change
On 16th December, 2016 at NCDS, Bhubaneswar

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GWP-IWP SPONSORED WORKSHOP ON

Odisha State Water Policy with special reference to Climate Change
On 16th December, 2016 at NCDS, Bhubaneswar

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Odisha State Water Policy with special reference to Climate Change
On 16th December, 2016 at NCDS, Bhubaneswar

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Annexure-C

Review of Odisha 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 Odisha 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 Odisha?
   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 type of areas such as flood prone, drought prone, coastal areas and on activities like agriculture, cattle rearing, fishery, industry etc. in your state?

10. Do you find potential sea level rise due to global warming in recent years in costal areas of your state?
    Yes No

11. Do you think that replacing water intensive crops such as Paddy, Sugarcane etc. by less water consuming crops like Pulses and Oilseeds would be one of the coping measures to deal with the impact of climate change?
    Yes No

12. If yes, to what extent farmers in Odisha are following this practice?
a) To a great extent b) To some extent c) Not at all d) No idea

13. Do you think that drinking water would be very much affected due to climate change?
    Yes No

14. 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

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

16. 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

17. 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

18. 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 Odisha State Water Policy in the Context of Climate Change

Schedule to be canvassed at the level of the 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 also suggest adaption of crop insurance by farmers?

Yes No

17. If yes, are there good schemes for crop insurance?

Yes No

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

(i) Favorable (ii) Indifferent (iii) Unfavorable

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 suggestion?

Yes No

22. If no, why?

23. What additional measures 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 Odisha 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, 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 are these?
10. Tumakuru 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 Odisha 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 Odisha 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 activities.
   Yes No No idea

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

Yes No

7. Has there been any demonstration on your/neighbor'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 Odisha 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.