



REPORT ON REVIEW OF DRAFT BIHAR STATE WATER POLICY IN LINE WITH NATIONAL WATER POLICY-2012 IN CONTEXT OF CLIMATE CHANGE

A large, stylized blue water drop graphic is centered on the page. It has a gradient from light blue at the top to a darker blue at the bottom, with a white highlight on the left side to give it a three-dimensional appearance.

**Study undertaken by:
India Water Partnership (GWP-India)**

**With support of:
Institute for Resource Management and
Economic Development**

December, 2014

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I. Context

The National Water Policy (NWP), 2012 approved by the National Water Resources Council was adopted by the Government of India during India Water Week-2013. With regard to climate change, the NWP (2012) had laid special emphasis on preparedness at the micro level. According to it **“special emphasis should be given towards mitigation at micro level by enhancing the capabilities of community to adopt climate resilient technological options”** (Para 4.1).

Measures dealing with adverse effects of climate change will have better chance of success if people and functionaries at the grassroots level are also aware of them and are associated with the preparatory measures to mitigate them especially in rural areas, which are dependent on agriculture and allied activities. While there is a growing literature on dimensions of climate change, and it's probable effects in different parts of the world including India, there is virtually no literature on perceptions of grassroots level functionaries as well as the public, with respect to adverse effects of climate change on their livelihood as well as the preparatory measures that can be taken at the local level for mitigation of these effects.

As per the NWP (2012), the State Water Policies are required to be aligned with it. Keeping this in view, India Water Partnership as part of its Work Plan 2014 reviewed the State Water Policy of two States namely; Bihar & Gujarat with the support of Institute for Resource Management and Economic Development (IRMED) in line with NWP-2012 with regard to climate change.

II. Criteria for selection of States

As a first step, the IRMED reviewed state water policies of all the states, which are in either draft or final stage. The review revealed that there are only 14 states, which have announced their state water policies starting from 1994 while three namely Delhi, Daman & Diu and Dadra & Nagar Haveli have adopted the National Water Policy-2012. The remaining 18 states are in the process of formulating their state water policies while some of the states are in the process of revising their earlier policies. The state of Tamil Nadu was the first state to announce the state policy. It did so in 1994 followed by Uttar Pradesh in 1999, Goa in 2000, Chhattisgarh in 2001, Karnataka in 2002, Madhya Pradesh and Maharashtra in 2003, Himachal Pradesh in 2005, Orissa in 2007, Andhra Pradesh and Kerala in 2008, Sikkim in 2009, Rajasthan in 2010 and Jharkhand in 2011. But, Himachal Pradesh is the only state to bring out a revised policy in 2013, which included climate change aspects also in line with the National Water Policy- 2012.

For selection of two states, the IRMED and IWP team had detailed discussions with senior officials of Government of India, as well as the State Government officials and officials of other

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

departments/agencies. These officials included: Shri A.B. Pandya, Chairman, Central Water Commission (CWC), Shri R.K. Jain, Chief Engineer, Shri Ashish Banerjee, Director (NWP), Shri Atul Jain, Director, CWC, Shri A.K. Srivastava, Secretary, CWC, Shri Avinash C Tyagi, Secretary General, International Commission on Irrigation and Drainage (ICID), Shri V.U. Koundanya, Executive Director, WAPCOS Ltd., Dr. Veena Khanduri, Executive Secretary, IWP, Dr. Suresh A Kulkarni, Secretary, Maharashtra, State Water Resources Regulatory Authority, Shri Mendi Giri, Director General, Water and Land Management Institute, Aurangabad, Shri Arvind Kumar and Shri Jai Kishore, Superintending Engineers, Monitoring Division of the Water Resources Department of the Government of Bihar, Shri I.C. Thakur of Water and Land Management Institute, Patna, and others.

Discussions with these officials revealed that various states are at different stages with respect to formulation or revision of their state water policy. Hence, it was decided to select only those states where formulation of state water policy is presently under consideration but may take a few more months before being finalized so that there was a scope of incorporating the study team's suggestions in the state water policy. Two other considerations were also taken into account. First, the states selected were major states and not minor ones like Goa, Manipur, Nagaland etc. Second, in the context of climate change, one of the selected states was drought prone while another flood prone for a representative picture for the country to emerge. After examining the criteria and need, it was decided to select Gujarat and Bihar as the two states for the study.

III. Methodology

The methodology adopted three types of deliberations to collect the requisite information for the review. At the outset, considerable discussion took place between the study team and state level senior officers of water resources and allied departments, who are the main stakeholders. This was done in groups as well as individually. The purpose at this stage was not only to get feedback of state level officers on issues related to state water policy, but to also motivate them to assume a proactive role in preparing a draft of the state policy. This was followed by enquiries at the district level and down below in a purposively selected districts of the state. The stakeholders included district and block level functionaries and other actors like villagers, people's representatives, NGOs, Panchayats, Municipalities, etc. The objective was to have a realistic picture of the micro level perceptions of the effects of climate change. Thereafter the next step was to hold a state level workshop of stakeholders such as senior officers of the state government, leading state level water resources professionals, NGOs, women and others. A questionnaire was also filled-in by the participants giving their perception, views and suggestions on issues related to state water policy. The study team processed these suggestions and thereafter sent it to the respective state government for possible incorporation in its respective state water policy. The detailed report on the review of Draft State Water Policy of Bihar undertaken by India Water Partnership with support of IRMED is given below:

IV. Review of Draft State Water Policy of Bihar

(i) Interaction at State Level

Bihar is the most flood prone state of India with 76 per cent of north Bihar living under the recurring threat of flood devastation. As a result, it was decided to complete the study before the onset of the flood season in June as after this officers dealing with water resources at all levels become excessively busy with damage control work related to floods.

As a first step, IWP team had an interactive meeting held on 16th April, 2014 with most of the senior officers of the two institutions concerned with the formulation of the Draft State Water Policy - the

Bihar Water Resources Department and the Water and Land Management Institute (WALMI), Patna. Senior officers of the Central Water Commission posted in Patna also participated in the meeting.

Information gathered during this interaction indicated that the Water Resource Department had prepared a Flood and Drainage Policy in 1993 for internal purposes. This had been done in the light of the National Water Policy of 1987. Subsequently following the passing of the National Water Policy of 2002, the Department had prepared the draft of a State Water Policy in 2009. But, it could not be finalized and announced. In the 6th meeting of the National Water Resources Council held to finalize the National Water Policy 2012, the Government of Bihar had raised several points, which were not taken into account in finalizing the National Water Policy 2012.

During the course of discussions and interactions of the study team with the state government water resource department officials, line department officials and civil society organizations suggestions were made by Prof. Kamta Prasad, Project Director, IWP study team & Chairman, IRMED as well as by the State Government officers. Based on this a broad consensus emerged on the outline of a new draft of the state water policy especially in the context of climate change. It was agreed that the State Water Policy would more or less follow the same pattern as the National Water Policy-2012 and would additionally have a separate section on climate change related aspects. Moreover, it also took into account those state specific aspects, which might not have been covered by the National Water Policy- 2012. Subsequently, a group was constituted under Professor J. N. Singh of Water and Land Management Institute (WALMI), Patna, to prepare the draft and submit it to Engineer-in-Chief, Government of Bihar at the earliest possible, preferably by the end of April, 2014. Thereafter, the Project Director had interactions on the related aspects of climate change with the Vice Chairman and the technical expert in the Bihar State Disaster Management Authority, as well as with the Principal Secretary, Department of Planning and Development, Govt. of Bihar. All of them offered cooperation and support.

(ii) Interaction at District Level

The second step was to understand the perception of grass-root level functionaries, communities and the farmers about the National Water Policy-2012, the Draft Bihar State Water Policy and climate change at the district level. For this purpose, Samastipur which is a severely flood prone district in North Bihar was selected. It also has the additional advantage of housing one of the major agricultural universities of the country - the Dr. Rajendra Prasad Agricultural University. Hence it was also decided to hold discussions with the scientists of the University and take stock of various climate change coping strategies developed by them in association with the local Krishi Vigyan Kendra (KVK). The idea was also to find out the extent to which farmers of the area had adapted the knowledge to field conditions. The study team in consultation with the district level officer of the Water Resources Department selected two gram panchayats of Samastipur district (Wajitpur and Jitwarpur Chauth) for detailed study.

These panchayats were visited on 4th, 5th and 8th of May 2014. Interactive sessions (Focus Group Discussion) were held with villagers in both the Panchayats. In the Focus Group Discussion at Wajitpur, 50 villagers (mostly farmers) took part. The group comprised of 24 men and 26 women from farming households. The next interactive session was held at Jitwarpur Chauth village in which 46 villagers (22 men and 24 women) participated. Both the gram panchayats were headed by women sarpanches (elected head of gram panchayat). Besides focus group discussions, information was also obtained from a sample of local people as well as local officers through structured questionnaires. The study team also interacted with the district level officers of Public Health Engineering Department (PHED),

Agriculture & Horticulture Department, Fishery Department, Minor Irrigation (Surface) including Lift Irrigation (from river), Irrigation & Flood Control Department, Block Development Officer, Block Agriculture Officer, Asstt. Engineer (State Tubewell Department) as well as office of the Nagar Palika (Municipality).

During the discussions, the lack of awareness about national and state water policy among the local officers as well as the public was observed. Only the scientists of Dr. Rajendra Prasad Agricultural University, Krishi Vigyan Kendra and a few agricultural officers were aware of the fact that a national water policy had been announced. There were no guidelines or funds for undertaking awareness generation activities relating to climate change and there was no platform at any level for discussing issues related to climate change and its effects.

There was very little awareness about climate change and its effects on water resources. Both local officers and public were purely concerned with day-to-day affairs related to water issues (without any reference to climate change) although these had been affecting them over the years. Farmers were concerned mainly with the recently prevailing scenario dominated by drought type situation for the last three years. They were not alarmed with the long-term implications of climate change on which no exposure had been provided to them by any agency of the state.

(iii) State-level Workshop

The final step was to organise a state level workshop to seek opinion/suggestions of different line department of the State Government, NGOs and other experts on the status of the draft Bihar Water Policy and inclusion of climate change aspects in the State Water Policy in line with climate change concerns. Accordingly, a State level workshop was organized at A. N. Sinha Institute of Social Studies, Patna on 14th June, 2014. This was attended by 50 eminent participants from various institutions.

The Inaugural-cum-Keynote address was delivered by Shri A. B. Pandya, Chairman, Central Water Commission, Government of India, who discussed the major highlights of the National Water Policy-2012. This was followed by another Keynote address by Shri Ram Pukar Ranjan, Engineer-in-Chief, Water Resources Department, Government of Bihar. He presented the highlights of the draft of the

Outcome

In pursuance of the decision taken in the workshop and various levels of discussions, the draft of the Bihar State Water Policy in both Hindi and English was uploaded on the website of the Water Resources Department of the Government of Bihar (www.wrd.bih.nic.in) on 27.06.2014 for wider dissemination. Subsequently, a press notification No.371 dated 14th July, 2014 inviting suggestions on the Bihar State Water Policy was also put on the website of the said department. A perusal of this shows that the climate change aspects have been incorporated quite adequately and are fully in line with the National Water Policy, 2012. After receiving suggestions from the various stakeholders, the Draft Water Policy would be finalized and placed before the State Cabinet for approval.

Bihar State Water Policy, copies of which were also circulated during the workshop. Shri Vijoy Prakash, IAS, Former Principal Secretary, Planning and Development, Government of Bihar delivered the presidential remarks in the inaugural session. Thereafter, rest of the workshop time was devoted to a detailed discussion on the draft of the Bihar State Water Policy. These discussions were conducted

under the Chairmanship of Dr. Santosh Kumar, Professor (Retd.) Water Resources, University of Patna. A feedback form was also filled-in by the 24 participants; out of which 21 participants were in favour of inclusion of climate change related aspects in the Bihar State Water Policy.

Based on the suggestions/opinion received from the various participants/stakeholders in the workshop, the Principal Secretary, Water Resources Department (WRD), Government of Bihar agreed to prepare a road map for future. For the purpose, an officer was nominated by the Principal Secretary to carry out the revision. It was also agreed that the WRD would bring the revised Bihar Water Policy under public domain through website and press release and send the revised draft to other related departments such as State Department of Environment, PHED, Minor Irrigation, Agriculture etc., for further comments and suggestions. After modifying the draft in the light of these comments and suggestions, the WRD would get it approved by the State Cabinet and notify it in the official gazette.

Thereafter the Bihar Government vide letter dated 9.12.2014 constituted a re-drafting committee to include the suggestions received from various stakeholders to finalize the State Water Policy within one month. Further the Bihar Government in line with earlier order dated 9.12.2014 again issued a notification dated 16.1.2015 for constituting a new committee for re-drafting the Water Policy.

The detailed report is given in the following pages.

1.1 Background and rationale

A National Water Policy in India was announced for the first time in 1987. Thereafter, a revised version of the policy came out in 2002. In 2012, yet another version of the National Water Policy was announced. A distinguishing feature of the 2012 National Water Policy is the emphasis laid on the impact of climate change in the context of water resources. This was in recognition of the profound impact that climate change is predicted to produce on socio-economic life of people. Water is the principal medium through which this impact would take place. Drawing attention to likely increase in the variability of water resources due to climate change and its effects on human health and livelihood, the Policy suggests measures to deal with them. These include enhancing the capability of community to adopt climate resilient technological options, increasing water storages in its various forms including revival of traditional water harvesting and water bodies, better demand management of available water, stakeholders' participation in land-soil-water management, etc.

Since water is viewed as a state subject in India, it is the state governments, which play a crucial role in the water sector in India. It will, therefore, be useful if the policy measures related to mitigating the adverse effects of climate change, which are included in the National Water Policy-2012, are also taken into account in the state level water policies. States, however, have been lagging behind in this respect. There

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- Himachal Pradesh is the only State to bring out a revised water policy in 2013 by including climate change aspects in line with National Water Policy-2012.

Box 1: Impact of climate change on water resources in India

The average global surface temperature is expected to increase by 1.4 to 3 degree Celsius during the period 1990 to 2100 for low emission scenario while the increase could be as much as 2.5 to 5.8 degree Celsius during the period for higher emission scenarios. The rise in sea level is expected to be around 9 to 88 cm during the period. Studies across the globe now indicate that climate change is expected to considerably impact availability of freshwater resources.

“In India, studies by several authors show that there is increasing trend in surface temperatures, no significant trend in rainfall on an all-India basis, but decreasing/ increasing trends in rainfall at some locations.”¹ Over the years, the water demand in India has increased a great extent owing to the processes of greater agricultural water demand, population pressure, urbanization and higher industrialization. These changes are putting a pressure on water resources. The magnitude and timing of rainfall and thereby runoff is altering considerably. The hydrological cycle is being modified in many river basins across various climatic regions of India. Change in climate is expected to impact soil moisture. The rise in intensity of rainfall or snowfall events is leading to higher potential for floods. At the same time there are states in India where drought episodes are on the rise. Studies also indicate that increasing temperature and reduction in rainfall could lead to reduced net recharge and affect levels of groundwater. The inter-annual variability of monsoon is also likely to increase in times to come.

To deal with demands for water in future, it will be necessary to rationalize on the various means of capturing and storing water. Therefore, any policy related to water needs to take cognizance of the potential for sustainable development of both surface and ground water resources within the constraints imposed by climate change.

are only 14 states, which have announced their state water policies beginning from 1994 while three namely Delhi, Daman & Diu and Dadra & Nagar Haveli have adopted the National Water Policy. The remaining 18 states are in the process of formulating state water policies while some of the states are in the process of revising their earlier policies. The state of Tamil Nadu was the first state to announce the state policy. It did so in 1994 followed by Uttar Pradesh in 1999, Goa in 2000, Chhattisgarh in 2001, Karnataka in 2002, Madhya Pradesh and Maharashtra in 2003, Himachal Pradesh in 2005, Orissa in 2007, Andhra Pradesh and Kerala in 2008, Sikkim in 2009, Rajasthan in 2010 and Jharkhand in 2011. However, Himachal Pradesh has been the only state to bring out a revised policy in 2013, which included climate change concerns in line with the National Water Policy 2012. A formidable task, therefore, lies ahead. It is for this reason that a study designed to review the state water policies in line with the National Policy was called for.

With regard to climate change, the National Water Policy (2012) had laid special emphasis on preparedness at the micro level. According to it "special emphasis should be given towards mitigation at micro level by enhancing the capabilities of community to adopt climate resilient technological options" (Para 4.1). Measures dealing with adverse effects of climate change will have better chance of success if people and functionaries at the grassroots level are also aware of them and are associated with the preparatory measures to be taken to mitigate them especially in rural areas which are dependent on agriculture and allied activities which, in turn, are most vulnerable because of their greater dependence on climate parameters. While there is a growing literature on dimensions of climate change, and its probable effects in different parts of the world including India, there is virtually no literature on perceptions of grassroots level functionaries as well as the public, with respect to adverse effects of climate change on their livelihood as well as the preparatory measures that can be taken at the local level for mitigation of these effects.

1.2 Objective

Objective of the study was to review the draft of Bihar State Water Policy and provide recommendations so that it is modified 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 order to achieve the above objective. The first step was to review of the different versions of the National Water Policy as well as water policy of several states to prepare a tentative list of state specific issues for deliberation with stakeholders so as to generate a broad based consensus among them.

As a second step, considerable discussion in groups as well as individually took place between the study team and state level senior officers of water resources and allied departments, who are the main stakeholders. The purpose was not only to get feedback of state level officers on issues related to state water policy, but also to motivate them to assume a proactive role in preparing a draft of the state policy. This was followed by enquiries at the district level and down below in a purposively selected district of the state. The stakeholders included district and block level functionaries and other actors like villagers, people's representatives, NGOs, Panchayats, Municipalities, etc. The objective was to have a realistic picture of the micro level perceptions of the effects of climate change. The final step was to hold a workshop of stakeholders such as senior officers of the state government, leading state level water resources professionals, NGOs, women etc. A questionnaire was also prepared for filled-in by the participants for giving their perception, views and suggestions on issues related to state water policy. These were processed by the study team on completion of the workshop and its suggestions were sent to the state government for possible incorporation in the state water policy.

1.4 Project sample

A list of states where state water policies were likely to be reviewed in the nearest future was prepared from available sources. The State of Bihar was selected after discussions with the Senior Joint Commissioner, Policy Planning Division of the Ministry of Water Resources, Government of India; Chairman, Central Water Commission (CWC); Chief Engineer and Director, Directorate of National Water Planning, CWC and Secretary, CWC. Discussion was also held with the Secretary General, International Commission on Irrigation and Drainage (ICID). Further discussions were held with Executive Director, WAPCOS Ltd. and Executive Secretary, IWP.

From Bihar, the district of Samastipur, a highly flood prone district was selected for the study and two panchayats of the district were identified for further interaction in consultation with officials at appropriate levels. The selected panchayats were Wajitpur and Jitwarpur Chauth.

1.5 Sources and types of information collected

Information was collected from both secondary and primary sources. The former included the three versions of the National Water Policy namely the National Water Policy of 1987, 2002 and 2012. It showed how the National policy had been evolving on account of changes taking place in water resources scenario and the consequent challenges the nation is facing. The gathered information also indicates the realization of the new challenge of climate change which led to incorporation of several new policy measures in the National Water Policy of 2012.

Copies of water policies of several states such as Andhra Pradesh, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Orissa, Rajasthan and Uttar Pradesh were also collected. With respect to the selected state of Bihar, published materials on salient features of the state and water resources scenarios were procured.

Because of the negligible information on micro level situation available from secondary sources, the main reliance was placed on primary sources, mainly through survey by way of structured-cum-open-ended schedules. Two types of schedules were developed, one for the state level workshop participants, and the other for the concerned district, block and panchayat level functionaries. In addition, there were Focus Group Discussions at village level for which separate guide points were developed. The structured part of the questionnaires as well as guide points comprised of questions related to awareness, preparedness, and suggestions for improvement. The schedules/ guide points are provided in **Annexures C, D and E** of the report.

Chapter 2: Review Related to Draft Bihar State Water Policy

2.1 Interactions with state level officers

Bihar is the most flood prone state of India. A study of its salient features made at the outset by the study team indicated that it was advisable to complete the study related to Bihar before the onset of the flood season in June after which officers dealing with water resources at all levels become excessively busy with the flood problem. However, as mentioned earlier, the notification of the General Election came on 5th March, 2014 and the model code of conduct came into force with immediate effect. As a result, the State Government functionaries were reluctant to welcome the study team and be available for discussion. However, with persistent persuasion of the study team Project Director, the Water Resources Department of the Government of Bihar agreed for an interaction on this issue. Most of the senior officers of the Water Resources Department as well as its Water and Land Management Institute (WALMI) concerned with the formulation of the State Water Policy were present in the interaction session, which took place on 16th April, 2014. Senior officers of the Central Water Commission posted in Patna also participated. The list of participants is given in **Annexure A**.

Information gathered during this interaction indicated that the Water Resource Department had prepared a Flood and Drainage Policy in 1993 for internal purpose. This had been done in the light of the National Water Policy of 1987. Subsequently in the light of the National Water Policy of 2002, the Department had prepared the draft of a State Water Policy in 2009. But, it could not be finalized and announced. In the 6th meeting of the National Water Resources Council held to finalize the National Water Policy 2012, the Government of Bihar had raised several points, which were not taken into account in finalizing the National Water Policy 2012.

A lively and fruitful discussion took place wherein the misunderstanding arising out of the 6th meeting of the National Water Resources Council was removed and several other points got clarified. Considerable discussion took place on the draft of the Bihar State Water Policy of 2009. In this respect, several suggestions were made by the Project Director as well as the officers and some broad consensus on the outline of a new draft of the State Water Policy especially in the context of climate change emerged. It was agreed that the State Water Policy would follow more or less the same pattern as the National Water Policy-2012 and would be in line with this along with a separate section on climate change related aspects. Nevertheless, it may also take into account any state specific aspects, which might not have been covered by the National Water Policy, 2012.

By the end of the meeting, the participants, who were somewhat indifferent in the beginning, got enthusiastic and gave several suggestions. A group under Professor J N Singh of Water and Land Management Institute (WALMI), Patna, was constituted to prepare the draft and submit it to the Engineer-in-Chief, Government of Bihar at the earliest possible, preferably by the end of April itself. Thereafter, the Project Director had interactions with the Vice Chairman and the technical expert on climate change of Bihar State Disaster Management Authority, as well as with the Principal Secretary, Department of Planning and Development, Government of Bihar. All of them offered cooperation and support.

Box 2: Bihar's objection to National Water Policy 2012

Bihar had strong objections to National Water Policy 2012 since water being described as a national resource. In particular, the state was opposed to central regulation and control of water resources and felt that it is unconstitutional, is a brazen violation of the federal structure under which water comes under the state's jurisdiction. Bihar was of the view that NWP 2012 was detrimental to its growth as well as that of other states. The state also pointed out the National Water Policy 2012 will also adversely affect development of Bihar with water being its main natural resource in the event of the centre seeking to regulate and control the resource. The state government had therefore raised objection to water being termed a national resource at the National Water Resource Council meet.

The water availability per capita per year is gradually declining in Bihar. As per a 2011 assessment, it stands at 1,200 cumec. Bihar was much below in the category of water-stressed states and, if steps are not taken earnestly, it will soon become a water scarce state.

If the centre is bent upon implementing the National Water Policy 2012 in the name of "equitable and fair" distribution of water resources, it should nationalize all resources and develop a system for collective use by all states without any constraints. Bihar was referring to mines and minerals and ports or fisheries available in abundance in many states and said that the centre should chalk out a policy or system for collective use of these resources for benefit of those states, which were deprived of such resources.

The officials thought that the centre was also not acting judiciously on inter-state water disputes as per the Inter-state Rivers Disputes Act, 1956. Bihar being a lower riparian state has several such disputes with Jharkhand and Uttar Pradesh pending with the centre. It had made several requests to settle issues like Tilaiya-Dhadhar, North Koel and disputes over Sone waters etc., to the Centre but to no avail.

The state felt that the centre should work on solving the flood problems in Bihar due to overflow of water from Nepal. This problem should be taken up for urgent redressal, besides water resources management be developed in the state at the initiative of the central government. The state government has proposed to construct dams on Kosi, Bagmati and Kamla rivers for water resources management; the centre should help it both financially, and in taking up the flood problem with Nepal for permanent solution.

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Box 3: Climate change: Bihar context

Bihar is highly dependent on climate sensitive sectors such as agriculture, animal husbandry, fisheries etc., and climate change is expected to impact natural and human systems adversely. It is also likely to exacerbate the state's already high physical exposure to climate-related disasters, in particular its vulnerability to hydro-meteorological natural disasters. North Bihar in general is highly flood-prone, and South Bihar highly drought prone. In the (relative) absence of state level climate models and/or vulnerability studies, as well low community awareness, Bihar is potentially more sensitive and vulnerable to climate change and its impacts.

The state is endowed with rich water bodies consisting of glacial rivers, rainfed rivulets, tals and groundwater. The whole of North Bihar is a courtyard of Himalayan Rivers and the whole of South Bihar the backyard of rivers flowing from south. Together they divide the State into seven river zones. Most of these rivers - Ghaghra, Gandak, Burhi Gandak, Bagmati, Kamla, Adhwara group of rivers, Koshi and Mahanada are of Himalayan origin and have considerable portion of their catchment in the glacial region falling in Nepal and Tibet. They are, therefore, positioned to receive very copious rainfall during monsoon when discharge of these rivers is 50 to 90 times larger than fair weather flow. This causes frequent and large scale flooding of North Bihar. As such, 73.63 percent of the geographical area of North Bihar is considered to be prone to floods.

The southern part of Bihar, on the other hand, is drained by rivers that are largely rainfed, having their origins either in the Vindhyaachal Hills or in the Hills of Chhottanagpur and Rajmahal. These rivers are either dry or have scanty discharges in non-monsoon months. Karmanasa, Sone, Punpun, Kiul, Badua, Chandan are the important rivers of this region.

If the rivers of North Bihar, due to their large catchment area in the Himalayas, cause floods in around 74 percent of its geographical area, then the rivers of South Bihar drain their water of the tract and accumulate them behind the high southern Bank of the Ganges, which has resulted in the formation of a number of tals. These tals also receive backwater of the Ganges when it is in high spate. They, therefore, get submerged during monsoon and affect the kharif cultivation in most of the area. Thus, the total geographical area affected by flood, water logging in tals etc. amount to 56 percent of the total geographical area of Bihar.

Floods in large parts of the plains of Bihar, especially North Bihar, are recurring features and cause havoc destroying crops and the quality of land and threatening the conditions of life and livestock due to large-scale displacement. From 2001 to 2010, the number of districts affected ranged from 9 to 25, number of blocks affected, from 6 to 269, the number of human life affected ranged from 7.18 lac to 244.42 lakh, livestock affected ranged from 0.1 lac to 86.86 lakh.

It is a paradoxical situation that a state so rich in water bodies, also suffers from severe droughts. Although, the average rainfall in Bihar is 1120 mm, but considerable variations occur with 2000 mm in the extreme eastern and northern part and less than 1000mm in the western and south-western part of the state. As a result 33 percent of the State receives less than 750 mm rainfall, making the southern part of Bihar vulnerable to drought. Even the 35 percent of north-eastern part of Bihar that receives around 1120 mm rainfall suffers drought once in four to five years due to scanty rains.

Based on "Chandra Shekhar Singh, Kumari Anima, Bimal Kumar, Gautam, Ankita Kumari, Environmental Challenge due to Climate Change in Bihar, Developing State of India, Journal of Natural Sciences Research, www.iiste.org, ISSN 2224-3186 (Paper) ISSN 2225-0921 (Online), Vol.4, No.13, 2014 – Special Issue

Box 4: Bihar Action Plan on Climate Change (draft version July 2012) – Salient points

- The Bihar Action Plan on Climate Change (BAPCC) recognizes that scientific knowledge and evidence base on impacts of climate change to the water sector is limited. As such, a comprehensive climate vulnerability analysis will be taken up in the state. As a complementary activity, a comprehensive water database in public domain and assessment of the impact of climate change on water resource through the various agencies responsible for different aspects of water resources management in the State will be developed, and updated and analyzed on an ongoing basis.
- Other initiatives will include adoption/ development of modern technology for measurement of flow in rivers areas, developing inventory of wetlands, development of water resources information system, and reassessment of basin wise water situation, apart from projection of water resources availability as a result of impact of climate change which would inter-alia include the likely changes in the characteristics of water availability in time and space.
- A State Water Policy framework will be developed on a priority basis, as well a comprehensive water sector roadmap. Both of these will take explicit cognizance of climate concerns and will include priority actions to be taken up by the State in this regard. In line with the priorities outlined in the State's Approach Paper to the 12th FYP, expeditious implementation of water resources projects particularly the multipurpose projects with carry over storages will be taken up. Significant emphasis and priority will be given to revival and repair of *ahar-pynes* and traditional systems of water storage, conservation, and micro-irrigation, and development of new systems will be promoted. Also, conservation and preservation of wetlands and maintenance of optimal wetland hydrology will be taken up on a priority basis in convergence with the Forest Department.
- Specific emphasis will be given to empowerment and involvement of Panchayati Raj Institutions, urban water bodies and primary stakeholders in management of water facilities, and practices of participatory irrigation management will be revitalized/ promoted. Systematic approaches to community level coping mechanisms and adaptation responses for coping with floods will also be developed.
- Physical sustainability of groundwater resources will be accorded high importance, and intensive programmes for groundwater recharge in over-exploited areas will be taken up. The state will also take other necessary steps for increasing water use efficiency, including incentivizing water harvesting and encouraging non-agricultural type developments of the type where not much water is required, incentivizing or encouraging leakage control programmes, developing regulations/frameworks for in-house water withdrawals of industries, through royalties and licenses, extending subsidies and incentives for recycling and recovery, revision of water tariff based on cost recovery principle, promotion of water efficient fixtures, incentivisation for recycling waste water, etc. Options for taking up water conservation measures under NREGA will also be examined.
- The state will take up steps for addressing the quality aspects of drinking water especially in rural areas, while also seeking to improve water efficiencies in urban water supply systems through promotion of water efficient techniques, technologies, and management, including effective and timely operation and maintenance of water resources projects and infrastructure assets across all water sub-sectors in the state.
- Steps will also be taken to foster integrated water resources development and management planning, and seeking convergence among the various water resources programmes and organizations such as Watershed Management Society, Agriculture Department, Forest Department, Industries Department, Urban Development Department, etc.
- Appropriate measures for mitigation of the impact of climate change on water resources, as also the adaptive measures are to be undertaken by various state departments and agencies. A water resources and climate change "Secretariat" will be explored for the necessary coordination and monitoring mechanisms.
- A range of institutional linkages, convergence potential, and partnerships is also envisaged.

2.2 Status assessment in a district

The next task was to conduct discussions at district, block and panchayat level in one district. In consultation with the state government, the district of Samastipur, which is a severely flood prone district in North Bihar, was selected. It had also the additional advantage of having one of the major agricultural universities of the country, namely the Rajendra Agricultural University located at Pusa within the district. Hence, it was also decided to have discussion with the scientists of the University and take stock of various coping strategies developed by them in association with the local Krishi Vigyan Kendra (KVK) with regard to the emerging climate change scenario and find out the extent to which this knowledge had percolated among farmers of the area. For the purpose two gram panchayats were selected for detailed study, in consultation with the district level officer of the Water Resources Department. The two Panchayats identified, were (I) Wajitpur and (II) Jitwarpur Chauth, one apart from the other by about 20 kilometres; both are located in Jitwarpur block.

These panchayats were visited on 4th, 5th and 8th of May 2014. Interactive sessions (Focus Group Discussion) with villagers in both the Panchayats were held. In Wajitpur session, 50 villagers took part most of whom were farmers. The group consisted of 24 men and 26 women from farming households. The next interactive session was held at Jitwarpur Chauth village, participated by 46 villagers (22 men and 24 women). In both the panchayats, the Sarpanch (elected head of Gram Panchayat) were women. Information was also obtained through structured questionnaires from a sample of local people as well as local officers.

The study team also interacted with the district level officers of Public Health Engineering Department (PHED), in-charge of drinking water supply in rural areas, Agriculture & Horticulture Department, Fishery Department, Minor Irrigation (Surface) including Lift Irrigation (from river), Irrigation & Flood Control Department and also Block Development Officer, Block Agriculture Officer, Asst. Engineer (State Tubewell Department) as well as office of the Nagar Palika (Municipality).



IRMED team interacting with villagers of Jitwarpur Chauth, Samastipur, Bihar



IRMED team interacting with villagers of Jitwarpur Chauth, Samastipur, Bihar

Thereafter, the team interacted with Dr. V P Singh, Director (Research) and Dr. Ram Suresh, Professor, College of Agricultural Engineering of the Rajendra Agricultural University as well as with Dr. Anil Kumar, Horticulture expert and Dr. A. P. Rakesh, Soil Scientist of Krishi Vigyan Kendra (KVK). It was found that the scientists of Rajendra Agriculture University (RAU), Pusa and KVK had done a number of field testing exercises on inter-cropping, direct sowing of paddy through zero tillage method, application of drip irrigation in fruit and vegetable crops, introduction of short duration crops requiring

less water, propagating for cultivation of soyabean and millets which were not being cultivated in Bihar earlier, and promoting use of less water intensive wheat variety HD-2888, M.P. wheat variety of short duration, maize variety of Shaktiman 1, 2, 3 and 4, Arhar variety Pusa-9, Til variety Krishna Pragati and Mustard variety of Routs 17.

However, farmers had shown little interest in switching over to new technological options. Short duration kharif crops to escape flood months were not acceptable to villagers because they had the apprehension that such crops would give less yields.

There was very little awareness about climate change and its effects on water resources. Both local officers and public were purely concerned with day-to-day affairs related to water issues (without any reference to climate change) although these had been affecting them over the years. Farmers were concerned mainly with the recently prevailing scenario dominated by drought type situation for the last three years. They were not alarmed with the long-term implications of climate change on which no exposure had been provided to them by any agency of the state.

The study team found lack of awareness about national and state water policy among the local officers as well as the public. Only the scientists of the Rajendra Agricultural University, Krishi Vigyan Kendra and a few agricultural officers were aware that a national water policy had been announced. There was very little awareness about climate change and its effects on water resources. Both local officers and public were merely concerned with day-to-day water related issues without any reference to climate change, as these had been affecting them over the years. Farmers were concerned mainly with the recently prevailing scenario dominated by drought type situation for the last three years and not with long-term implications of climate change on which no exposure had been provided to them by any agency.

There were no guidelines or fund for undertaking awareness generation activities relating to climate change and there was no platform at any level for discussing issues related to climate change and its effects.

Some awareness of climate change was found among agencies dealing with drinking water. Coping strategy involved upgradation of 100 out of 250 hand pumps used in rural areas for drinking and other domestic uses. For urban areas, there was a proposal to lift water using 4 pumps both from surface and groundwater sources and supply to households of Samastipur town through pipes. State tubewell scheme was a failure. Only 79 out of 254 such tubewells were reported to be in operation at varying levels of efficiency or yield.

2.3 State level stakeholders workshop

As a final step of the study, a workshop on **“Approach to Bihar State Water Policy with special reference to Climate Change”** was organised on 14th June, 2014 at A N Sinha Institute of Social Studies, Patna. The basic paper for the workshop was draft of the Bihar State Water Policy in the context of climate change, which was prepared by the Water Resources Department (WRD) of Bihar Government as a result of the initiative taken under this study.

The workshop was well attended by a large number of senior officers as well as noted experts, academicians, researchers of Patna along with a good number of those from the younger generation including a few journalists.

Shri. A B Pandya, Chairman, Central Water Commission, Government of India delivered the inaugural cum keynote address. He provided the major highlights of the National Water Policy 2012. This was followed by another keynote address by Shri Ram Pukar Ranjan, Engineer-in-Chief, Water Resources

Department, Government of Bihar. He presented the highlights of the draft of the Bihar State Water Policy, copies of which were also circulated in the workshop. The presidential remarks in the inaugural session were given by Shri Vijoy Prakash, I.A.S., Former Principal Secretary, Planning and Development, Government of Bihar, Patna. Thereafter, the rest of the workshop time was devoted to a detailed discussion on the draft of the Bihar State Water Policy. These discussions were conducted under the Chairmanship of Dr.Santosh Kumar, Professor (Retd.) Water Resources, University of Patna.

A copy of the proceedings of the workshop is enclosed as **Annexure B**. The more significant point that deserves to be mentioned is that a road map for future was drawn in the workshop to which the Principal Secretary, Department of Water Resources, Government of Bihar also agreed. The first step was to revise the draft of the policy in the light of comments and suggestions of the participants. An officer to carry out the revision was nominated by the Principal Secretary of the WRD of the state government and he was in touch with the Project Director, IWP study team. Thereafter, it was decided that the WRD would bring the draft Bihar Water Policy under public domain through its website and press release and send the revised draft to other related departments such as Environment, PHED, Minor Irrigation, Agriculture etc. for further comments and suggestions. After modifying the draft in the light of these comments, the WRD would get it approved by the State Cabinet and notify it in the official gazette.



Sitting (L to R): Mr. Vijoy Prakash, IAS, Mr. AB Pandya, Mr. Deepak Singh, IAS and Prof. Kamta Prasad



View of the Workshop

capacity. It was expected that the participants will be aware about NWP and its one of the section on Climate change. However, it is surprising that a few members were not aware of the above.

Mr. R.P. Ranjan, Engineer in Chief, Water Resources Dept., Govt. of Bihar, explaining the provisions of the Draft Bihar State Water Policy

2.4 Perceptions and views of the workshop participants

During the workshop on 14th June, 2014, a schedule on approach to Bihar state water policy in the context of climate change prepared by the study team (copy reproduced as **Annexure- C**) was also got filled in by 24 workshop participants in their personal



Table 2.1 : Awareness of Water Policy and Climate Change

Description	Yes	No
National Water Policy (NWP) 2012	20	4
Provisions related to climate change in NWP 2012	20	4
Need for including climate change related provisions in Bihar Water Policy	21	3

Table 2.2 shows that the impacts of climate change were perceived by respondents to be different in different types of areas and on different activities. In flood prone areas, as in North Bihar, problems of salinity and siltation would increase while in drought prone areas, as in South Bihar, ground water table would be lowered. This is because intensity of both flood and drought would increase along with increase in dry spell.

Table 2.2 : Perceived water related impacts of Climate Change

Description	Yes	No	Not sure
Water related impacts of climate change will vary in different types of areas such as flood prone, drought prone etc, and on activities such as agriculture, cattle rearing, fishery etc	21	3	-
Effect on drinking water	19	-	5
Serious effect on flood problem	20	3	1

Table 2.3 gives responses with respect to awareness of measures to mitigate the adverse effects of climate change. These indicate the importance of water storage, demand management and capacity building training. But, about one third of respondents felt that the scope of increasing water storage capacity was quite limited in Bihar.

Table 2.3: Awareness of measures to mitigate the adverse effects of Climate Change

Description	Yes	No	Not sure
Role of water storage in various forms	21	1	2
Scope for increasing water storage	15	8	1
Role of demand management for reducing water use	20	2	2
Capacity building training at local levels	20	3	1

The respondents gave the following suggestions for mitigating the adverse effects of climate change:

- State Water Policy should include the provisions to counter the impact of climatic change on water resources
- Relook on status of existing irrigation and flood structures to comply with expected climate change

- Strengthening of flood forecast mechanism and early flood warning system
- Hydrological studies should be done
- Water availability study and convergence of climate change on flood and drought problem of Bihar
- Detailed collection of data of rainfall/ irrigation/ drinking water
- Studies on holistic development of river basins
- Detailed and regular collection of statistics of groundwater
- Inclusion of issues related to climate change in school curriculum
- Need to understand river behaviour
- Integrated water resources development management must be implemented and stakeholders may be properly educated
- Enhancing the water storage capacity including underground water storage
- Groundwater recharge should be done
- Need for avoiding more extraction of ground water by using surface water for drinking
- Multi-purpose water resources development projects should be undertaken
- Need for treating of water logged areas suitably
- River pollution be controlled and sewage treatment by proper solid and liquid waste management needs to be taken up immediately
- Water harvesting campaign needs to be launched in urban areas
- Long term measures should be undertaken i.e., Kosi high dam, dam in Bagmati and Chisaponre in Katua should be constructed
- Afforestation in catchment areas
- Himalayan river Interlinking hold the key
- Renovation of traditional ahar-pynes and ponds.
- Improved water application such as drip and sprinkler irrigation need to be promoted
- Various departments related to climate change must come together
- Since most of the rivers come from Nepal, projects situated on trans-boundary rivers should get central funding

Some of the suggestions already formed part of the draft of Bihar State Water Policy. This is understandable because the participants did not have prior knowledge of the contents of the draft policy. Some of the suggestions had been mentioned by them during discussions in the workshop. These were presumed to have been taken into account while preparing the revised draft of the Bihar State Water Policy, which was prepared subsequently.

2.5 The outcome

In pursuance of the decision taken in the workshop, the draft of the Bihar State Water Policy in both Hindi and English was uploaded on the website of the Water Resources Department of the Government of Bihar (www.wrd.bih.nic.in> Bulletin> Irrigation Bulletin> Bihar State Water Policy) on 27.06.2014 for wider dissemination. Subsequently, a press notification No.371 dated 14th July, 2014 inviting suggestions on the Bihar State Water Policy was also put on the website of the said department.

It is also noted that the climate change aspects have been incorporated quite adequately and are fully in line with the National Water Policy, 2012. References to climate change related issues have been made quite prominently in Sections 1, 1.2, 1.3, 9, 10 and 15 of the draft water policy.

- The last paragraph of the 1st Section dealing with introductory aspects draws attention to effects of climate change in reducing volume of utilizable water in the state.
- Paragraphs III of Section 1.2, dealing with perspectives for management of water resources in the state indicates that climate change might affect the distribution of water over space and time in the state. As a result, the incidence of water related disasters like flood and drought might increase.
- Paragraph IV of Section 1.2 draws attention to the possibility of adverse effects of climate change on area available for cultivation and housing due to increase in frequency of flood and water congestion.
- Paragraph VIII of Section 1.3, dealing with basic principles of development and management of water resources in the state, also draws attention to variability in water resources due to climate change, while paragraph X of the same section lays emphasis on treating climate change as an important factor affecting decisions related to availability of water resources in the state.
- Paragraph 9.1 of Section 9 dealing with planning makes a reference to climate change as a factor to be kept in view for planning.
- Para 10.3 of Section 10 dealing with flood and drought draws attention to need for scientific study of probable increase in flood intensity, due to climate change.
- Para 15.1 of Section 15 dealing with database and information system pleads for undertaking studies keeping climate change in view.

There is a separate section (Section 4) dealing with policies related to climate change. This is reproduced below. As can be seen, this is in line with the National Water Policy 2012.

- 4.1** It is true water is an important resource for human health and livelihoods and the climate change is likely to increase the variability of water resources. Therefore, special impetus should be given at micro level by enhancing the capabilities of community to adopt climate resilient technological options.
- 4.2** The increased variability in availability of water due to climate change should be dealt with by increasing water storage in its various forms, as soil moisture, ponds, ground water, small and large reservoirs and their combination. Increase in capacity of water storage should be encouraged at community level and so revival of traditional water harvesting structures and water bodies should be given special attention.
- 4.3** Integrated water management should be done for water used in agriculture to increase water use efficiency and crop productivity. In order to enhance the water use efficiency, the compatible agricultural strategies and cropping patterns and improved water application methods such as land levelling and/or drip /sprinkler irrigation should be adopted. Principle of using every drop of water should be adopted.
- 4.4** Stakeholders' participation should be encouraged in land-soil-water management with scientific inputs from local research and academic institutions for evolving different agricultural strategies, reducing soil erosion and improving soil fertility. Special attention should be given to water and land management on scientific knowledge.
- 4.5** Planning and management of water resources structures, such as, dams, flood embankments, etc., should be incorporated in strategies for possible climate changes. The acceptability criteria with regard to new water resources projects need to be re-worked in view of the likely climate changes."

2.6 Additional suggestions for incorporation in the Draft Bihar Water Policy

A perusal of the above still indicated a few gaps. The following recommendations, therefore, were forwarded to the state government by the study team for incorporation in the final draft. It is understood that these are being considered favourably for the same. The finalization is delayed among others because of non-receipt of the feedback from other concerned departments, which is necessary for approval by the State Cabinet.

- There is need to take up massive programmes of awareness generation on climate change for the general public, students, local level functionaries and other stakeholders at block and panchayat levels in the state so as to enhance their coping capacity.
- 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 strengthening and creating adequate facilities for studies and research on hydrological, hydro-metrological and geomorphologic aspects related to climate change within the Department of Water Resources, WALMI, Universities and other institutions including creating new institutions.
- Need for modernizing and expanding instrumentation and measurement techniques and networks.
- Need for revising existing courses of studies, creating new subjects and instituting programmes as well as post-graduates diplomas and degrees.
- More emphasis should be placed on Afforestation and other water conservation methods. Wherever commercially viable, wetlands should be preserved and developed for fishery and aquaculture.
- The different departments of the state government, whose works are related to climate change, should have a common forum, which should meet at frequent intervals to take an integral 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.

To sum up, it can be seen from the above that the objective of the study for Bihar has been fully achieved.

Chapter 3: Conclusion and Outcome

3.1 Backdrop

The present study is the outcome of the need to review state water policies in line with the National Water Policy, 2012, in the context of climate change. Its objective was to review the draft of Bihar Water Policy so as to provide the suggestions to modify or include the sections or sub sections in the context of the ensuing climate change, involving awareness, preparedness, coping mechanism at the state level and down below.

Apart from using information from secondary sources, the study team conducted wide-ranging interactive sessions with individuals, government departments and other stakeholders at the state, district and panchayat levels followed by state level workshop to generate consensus on the suggestions for modifying the earlier draft of the state water policy. Written responses of perceptions and views of the workshop participants were also obtained, analysed and used for the purpose. The suggestions were transmitted to the state governments at different stages of the study. There was a continuous dialogue between the study team and the state governments during the period of study.

3.2 Bihar Draft Water policy

The suggestions made in the first interactive session on 16th April, 2014 resulted in preparation of a new draft of the Bihar State Water Policy, which is in line with the National Water Policy 2012 with a separate section dealing with climate change. This version was presented at the workshop held in Patna on 14 June, 2014. The suggestions made in the workshop were also taken into account in revising the draft version. The modified version was put on website of the Water Resources Department of the State Government on 27 June, 2014 and can be visited at www.wrd.bih.nic.in [Bulletin > Irrigation Bulletin > Bihar State Water Policy]. This was a major outcome of the project.

3.3 Outcome

To sum up, the tasks assigned for the study were successfully completed. The draft of the Bihar state water policy was revised in the light of the National Water Policy, 2012 and recommendations for modifying these were given. These were taken into account by the concerned officers of the state resulting in a different draft. Thus, the objective of the study has been fully achieved.

List of senior officers present in the Meeting on 16 April, 2014 held in Water Resources Department, Government of Bihar, Patna.

1. Shri Rajeshwar Dayal, Engineer-in-Chief, Water Resources Dept. Government of Bihar.
2. Shri Ram Pukar Ranjan, Engineer-in-Chief (M), Water Resources Dept. Government of Bihar.
3. Shri Indu Bhushan Kumar, Chief Engineer, Planning and Monitoring, Water Resources, Dept, Government of Bihar.
4. Shri Jainendra Nath Singh, Professor, Water and Land Management Institute, Patna.
5. Shri Jai Kishore, Superintending Engineer (M), Water Resources Dept. Government of Bihar.
6. Shri Jawahar Lal, Superintending Engineer, Flood Control Monitoring and Planning, Water Resources Dept. Government of Bihar.
7. Shri Sunil Kumar, Superintending Engineer (M), Minor Water Resources Dept., Government of Bihar.
8. Shri Suresh Purbey, Executive Engineer, Planning and Monitoring, Water Resources Dept, Government of Bihar.
9. Shri T. K. Bhaduri, Deputy Director, Water Resources Dept., Government of Bihar.
10. Shri Krishna Kant Verma, Reader Agricultural Engineering. Water and Land Management Institute, Patna.
11. Shri Sanjay Kumar Srivastava, Reader, Flood Management. Water and Land Management Institute, Patna.
12. Shri I. C. Thakur, Reader. Water and Land Management Institute, Patna.
13. Shri Ranjit Kumar Singh, Reader. Water and Land Management Institute, Patna.
14. Shri Murlidhar Singh, Reader, Drainage, Water and Land Management Institute, Patna.
15. Shri Deepak Kumar Sharma, Reader, Water and Land Management Institute, Patna.
16. Shri Mani Kumar, Asst. Professor, Water and Land Management Institute, Patna.
17. Shri D P Tripathi, Director, PPM, Dept. of Agriculture, Government of Bihar.
18. Shri Arun Kumar Sinha, Member, (Planning), Ganga Flood Control Commission, Ministry of Water Resources, Government of India, Patna.
19. Shri S K Sahu, Chief Engineer, LGBO, Central Water Commission, Government of India, Patna.
20. Shri L P Singh, Superintending Engineer(C), Central Water Commission, Government of India, Patna.

Interactions with other officers

1. Shri Amit Prakash, Project officer, Environment and Climate Change, Bihar State Disaster Management Authority, Government of Bihar, Patna.
2. Shri Vijay Prakash, IAS, Principal Secretary, Department of Planning and Development and Secretary, Bihar State Planning Board, Government of Bihar, Patna.
3. Sri Anil K. Sinha, IAS (Retd.), Vice Chairman (Status Cabinet Rank Minister), Bihar State Disaster Management Authority, Government of Bihar, Patna.

Proceedings of the GWP-IWP sponsored workshop on “Approach to Bihar State Water Policy with Special Reference to Climate Change”

Venue: A N Sinha Institute of Social Studies, Patna, 14th June, 2014.

Organised by India Water Partnership with the support of Institute for Resource Management and Economic Development, Delhi in collaboration with A N Sinha Institute of Social Studies, Patna, the workshop was attended by 50 participants of different backgrounds as per list attached.

The session started with the welcome address by Prof. Nil Ratan, A N Sinha Institute of Social Studies, Patna. This was followed by an introduction about the workshop by Prof. Kamta Prasad, Chairman, Institute for Resource Management and Economic Development, Delhi and Director GWP-IWP Project. He gave a brief account of the GWP-IWP study to review state water policies as well as necessary information about the National Water Policy and State Policies announced so far. He also referred to the meeting organized at his initiative as part of the IWP study on state water policies in the chamber of Principal Secretary, Water Resource Department, Government of Bihar on 16th April, 2014, the outcome of which was a draft Bihar State Water Policy. He mentioned that the workshop had been called mainly to discuss the draft so that it could be improved further.

After his introduction, Shri A B Pandya, Chairman, Central Water Commission, while inaugurating the workshop, spoke on the National Water Policy, 2012. Shri Pandya mentioned that due to climate change, there would be temporal variations of water which would create skewness in the hydrological phenomena which needs a proper assessment to do prior preparation for likely flood and drought both of which are relevant for Bihar. The National Water Policy is an umbrella under which the state water policy should be framed to suit the requirements of the state for the benefit of the public. He pointed out following main issues of concern to be looked into:

1. Water availability
2. Temporal variation/ rainfall skewness
3. Water conservation
4. Demand and allocation
5. Resilience of society to deal with climate change
6. Water regulatory authority to fix the water rates for various uses/users

Thereafter, Shri Ram Pukar Ranjan, Engineer-in-Chief, Water Resource Department, Government of Bihar, Patna, presented the Bihar State Water Policy, 2014 (Draft) in detail. He explained that the issues like flood, drainage, water logging, existing irrigation system and its restoration to the design potential had been taken into account. Water management of old canals had become a very difficult task. Hence, canals should be lined and system should be restored to the designed level taking the recent advancement in the technology. Water management should be with the help of local bodies and water user associations. The manpower should be trained to the highest level for effective management. Climate change issue was raised very effectively and he expressed the need to consider a new approach for design due to the possible effect of climate change.

Shri Deepak Kumar Singh, Principal Secretary, Water Resources Department, Government of Bihar who had joined the department only a few days ago told that Bihar had a forest cover to the tune of 9.7 per cent of geographical area. To counter the effect of climate change, the state had an action plan to cover 15 per cent of the geographical area by Afforestation up to the year, 2015. He also stressed upon the need for policy to preserve the wetlands. Dr. M N Karn, the noted social scientist expressed his views that in the draft policy, in place of "should be" "shall be" or "will be" should be used. Shri Vijoy Prakash, while giving his presidential remarks suggested that the traditional ahar pyne system should be revived. Also, there should be care for the livelihood of weaker sections of the society. Also, cropping pattern should be planned better and production of coarse cereals needs to be started again. Water should be treated as a social issue and not only an engineering one. Water should be introduced in school curriculum and its conservation should be made a mass movement and not only a government responsibility. He also stressed upon the need for action plan for policy. In response to a query from Prof. Kamta Prasad, Shri Prakash indicated the next course of action related to approval of State Water Policy. According to him, Water Resources Department, Government of Bihar should finalize the draft policy and then it should be sent to all the concerned departments for their opinion and departmental approval. After that it will be put up before the state cabinet for final approval. The Principal Secretary, Water Resources Department indicated his readiness to initiate the process.

After tea break, the technical section was chaired by Dr. Santosh Kumar, Ex Professor of Water Resources, Department of Civil Engineering, University of Patna. Prof. Kamta Prasad briefly apprised the participants of the findings of the study conducted by IRMED, Delhi in May, 2014 in Samastipur district of Bihar which showed lack of awareness about the water policy and climate change among people as well as local level functionaries. This indicated the need for including awareness generation as a part of State Water Policy. Shri Shankar Dayal from Bihar Disaster Management Authority presented his work on shifting characteristics of river Ganga. Shri S N Tiwari, Director, Ganga Flood Control Committee (Retd) expressed the need for regulating human interventions in floodplains so as to facilitate proper management of floodplains. He also stressed the need for database management system and keeping the data in public domain. In this context, Prof. Kamta Prasad suggested the need for review of classified data. ShriTKBhaduri of WRD, Government of Bihar, emphasized the need for a review of design of culverts, bridges, embankments etc., in the light of climate change.

Mr Bashir Ahmed Khan, Chief Conservator of Forests, Forest Department, Government of Bihar told that wetland management should be incorporated in the State Water Policy. The objective should be to keep the wetlands alive. He also emphasized the need for treating catchments to reduce silt load. He stressed the need for awareness generation on water being a finite resource and the fact that it would become scarcer due to climate change. Shri Jai Shankar Chowdhary, the Engineer-in-Chief PHED, underlined the need for inclusion of pricing of water and metering its supply in the State Water Policy.

Er. Jay Kishore, S. E., WRD, Government of Bihar told that the draft of Bihar State Water Policy, 2014 would be uploaded on the website of WRD Government of Bihar, for public comments. This would be also published through newspapers for comments from all stakeholders.

Mr M.D Singh, WALMI, observed that several of the opinions expressed in the workshop were already there in the draft policy. New issues raised would be incorporated. Others who participated included

Shri C Thakur and Shri Satyendra Narain Singh of WALMI, Shri Rama Shankar Prasad of Irrigation Department, and Shri Ashis Deo Upadhyaya from Katihar based NGO.

Dr Santosh Kumar in his concluding remarks as chairperson said that institutions like WALMI and its work on Flood Management Information Systems (FMIS) should be strengthened for meeting the changing needs of the department. He expressed that survival of the weakest should be the aim of Bihar State Water Policy. He also expressed that arrangements should be explored for direct talk between Bihar and Nepal, if possible, in case of water related issues.

The workshop concluded with an unanimous recommendation that the draft of the Bihar State Water Policy should be revised in the light of the comments and suggestions offered in the workshop as well as those which might be sent by participants through email within a week, to Prof. Kamta Prasad. Prof. Kamta Prasad will thereafter send a consolidated list to Shri Murlidhar Singh of WALMI who was nominated by Principal Secretary, WRD for this purpose. Thereafter, the WRD will send the draft to other related departments such as Environment, PHED, Minor Irrigation, Agriculture etc., for their comments and suggestions to be received within a fortnight. After modifying the draft in the light of those comments, the WRD will get it approved by the State Cabinet and notify it appropriately.

The workshop concluded with the vote of thanks to all concerned persons.

LIST OF PARTICIPANTS

1. Shri A B Pandya, Chairman, Central Water Commission, Govt. of India, New Delhi.
2. Shri Vijoy Prakash, IAS, Former Principal Secretary, Planning and Development, Government of Bihar, Patna.
3. Shri Deepak Kumar Singh, IAS, Principal Secretary, Department of Water Resources, Government of Bihar, Patna.
4. Professor Kamta Prasad, Chairman, Institute for Resource Management and Economic Development, Delhi.
5. Shri R P Ranjan, Engineer-in-Chief, Department of Water Resources, Government of Bihar, Patna.
6. Prof. M N Karn, Eminent Sociologist and Former Director, A N Sinha Institute of Social Studies, Patna.
7. Prof. Y D Prasad, Eminent Historian and Former Director, A N Sinha Institute of Social Studies, Patna.
8. Prof. Santosh Kumar, Former Professor, Water Resources, National Institute of Technology, Patna University, Patna & Consultant Hydrologist, World Bank Project.
9. Dr. Shankar Dayal, Senior Adviser, Bihar State Disaster Management Authority, Patna.
10. Shri S K Sahu, Chief Engineer, LGBO, Central Water Commission, Patna.
11. Shri S S Rahman, Deputy Director, Ground Water Design Directorate, Patna.
12. Dr. Nil Ratan, Professor of Political Science and Registrar, A N Sinha Institute of Social Studies, Patna.
13. Shri Bimlesh Kumar Jha, Professor, Water and Land Management Institute, Patna.
14. Shri S S Singh, Retd. Chief Engineer, Water Resources Department, Government of Bihar, Patna.
15. Shri Jai Shankar Choudhary, Engineer-in-Chief-cum-Special Secretary, Public Health Engineering Department, Government of Bihar, Patna.
16. Shri Indu Bhushan Kumar, Chief Engineer (Monitoring), Water Resources Department, Government of Bihar, Patna.

17. Shri Jai Kishore, Superintending Engineer, Monitoring, Water Resources Department, Government of Bihar, Patna.
18. Shri S K Sinha, Former Engineer-in-Chief, Water Resources Department, Government of Bihar, Patna.
19. Shri K P Verma, Superintending Engineer (Retd.), Water Resources Department, Government of Bihar, Patna.
20. Mr. B A Khan, Principal, Chief Conservator of Forests, Government of Bihar, Patna.
21. Shri Sharad Chandu, Director (Monitoring), Central Water Commission, Patna.
22. Shri A Nayak, Superintending Engineer, Central Water Commission, Patna.
23. Shri T K Bhaduri, Deputy Director, FMISC, Water Resources Department, Government of Bihar, Patna.
24. Dr. Murlidhar Singh, Reader, Water and Land Management Institute, Patna.
25. Shri Sanjay Kumar Srivastava, Reader, Water and Land Management Institute, Patna.
26. Shri D K Sharma, Reader, Water and Land Management Institute, Patna.
27. Shri C Thakur, Reader, Water and Land Management Institute, Patna.
28. Shri Ranjit Kumar Singh, Reader, Water and Land Management Institute, Patna.
29. Shri Satyendra Narain Singh, Reader, Water and Land Management Institute, Patna.
30. Shri K K Verma, Reader, Water and Land Management Institute, Patna.
31. Shri A K Singh, Executive Engineer, Central Water Commission, Patna.
32. Shri Rajesh Kumar, Assistant Director, Central Water Commission, Patna.
33. Shri Mani Kumar, Asst. Professor, Water and Land Management Institute, Patna.
34. Shri S K Mishra, Asst. Engineer, Soil Conservation, Govt. of Bihar, Patna.
35. Shri S N Tiwari, Director (Retd.), Ganga Flood Control Commission, Patna.
36. Er. R K Sinha, Estate Officer, WALMI, Patna.
37. Shri Rama Shankar Prasad, Asst. Engineer, Water Resources Department, Planning & Monitoring circle, Patna
38. Shri Amit Kumar, Director, Institute of Environment & Eco Development, Patna.
39. Shri Shashi Kumar Divakhar, Institute of Environment & Eco Development, Patna.
40. Shri Ashish Dev Upadhyay, Project Director, Welfare India, Katihar, Bihar.
41. Shri Raj Chand, Chetna Brignpaura (Press).
42. Shri Vijay Kumar Diwakar, Patna.
43. Prof. Arun Kumar, Lecturer, R N SY College, Jehanabad, Bihar.
44. Shri Mukul Verma, Business Economist.
45. Shri Roshan, Dainik Jagran.
46. Shri Sanjay Pandey, Reporter, Hindustan.
47. Shri Danushri Narayan, Reporter, Dainik Bhaskar.
48. Shri M A Shaban, Bureau chief, Qaumi Tanceen Daily, Patna.
49. Shri Upendra Prasad, Research Officer, ANSISS, Patna.
50. Mr. Shah Nawaz Khan, Research Officer, ANSISS, Patna.

11. If yes, what additional measures can be taken to deal with this problem?
12. 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 Not sure
13. What measures your state is taking to increase the water storage capacity?
14. Is there enough scope to increase water storage in different areas of your state in view of climate change?
- Yes No
15. If no, what other climate change resilient technological options such as improved water application methods, modification in cropping pattern etc, are available?
16. What facilities and incentives may be given to your state to develop appropriate strategy to minimize the adverse effect of climate change on water resources?
17. Do you think that demand management i.e., growing floodwater resistant crops in flood prone areas and less water intensive crops in drought prone/ dry areas will reduce the effect of climate change?
- Yes No Not sure
18. Is your state following the above strategy?
- Yes No Not sure
19. If yes, please give the details?
20. If no (to question no 18), should it be included in State Water Policy?
- Yes No
21. Do you feel that advance preparedness in terms of capacity building training at local levels, will help to counter the effect of climate change?
- Yes No Not sure

22. If yes, how you want to go about it?

Short duration training	Yes	No
Through demonstration	Yes	No
Audio-visual publicity	Yes	No
Door to door canvassing	Yes	No
Use of Electronic/print media	Yes	No
Through other modes (specify)	Yes	No

23. What should be the range of other coping strategies to overcome water related vulnerability to climate change?

Sectors

Coping Mechanism

24. Any other suggestions that you may like to offer.

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Review of State Water Policy in the context of Climate Change

Schedule to be canvassed at the district, block and Panchayat Level

Name and contact details of government department/ agency

- Climate change due to global warming is going to pose a serious threat to water resources sector. Are you aware of this?

Yes

No

- 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				
Flood Management				
Agriculture				
Fishery				
Horticulture				
Others (specify)				

- Has your state adopted climate change resilient technological options to counter the adverse effects of climate change?

Yes

No

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

Measures

Adequate

Not adequate

-
-
-

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

Name and designation of the official(s) contacted

Institute for Resource Management and Economic Development, Delhi
(irmed7@gmail.com)

Review of 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

India Water Partnership

Established in 2001, India Water Partnership (IWP) is a non-profit organization with a goal of promoting Integrated Water Resources Management (IWRM) in India. It has been accredited by the Global Water Partnership (GWP) headquartered at Stockholm, Sweden as Country Water Partnership of GWP and hence also known as GWP-India.

IWP started as an informal body first under the Chairmanship of Prof. S R Hashim, the then Member Secretary, Planning Commission, Government of India (1997-98). W.e.f 1st January 2013, Mr. R K Gupta, Chairman-cum-Managing Director, WAPCOS Ltd. is the President of IWP.

IWP has been active in promotion of Integrated Water Resource Management (IWRM) principles and practices through its network partners to support national development priorities. Some of the core priority areas are; promoting IWRM approach effectively through workshops and consultations to address adaptation to climate change with the support of zonal water partners across the country; encouraging use of innovative low cost water saving technologies by the farming communities; sustainable natural resource management; integrated domestic water management; promoting Area Water Partnership (AWP) for river basin management; conflict resolution on water sharing; inter-state trans-boundary water sharing issues; gender mainstreaming, etc.

India Water Vision-2025 by IWP

IWP prepared “India Water Vision-2025” during 1999 based on the projections for country's water demand in 2025 on the initiatives of GWP and South Asia Technical Advisory Committee. The Vision Document was prepared after a series of four regional consultations with the senior government officials from Central and State Governments, policy makers, academicians, water experts, donor agencies, UNICEF, World Bank, NGOs and industry representatives. India Water Vision is cited in National Water Policy-2002. As per the India Water Vision, the total estimated demand for water (gross) for 2025 is 1027 BCM. In order to meet this demand, water availability will have to be increased from around 520 BCM in 1997 to more than 1000 BCM in 2025. For meeting additional demands, investment requirements have been estimated to Rs. 5000 billion during next twenty five years or about Rs. 200 billion per year. The India Water Vision-2025 is well cited in a number of national and international documents/reports/scientific research papers.

IWP Contribution in National Water Policy-2012

IWP board members and its network partners actively contributed during 2010 and 2011 in the brainstorming sessions organized by Ministry of Water Resources, Government of India to review the draft National Water Policy-2002. IWP was well represented in the Drafting Committee of National Water Policy-2012.

IWP organized a side event on 13th April, 2012 during India Water Week-2012 on “**Approach of Draft National Water Policy (DNWP), 2012 in Context of Climate Change**”. Objective of the side event was to examine how the Draft National Water Policy (2012) reflects on the issue of climate change to address water and food security. The event was attended by Govt. of India officials, academia, policy makers, State Government Officials, NGOs and GWP representatives. Recommendations of the side event were sent to the Ministry of Water Resources, Govt. of India and some **of them have been included in the National Water Policy-2012 under Section -4: Adaptation to Climate Change.**

India Water Partnership (IWP)

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