6th INDIA WATER WEEK-2019

WATER COOPERATION - COPING WITH 21ST CENTURY CHALLENGES

POST SESSION PROCEEDINGS

THE LARGEST WATER RESOURCES EVENT

#IWW2019

GOVERNMENT OF INDIA
MINISTRY OF JAL SHAKTI

facebook.com/indiawaterweek.in twitter.com/indiawaterweek instagram/indiawaterweek

राजेन्द्र कुमार जैन
अध्यक्ष
तथा पदेन सचिव, भारत सरकार

RAJENDRA KUMAR JAIN
CHAIRMAN
& *ex-officio* Secretary
to the Government of India

सत्यमेव जयते

भारत सरकार
जल शक्ति मंत्रालय
जल संसाधन, नदी विकास और गंगा संरक्षण विभाग,
केन्द्रीय जल आयोग
Government of India
Ministry of Jal Shakti
Deptt. of Water Resources,
River Development and Ganga Rejuvenation,
Central Water Commission

Foreword

Water is essential for almost all activities on the planet. It is required for drinking, cleaning, agriculture, transportation, recreation, animal husbandry, electricity production and various other industrial and commercial activities. The sustainable water management all over the world has multiple challenges like meeting ever increasing demand of water, spatial and temporal variation in availability of water, widening of such variations due to climate change, degradation of environment by human activities, indiscriminate use of available water and pollution of water resources etc. In addition, there are several socio-economic, technological, financial, legal, administrative and trans-boundary issues which need to be addressed for optimum management of water resources.

Department of Water Resources, River Development & Ganga Rejuvenation, Union Ministry of Jal Shakti, Government of India is organising India Water Week (IWW) since 2012 to provide a platform to all stakeholders around the globe to share their experiences and help each other to adopt better practices in field of water resources management. The 6th India Water Week (IWW) was organised during 24-28 September, 2019 at New Delhi with very apt theme "Water Cooperation-Coping with 21st Century Challenges". Technological advancements and benefits reaped through them were showcased in an Exhibition.

After each India Water Week event, post session proceedings are compiled and published in the form of a booklet, which is also made available on the website of the event. Post session proceedings contain recommendations generated from various technical sessions and highlights of various events conducted during this international conference. In order to apprise the various governments and all other stakeholders engaged in the field of water resources, concise action points emerged from each of the IWW events are also included in post session proceedings. I am happy to present the 'Post Session Proceedings of the IWW 2019' for benefit of all the stakeholders.

I expect that the recommendations and action points of the IWW-2019 would be widely considered for implementation and inclusion in the policy guidelines and other relevant documents by the various Governments and other Stakeholders all over the world.

I compliment the entire team of officers and staff who compiled and prepared 'Post Session Proceedings of IWW-2019' and congratulate them for carrying out a commendable job in preparing such a useful publication.

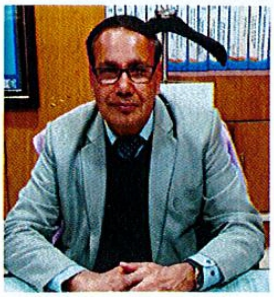
New Delhi
September, 2020

(Rajendra Kumar Jain)

द्वितीय तल (द), सेवा भवन
आर. के. पुरम, नई दिल्ली-110606
दूरभाष : 011-26715351, 26195415
फैक्स : 011-26108614

2nd Floor (S), Sewa Bhawan
R. K. Puram, New Delhi-110606
Tel. : 011-26715351, 26195415
Fax : 011-26108614
Email : chairman-cwc@nic.in

Bhopal Singh



सत्यमेव जयते

Director General & Secretary,
Organising Committee of 6th IWW-2019
National Water Development Agency
Department of WR,RD&GR
Ministry of Jal Shakti
Government of India

Preface

The Department of WR,RD&GR, Ministry of Jal Shakti, Government of India has been organizing India Water Week (IWW) since 2012. The National Water Development Agency (NWDA) under DoWR,RD&GR, Ministry of Jal Shakti has been entrusted with the task of organizing IWW as an International event.

The 6th India Water Week- 2019 (IWW-2019), the sixth in the series was organized during 24-28th September 2019 at New Delhi with the theme, "Water Cooperation – Coping with 21st Century Challenges". The main theme was discussed during the conference in 15 Seminars, 12 Panel Discussions, 4 Brainstorming Sessions, and 6 Special Sessions. The exhibition, received response from 60 companies and agencies who showcased their expertise and products.

The event has received overwhelming responses from the water resources community across the globe through about 1500 participants including 75 international participants and 166 technical papers. Japan and European Union associated themselves as international partners. The Post Session Proceedings of the IWW-2019 contains theme wise summarized details and recommendations; messages, addresses of dignitaries, and highlights of various events. The action points and the recommendations emerging from various technical sessions are also included in the Proceedings.

I would like to acknowledge the contribution and guidance of Shri U P Singh Secretary, DoWR, RD & GR, Ministry of Jal Shakti and Chairman of the Organizing Committee, Shri M K Srinivas, former Director General, NWDA, Shri A K Sinha, then Chairman, CWC and Chairman Technical Committee of IWW–2019, Shri A B Pandya, Secretary General, ICID, Shri S. Masood Husain former Chairman, CWC, Shri M E Haque, Former Member CWC. My compliments to the entire team of NWDA officials, Chief Engineer (HQ), Director (Technical) and other officers of NWDA for their dedicated work for the preparation of the Proceedings.

I hope the recommendations and action points which emerged during the IWW-2019 would be useful to sustainable development and management of water resources and energy and taking appropriate policy decisions.

(Bhopal Singh)

CONTENTS

ADDRESSES BY DIGNITARIES DURING INAUGURAL FUNCTION

Address by Hon'ble President of India, Shri Ram Nath Kovind

I am happy to inaugurate the 6th India Water Week-2019 being attended by a large number of delegates and stakeholders from within the country and across the globe. I am sure that all of you will engage in meaningful discussion and help find effective ideas and innovative solutions to address water-related issues in India.

Ladies and Gentlemen, I pose a question to all of you. Can we imagine life without water? We all will say 'No'. Our Vedas have highlighted its importance. I quote a few words from Yajurveda:

आपो हिष्ठा मयो भुवः,
स्था न ऊर्जे दधातन.....
यो वः शिवतमो रसः।

Broadly, it translates to: Water is the life-giver on earth. It is a great source of energy. It is the most beneficial elixir.

Over the ages, great civilizations and cities flourished alongside mighty rivers. Be it the Indus Valley, Egyptian, or Chinese Civilizations or be it Varanasi, Madurai, Paris, or Moscow, they all grew next to rivers. Where there was water, humanity thrived and survived. In the present times, we humans search for water as distant as the moon. At the same time, we have been negligent in preserving water resources on our own planet. When a child is born, the parents start planning for his or her future.

We start saving for their future needs of education and so on. But do we ever think that our child would need fresh and clean water for his or her survival? We owe it to our future generations to make water conservation a priority. Many efforts for this cause are underway across the world. India Water Week too is one such notable effort.

The theme of this edition of India Water Week is 'Water Cooperation – Coping with 21st Century Challenges'. Indeed, cooperation between different stakeholders is critical, if we are to face the challenges concerning water effectively. Water issues are too multi-faceted and complex to be solved by only the government or just one nation. All nations and their water communities have to come together to help build a water sustainable future for all.

Research suggests that about 40 per cent of the world's population lives in water-stressed areas. Climate change and related environmental concerns have made provision of safe and clean drinking water even more challenging. Despite the challenges, I am happy to note that the Government of India has made provision of safe and clean drinking water to citizens one of its primary goals.

To ensure better water governance and improved sanitary conditions, the Government merged several departments related to water and sanitation into a new integrated Ministry of Jal Shakti. Now, this Ministry will provide a single-window system for all water-related issues, ensuring speedier and effective solutions.

Ladies and Gentlemen, I also appreciate the Government for envisaging the Jal Jeevan Mission, which plans to supply water to every rural household by 2024. This is a bold and ambitious Mission as presently only about 18 per cent of rural households in India get piped water supply. This Mission will focus on integrated demand and supply side management of water at the local level. It will create infrastructure for rainwater harvesting, ground-water recharge and management of household waste-water. I am confident that with widespread people's participation, the Government will be able to achieve the Mission's goal.

Water is a key resource for our farmers and for sustainable agriculture. The Pradhan Mantri Krishi Sinchayee Yojana which was launched in 2015, is a major initiative for this sector. This nation-wide scheme is being implemented to increase the irrigated area in the country. Consistent with our water conservation goals, the scheme also envisages adoption of precision-irrigation and water saving technologies to ensure "More Crop-Per Drop". We often talk of reducing our "carbon-footprint". It is time we talk of reducing our "water-footprint" as well. Our farmers, corporate leaders and government bodies need to actively consider the "water-footprint" of different crops and industries. We need to encourage agricultural and industrial practices that have the least water-footprint.

Managing and mapping ground-water resources is also an important aspect of water governance. The widespread use of boring machines has led to unregulated and excessive exploitation of ground-water. We have to value our ground-water and be responsible. Moreover, we need to document our ground-water resources. I am told that under our National Aquifer Mapping Program, we have so far, mapped over a million square kilo meters, while another 1.5 million will be mapped by March 2021.

We have to ensure that our precious rainwater does not get wasted. We need to store and capture our rainwater by utilizing our existing reservoirs, dams, other water bodies and by adopting water harvesting measures in our homes and neighbourhoods. Water scarcity and drought situation faced by many of our states can be greatly mitigated with effective rainwater harvesting.

Ladies and Gentlemen, India is blessed with a number of rivers. These rivers form an integral part of our lives and culture. We worship them and we hold them in high regard. Yet, today our rivers are polluted. It is time we come together to rejuvenate them.

Here, I must appreciate the Government of India for launching 'National Mission for Clean Ganga'. This mission entails numerous projects to ensure the continuous and unpolluted flow of the Ganga. I grew up in Kanpur and have fond memories associated with river Ganga, which we regard as our mother. I am personally attached to the vision of a Clean Ganga. While attending an event last year, I was elated to witness both citizens and organisations pledging themselves to this cause. Making Ganga and our other rivers clean cannot be a mission of the Government alone. It has to be our collective endeavour and our collective promise.

As citizens we must contribute to this cause. For instance, we recently celebrated Ganesh Chaturthi and Navratras are a few days away. We need to ensure that the idols of deities immersed in the rivers are made of environment-friendly materials. It will help keep the rivers clean and ensure the safety of marine life.

Ladies and Gentlemen, A few days from now, on 2nd October we will be celebrating the 150th birth anniversary of Mahatma Gandhi. It will also mark the official completion of the Swachha Bharat Abhiyan. Over the past five years, Swachha Bharat Abhiyan saw participation of people from all strata of society as well as organisations, who took responsibility and made it their personal mission. I was pleased to felicitate few such Swachhta crusaders earlier this month in this very hall, as part of the Swachh Mahaotsav 2019. Today, we have achieved almost full sanitation coverage and the country is on the verge of becoming open defecation free. We all need to show the same dedication and commitment towards Jal Shakti Abhiyan.

The Central and State Governments are already collaborating on water conservation activities in the most water stressed blocks and districts of the country. Focused interventions for rain water harvesting and water conservation, including the restoration and renovation of traditional water bodies are being planned. I also acknowledge the several NGOs working for water conservation across the country. And there are numerous techno-entrepreneurs who are developing and implementing innovative technology solutions for improving our water management. I am sure that the Jal Shakti Ministry would build partnerships and work with all stakeholders to make the pursuit of assured water availability to each citizen, a Jan Andolan.

While we seek solutions to address different water-related issues, we should not lose sight of our age-old methods of conserving water. A blending of our traditional knowledge with modern technologies and techniques can help us become a water secure nation. Let us pledge to achieve our water-related goals with robust cooperation among all our states, public and private organisations and our people.

I wish all of you and the India Water Week - 2019 all success.

Thank you!
Jai Hind!

Address by Shri Gajendra Singh Shekhawat, Hon'ble Minister of Jal Shakti

Hon'ble President of India, Honourable Minister of State Shri Rattan Lal Kataria Ji, Secretary Shri U P Singh Ji, Chairman CWC, Experts in the field of Water Resources from various Countries, Officers from Central and State Governments, Learned faculty from various Academic Institutions, Representatives from Non-Governmental Organisations, Activists in conservation of water resources, Representatives from civil society, Print and Electronic Media and Friends.

It gives me immense pleasure to welcome you all, in this prestigious event 6th India Water Week-2019 (IWW-2019). The event is targeted at International and National audience comprising of policy planners and technologists involving with water resources, in all key sectors of economy like Agriculture and Irrigation, Energy, Industry and Drinking Water Supply. This year the theme for the event is "Water Cooperation - Coping with 21st Century Challenges".

I would like to take the advantage of this occasion to briefly describe the various challenges in the field of water resources in India and the efforts of our Ministry in meeting them. We all know that water plays vital role in life and livelihood, food security and sustainable development. India is second largest populous country, but has only 4% of the renewable water resources. In India, we are overwhelmed by the size and complexity of the water problems we face.

India depends on monsoon rains for its water resources. There are further limits on utilisable quantity of water owing to uneven distribution of water over time and space. With the growing population, the rising needs of fast developing nation as well as the given indication of the impact of the climate change, availability of utilisable water will be under further strain in future along with the possibility of deepening of the water conflicts among the different user groups. Although water is a State subject and a majority of the related activities come under the jurisdiction of State Government, the Central Government is taking many initiatives on its part for planning, development, management of water resources within the ambit of constitution of the country.

Our country has wide variation in water availability across various river basins while Ganga and Brahmputra river basins are well endowed with water. The basins in peninsular India are relatively water scarce and most of them have already reached their stage of full development. In this context, the inter basin water transfer programme known as Interlinking of rivers programme has been conceived for transfer of water from surplus basins to deficit basins. We will adopt win-win strategy for implementation of the programme.

Climate change is well recognised and well established phenomenon and looming large upon us. The National Action Plan on climate change of Government of India envisages, institutionalisation of 8 National Water Mission objectives realising that there is a large number of stakeholders in water sector, as it involves many ministries and departments have key role to play in its implementation.

Groundwater in India is a vital resource. With the fast growing demand for groundwater, there is rapid increase in number of aquifers reaching unsustainable level of exploitation. This has serious implications on the sustainability of agriculture, long term food security and water security and livelihood and economic growth. On the other hand, there are places where the groundwater is still under-developed with regard to its potential uses. This represents that there is potential for improving livelihood. There are deeper aquifers which contains vast sources of water. The National Project on Aquifer Management (NAQUIM) is an important programme of our Ministry for mapping aquifers at micro level to quantify the available groundwater resources and to propose plans at appropriate levels to the scale of demand and aquifer characteristics. Artificial recharge of groundwater is one of the most efficient groundwater management tools for ensuring sustainability of ground water resources.

Inspired by the Hon'ble Prime Minister's impetus on Jal Sanchay, our ministry launched **Jal Shakti Abhiyaan (JSA),** which is time bound, mission mode water conservation campaign.

The JSA will run in two phases Phase I from 1st July to 15th September 2019 for all States and Union Territories and Phase 2 from 1st October to 30 th November 2019 for states and UTs receiving the retreating monsoon or North-East monsoon (AP, Karnataka, Puducherry and Tamil Nadu).

During the campaign, officers, ground water experts and scientists from Government of India will work together with State and district officials in India's most water stressed districts for water conservation and water resources management by focussing on accelerated implementation of five target interventions. The JSA aims at making water conservation a Jan Andolan through asset creation and extensive communication.

Another most important task our Ministry has been assigned is the **Rejuvenation of Ganga river,** which is not only the life line of the country but also linked with the spiritual and cultural aspirations of large populations of the country. The Ganga Rejuvenation plan provides for short term, medium term and long term action plan. The projects and activities under this plan include pollution abutment, identifying different sources of pollution, river plan development, afforestation and conservation of aquatic life, communication and public outliers, water quality, monitoring and enforcement of standards and other policies for ensuring Aviral and Nirmal Ganga.

I hope that there will be in-depth deliberations in the sessions of the conference and dissemination of the knowledge from all the National and International experts, which will guide us and traverse the path of resource development in a sustainable manner and environmental friendly way.,

Ladies and gentlemen,

Now is the time for accelerated, energized and concerted action on water and sanitation. There is a need for us to accept responsibility in each specific sector. But there is also a need to develop dynamic partnerships and cooperation between us.

Finally, let me turn to the issue of water and water management from the perspective of conflict generation and conflict resolution. In many parts of the country we see growing risks of water, or the lack of water, becoming a reason for conflict.

I have seen it in complex and strained relations among States related to cross-border management of waterways and rivers. Any our country needs water for energy, for agriculture, for domestic needs and for industries. These are often issues of fundamental national, economic and political interest. These interests need to be reconciled in mutually acceptable ways in order to provide security and prosperity.

It is of great importance that we in today's world realize that scarce resources must be managed fairly and wisely and must be shared as much as possible.

With these words, I wish the conference a grand success and hereby inaugurate the Sixth IWW-2019.

श्री रतन लाल कटारिया, माननीय राज्य मंत्री, जल शक्ति का भाषण

भारत के महामहिम राष्ट्रपति, माननीय मंत्री, जल शक्ति, श्री गजेन्द्र सिंह शेखावत जी, सचिव, श्री यू.पी. सिंह, श्री ए.के. सिन्हा, अध्यक्ष, केंद्रीय जल आयोग, गणमान्य अतिथियों, प्रतिभागियों, बहनों एवं भाइयों।

भारत जल सप्ताह 2019 के उद्घाटन समारोह में आपके बीच उपस्थित हो कर और आप सभी सम्मानित गणमान्यों को संबोधित करने का सुअवसर मिलने की मुझे बहुत प्रसन्नता है। हमारे देश में "भारत जल सप्ताह" जल क्षेत्र की अत्यंत महत्वपूर्ण गतिविधि है, जिसमें हमारे देश में जल संबंधी विभिन्न मुद्दों पर विचार-विमर्श करने का सुअवसर प्राप्त होता है। इस वर्ष भारत जल सप्ताह की विषयवस्तु 'जल सहयोग - 21 वीं सदी की चुनौतियों का सामना" है और अपनी सरकार के विकास के एजेंडा को ध्यान में रखते हुए मुझे यह लगता है कि यह बहुत ही उपयुक्त और उचित समय पर उठाया गया सही कदम है। इस अवसर का उपयोग करते हुए मैं जल संसाधन क्षेत्र के कुछ मुद्दों और भविष्य में होने वाली पहलों पर प्रकाश डालना चाहता हूं।

हम सभी को इस बात का ज्ञान है कि दुनिया की जनसंख्या का 17% भाग भारत में है लेकिन ताज़े जल का केवल 4% भाग ही है। ज़ाहिर है कि चुनौतियां बहुत हैं क्योंकि आगे समय और स्थान में इस सीमित जल की उपलब्धता समान नहीं है। भारत अपनी जनसंख्या की आजीविका, मानव कल्याण, आर्थिक विकास और पारिस्थितिकीय सततता की चुनौतियों के साथ पेयजल, घरेलू, कृषि, औद्योगिक तथा पारिस्थितिकीय आवश्यकताओं को पूरा करने के लिए उल्लेखनीय जल संकट का सामना कर रहा है। देश जैसे-जैसे 21 वीं सदी में आगे बढ़ रहा है, वैसे-वैसे पानी की चुनौतियां, जिनको जलवायु परिवर्तन के प्रभाव और अधिक बढ़ा रहे हैं, विकराल रूप धारण कर रही हैं।

जल संसाधनों की कमी के बहुत व्यापक प्रभाव हैं, जिनमें मरूस्थलीकरण, जैव विविधता को खतरा, शहरी क्षेत्रों की वहन क्षमता का सीमा पार करना शामिल हैं। प्राकृतिक विकास और प्रवास के कारण भारत के शहरों की बढ़ती आबादी ने उन्हें रहने योग्य नहीं रहने दिया है और विशेषकर गर्मियों के दिनों में तो स्थिति और भी खराब हो जाती है। एक दूसरा पक्ष जिस पर तत्काल ध्यान देने की आवश्यकता है अपशिष्ट जल को शुद्ध करना तथा इसका पुन: उपयोग करना और उचित प्रकार से उनका निपटान करना है। यद्यपि हम भारतीय जल से भावनात्मक रूप से जुड़े हुए हैं, और अपनी नदियों को पवित्र मानते हैं, किन्तु यह एक कटु सत्य है कि दिन प्रतिदिन हमारी नदियां प्रदूषित होती जा रही हैं, तथा खुद को जीवित रखने के लिए प्राथमिकता के आधार पर नदियों के पुनरूद्धार की आवश्यकता है।

मुझे ऐसा लगता है कि समय की मांग है कि देश के आर्थिक विकास तथा पारिस्थितिकी तंत्र की प्रणाली में स्थिरता के लिए उपलब्ध जल संसाधनों का वैज्ञानिक प्रबंधन किया जाए। कुछ राज्यों ने जल प्रबंधन में बहुत अच्छी प्रगति की है, तथापि यह पर्याप्त नहीं है। हमें इस प्रगति को और आगे बढ़ाना होगा और अपने प्रबंधन के तरीकों को वैश्विक स्तर तक उन्नत करना होगा जिससे कि वांछित और वास्तविक परिणाम प्राप्त हो सकें।

जल क्षेत्र में केन्द्र सरकार तथा राज्य सरकारों द्वारा चलाए जा रहे विभिन्न कार्यक्रमों की सूची बताने के बजाय मैं चाहूंगा की हम आगे के मार्ग तथा जल के प्रति अपने व्यवहार में आवश्यक बदलाव लाने पर ध्यान केन्द्रित करें। हम सभी को अलग-थलग प्रयास करने के स्थान पर एक राष्ट्र के रूप में प्रयास करने होंगे। मेरा मानना है कि घरेलू स्तर, गांव, जिला, बेसिन, राष्ट्र तथा अंतरराष्ट्रीय स्तरों पर सभी भागीदारों के मध्य में ही देश का भविष्य निहित है और इसी से हम जल चुनौतियों का सामना करने में सफल होंगे।

इससे पहले कि मैं अपनी बात समाप्त करूँ हमारे यहां एक कहावत है कि "एकता में शक्ति है लेकिन भारत विविधता में एकता का प्रतीक है। हम विविध सामाजिक, भाषायी और संस्कृति की पृष्ठभूमि वाले भारत के लोग पीढ़ियों से सामंजस्यपूर्ण तरीके से एक साथ रहते आए हैं। इसी प्रकार, देश जल की जिन चुनौतियों का सामना कर रहा है उनका प्रभावी ढ़ग से प्रबंधन करने के लिए हम जल क्षेत्र के हितधारकों को सहयोग और समन्वय की भावना दिखानी होगी। मैं जल की सदा उपलब्धता सुनिश्चित करने के लिए मानवता द्वारा "सामूहिक संरक्षण तथा ईमानदार उपयोग" का आह्वान करता हूं। मेरा सुझाव है कि हम अपने प्राचीन ज्ञान से विरासत में मिली पारंपरिक जल प्रबंधन प्रथाओं को पुनर्जीवित करें और उन्हें आधुनिक तकनीक से जोड़े। अब समय आ गया है कि पूरा देश एकजुट हो और अपने जल संसाधनों के प्रबंधन और उपयोग के लिए उचित कदम उठाए।

अब मैं इसे आप पर छोड़ता हूं, जल संसाधन बिरादरी अगले पांच दिनों में इन विचारों पर गहन विचार-विमर्श करे और जल सुरक्षित भारत बनाने के सरकार के प्रयासों में मदद करने के विचारों को प्रस्तुत करे।

आइए हम एक साथ मिलकर जल संरक्षण के लिए प्रयास करें क्यूंकि यह एक मूलभूत मानवीय आवश्यकता और चुनौतीपूर्ण राष्ट्रीय संपत्ति है।

मेरी ओर से शुभकामनाएं।

जय हिन्द।

Address by Shri U P Singh, Secretary, Department of Water Resources, River Development & Ganga Rejuvenation

Hon'ble President of India, Hon'ble Minister of Jal Shakti, Hon'ble Minister of State for Jal Shakti, Chairman, Central Water Commission, delegates from India and abroad, distinguish guests, ladies and gentlemen,

On this august occasion of inauguration of 6th India Water Week-2019, I feel privileged to welcome Hon'ble President of India, Shri Ram Nath Kovind ji. The Ministry of Jal Shakti and all those who are present here are indeed extremely grateful to you Sir, that you could find time from your extremely busy schedule to be amongst us this morning. Your august presence fire us to work with new vigour and determination for water secure India. I also take this opportunity to welcome Shri Gajendra Singh Shekhawat, "Hon'ble Union Minister of Jal Shakti and Shri Rattan Lal Kataria," Hon'ble Minister of State for Jal Shakti who have been guiding all those Wh are working for cause of water security in the country. I extend a very warm welcome to Ambassadors of various Countries, Secretaries and Officers of State and Central Governments, dignitaries, delegates from India and abroad, friends from Media and other distinguished guests. Conceptualized and organised for the first time in 2012, the India Water Week provides an important forum for discussions on all important issues relating to water with eminent Stakeholders through Seminars, Panel Discussions and Brainstorming Sessions. Such discussions help us in fine tuning our policy and strategy for optimal utilisation of valuable resources. This is the 6th event of this kind with the theme "Water Cooperation - Coping with 21st Century Challenges". Japan and European Union are our International Partners in this event. The event comprises of 15 Seminars, 4 Brainstorming Sessions, 12 Panel Discussions and 6 Special Sessions. Apart from this, an exhibition showcasing the technological advancement in water resource sector is also been organised at Indira Gandhi International Centre for Arts. About 60 organisations are participating in the exhibition.

While challenges have always existed in the water sector, climate change is the new elephant in the room. Climate change has major implications on water resources and India is particularly vulnerable to this aspect. However, every challenge is opportunity in itself. The challenges of water management present an opportunity to convert to resilience, poverty to well being and degraded ecosystem to vibrant one. Management of water resources is always a priority sector of the Government of India.

Many initiatives have undertaken to meet the challenges to this field. Some of these are integration of all water related functions under the newly formed Ministry of Jal Shakti. Launch of Jal Jeevan Mission with the objective of providing tap water to every household in the country in the next five years, Pradhan Mantri Krishi Sinchayee Yojana in irrigation sector, NamamiGange, National Hydrology Project, Dam Rehabilitation and Improvement Program, National aquifer mapping & management programme and Jal Shakti Abhiyan, a collaborative effort of the Centre and State Governments to accelerate water conservation activities in the most water stressed areas in the country.

I once again welcome all the dignitaries on dais, distinguished guests and delegates to this IWW-2019 and hope the deliberations in this conference would help in refining the progressive effort of Government in building water secure India.

Thanking you,

Jai Hind.

GLIMPSES OF INAUGURAL FUNCTION

Dignitaries on Dias During Inaugural function of IWW-2019

Lighting the lamp by Hon'ble President during Inaugural function of IWW-2019

Releasing Proceedings of IWW-2019 by the Dignitaries

Inaugural address by Hon'ble President of India

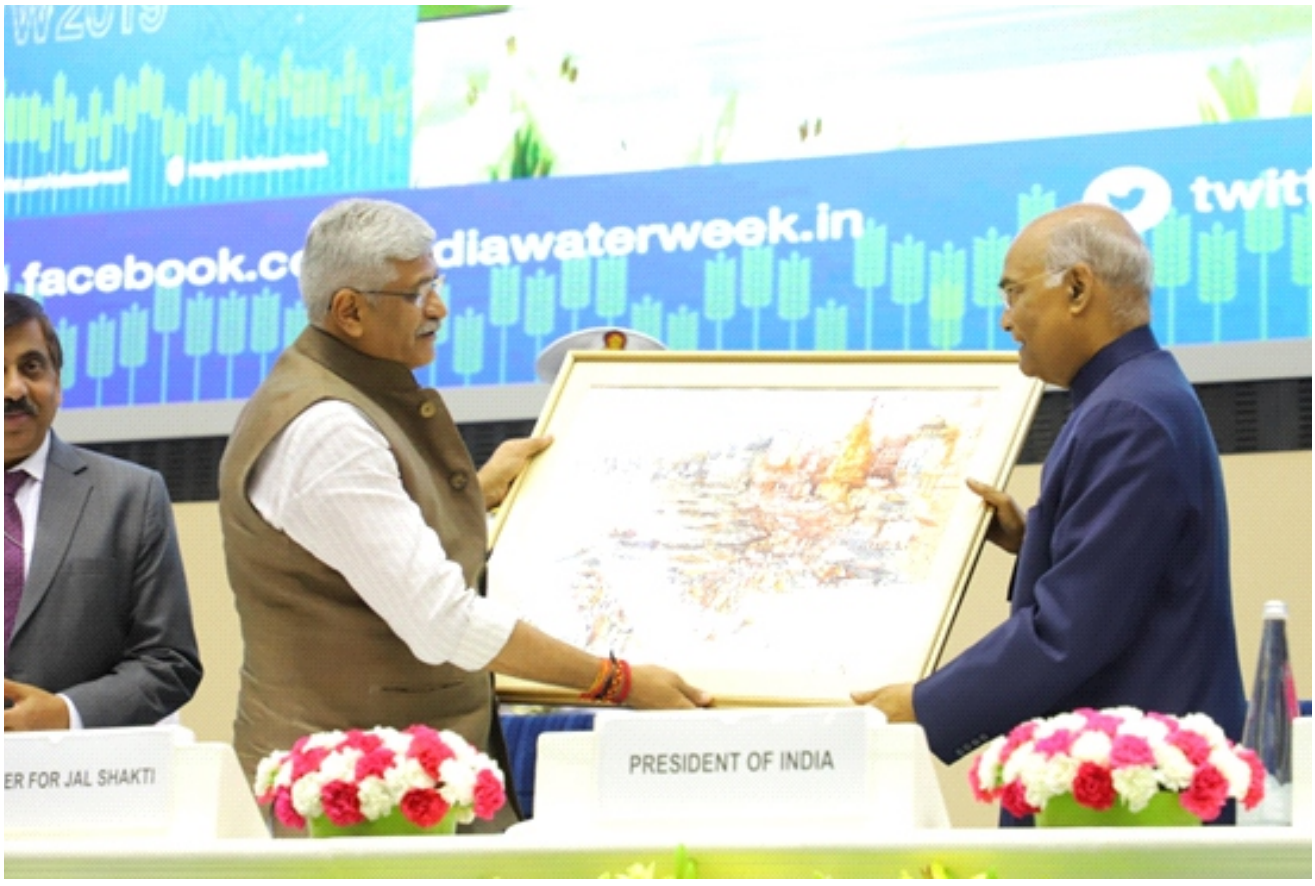
Inaugural function of India Water Week-2019

Address by Hon'ble Minister of Jal Shakti

Audience during the Inaugural function of India Water Week-2019

Audience during the Inaugural function of India Water Week-2019

Shri Gajendra Singh Shekhawat, Hon'ble Minister of Jal Shakti felicitating Hon'ble President Shri Ram Nath Kovind



Glimpses of Inaugural Function

CONFERENCE VENUE (VIGYAN BHAWAN) ENTRANCE

CONFERENCE VENUE (VIGYAN BHAWAN) ENTRANCE

FRONT OFFICE -REGISTRATION COUNTER

ADDRESSES BY DIGNITARIES DURING VALEDICTORY FUNCTION

समापन समारोह पर माननीय मंत्री श्री गजेन्द्र सिंह शेखावत, जल शक्ति मंत्रालय का भाषण

जल शक्ति मंत्रालय में मेरे सहयोगी माननीय श्री रतन लाल कटारिया जी, श्री यू.पी. सिंह, सचिव (जल संसाधन, नदी विकास और गंगा संरक्षण विभाग), श्री ए.के. सिन्हा, अध्यक्ष, केन्द्रीय जल आयोग, श्री एम.के. श्रीनिवास, महानिदेशक एन.डबल्यू.डी.ए., भारत के विभिन्न हिस्सों, भागीदार देश जापान और यूरोपीय संघ के विशिष्ट प्रतिनिधि, विभिन्न केन्द्रीय मंत्रालयों, राज्य सरकारों और उनके संबंधित संगठनों के अधिकारी, शिक्षाविद्, उद्यमी, गैर-सरकारी संगठनों के प्रतिनिधि, प्रिंट एवं डिजिटल मीडिया के प्रतिनिधि, देवियों और सज्जनों;

मुझे छठे भारत जल सप्ताह - 2019 के समापन सत्र में आप सबको सम्बोधित करते हुए बहुत खुशी हो रही है। मुझे खुशी है कि मंत्रालय के तत्वाधान में जल संसाधन, नदी विकास और गंगा संरक्षण विभाग, द्वारा अन्य मंत्रालयों / संगठनों के सहयोग से यह कार्यक्रम सफलापूर्वक आयोजित किया गया है।

देवियों और सज्जनों,

जल संरक्षण के लिए किफायती और नवीन मॉडल समय की मांग है। मेरे विचार से अनुसंधान, किसानों के लिए जल प्रबंधन के साधारण और किफायती मॉडल तैयार करने पर केन्द्रित होना चाहिए ताकि किसान इसे समझ सकें और खरीद सकें। मैं इस बात पर जोर देना चाहूंगा कि भारत में जल प्रबंधन की प्राचीन बौद्धिक और समृद्ध परम्परा रही है, जिसे फिर से पुनर्जीवित करने और अपनाने की आवश्यकता है। यदि हम सभी स्टेक-होल्डर एकजुट होकर सद्भाव से कार्य करेंगे तो जल संरक्षण के लिए सरकार द्वारा किए गए सभी प्रयासों का वांछित परिणाम प्राप्त होगा।

दोस्तों,

मुझे बताया गया है कि यहां भारत जल सप्ताह में एकत्र हुए जल संसाधन प्रबंधन के विभिन्न क्षेत्रों के विशेषज्ञों ने विभिन्न पहलुओं पर बड़े विस्तार से विचार-विमर्श किया है।
इस विचार-विमर्श के कुछ महत्वपूर्ण बिन्दु इस प्रकार हैं-

- लेज़र लेवलिंग, रेज्ड बेड प्रौद्योगिकी, जैव गैसीय घोल अनुप्रयोग, सूक्ष्म सिंचाई, सेंसर प्रेरित सिंचाई प्रणाली जैसी प्रौद्योगिकियां जल और ऊर्जा दक्षता को बढ़ा सकती हैं।
- जल एक संसाधन के रूप में अंतर-निहित भू-राजनीतिक महत्व रखता है और इसलिए इसे भू-राजनीतिक दृष्टि से समझा जाना चाहिए।
- नीति मुद्दों सहित वृहद स्तर पर जल का संरक्षण और संबंधित छोटे कार्यों और तकनीकों के विकेंद्रीकरण की आवश्यकता है ताकि बेहतर जीवन के लिए उनका प्रभावी रूप से कार्यान्वयन सुनिश्चित हो सके।
- जल उत्पादकता, अपशिष्ट जल के पुनर्चक्रण और पुनः उपयोग को सुधारने और उसकी निरंतरता को बनाए रखना अनिवार्य है और प्रौद्योगिकी कार्य उसके सुरक्षित और सतत प्रयोग को बढ़ावा देने में सहायक होंगे।
- जल आंकड़ों का संश्लेषण समेकन और कार्रवाई करने के लिए राष्ट्रीय जल , 2012 , नीति के साथ सुसंगत राष्ट्रीय जल आंकड़ा नीति लागू करना समय की आवश्यकता है।

कृषि वानिकी विषय पर मुख्य रूप से चर्चा की गई। एकत्रित हुए वैज्ञानिकों और कृषि शास्त्रियों का यह मत था कि देशी अथवा विदेशी पतझड़ी वृक्ष प्रजातियों का पौधा रोपण, जिनसे फल या लकड़ी जैसे अत्यधिक कीमती उत्पाद उत्पन्न होते हैं, ऐसी कृषि करने से अधिक मात्रा में वर्षा को सोखा जाएगा जो भूजल के पुनर्भरण में सहायक होता है। इसके अतिरिक्त, यह भी नोट किया जाए कि देशी वृक्ष प्रजातियों का पौधा रोपण नदियों के किनारे अत्यधिक रूप से उपयुक्त होगा। कृषि वनों और सामाजिक वनों के पेड़ स्रोतों के पुनरुद्धार और छोटे स्थानीय झरने जैसे दीर्घावधि इको सिस्टम सेवाएं प्रदान करते हैं, जिसके परिणाम स्वरूप नदियों का पुनरुद्धार होता है। इसके साथ इससे वाटरशेड सुरक्षा और भूमि जल पुनर्भरण और जैव विविधता संरक्षण में भी सहायता मिलेगी।

मुझे विश्वास है कि विदेशी प्रतिनिधियों और भारतीय जल के विद्वानों के साथ ज्ञान साझा करने से यह चर्चा बहुत सार्थक होगी। मैं आशा करता हूं कि आपसी सहयोग के माध्यम से जल संरक्षण परियोजनाओं के कार्यान्वयन को बढ़ावा मिलेगा। इसके अतिरिक्त, मुझे यह देखकर खुशी हुई है कि भारत के ९ राज्य भी इस समारोह के भागीदार हैं और उन्होंने इसमें भाग लेकर तथा अपनी प्रौद्योगिकियों का प्रदर्शन करके सम्मेलन और प्रदर्शनी में बहुमूल्य सहयोग दिया है।
मैं श्री यू. पी. सिंह और उनके दल की सराहना करता हूं जिन्होंने इस महोत्सव का सफल आयोजन करने में अपना पूरा योगदान दिया है।

जय हिन्द।

समापन समारोह पर माननीय राज्यमंत्री, श्री रत्तन लाल कटारिया, जल शक्ति मंत्रालय का भाषण

माननीय जल शक्ति मंत्री श्री गजेन्द्र सिंह शेखावत जी, श्री यू.पी. सिंह सचिव (जल संसाधन, नदी विकास और गंगा संरक्षण विभाग), श्री ए. के. सिन्हा, अध्यक्ष, केंद्रीय जल आयोग, श्री एम.के.श्रीनिवास, महानिदेशक राष्ट्रीय जल विकास अभिकरण, विभिन्न देशों से पधारे गणमान्य प्रतिनिधिगण, केन्द्र व राज्य सरकार के अधिकारीगण, गैर सरकारी संगठनों के प्रतिनिधिगण, प्रिट एवं डिजिटल मीडिया के बंधुगण, बहनों एवं भाइयों।

आज मेरा यह सौभाग्य है कि मैं India Water Week-2019 के समापन समारोह में आप सब के बीच हूँ। सबसे पहले मैं इस India Water Week में भाग लेने वाले सभी लोगों को उनके सक्रिय योगदान और सहयोग के लिए बधाई देता हूँ।

यह **"India Water Week"** 24 सितंबर, 2019 को महामहिम राष्ट्रपति जी की उपस्थिति में शुरू हुआ था। इस पूरे आयोजन के दौरान इसकी विषयवस्तु "जल सहयोग-21 वीं सदी की चुनौतियों का सामना" में जल से संबंधित हर प्रकार की चिंताओं और उसके प्रासंगिक मुद्दों पर सेमिनार, Discussion, Presentation और पैनल Discussion के अनेक सत्रों में विस्तृत रूप से चिन्तन किया गया। इसके अतिरिक्त केन्द्र सरकार तथा राज्य सरकारों के विभिन्न विभागों तथा अंतरराष्ट्रीय एवं राष्ट्रीय कंपनियों ने भी Water Week में आयोजित Water Exhibition 2019 में अपनी Expertise को हम लोगों के सामने रखा।

देवियों और सज्जनों,

हम जानते हैं कि सामान्य मानव जीवन की विभिन्न गतिविधियों जैसे भोजन, कृषि, पशु पालन, ऊर्जा उत्पादन, उद्योग-धंधों, स्वास्थ्य तथा पर्यावरण सभी के लिए जल एक महत्वपूर्ण घटक है। आज जिस तरीके से जल का प्रबंधन किया जा रहा है उसमें जल के उपयोग की निम्न दक्षता, खराब गुणवत्ता, भूजल का अत्यधिक दोहन, बाढ़ और सूखे का अपर्याप्त प्रबंधन शामिल है। इसलिए हमें जल संरक्षण और जल प्रबंधन तथा जल के उचित उपयोग के आम जन के व्यवहार में परिवर्तन लाने तथा सुधारवादी कदम उठाने की आवश्यकता है जिससे यह सुनिश्चित किया जा सके कि देश के लोग उपलब्ध सीमित ताजे जल की सीमा में ही अपने हिस्से का जल प्राप्त कर सकें।
इसके साथ ही अपशिष्ट जल के संग्रह और उपचार में शामिल उच्च लागत, पर्याप्त अपशिष्ट जल प्रबंधन सुनिश्चित करने में प्रौद्योगिकी, निधि और भूमि संसाधनों की उपलब्धता भी अन्य प्रमुख चुनौतियां हैं। हम सब जानते है कि उद्योगों को पूरे वर्ष पानी की नियमित आवश्यकता होती है। इसलिए पानी की कमी के दौरान भी उद्योग धंधों को पानी उपलब्ध कराना हमारे सामने एक और बड़ी चुनौती है। पानी की खपत के अलावा, उद्योग-धंधों से निकलने वाले अपशिष्ट जल प्रदूषण बढ़ाने का एक प्रमुख कारण है। इंडस्ट्रीज से होने वाले प्रदूषित पानी के ट्रीटमेंट के साथ दूषित पानी के Disposal और इसके Reuse तथा Recycle पर भी हमें अपना ध्यान देने की जरूरत है।

मित्रों,

मैं यह बताना चाहूंगा कि माननीय प्रधान मंत्री श्री नरेन्द्र मोदी जी के नेतृत्व में भारत सरकार ने जल संरक्षण तथा जल संचयन के महत्वपूर्ण मुद्दे को पूरी गंभीरता से लिया है तथा सरकार जल क्षेत्र में चुनौतियों को दूर करने के लिए व्यापक स्तर पर प्रयास कर रही है। एक ओर जहाँ पूरे देश में जल शक्ति अभियान चलाया जा रहा है वही दूसरी ओर सिंचाई परियोजनाओं तथा कमान Area Development के लिए प्रधानमंत्री कृषि सिंचाई योजना (PMKSY) का क्रियान्वयन किया जा रहा है जिससे सुनिश्चित सिंचाई के अंतर्गत एक बड़े क्षेत्र को सिंचाई लाभ दिया जा सके। इससे ना केवल देश में खाद्यान्न उत्पादन में वृद्धि होगी बल्कि किसानों की आय भी बढ़ेगी। साथ ही साथ हमारी सरकार ने गंगा सहित सभी नदियों के पोषण और उनकी पारिस्थितिकी को बेहतर बनाने के लिए स्वच्छ गंगा और अन्य विभिन्न कार्यक्रमों के लिए राष्ट्रीय मिशन भी शुरू किया है।

मुझे आशा है कि हमारा देश जल संबंधी जिन चुनौतियों का सामना कर रहा है उनका India Water Week में सभी Stakeholders के बीच हुए विचार विमर्श के पश्चात दीर्घकालीन समाधान खोजने में मदद मिलेगी तथा हमारी सरकार भी इस सप्ताह में हुए Discussion के आधार पर उचित कदम उठाएगी जिससे जल संसाधनों का अधिक कुशल तथा उपयोगी Management किया जा सके।
अंत में एक बार फिर **India Water Week** के सफल आयोजन के लिए मैं सभी Stakeholders, Participants, मीडिया के बंधु और आयोजकों को बधाई देता हूँ और आशा करता हूँ कि इस महत्वपूर्ण विषय पर हम भविष्य में भी और अधिक गंभीरता से कार्य करते रहेंगे।

धन्यवाद, जय हिन्द।

Address by Shri U P Singh, Secretary, Department of Water Resources, River Development & Ganga Rejuvenation

Hon'ble Union Minister for Jal Shakti, Shri Gajendra Singh Shekhawat Ji, Hon'ble Minister of State for Jal Shakti, Shri Rattan Lal Kataria Ji, Chairman, Central Water Commission and Director General, NWDA.

On behalf of Ministry of Jal Shakti, I extend my warm welcome to all of you on the occasion of Valedictory Session of 6th IWW-2019. The event has been very successfully organised under the guidance of our Minister of Jal Shakti Shri Gajendra Singh Shekhawat Ji. The event was spread over 5 days from 24th to 28th September, 2019 with the theme "Water Cooperation – Coping with 21st Century Challenges". Hon'ble President of India while inaugurating the event has mentioned that water issues are too multi-faceted and complex to be solved by the Government or a Nation alone. All nations must come together to build a water sustainable future. Accordingly, this year's theme of IWW-2019 viz "Water Cooperation – Coping with 21st Century Challenges" covered these aspects in detail during the deliberations. In the Plenary Session, issues like future challenges in water sector, Jal Shakti Abhiyan, International & Regional cooperation etc. were discussed at length. About 1500 delegates including 75 from other countries have actively participated in the event.

Also, National Water Mission Awards were given away by Hon'ble Minister of Jal Shakti during India Water Week-2019. An interactive session was organised for school children in which more than 400 children participated and a session on Participatory Irrigation Management was organised by India – NPIM with active participation of farmers.

The main theme was discussed during the conference through 15 Seminars, 4 Brainstorming Sessions, 12 Panel Discussions and 6 Special Sessions. The Exhibition of IWW-2019 had a participation of 60 companies and agencies showcasing their expertise, and products.

Japan and European Union associated themselves as international partners and delegation led by Mr. Kenji Hiramatsu, Ambassador of Japan and Mr.Walter Lindner, Ambassador of Germany have actively participated in the event.

The organisation of India Water Week-2019 has been a great success due to active participation of all of you.

I take this opportunity to acknowledge the efforts made by officials of Ministry of Jal Shakti, Department of WR,RD&GR and its attached/subordinate offices.

GLIMPSES OF VALEDICTORY FUNCTION

Dignitaries on Dias during Valedictory function

Shri U.P. Singh, Secretary, Department of WR,RD&GR, Ministry of Jal Shakti felicitating Shri Rattan Lal Kataria, Hon'ble Minister of State, Jal Shakti

Shri U.P. Singh, Secretary, Department of WR,RD&GR, Ministry of Jal Shakti felicitating Shri Gajendra Singh Shekhawat, Hon'ble Minister of Jal Shakti

Shri Gajendra Singh Shekhawat, Hon'ble Minister of Jal Shakti addressing Valedictory function

Shri Rattan Lal Kataria, Hon'ble Minister of State, Jal Shakti addressing Valedictory function

Participants during Valedictory Function

Shri M K Srinivas, Director General NWDA delivering vote of thanks during Valedictory function

Students with dignitaries during Valedictory Function

Participants during Valedictory Function

Glimpses of Valedictory function

PLENARY SESSION & KEYNOTE ADDRESSES

Keynote address by Shri U.P. Singh, Secretary, Department of WR,RD&GR, Ministry of Jal Shakti during Plenary session

Challenges and Initiatives in Water Resources Management in India

Mr.U.P.Singh
Secretary,
Department of Water Resources, RD and GR
Ministry of Jal Shakti
Government of India

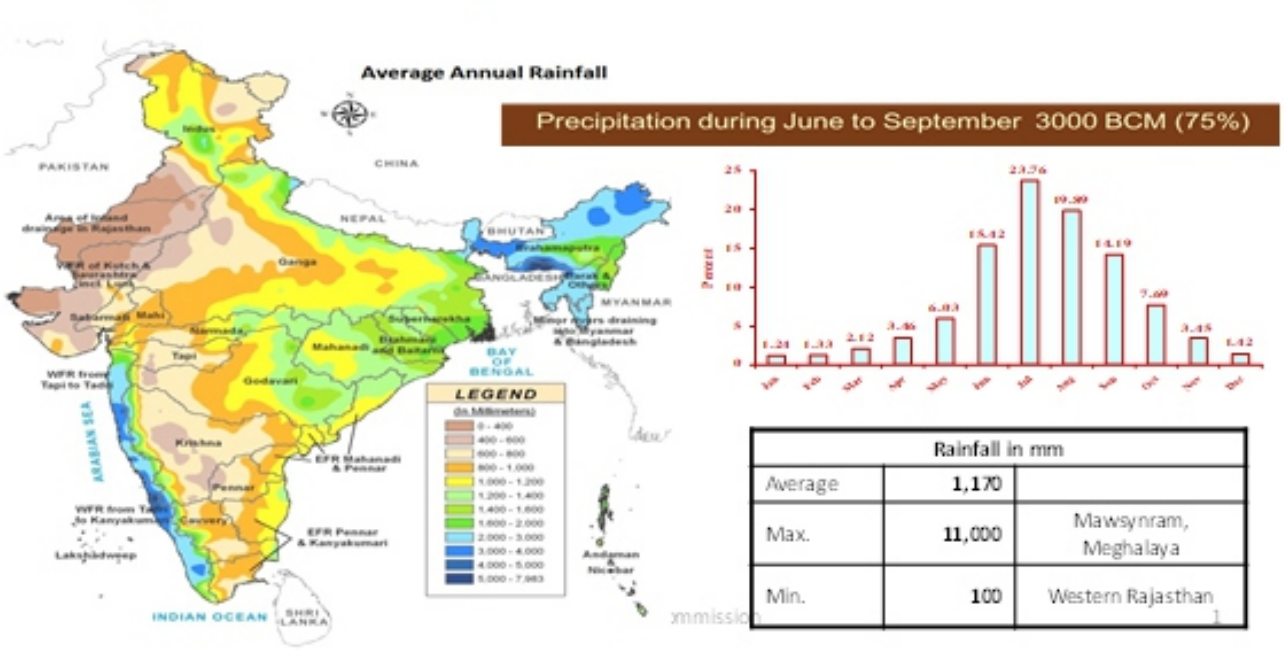
RESOURCE PROFILE

India has

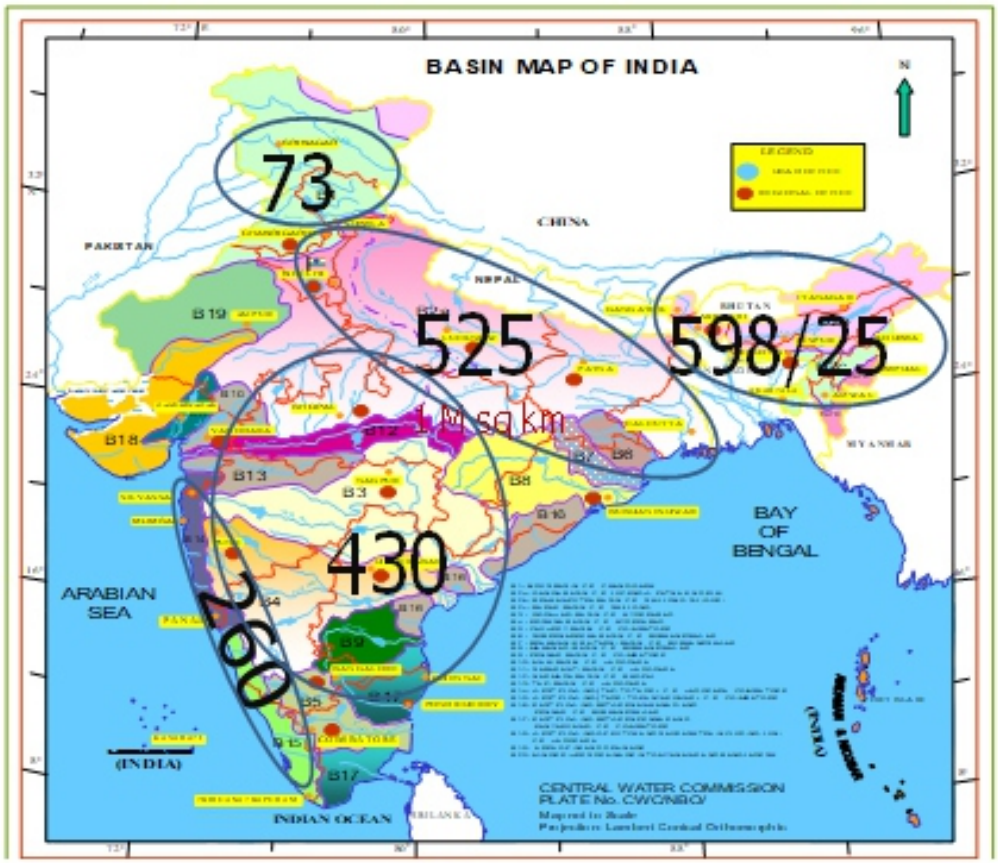
2% of world's land (3.29 M sq km)
4% of world's freshwater resources
17% of world's population
15% of world's cattle population

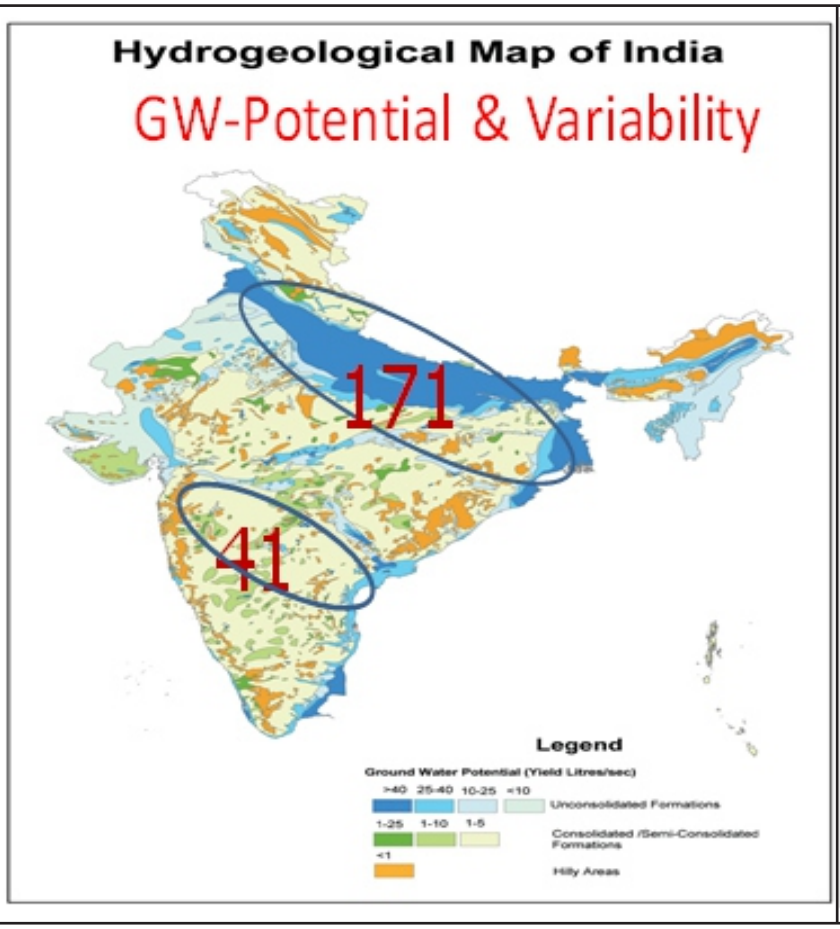
Estimated annual precipitation (including snowfall)	**4000 BCM**
Average annual potential (in rivers)	**1869 BCM**
Estimated utilisable water potential (total) **(i) Surface** **(ii) Ground**	**1122 BCM** **690 BCM** **432 BCM**

Spatial & Temporal Variation of Rainfall



SW-Potential (BCM) & Variability





Brahamaputra, Indus, and Krishna → each about 26 BCM/yr

Total GW Potential =

432BCM/yr

Storage Capacity

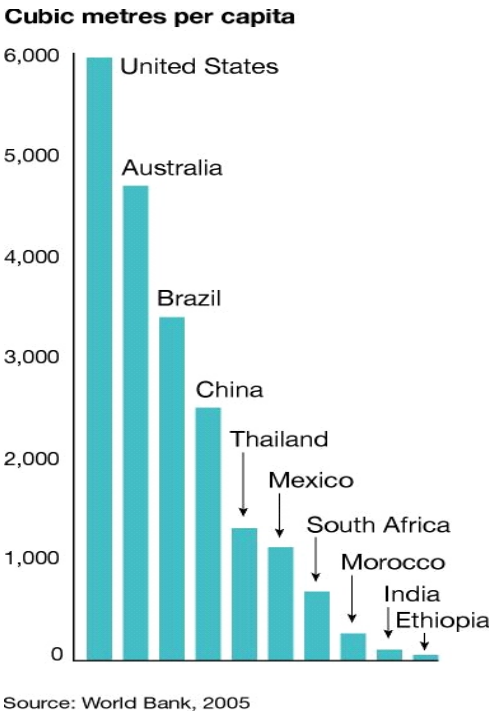
Total Live Storage

- Pre Plan (before 1951) = 16 BCM
- Completed = 257 BCM
- Under Construction = 51 BCM
- Planned = 104 BCM

Maximum Feasible Storage = 450 BCM

Rengali dam

Hirakund dam



Source: World Bank, 2005

Irrigation Development

•Total Cultivable Land:	181.98 Mha
•Ultimate Irrigation Potential:	139.89 Mha
•Potential Created	113.53 Mha
–Major & Medium:	47.97 Mha
–Minor:	65.56 Mha
•Gross Sown Area:	195.25 Mha
•Gross Irrigated Area:	91.53 Mha
•Net Sown Area:	140.80 Mha
•Net Irrigated Area:	65.26 Mha

Challenge: Production of 450 MT cereal by 2050 requiring 807 BCM water

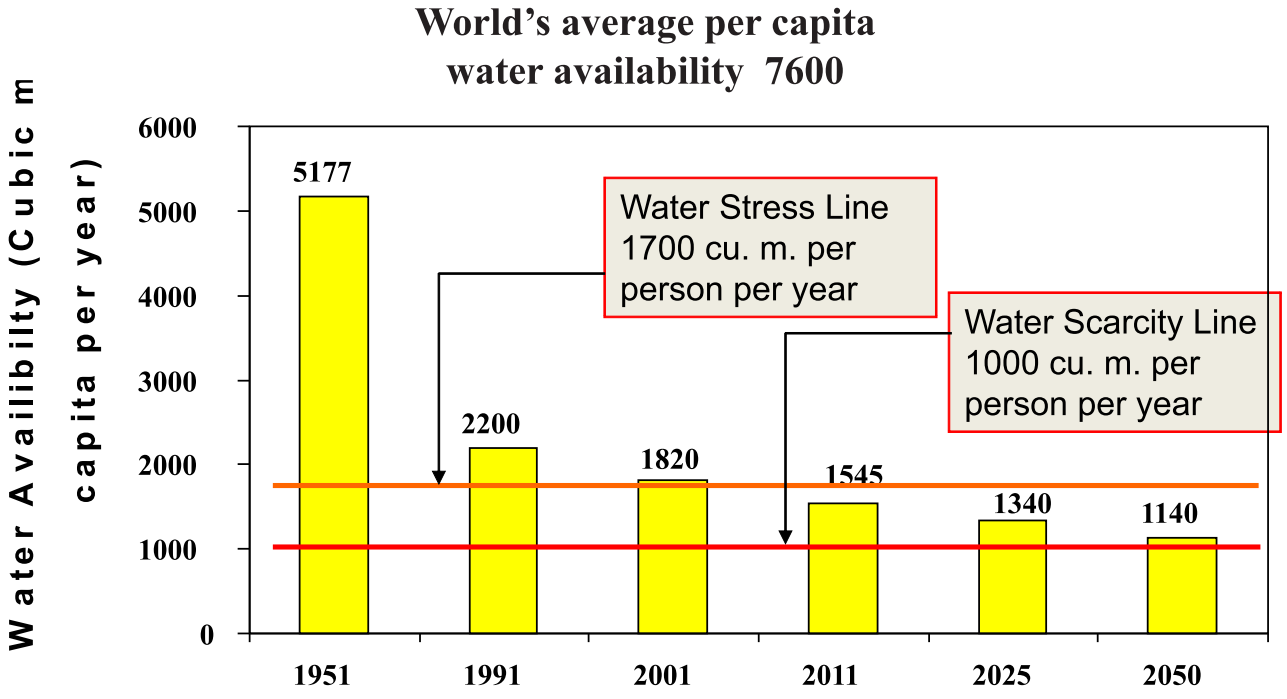
Primary Challenges

- Growing demand
- Decreasing per capita water availability
- Water quality concerns
- Over exploitation of ground water
- Flood Management
- Climate Change Impact

Estimated Water Demand (BCM)

Year	2010	2025	2025
Irrigation	557	611	807
Drinking Water	43	62	111
Industry	37	67	81
Energy	19	33	70
Others	54	70	111
Total	**710**	**843**	**1180**

Per Capita Water Availability



Water Quality

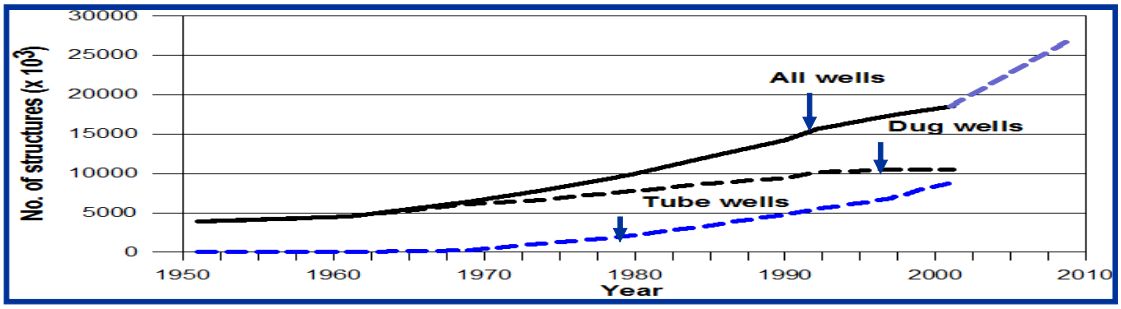
- 302 polluted river stretches on 275 rivers identified by CPCB in 2015 (650 towns located along these stretches)
- River stretches categorised in 5 priority classes based on BoD levels
- Major Ground Water Quality issues
  - Arsenic
  - Fluoride
  - Iron
  - Nitrate
  - Salinit

Ground Water use in India

- Highest in the World
- Meets 85% of rural domestic requirements, 50% of urban water, and more than 65% of irrigation requirements.

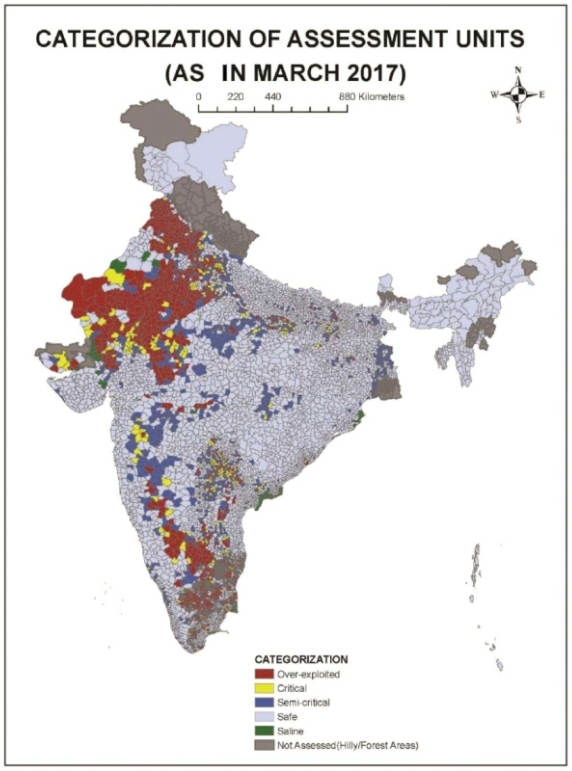
GW Structures

- 3.9 million in 1951
- 18.5 million in 2001
- 27 million in 2009
- 31 million in 2013 (estimate) (approx. 10 structures/sq. km)



Growth of GW Structures

Ground Water Development Scenario



Assessed units	6881
Over-Exploited	1186 (17%)
Critica	313 (5%)
Semi-Critica	972 (14%)
Safe	4310 (63%)
Saline	100 (1%)

Flood Management

Flood 49.815 mha
Area Protected, so far: 20.538 mha
LLength of Embankment Constructed: 37072 Km
Flood Forecasting Stations: 325
Collaboration with Google for Inundation forecast
Lead time for forecasting to be reduced to 72 hrs.

Climate Change - Implications on WR

- Decline in the glaciers in the Himalayas

- Increased drought & flood events – same amount of rainfall in shorter duration

- Increased saline intrusion of coastal & island aquifers due to rising sea levels

- Impact on WQ
- Increased water stress

POLICY INITIATIVES

National Water Policy, 2012

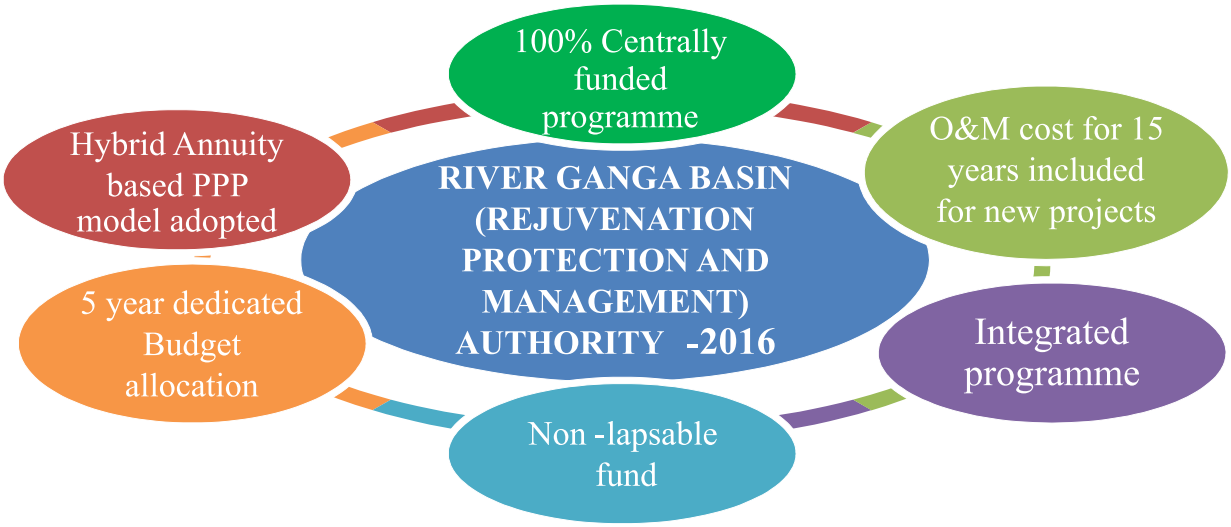
- Prioritizes water use - safe drinking water and sanitation; food security & livelihood followed by eco-system needs.
- Develop benchmarks for water uses for different purposes to ensure efficient use of water.
- Recommends setting up of Water Regulatory Authority
- Incentivisation for recycle and re-use.
- Water resources projects & services be managed with community participation

Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)

- Launched during 2015-16
- Aim to enhance physical access of water on farm and expand cultivable area under assured irrigation.
- 99 projects identified to be taken up for their completion by December, 2019.
- Likely potential utilization through these projects is estimated to be 76.03 lakh hectare.
- Innovative Measures
  - Maximum use of Piped distribution Network (saving in-land acquisition)
  - Participatory Irrigation Management (PIM)
  - Management Information System for monitoring
  - Assessment through Remote Sensing

Namami Gange Programme

- **"Namami Gange – Integrated Ganga Conservation Mission**



Dam Rehabilitation & Improvement Project

- **Objective:** Improve safety and operational performance of selected existing dams, along with institutional strengthening with system wide management approach.
- **Budget Outlay:** US $ 416.5 M with World Bank assistance.
- **Scope:** 7 States, 198 dams, 10 Agencies (8 States & 2 Central)
- **Duration**: 8 years, Scheduled closing in June 2020
- **Three Components:**
  - Rehabilitation and Improvement of dams and associated appurtenances;
  - Institutional strengthening; &
  - Project Management

National Hydrology Project

- Nation wide project in collaboration with World Bank
- Standardizing Water Resources data and Information System for the country with uniform procedures and database.
- Integration of River basin information with improved access to Centre, States and Public-domain.
- Introducing country wide generic solutions for flood forecasting and River basin based water management.
- Developing site specific solutions for water resources planning, operation and management including use of remote sensing based techniques.

Interlinking of Rivers

- The National Perspective Plan (NPP) for Water envisaging Inter Basin Water Transfer comprising of two Components :
  - Peninsular Rivers Development - 16 links
  - Himalayan Rivers Development - 14 links
- Priority Projects :
  - –Ken – Betwa
  - –Damanganga – Pinjal & Par – Tapi – Narmada
  - –Godavari-Krishna-Cauvery (Grand Anicut) alternative scheme

National Aquifer Mapping and Management Programme (NAQUIM)

- NAQUIM initiated in 2012 with objective to delineate aquifers
- Area identified - ~25 lakh sq km
- Generation of aquifer maps & management plans.
- Aquifer maps and management plans prepared for nearly 11 lakh km^2.
- Proposed to cover Over-exploited & critical Blocks by 2020.

Jal Shakti Abhiyan (JSA)

Objective
Time bound, Mission mode, Water conservation campaign

Duration –
Phase I: 1st July – 30th September 2019
Phase II: 1st October – 30th November for 4* States/UTs with the retreating monsoon

36 States/UTs 256 Districts 1592 Blocks	256 ASs/JSs 447 DySecy/Dir 447 Tech officers	5 targeted Water Conservation Interventions areas	Targeted Communications Campaign Farmer / Communit mobilization	Application of Space Technology for Water Resource Management	Real Time monitoring dashboard

** Andhra Pradesh (South), Karnataka (South), Puducherry and Tamil Nadu*

Initiatives of State Governments

- **33 States/UTs have made Roof top Rainwater Harvesting mandatory**

- **Number of flagship programs are run by the State Governments with focus on water conservation/harvesting:**

  - **Andhra Pradesh – Neeru Chettu**
  - **Maharashtra – Jalyukt Shivar Abhiyan**
  - **Rajasthan – Mukhyamantri Jal Swawlamban Yojana**
  - **Telangana – Mission Kakatiya**
  - **Tamilnadu – Kudimaramath**
  - **Gujarat – Sujalam Safalam Jal Abhiyan**
  - **Uttar Pradesh – Khet Talab**
  - **West Bengal - Jal Dharo Jal Bharo**
  - **Chhattisgarh – Narwa Garwa Gurwa Badi**

Initiatives of State Governments contd…

- Ban on early sowing of paddy – Punjab & Haryana
- Jal hi Jeevan Hai - MSP/Incentive for less water intensive crops – Haryana
- Pani Bachao Paisa Kamao - Punjab
- Rebate in property tax – Jabalpur, Indore & Gwalior Municipal Corporations.
- Financial incentives for adopting rainwater harvesting and rebate in water bills – Delhi
- Total prohibition on groundwater extraction from deep tube wells (≥ 60 m) – Maharashtra
- Mandatory use of drip irrigation for sugarcane cultivation - Maharashtra
- Constitution of State Regulatory Authorities in few States

District-level Initiatives

- Banda (Uttar Pradesh) – Kuan Talab Jiyao Abhiyan
- Jalaun (Uttar Pradesh) – Bhujal Kosh Sanchay
- Chitrakoot (Uttar Pradesh) – Revival of river Mandakini (Mandakini Sena)
- Almora (Uttarakhand) – Revival of river Kosi
- Kannur (Kerala) – Haritha – Theeram
- Koderma (Jharkhand) – Project Sanrakshan

Individual / NGO/CSR Initiatives

Some of the initiatives of private/NGOs with focus on water conservation/harvesting:

- **Hivre Bazar – District- Ahmednagar, Maharashtra**
- **Ralaegaon Siddhi – District - Ahmednagar, Maharashtra**
- **Apna Taalab abhiyan – Bundelkhand, MP/UP**
- **Jal Saheli – Bundelkhand, MP/UP**
- **MARVI- Gujarat/Rajasthan.**
- **Pani Foundation – Maharashtra.**
- **Gram Vikas Navyuvak Mandal – Laporia, Rajasthan**
- **ACWADAM – Maharashtra**
- **Akaar charitable trust – Rajasthan**

Way Forward

- **Integrated River Basin Development and Management**
- **River Development by ensuring**
  - **Environmental flows in rivers**
  - **Sediment management in rivers**
  - **Flood plain management**
  - **Pollution abatement**
- **Increase water storage (rainwater harvesting, ground water recharge, surface water storages)**
- **Increasing irrigated area (AIBP), reducing gap between Irrigation potential created & utilized (IPC-IPU)**
- **Recycle-reuse of water**
- **Increasing water use efficiency (micro-irrigation, pipe irrigation)**
- **Permanent mechanism to resolve Inter-State disputes**
- **Promote research & development activities in water sector**
- **Participatory Water Management**

Thanks

Keynote address Shri Prameswaran Iyyar, Secretary, Department of DW&S Ministry of Jal Shakti During Plenary session

सत्यमेव जयते

JAL SHAKTI AND WATER GOVERNANCE

Parameswaran Iyer
Secretary, Department of Drinking Water and Sanitation,
Ministry of Jal Shakti
Government of India

STRUCTURE OF THE PRESENTATION

Leaving no one behind

The Policy of Implementation

Water – with a capital 'W'

Jal Shakti

- Jal Shakti Mantralaya
- Jal Jeevan Mission

Everybody's business

LEAVING NO ONE BEHIND

Sabka Saath, Sabka Vikaas

Identifying the marginalized and ensuring basic service delivery

Fast-tracking progress among the furthest behind – correcting legacies of incomplete delivery

Social inclusion and participatory initiatives

Bottom up approach: of the people, by the people, for the people, **with the people**

Did You Know?

Of the Swachh Bharat Mission's 10 crore toilets, over 9 crore are for BPL households, women headed households, and households belonging to Persons with Disabilities, marginalized and landless farmers, Scheduled Castes and Scheduled Tribes.

THE JAL SHAKTI MANTRALAYA

A bold, needed step for institutional integration

An integrated Ministry for Water

D/o Drinking Water and Sanitation

D/o Water Resources, River Development and Ganga Rejuvenation

Integration till the grassroots

- Ministry of Jal Shakti
- State Departments
- District administrations
- Village water and sanitation committees

JAL SHAKTI ABHIYAN

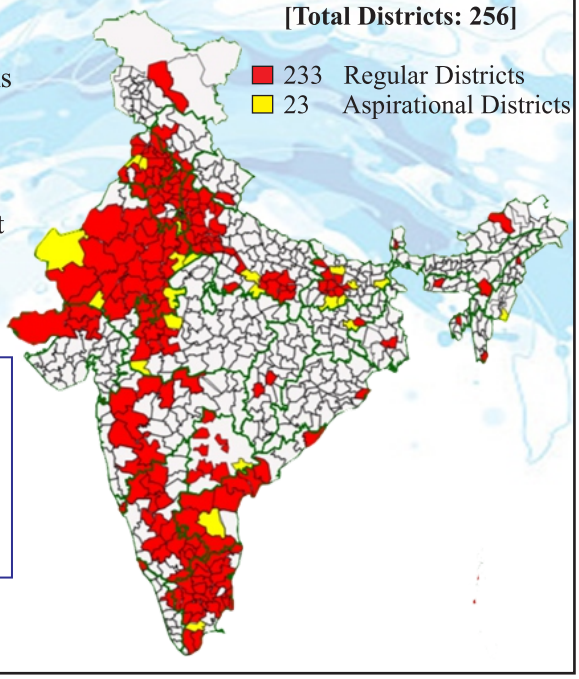
Kickstarting water conservation efforts with participatory Governance

1st July – 30th November 2019

- 36 States/UTs, 256 Districts, 756 Urban Local Bodies, 1592 Blocks
- 256 ASs/JSs, 447 DySecy/Directors, 447 Technical officers
- Targeted Communications Campaign
- Application of Space Technology for Water Resource Management

5 key intervention areas

Water conservation and Rainwater Harvesting	Rejuvenation of traditional and other water bodies	Reuse and Recharge Structure	Watershed Development	Intensive Afforestation (saplings planted)



THE POLICY OF IMPLEMENTATION

First things first: Sadak, Bijli, Shauchalaya… Paani

Learning from Swachh Bharat

- **Effective delivery of services**
- **Government as support agents**
- **Bottom up approach**

The Swachh Bharat *jan andolan*

- A people's movement for behaviour change
- Over 6.5 lakh Swachhagrahis engaged in Inter Personal Communication
- Declaration of progress by Gram Sabhas
- SBM units at village, block, district, state level
- Real time monitoring and engagement
- Not just a *sarkaari* programme

Water – with a capital 'W'

A multi-dimensional challenge

- Ground water
- Sea water
- River water
- Rain water
- Water Supply
- Wastewater Management
- Water Quality
- Sanitation
- Water conservation
- Agricultural use
- Industrial use
- Use for Energy
- Use for domestic purposes

JAL JEEVAN MISSION

Har Ghar Nal Se Jal by 2024

Source Sustainability	Piped Water Supply	Reuse of Greywater	Operations and Maintenance
• Rainwater harvesting at all public buildings • Borewell recharge structures	• Ground/Surface waste • Overhead tanks • Distribution	• Drains • Community soak pits/waste stabilization ponds	• Community to finance and manage O&M

The JJM aims to take household piped water connections from 18% to 100% in five years

TRANSFORMING WATER GOVERNANCE

Lessons from the 4 Ps of the SBM

Political Leadership	• PM announced piped water supply for all in five years • Integration of water related departments to form the Ministry of Jal Shakti
Public Funding	• Over Rs. 3.5 lakh crore committed for the Jal Jeevan Mission
Partnerships	• Massive drive to kickstart JJM with water conservation, through joint efforts by GoI, Development Partners, NGOs and pvt. sector
People's Participation	• Making water – everyone's business • **Water to be managed at the lowest appropriate level**

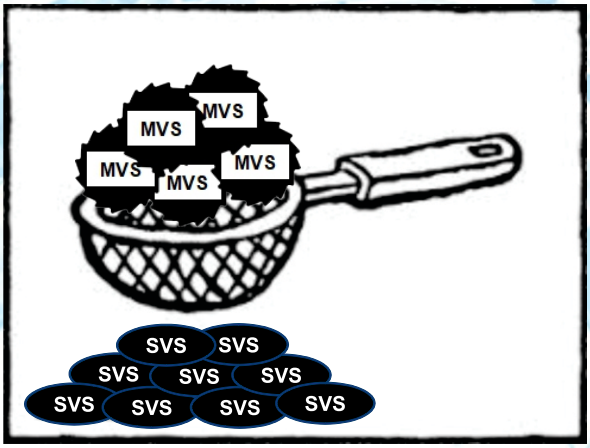
SCALE & SUSTAINABILITY

The Big 'Ss' for National Development

Principle of subsidiarity

At the lowest appropriate level

- Community -managed and sustainable water management
- Most tasks performed at a more immediate or local level



Overall role of the Gram Panchayat

The Gram Panchayat has overall role for the oversight and coordination of water supply initiatives, through the GP's villages.

EVERYBODY'S BUSINESS

Community based water supply for sustainable development

The Swajal project in Uttarakhand and WASMO in Gujarat, demonstrated that with adequate capacity and training, water can be most efficiently managed at the lowest appropriate level

1. Tata Trusts have reached out to more than 2,000 villages across 8 states by providing safe drinking water through an integrated community-driven approach

Participatory Groundwater Management by Arghyam and its partners to build a suitable model for groundwater management through aquifer-based, community-centric approach

The Aga Khan Rural Support Programme improved household-owned drinking water assets and promoted a village-level system in collaboration with community institutions

Thanks

Keynote address by His Excellency Mr. Walter Lindner, Ambassador of Germany during Plenary Session

Namaskar!

I am extremely glad to see that the India Water Week 2019 is being organised in the most fitting times. Across the world deliberation and discussions on mitigating the impacts of climate change are happening. It is a time of global action. While we gather here, world leaders including from India and Germany are conferring at the Climate Action Summit in New York to express their concerns and plans to make this planet a greener place. This is the time when we are trying to revise the price tag on carbon emissions in Germany. The young generation is becoming increasingly concerned about climate change and what actions we are taking. Their international movement has already changed the mindset of many.

The challenges like plastic pollution in our oceans, melting glaciers, and threats to biodiversity have never been so severe. In India and worldwide, the impacts of climate change have reached to all of us. Erratic climatic events like floods and heatwaves are being reported from all parts of the world. Recently, the European countries have witnessed one of the hottest summers in the history. Freshwater resources have been most adversely affected by the climate change. The situation is expected to worsen as global population will reach to 10 billion in next 30 years and one of the most pressing challenges will be how to cater their water needs. This demands for our collective action to sustainably manage water resources by deploying strategies like harvesting rainwater, accelerated efforts to clean our rivers and reusing treated wastewater.

I would like to reiterate that we can address the perils of climate change by collective action and I count on all water professionals to join forces to find solutions. I am happy to share that Germany is working together with India's National Mission for Clean Ganga – Namami Gange in the states of Uttarakhand and Uttar Pradesh for the rejuvenation of river Ganga. Moreover, the India-EU Water Partnership has been supporting India in implementing River Basin Management since its inception in 2016.

I am happy to see the experts from all over the world here to find the solutions for challenges of water resource management in India and other countries. I am convinced that if we can develop solutions in the Indian context, it will indeed lead us to relatable solutions for the rest of the world. I would like to conclude that only collaborative efforts from everyone will lead us into a sustainable future.

Let us work together to make this planet and India a greener and cleaner place.

Keynote address by His Excellency Mr. Kenji Hiramatsu, Ambassador of Japan, during Plenary Session

Mr. U.P. Singh, Secretary, Department of Water Resources, River Development & Ganga Rejuvenation, Ministry of Jal Shakti, Mr. Parameswaran Iyer, Secretary, Department of Drinking Water & Sanitation, Ministry of Jal Shakti, Distinguished Participants, Ladies and Gentlemen,

I would like to begin by offering my heartfelt congratulations on this 6th India Water Week. It is my greatest honour to participate in this prestigious event, on behalf of Japan, the Partner Country. Prime Minister Mr. Narendra Modi's sense of urgency in overcoming water issues in India encourages us. “Water” lies at the base of the achievement of SDGs, linking solutions to sanitation, education, gender equity, food production, energy and disaster risk reduction. I pay my sincere respect to Prime Minister Modi for being at the forefront of resolving difficulties in the water sector in India, in which there are various challenges, including water shortage, flooding, securing purified water, and sanitation. I, personally and on behalf of Japan, would like to totally support such earnest efforts of India.

Japan is a country rich in water. The North-west monsoon in winter brings much snow on the high ridges of mountains; this snow percolates down into the mountains; the mountain rocks filter the ground water, and ground water ultimately springs out at the mountain foot, after undergoing a hundred-year long natural filtration process. But at the same time, Japan is a disaster-prone country, and has been repeatedly experiencing water-related disasters and droughts over the centuries.

With such a history, the ancient people of Japan developed various knowledge and techniques to manage water-related issues. For example, there is a region in the island of Shikoku in the western part of Japan that is known for having dry climate throughout the year.

This region has historically suffered from perennial droughts. There, as early as in the 8th century, a water reservoir called "Man-No Ike"（満濃池was built to secure irrigation for paddy fields.

In the 16th century, a Japanese feudal lord from Yamanashi Prefecture undertook an innovative piece of civil work that functioned to reduce water flow in the rivers during times of flood. This infrastructure is still functional and maintained, and its concept has been inherited to present-day civil engineering.

In the same Prefecture, there is a unique facility called "Sanbu ichi Yusui"（三分一湧水）was established in the Middle Ages. I am sure this name is of no meaning to those of you who don't speak Japanese, but it means something like "spring water divided equally into three parts." This facility applies a very creative method to divide the spring water of 8,500 tons per day equally among 3 villages downstream, ending a long-standing water dispute among these villages. This mechanism is still functional to date.

After the Second World War, in the period of spectacular economic growth and rapid population increase, Japan made its hardest efforts to secure water resources for drinking, industrial use and agriculture, to improve sanitation, as well as to protect the people from water-related disasters. As a result, 98% of the population of Japan are now served by piped potable water. *(Modernised sanitation, such sewerage or decentralised wastewater treatment, covers almost of all the populated areas.)* Japan is very pro-active towards maintaining these infrastructure in good condition. For instance, the water leakage rate of Tokyo Waterworks is just approximately 3%.
Japan is no exception when it comes to being affected by climate change. The phenomena and damages arising from meteorological disasters are becoming severe and extreme. In 2018, a devastating flood occurred in western Japan that claimed more than 200 lives, which was the worst such calamity in the past 30 years. Encountering such situations, Japan, with its constantly evolving expertise, has been making incessant efforts to overcome new challenges, including adaptation to climate change.

Based on such technologies and experiences, Japan has been involved in various kinds of cooperation on water issues in India, through its ODA channel. The cumulative amount of Japanese ODA loans for the water sector in India has reached 299 billion JPY, approximately 19,700 crore INR. Many projects are currently under way, such as the "Ganga Action Plan Project in Varanasi", "Rajasthan Water Sector Livelihood Improvement Project", "Bengaluru Water Supply and Sewerage Project", and the "Chennai Seawater Desalination Plant", to name a few examples. In addition, recently, Japanese experts also have become involved in cooperation activities for flood management.

I had the honour of meeting with H. E. Mr. Gajendra Singh Shekhawat, Honourable Minister of Jal Shakti, immediately after the beginning of his office, and discussed with him policy for future cooperation between Japan and India in the water sector. I also have received requests and proposals for cooperation with Japan directly from Chief Ministers of several states. I want to respond positively to such hopes and expectations, and will personally stay committed to water-related issues, as one of the most important issues at hand.

7 Japanese companies, Toshiba Water Solutions, Totetsu, AGC, Sekisui DLJM, Asahi Kasei, Kuraray Aqua, and Daiki Axis, are participating for the first time in the 6th India Water Week to showcase their latest and cutting-edge products and excellent services.

All of these companies have solid track records and performances in India, and are trying to introduce their products and services to India by working with JICA. Let me give you some examples of such products; a resin structure that can be installed under sporting fields or gardens to harvest percolating rain water to mitigate drought; an Electro-dialysis Purification System that is capable of purifying groundwater contaminated by nitrate etc., to provide safe, potable drinking water in rural areas.

I hope that the potential of these products and services would be utilised to the maximum extent, and would contribute to the effective mitigation of India's water issues.

In the afternoon tomorrow, 25th September, Japan is organising a special session, entitled "Japan's Contribution to India's Water Challenges - Cutting-edge Technologies and Long-term Experiences of Japan". In this session, Japanese companies I just introduced will be demonstrating their good products and services. Furthermore, delegates from the Government of Japan will share our comprehensive policy on the integrated management of water resources, water related disasters as well as the environment.

Taking this opportunity, I am pleased to inform you that the 4th Asia-Pacific Water Summit, which is the high-level meeting on water related policy in the Asia-Pacific Region, will be held in October 2020 in Kumamoto, Japan. Kumamoto is known as a city whose single source of drinking water for all of its 740,000 inhabitants is groundwater. The perfection of the water cycle system there, established more than 400 years ago, makes this possible. I whole-heartedly welcome and hope that a number of high-level delegates from India would participate in the 4th Asia-Pacific Water Summit next year.

Human beings cannot survive without water. It is paramount that we overcome water issues to enable people to carry on with their socio-economic activities, and to free ourselves from the travails and anxieties of obtaining water. Japan is determined to support India's further growth through water-related initiatives and projects. I desire to realise our common dream of "Water Hassle Free India" by working together hand-in-hand with all of you.

Thank you.

Keynote address by Justice Tejinder Singh Doabia (Retd.) during Plenary Session

Importance of water and need for Cooperation of all citizens to make sensible use of this rare commodity:

Lest the human race face the same fate which fell "Ancient Mariner" of Coleridge it is apt to take stern remedial measures. There may be water around us but "not a drop to drink".
It is said that in the last century most of the wars were fought with a view to control the oil producing areas. This century is likely to witness wars with a view to control pollution free fresh water sources.
It would be apt to remind both the State and Municipal Authorities that they should wake up before the matter slips out of their hands.

"As stated by Thomas Fuller in Gnomolgia 5451 we never know the worth of water till the well is dry. The authorities and functionaries must bear in mind that "nature never did betray the heart that loved her". (WORDSWORTH IN TINTERN ABBEY). Nature's fury when aroused have been described by Rober E Sherwood in "The Pertrified Forest" in the following words.—

".....Nature is hitting back. Not with the old weapons – Floods, plagues, holocausts. We can neutralize them. She's fighting back with strange instruments called neuroses. She's deliberately inflicting mankind with the jilters....She's taking the world away from the intellectuals and giving it back to the apes."

Let all concerned continue as intellectuals and not become apes by provoking antagonizing nature. Easiest way to provoke nature is by polluting water and remaining callous to pollution, because water is one of the greatest gifts of nature.

Water has often been worshiped and revered as a source of life. The Egyptians worshiped the Nile. The Hindus worship the Ganges. The natural springs of Greece were chosen as sites for temples. And, of course, baptisms are performed in water.

Water is life

Deprived of water, plants droop and wither. Without water animals thirst and die. Water is the essence of life. Without it there is no life. No seed could germinate. No plant could grow. No animal could live. Without water, This planet would forever have remained one vast barren rock, a lifeless desert**.**

Right to clean water as basic human right

Clean water should be the basic human right all over the world. Clean air and clean water are also necessary for all animals of the world who require water for drinking and without water no animal plant, can survive.

As agriculture is more and more dependent on chemical fertilizers, these, too, find their way on to our food items. In our country there is no restriction on the use of pesticides.

The chlorine in chlorinated tap water combined with animal fats in the diet results in a chemical union of the chlorine and fat into a sticky paste like substance. This stuff adheres to arterial walls, thus causing atherosclerosis – heart disease, in plain English, the biggest killer in the world.

Right to get water is a part of right to life guaranteed by Article 21 of the Constitution

The Court lamented that a Country like India which solved the problem of town planning 6000 years ago in the Indus Valley Civilization and which discovered the decimal system in Mathematics and Plastic Surgery in Medicine in ancient times, and is largely managing Silicon Valley in U.S.A. today has been unable to solve the problem of water shortage till now. The right to get water is a part of right to life guaranteed by Article 21 of the Constitution. In this connection, it has been observed in *Delhi Water Supply & Sewage Disposal Undertaking v. State of Haryana*,that "water is a gift of nature. Human hand cannot be permitted to convert this bounty into a curse, and oppression, the primary use to which water is put being drinking, it would be mocking nature to force the people who live on the bank of a river to remain thirsty." Similarly in *Chameli Singh v. State of Uttar Pradesh*, the Court observed that "right to live guaranteed in any civilized society implies the right to food, water, decent environment, education, medical care and shelter. These are basic human rights known to any civilized society. All civil, political, social and cultural rights enshrined in the Universal Declaration of Human Rights and Convention or under the Constitution of India cannot be exercised without these basic human rights."

Wastage of water, need to create social awareness

For the purpose of mouth-wash, we require not more than half a litre of water, but we always keep the water-tap open and we waste water which is 75% out of 100% taken from the tap. Urban population use tap-water not only for gardening, but even for washing outer walls of the big buildings. In order to stop the wastage of water, people have to be made aware of future water crisis. No awareness can succeed unless the children are given regularly the environmental education.

They must be taught the necessity of water and reach to the masses that unless we preserve water and unless we stop the wastage of water, it will lead to water scarcity. Water is the gift of the Nature and such gift of the Nature should not be misused. If it is misused, we have to pay the penalty.

Issues in *Intellectuals Forum*, *Tirupathi*, conflict between the competing interests of protecting the environment and social development

The issues which arose in *Intellectuals Forum*,*Tirupathi v. State of Andhra Pradesh*, may be serialised:

(a) Whether the Urban Development could be given primacy over and above the need to protect the environment and valuable fresh water resources?
(b) Whether the action of the State in issuing the Government orders could be permitted in derogation of Articles 14 and 21 of the Constitution of India as also the Directive Principles of State Policy and fundamental duties enshrined in the Constitution of India?
(c) Whether the need for sustainable development can be ignored, done away with and cause harm to the environment in the name of urban development?
(d) Whether there are any competing public interests and if so how the conflict is to be adjudicate or reconciled?

The Supreme Court of India considered the sensitive issues raised in *Intellectuals Forum*, *Tirupathi v. State of Andhra Pradesh*, and was of the opinion, that the nature of the question involved the jurisprudential issues. In the event of conflict between the competing interests of protecting the environment and social development, the Supreme Court of India in the case of *M.C. Mehta v. Kamal Nath*, has held that the issues present a classic struggle between those members of the public who would preserve the rivers, forests, parks and open lands in their pristine purity and those charged with administrative responsibility, who under the pressures of the changing needs of an increasingly complex society find it necessary to encroach to some extent upon open lands heretofore considered inviolate to change. The resolution of this conflict in any given case is for the legislature and not for the Courts. If there is a law made by Parliament or the State Legislatures, the Courts can serve as an instrument for determining legislative intent in the exercise of powers of judicial review under the Constitution. But, in the absence of any legislation, the executive acting under the doctrine of public trust cannot abdicate the natural resource and convert them into private ownership or commercial use. The aesthetic use and the pristine glory of the natural resources, the environment and the ecosystems of the Country cannot be permitted to be eroded for private, commercial or any other use unless the Courts find it necessary, in good faith, for the public and in public interest to encroach upon the said recourses.

Steps which can be taken to save water

(1) Turn off the tap while brushing teeth or shaving. This would save four to ten gallons of water a day.
(2) Use plain white toilet paper which degrades faster than decorated, coloured paper.
(3) Don't flush the toilet after every use.
(4) Rather than washing your car in the driveway, do it on a green area. Wash your car out of a bucket and use the hose for rinsing.
(5) Use a broom, not a hose, to clean off your driveway or sidewalk.
(6) Install sink faucet aerators and water-efficient showerheads, which use two to five times less water but do not noticeablu decrease cleansing performance.

(7) If your shower fills a half-gallon milk carton in less than ten seconds you are using too much water.

Ground water

For a country which faces the big thirst 20 years from now, groundwater and its proper use is crucial. An accurate picture of India's groundwater resources and use is not readily available. However, guesstimates are : groundwater reserves at a depth of 300 metres are said to be about 3,700 million hectare – metres (mham), almost 10 times the annual rainfall. The investigations show that the 'hard rock' formations of peninsular India – nearly 70 per cent of the country's land mass – hold more groundwater than was assumed earlier. Thus, the most up-to-date figures by the Central Ground Water Board put the annual exploitable potential at 42.3 million hectare-meter, of which only 10 million hectare-meter are being exploited at present.

Groundwater use offers a number of advantages when compared to surface water. Groundwater reservoirs and evapotranspiration losses are also minimized. Groundwater can be developed quickly and near the place of use, whereas surface water storage reservoirs require suitable sites and costly distribution systems. Groundwater is less likely to get polluted and the expenditure can be recovered faster. It is also a remedy for water logging, particularly where the water table is high.

Growing misuse

The spurt in the number of tube wells is an indication of the increasing use of groundwater. As in the exploitation of almost every resource in this country, there is more than a suggestion of misuse. For one, the water table is declining. Groundwater withdrawals consistently exceeding the recharge lead to a permanent decline in the water table. Inevitably, there is little official or authentic data on the extent of the decline.

There are six districts in the west Indo-Gangetic plains where the annual withdrawal of groundwater exceeds the recharge :Kapurthala and Malerkotla in Punjab, Mohindergarh in Haryana, Baghpat, Alipur and Saharanpur in Western Uttar Pradesh. The surge of tube well irrigation in Punjab and Haryana peaked in the mid-seventies and then fell because there wasn't enough groundwater to go around.

The decline in the water table affects poor farmers the most – the richer ones can dig deeper and stave off disaster. Users of dug wells and those who rely on traditional water lifts, human or animal operated, are literally left high and dry. In Malerkotla district, a CGWS study concluded that annual groundwater withdrawals were about 58,000 hectare metres against a yearly recharge of only 49,000 hectare metres. The water table had declined from a depth of 12 ft to 15 ft to more than 300 feet. As a result, the Persian wheels (a traditional water lift) have fallen into disuse.

It was estimated that between 9.5 to 14.3 million cubic miles of water are stored in the underground and only a small portion of the volume is available for consumption. The world's largest aquifer is the Ogallala aquifer which stretches from southern South Dakota to North-west Texas, covering an area three times larger than New York States. In U.S. one-fifth of all irrigated land is irrigated by ground water extracted from Ogallala aquifer which is stated to be a body of water equal to that of Lake Huron. It took nearly half million years for that ground water to accumulate and it was estimated that with the current rate of extraction it will be depleted within few years.

In U.S. the environmentalists were protesting against unlimited extraction of ground water. Unlimited extraction without any recharging creates a vacuum in the underground water level which may subside the land and may start to compact. The result is that widespread land subsides, gapping holes are appearing in some areas. In California over 5000 Sq. miles were affected. Around Mexico City some lands have subsided by 30 ft.

In India no effective step or initiative has been taken as for preserving rain or surface water. Every year 95,000 cubic miles of water evaporate from the oceans into the atmosphere and out of that about 90% of that water return to the oceans. Out of 10% that falls on the land, if a fraction of it can be preserved, there will be no scarcity of water and there will be no need to depend mainly on underground water.

Falling ground water level

The Supreme Court of India took notice of the news item under the caption "*Falling Groundwater Level Threatens City*" appearing in the *Indian Express* of 18th March, 1996. In response to the notice issued to the Government it was stated "that the main reason for gradual decline in the level of groundwater in certain areas of the country is over-exploitation. Presently the control being exercised in the country for regulating groundwater development is in the form of indirect administrative measures being adopted by institutional finance agencies who by and large insist on technical clearance of the schemes from authorised groundwater departments of the respective States. These departments in turn look into the various aspects of groundwater availability. Another control imposed by the institutional agencies, availing financing facilities from National Bank for Agriculture and Rural Development is by way of prescribing spacing criteria between the groundwater structures. Yet another method of indirect control is by way of denial of power connections for the pump-sets financed through loans from banks. However, in the absence of any law, the administrative measure do not prevent affluent farmers from constructing wells in critical areas. An affluent farmer with his large capital investment can construct a high capacity well which affects shallow wells in the neighbourhood. In order to arrest the depleting trend and to avoid indiscriminatory withdrawal of groundwater, the Government of India had then to bring out suitable legislation on the lines of the Model Bill to regulate and control the development of groundwater in their respective areas."

Concern for fall in level of ground water, the issue of regulating the indiscriminate boring and withdrawal of underground water in the country and the issue of necessary regulatory directions was subject matter of a decision in the case of *M.C. Mehta v. Union of India*. The Court took note of a news item appearing in Indian Express, this was under the heading "Falling Ground Water level threaten city". The Ministry of Environment and Forest, Government of India was directed to formulate the Central Groundwater Board as an authority under Section 3(3) of the Environment (Protection) Act, 1986. This authority was supposed to exercise power under the Environment (Protection) Act, 1986 and regulate and control the ground water management and development. The need to regulate indiscriminate boring and withdrawal of underground water was required to be given urgent attention. The steps which this authority was supposed to take were indicated these are.—

(a) To deploy river basins as the basis for regional planning for sustainable water resource management (along with commensurate land use).
(b) To prepare medium and long term national land use plans *inter alia* including agricultural practices, human, settlement patterns and industrial typology in consultation with Departments concerned. This was to be based on the regional water supportive capacity.
(c) To assess the present irrigation practices and cropping patterns with respect to high water consuming crops and lay down National Agricultural Water Use policy to encourage judicious use of water resources.
(d) To keep under review groundwater levels and quality, and surface water quantity and quality.
(e) To devise and implement pragmatic strategies at plan and programme levels.
(f) To ensure maintenance of minimum flows in the rivers so as to fulfil the riparian rights, to protect the flood plains, as also to protect the vital ecological functions of the rivers.
(g) To ensure techno economic feasibility and to implement programmes on reuse of appropriately treated sewage for agriculture, reuse of industrial waste waters as industrial process water, use of treated sewage in social forestry and public parks in municipal areas and reuse of treated wastewater in new housing complexes for non-consumptive usages.
(h) To protect, conserve and augment traditional water retaining structures.
(I) To protect, conserve and augment natural and manmade wetlands in the country.
(j) To promote rain water harvesting in human settlement practices, particularly in cities with more than 10 lakhs population in arid/semi arid regions.
(k) To promote and implement modern and traditional water harvesting technologies to ensure minimal expenditure in groundwater harnessing.
(l) To design and implement programmes to arrest alarming rates of decline in snowline in the country.
(m) To ensure catchment area treatment, including construction of checkdams, contour binding, control of river bank erosion and plantation of endemic fast growing tree species to arrest soil and water loss in all river basins.
(n) To ensure implementation of a forestation programmes for achieving a minimum of 33% forest cover as per the National Forest Policy, 1988.
(o) To prepare and implement guidelines on water rate structure for various water usages commensurate with the production and scarcity value of the resource.
(p) To ensure community participation with a view to harnessing traditional knowledge at all stages in the hololological approach to water resource management."

Today, India uses only a tenth of the rainfall it receives annually and even 40 years from now, will be using only a quarter. But it must learn to store the water and use even the fraction it uses without polluting it, otherwise there will be serious water shortages.

India's groundwater resources are almost 10 times its annual rainfall. But with tube wells, the water table is declining in many areas, leaving the dug wells of the poor high and dry.

Ancient India stored rainfall in tanks and ponds but the British and the independent Indian administrations have neglected them, so where tanks irrigated half the cropped area a century ago they now irrigate less than 10 per cent. Experts calculate that tanks built over 3 per cent India's land area could store a quarter of it rainfall.

The slow death of Kashmir's Dal lake is threatening the livelihood of 50,000 fisher folk.

The ecological value of wetlands has yet to be understood. Calcutta's Salt Lake City today stands on a former sprawling wetland and the result is, with the city's natural drainage system blocked, every shower turns into a flood and the city has lost a major source of fish, its favorite food.

India is one of the wettest countries in the world. Its average annual rainfall is 1,170 mm, with Cherrapunji in the northeast corner getting drenched under 11,400 mm and the sands of Jaisalmer at the other end of the scale pulling along with 210 mm. Considering that the Midwestern United States –the breadbasket of the world – gets an average of 200 mm a year, India should consider itself singularly blessed.

Unfortunately, the country has a singular habit of not making use of its blessings. Even though by 2025 A.D., India will use only a fourth of the total annual rainfall, it is expected to face the threat of shortages two decades from now. The reason for this is simply that India cannot hold on to all the water it receives.

Deforestation is, a major factor in this gloomy scenario. Soil conservation has so far been conspicuous by its neglect, so that a large portion of the monsoon disappears into the sea as surface runoff. To add to the problem, community resources such as ponds, tanks and rivers are the object of continuous and unchecked misuse. The ponds and tanks are fading out through neglect and groundwater is increasingly becoming a private resource through the increasing use of tube wells. Rives, the biggest source by far, are convenient dumps for urban and industrial wastes.

Once ponds and tanks represented an important community resource in rural India. Villagers all over the country would desilt their water bodies. In some parts special festive days were set aside for de-silting operations. In north India, villagers would use the fine silt to coat the walls of their homes. In Bengal, the mud would be used to make houses. In South India, people used it as manure because of the organic content of the decaying vegetable and organic matter.

The Central Ground Water Board announced recently that it expects to complete a nationwide survey. By that time, if the present predications are anything to go by, India will already be coping with the beginning of dry rot.

INDIA'S WATER BUDGET

Despite an increasingly desperate situation, India's continues to use its water resources as if the supply is assured. Sudhir Sen, a former Chairman of the Damodar Valley Authority, ascribes this to planners 'resource illiteracy'.

It is difficult to prepare an accurate national picture of India's water resources because accurate field data is almost non-existent. Unbelievable as it may seem, till now we have no arrangements in this country to compile and publish on an annual basis, comprehensive data regarding various aspects of water which are important for policy analysis and programme formulation and for monitoring the efficiency of use of our scarce water resources.

The water flow chart shown in an attempt to quantify the hydrologic cycle. The chart's true value lies in showing the current and future water resources and use patterns. These estimates show that out of the annual precipitation of 400 million hectare-meter (mham) the water utilization in 1974 was only 30 million hectare-meter (9.5 per cent). In 2025 it will rise to 105 million hectare-meter (26 per cent). The latter figure represents the maximum usable potential according to Nag and Kathpalia.

Water demand

The main demand for water is for irrigation. In 1974, irrigation used about 92 per cent of all the water consumed in the Country. Domestic and industrial uses accounted for the remaining 8 per cent. Water scarcity in rural areas or the lack of access to it, forces people to consume less. Even if all domestic and industrial needs are adequately met by 2025, irrigation withdrawals will be almost 73 per cent of total water consumption.

How much of the annual precipitation can be realistically exploited? Estimates range from 86 million hectare-meter to 100 million hectare-meter. Scientists at the Indian Agricultural Research Institute in New Delhi calculate usable potential of 86.5 million hectare-meter, while a team of Indian and American experts estimated it at 92.7 million hectare-meter. In both cases, it was assumed that the present levels of use efficiencies will prevail.

Disaster-Prone Poor

A detailed study commissioned by the Swedish Red Cross found that from the 1960s to the 1970s the average number of disaster events per year increased by half, the average number of people killed per year in these disasters increased over six times and the average annual number of people affected by them almost doubled – an increase that could not be justified merely by population growth. The Swedish Red Cross study concluded: "some disasters, particularly droughts and floods, have become seemingly endless processes that grow only larger and larger". Increasing environmental destruction is increasing the hazard-proneness of the environmentally affected areas and increasing poverty is making large, and growing, numbers of people more vulnerable to these disasters. Within the Third World, these two facts – poverty and environmental destruction – combine to create a literally 'disastrous' situation.

Droughts affect more people in the world than any other form of natural disaster. Global statistics show during the 1960s and 70s the largest number of drought-affected victims lived in India.

The most flood prone areas are in the Ganga and Brahmaputra basins – annual flood damages in the Ganga basin States alone account for about 60 per cent of the total. In the fifties and sixties, Uttar Pradesh, Bihar, West Bengal, Orissa and Assam used to account for three fourths of flood damage. But between 1976 and 1978 Andhra Pradesh, Rajasthan and to a lesser extent Gujarat and Haryana, which lies outside the traditional flood zone were also affected, accounting for about half the total damage in the country. In traditional flood prone areas like West Bengal, matters have become worse because of the increased use of flood plains for agriculture and urbanization and unplanned development of flood prone areas.

"Over-exploitation of groundwater for irrigation is an abuse". In Maharashtra, withdrawals of groundwater in excess of the annual recharge for cultivation of water-intensive crops has led to a serious drinking water and food crisis. This was mainly due to the spread of the use of mechanized pump sets. The rapid depletion of groundwater has increased the number of "problem villages" with no source of drinking water.

The shift in cultivation from rain-fed coarse grains to the water-intensive sugarcane crop in Maharashtra has also led to serve local shortages of groundwater.

Much the same thing is happening elsewhere. The Ahmedabad Municipal Corporation increased its groundwater withdrawals from 10.7 billion gallons in 1951-52, to 18.35 billion gallons in 1971-72. The city magazine 'Amdavadma' reported that in 1980, 450 tube wells withdrew 34 billion gallons to meet domestic and industrial demand.

Overuse of groundwater can lead to the intrusion of saline water, particularly in coastal areas, making the water unfit for drinking and irrigation. In the fifties, farmers in the southern coastal plains of Saurashtra in Gujarat, began intensive cultivation of vegetable and sweet lime using groundwater. By 1970, the groundwater was affected by saline intrusion from the sea and a drop in agricultural production followed. Between 1971 and 1977, the affected area increased from 35,000 hectares to 100,000 hectares. An reclamation plan which will cost Rs.64 crore.

Pollution

Groundwater is less susceptible to pollution than surface water, but its pollution is more difficult to detect or rectify. Recent studies indicate that the problem is growing and in some parts seriously. Some of the culprits :textile printing and dyeing units in Rajasthan, tanneries in Tamil Nadu and Uttar Pradesh and the coir processing industry in Kerala.

Keynote address by Shri A B Pandya, Secretary General, ICID during Plenary Session

INTERNATIONAL AND REGIONAL COOPERATION IN WATER SECTOR

ASHWIN B PANDYA,
SECRETARY GENERAL
INTERNATIONAL COMMISSION ON IRRIGATION AND DRAINAGE (ICID

OUTLINE:

- WATER-SHARING ISSUES: INTERNATIONAL, REGIONAL, STATE TRANS-BOUNDARIES
- NEED FOR WATER COOPERATION TO GENERATE AN EQUITABLE REGIME
- TRANSBOUNDARY NEGOTIATIONS AND TREATIES: GLOBAL AND REGIONAL EXAMPLES
- MECHANISMS FOR WATER COOPERATION
- ROLE OF INTERNATIONAL ORGANIZATIONS IN WATER COOPERATION
- COMMUNICATION AND CAPACITY DEVELOPMENT TO FACILITATE COOPERATION
- CONCLUSIONS

SUSTAINABLE DEVELOPMENT GOALS (SDGS)

TRANSBOUNDARY WATER COOPERATION CAN, IN FACT, HAVE A POSITIVE EFFECT ON MOST OF THE SUSTAINABLE DEVELOPMENT GOALS, EITHER DIRECTLY OR INDIRECTLY

Directly

InDirectly

NEED FOR COOPERATION

- COOPERATION - A PRECONDITION TO SUSTAINABLE DEVELOPMENT, PEACE AND SECURITY
- SOCIAL AND POLITICAL BOUNDARIES INCONGRUENT WITH TRANSBOUNDARY BASIN BOUNDARIES
- MANAGEMENT AND DEVELOPMENTS, HOWEVER, FOLLOW THE POLITICAL AND ADMINISTRATIVE BOUNDARIES
- TRANSBOUNDARY WATERS ALSO CREATE SOCIAL, ECONOMIC, ENVIRONMENTAL AND POLITICAL INTER-DEPENDENCIES
- STAKEHOLDER INVOLVEMENT IS NECESSARY TO ADDRESS THE DISPUTES
- BILATERAL MECHANISM ALLOW FOR THE QUICK PLANNING AND FINANCING OF THE MEASURES OF INTERVENTION FOR UTILISING THE WATER RESOURCES BY EITHER PARTIES
- INTERNATIONAL BEST PRACTICES SUGGEST THAT BETTER WATER MANAGEMENT AND RATIONAL ALLOCATION TO SECTORS ADDING VALUE TO GDP IS BEST PURSUED THROUGH SUCH CO-OPERATIONS

CHALLENGES

WATER RESOURCES ACROSS THE BOUNDARIES (STATE/INTERNATIONAL) ARE UNDER SEVERE STRESS

- CLIMATE CHANGE
- POPULATION GROWTH
- EXPANDING ECONOMIES
- INCREASED ENVIRONMENTAL PRESSURE THROUGH LAND AND ECOSYSTEM DEGRADATION, WATER MISMANAGEMENT
- UNSUSTAINABLE DEVELOPMENT

JOINT MANAGEMENT OF TRANSBOUNDARY WATERS IS OFTEN INHIBITED BY

- DIFFERENT LEVELS OF SOCIOECONOMIC DEVELOPMENT
- INSTITUTIONAL CAPACITIES
- DIVERGENT PRIORITIES
- INCONSISTENT POLICIES
- NON-COOPERATION AMONG STAKEHOLDERS
- DEVELOPMENT PROJECTS ON THE UPPER RIPARIAN SYSTEM WITHOUT A BASIN VIEW

Water Diplomacy is urgently needed to address the water insecurities and cross-border management through integrating science, policy, and practical perspectives to contribute to improved transboundary water cooperation

MANAGEMENT TASKS-SUPPLY SIDE

WATER QUALITY MANAGEMENT

- IDENTIFICATION OF POLLUTION SOURCES
- JOINT MONITORING
- MAINTENANCE OF JOINT POLLUTION INVENTORIES
- SETTING EMISSION LIMITS
- ELABORATION OF JOINT WATER QUALITY OBJECTIVES

WATER QUANTITY MANAGEMENT

- WATER ALLOCATION AND/OR FLOW REGULATION
- WATER USE EFFICIENCY
- MAINTAINING ENVIRONMENTAL FLOWS
- MANAGEMENT AND PREVENTION OF FLOOD OR DROUGHT RISKS
- PREPAREDNESS FOR EXTREME EVENTS, E.G., COMMON EARLY WARNING AND ALARM PROCEDURES

MANAGEMENT TASKS- DEMAND SIDE

MANAGING WATER DEMAND INDIVIDUALLY EACH SECTOR, I.E. AGRICULTURE, DOMESTIC AND INDUSTRIES

- INCREASING SUPPLY USUALLY DEMANDS HIGHER INVESTMENTS IN INFRASTRUCTURE, INCREASED MINING OF GROUNDWATER RESERVES AND SIMILAR ACTIVITIES, PUSHING THE LIMITS OF WATER AVAILABILITY TO ITS MAXIMUM
- AUGMENTING AVAILABLE SUPPLIES TO COMPLEMENT DEMAND
- CHANGE FROM TRADITIONAL TO MODERN FARMING
- CHOOSING SUITABLE CROPPING PATTERN
- WASTEWATER RECYCLING IN INDUSTRIES
- USE OF MARGINAL QUALITY WATER FOR AGRICULTURE

MECHANISMS FOR COOPERATION

- PROCEDURAL AND INSTITUTIONAL ISSUES SUCH AS CONFLICT PREVENTION AND RESOLUTION, INSTITUTIONAL COOPERATION (JOINT BODIES), CONSULTATION ON PLANNED MEASURES AND SO FORTH
- COOPERATION FOR RESOLVING WATER MANAGEMENT ISSUES SUCH AS WATER ALLOCATION, INCREASING DEMANDS, WATER QUALITY, ADDRESSING ISSUES OF FLOODS OR DROUGHTS, AND IMPLEMENTING STRATEGIES TO MITIGATE CLIMATE CHANGE
- MONITORING AND EXCHANGE THROUGH JOINT MONITORING, ANALYSES AND ASSESSMENTS
- JOINT PLANNING AND MANAGEMENT THROUGH DEVELOPMENT OF ACTION PLANS FOR INTERNATIONAL BASIN MANAGEMENT AND ITS INFRASTRUCTURE

MECHANISMS FOR COOPERATION

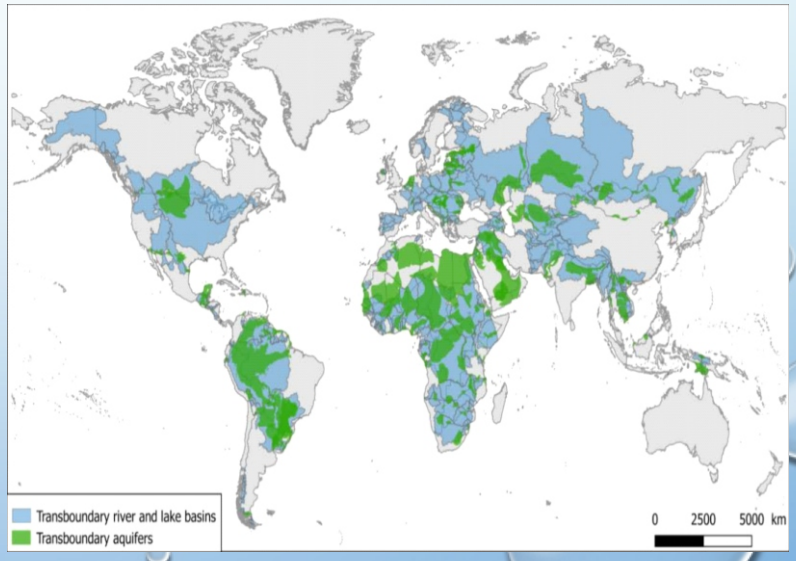
- WATER IS A MATTER OF NATIONAL SIGNIFICANCE REQUIRING A GOVERNANCE FRAMEWORK THAT BRINGS ALL INTERESTED GOVERNMENTS TO THE TABLE
- TRANSBOUNDARY ISSUES INVOLVES SOLVING COMPLEX WATER PROBLEMS WHICH DEMANDS TECHNICAL SOLUTIONS, POLITICAL TRADE-OFFS AS WELL AS BEHAVIORAL CHANGE
- POLITICAL TRADE-OFFS NEED TO BE NEGOTIATED ON THE BASIS OF SCIENCE, HYDROLOGY AND ECONOMICS
- SUSTAINED FINANCING MECHANISMS MUST BE AVAILABLE FOR RESEARCH TO IMPROVE KNOWLEDGE AND ENABLE EVIDENCE TO INFORM DECISION-MAKING OF THE CONSEQUENCES OF POLITICAL TRADE-OFFS
- DEVELOP CAPACITY WITHIN THE GOVERNMENT AGENCIES TO ENGAGE WITH THE RESEARCH AND INDUSTRY SECTORS TO IMPROVE INNOVATION ADOPTION
- EFFECTIVELY ENGAGE WITH AND EDUCATE COMMUNITIES ON THE NEED FOR REFORM
- WATER REFORM IS REGIONAL/RURAL REFORM AS WELL AS ENVIRONMENTAL RESTORATION, SO IT IS NECESSARY TO INVEST HEAVILY IN TRANSITIONING AFFECTED SECTORS
- COUPLING POLICY REFORM WITH NEW WATER INFRASTRUCTURE INVESTMENT IS MORE LIKELY TO DELIVER LONG-TERM, SUSTAINABLE SOLUTIONS
- BASIN-WIDE PLANNING ESSENTIAL TO MITIGATE THIRD-PARTY IMPACTS FROM AD HOC POLICY REFORM OR INFRASTRUCTURE INVESTMENT
- SET A LONG-TERM VISION AND GOALS THAT CAN TRANSCEND POLITICAL-CYCLES

COMMUNICATION FOR COOPERATION

- WE ALL KNOW MEANINGFUL COMMUNICATION PRECEDES ANY FRUITFUL COOPERATION AND MUTUALLY BENEFICIAL COLLABORATION AMONG HETEROGENEOUS STAKEHOLDER GROUPS.
- EFFECTIVE AND EFFICIENT USE OF WATER IN AGRICULTURE IS NOT JUST CONFINED TO THE KNOWLEDGE OF A SINGLE DISCIPLINE OF SCIENCE, ON THE CONTRARY, IT IS MULTI-DISCIPLINARY IN SCIENTIFIC TERMS TO BEGIN WITH AND IT ALSO INVOLVES THE PARTICIPATION OF MULTIPLE STAKEHOLDERS WITH ASYMMETRIC KNOWLEDGE CONTEXTS, SOCIO-ECONOMIC BACKGROUNDS AND CULTURAL BELIEFS.
- SUSTAINABLE AWM WILL REQUIRE A HOLISTIC APPROACH IN WHICH ALL THE PREVIOUSLY MENTIONED STAKEHOLDERS ARE INVOLVED THROUGH BETTER COMMUNICATION PROCESSES AND PLATFORMS SO THAT THEY ARE ABLE TO UNDERSTAND EACH OTHER'S VIEWPOINTS, POSITIONS, AND ARGUMENTS BASED ON A COMMON UNDERSTANDING OF BIOLOGICAL, CHEMICAL, PHYSICAL AND SOCIOLOGICAL PRINCIPLES OF THE UNDERLYING SCIENCE.

INTERNATIONAL COOPERATION

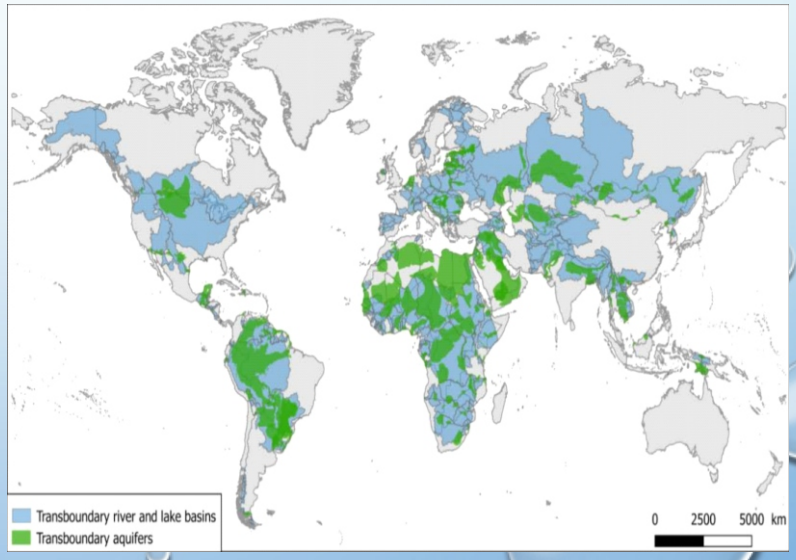
- TRANSBOUNDARY BASINS PROVIDE WATER FOR AGRICULTURE, INDUSTRIES, HYDROPOWER, ECOSYSTEM AND DOMESTIC PURPOSES
- WATER RESOURCES UNDER STRESS DUE TO:
  - CLIMATE CHANGE
  - INCREASING POPULATION
  - ECONOMIC GROWTH
  - UNSUSTAINABLE DEVELOPMENT



Source: UNESCO IHP, 2015

INTERNATIONAL COOPERATION

- WORLDWIDE, 154 COUNTRIES SHARE 310 RIVERS AND LAKES (SIWI) AND 592 TRANSBOUNDARY AQUIFERS (IGRAC AND UNESCO IHP)
- 52% OF WORLD POPULATION LIVES WITHIN SHARED RIVER BASINS (SIWI) AND ALMOST 90% OF THE WORLD POPULATION LIVES IN COUNTRIES SHARING TRANSBOUNDARY WATERS
- 2.8 BILLION PEOPLE (42% OF THE WORLD'S POPULATION), COVER 62 MILLION KM^2



Source: UNESCO IHP, 2015

KEY MESSAGES

- TRANSBOUNDARY BASINS COVER MORE THAN HALF OF THE EARTH'S LAND SURFACE, ACCOUNT FOR AN ESTIMATED 60 PER CENT OF GLOBAL FRESHWATER FLOW AND ARE HOME TO MORE THAN 40 PER CENT OF THE WORLD'S POPULATION.
- TRANSBOUNDARY WATER COOPERATION IS CRITICAL FOR ENSURING SUSTAINABLE MANAGEMENT OF WATER RESOURCES AND ACHIEVING SUSTAINABLE DEVELOPMENT ACROSS THE WORLD, 153 COUNTRIES SHARE RIVERS, LAKES AND AQUIFERS.
- CONFLICTING DEMANDS OVER SHARED WATERS CAN ENGENDER POLITICAL CONFLICTS AND REGIONAL INSTABILITY.
- COOPERATION IS SHAPED BY THE PARTICULAR HISTORICAL, LEGAL AND POLITICAL CONTEXT, AND EXISTING ARRANGEMENTS VARY CONSIDERABLY IN TERMS OF SCOPE AND INTENSITY OF COOPERATION.
- IN SOME REGIONS AND BASINS, SIGNIFICANT PROGRESS HAS BEEN MADE TO FURTHER TRANSBOUNDARY WATER COOPERATION THROUGH OPERATIONAL ARRANGEMENTS. PROGRESS IS PARTICULARLY ADVANCED IN EUROPE AND NORTHERN AMERICA, AND IN MOST MAJOR RIVER AND LAKE BASINS IN SUB-SAHARAN AFRICA.
- FOR THE 62 COUNTRIES CONSIDERED IN THIS FIRST ASSESSMENT, ONLY 59 PER CENT OF THEIR TRANSBOUNDARY BASIN AREA IS COVERED BY OPERATIONAL ARRANGEMENTS, WHILE ONLY 17 COUNTRIES HAVE ALL THEIR TRANSBOUNDARY BASINS COVERED BY OPERATIONAL ARRANGEMENTS.
- COOPERATION ON TRANSBOUNDARY AQUIFERS REPRESENTS A PARTICULAR CHALLENGE AND IS LAGGING FURTHER BEHIND. DELINEATING TRANSBOUNDARY AQUIFERS AND REALIZING COMMITMENTS TO COORDINATED OR JOINT MANAGEMENT OF THIS INVISIBLE RESOURCE THEREFORE POSE PARTICULAR CHALLENGES

UNEP-DHI STUDY FINDINGS (2016)

No of Basins	Population (Million)	Status	Causes
45	90	Under developed	Low risk due to little development or isolated
39	870	Inadequate governance, low development	High risk due to exposure to droughts and floods
25	80	Poor Governance, High water use	Utilizing relatively high portions of available water resources and have high economic dependence on them. Transboundary inter -sectoral allocation mechanisms required
25	280	Good governance, high human wellbeing	Low risks of agricultural water stress but high risks from ecosystem impacts storage capacity has been developed to mitigate agricultural water stress

SOME EXAMPLES OF WATER COOPERATION

- AGREEMENTS WITH CHINA, BHUTAN AND NEPAL FOR GANGA-BRAHMAPUTRA-MEGHNA RIVER SYSTEMS TO SHARE DATA FOR WATER MANAGEMENT AND FLOOD FORECASTING
- GANGA WATER SHARING TREATY PROVIDES A DYNAMIC DISTRIBUTION OF THE CURRENT FLOWS AT VARIOUS PERIODS OF TIME IN A HYDROLOGICAL YEAR
- INTERNATIONAL EXAMPLES
  - NILE RIVER BASIN
  - RED RIVER BASIN
  - RHINE RIVER BASIN
  - MEKONG RIVER BASIN
- REGIONAL EXAMPLES
  - DAMODAR VALLEY COOPERATION
  - GODAVARI TRIBUNAL
  - BHAKRA BEAS PROJECTS

INTERNATIONAL EXAMPLES – NILE RIVER BASIN

- Managed by Nile Basin Initiative
- Basin Cooperation achieved through a neutral regional platform facilitating collective actions to use Nile Basin water to maximize benefits and minimize risks and costs to all Member States
- Enabled environment created for institutional and technical capacity building and knowledge management to manage the water resources to support decision making and action at local levels
- Cooperation leading to water resources development by mobilizing financial and technical resources for investment projects which are environmentally, economically and socially beneficial.

Member States – Rwanda, Burundi, Democratic Republic of the Congo (DRC), Tanzania, Kenya, Uganda, Ethiopia, South Sudan, Sudan and Egypt

Source: Nile Basin Initiative

INTERNATIONAL EXAMPLES – RHINE RIVER BASIN

- Managed by the International Commission for the Protection of the Rhine in coordination with the European Water Framework Directive
- To analyze river pollution levels, implement water protection measures, exchange water data and synchronize monitoring and analysis methods thereafter
- Transboundary cooperation of utmost importance for sustainable development of the basin in terms of the river and ecological health, flood mitigation, water quality improvement and groundwater protection for current and future generations

Member States – Germany, France, Luxembourg, the Netherlands, Switzerland, European Commission in co-operation with Austria, Liechtenstein and Belgian region of Wallonia and Italy

Source: International Commission for the Protection of the Rhine

INTERNATIONAL EXAMPLES - RED RIVER BASIN

- Managed by International Red River Board in coordination with the International Joint Commission
- Prevent and resolve transboundary disputes regarding the waters and aquatic ecosystem of the river, its tributaries and aquifers
- Monitor basin activities affecting transboundary river flows, water quality, and ecosystem health in the river and its tributaries
- Timely and accurately sharing transboundary information to develop flood forecasting techniques and procedures for early flood warning
- Overall basin management and development

Member States – United States of America and Canada

Source: International Red River Board

INTERNATIONAL EXAMPLES – MEKONG RIVER BASIN

- Managed by Mekong River Commission
- Upstream countries, China and Myanmar, are Dialogue Partners
- Works to maximize efficient and mutually beneficial development of Mekong River while minimizing the potentially harmful effects on the people and the environment in the Basin
- Facilitates dialogue among various stakeholders for efficient decision-making

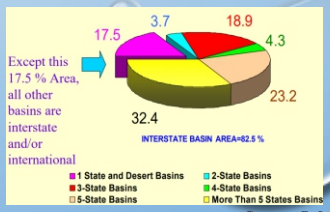
Member States – Cambodia, Lao PDR, Thailand and Viet Nam

Source: Mekong River Commission

INTRA-NATIONAL COOPERATION (INDIA)

- 20 rivers basins comprising 12 major (drainage area > 20,000 km2) and 8 composite river basins (CWC)
- Nearly 83% of the geographical area within inter-state river basin (World Bank, GoI)
- States have their exclusive jurisdictions over issues like land, water and agriculture with water resources distributed across multiple boundaries, thus, bilateralism principles of water agreements becomes essential
- In case of interstate arrangements, legal discourse is feasible for conflict resolution

Source: Central Water Commission



Source: GoI

REGIONAL EXAMPLE – DAMODAR RIVER BASIN

- Managed by Damodar Valley Corporation
- Provides services such as hydropower generation, flood control, irrigation, water supply, soil conservation along with socio-economic development of the Damodar Valley
- One of the earliest arrangements based on Tennessee Valley Authority covering all aspects of a River Basin Organisation in form of Damodar Valley Corporation
- Functioning since 1960s

Member States – West Bengal and Jharkhand

Source: Damodar Valley Corporation

REGIONAL EXAMPLE – BHAKRA BEAS SYSTEM

- Created out of agreements between Union, Punjab (undivided) and Rajasthan Governments
- The Bhakra Nangal and Beas Projects aided the Green Revolution and White Revolution in the States of Punjab, Haryana and Rajasthan
- Enhanced agricultural activities in the region after independence due to improved access to water
- Regulate supply of the Sutlej, Ravi and Beas rivers to the member states
- Operation and maintenance of the projects under its jurisdiction and water allocation for irrigation based on inflows to the reservoirs
- Power distribution in consultation with beneficiary states

Member States – Punjab, Haryana, Rajasthan, and the National Capital Territory of Delhi

Source: Tribune India

REGIONAL EXAMPLE – GODAVARI RIVER BASIN

- The tribunal adopted an interesting approach of generating dialogue amongst party states
- States were encouraged to enter into bilateral and trilateral agreements for parts of basin
- The agreements were then assembled to arrive at the allocation arrangements
- Legalistic arguments were largely avoided when compared to other such efforts

Member States – Andhra Pradesh, Karnataka, Maharashtra, Madhya Pradesh and Odisha

Source: Wikipedia

ROLE OF INTERNATIONAL ORGANIZATIONS (1/2)

- TO SYNERGIZE BILATERAL AND MULTI-LATERAL AGREEMENTS BETWEEN DIFFERENT STATES TO PREVENT UNILATERAL OVER-USE OF WATER RESOURCES
- FACILITATE WATER DIPLOMACY
- PROVIDE FINANCIAL MOTIVATION FOR INDUCING COOPERATION IN REGIONS OF CONFLICTS
- PROTECTING WATER-SHARING AGREEMENTS FROM ONGOING CONFLICTS IN THE REGION
- PROVIDE UNBIASED GUIDANCE TO UPDATE THE TERMS OF AGREEMENTS BASED ON CHANGING CLIMATE, POPULATION AND OTHER FACTORS
- COOPERATION IN CASE OF DISASTER MANAGEMENT

ROLE OF INTERNATIONAL ORGANIZATIONS (2/2)

- CRUCIAL FOR PROVIDING COOPERATIVE FRAMEWORK FOR SUSTAINABLE DEVELOPMENT
- MECHANISMS FOR PROVIDING COOPERATIVE GUIDELINES FOR DATA EXCHANGE
- COOPERATION THROUGH TECHNOLOGY AND KNOWLEDGE-SHARING
- FACILITATE CAPACITY BUILDING OF DIVERSE STAKEHOLDERS
- BRINGING GLOBAL EXPERIENCES THAT MAY SERVE AS GOOD EXAMPLES IN OTHER REGIONS WITH SIMILAR AGRO-CLIMATIC CONDITIONS
- ENGAGING AND TRAINING YOUNG PROFESSIONALS TO DEAL WITH THE UPCOMING CHALLENGES

ROLE OF INTERNATIONAL ORGANIZATIONS EXAMPLE - INDUS RIVER BASIN

- WORLD BANK FACILITATED COOPERATION BETWEEN INDIA AND PAKISTAN RESULTING IN INDUS WATERS TREATY (IWT) IN 1960 FOR WATER-DISTRIBUTION
- ONE OF THE MOST SUCCESSFUL INTERNATIONAL TREATIES
- CRUCIAL FOR PROVIDING COOPERATIVE FRAMEWORK FOR IRRIGATION AND HYDROPOWER DEVELOPMENT MEANWHILE AVOIDING CONFLICTS IN THE REGION
- DIFFERENT PROCEDURES ESTABLISHED TO ADDRESS AND RESOLVE DIFFERENT ISSUES
- TREATY PROVED CONSEQUENTIAL IN BRINGING GREEN REVOLUTION IN INDIA AND PAKISTAN

ROLE OF WORLD BANK

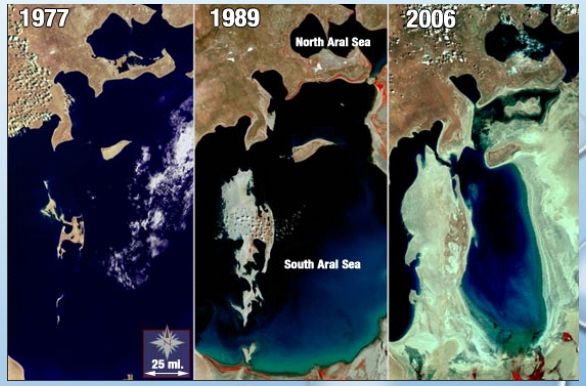
- In 1951, David E. Lilienthal, former chairman of Tennessee Valley Authority, visited India and Pakistan.
- Lilienthal wrote an article with suggestions that Indus Basin be treated, exploited, and developed as a single unit.
- World Bank mediated from 1952 onwards, and Indus Waters Treaty (IWT) was signed in September 1960 although Pakistan, not fully convinced ,refused to sign until 1958.
- IWT conferred rights over 3 western rivers of Indus river system (Jhelum, Chenab and Indus) to Pakistan, and over 3 eastern rivers (Sutlej, Ravi and Beas) to India.

Source: Slideshare

ROLE OF INTERNATIONAL ORGANIZATION EXAMPLE – ARAL SEA BASIN

INTERNATIONAL COMMISSION ON IRRIGATION AND DRAINAGE (ICID) CONSTITUTED A SPECIAL WORK TEAM ON ARAL SEA BASIN (ST-ARAL) FOR

- ASSIST IN ESTABLISHING BROAD-BASED NATIONAL COMMITTEES IN EACH ARAL BASIN COUNTRY
- OBTAIN AND DISSEMINATE INFORMATION ON PROBLEMS OF ARAL BASIN TO OTHER ICID COUNTRIES WITH SIMILAR PROBLEMS
- ORGANIZE NATIONAL AND INTERNATIONAL DISCUSSIONS ON RELATED SCIENTIFIC AND TECHNICAL ISSUES IN THE BASIN
- COOPERATE WITH OTHER INTERNATIONAL ORGANIZATIONS IN RELATED ACTIVITIES



Source: Columbia University

ROLE OF INTERNATIONAL ORGANIZATION EXAMPLE – TRANSBOUNDARY WATER MANAGEMENT

INTERNATIONAL COMMISSION ON IRRIGATION AND DRAINAGE (ICID) CONSTITUTED A TASK TEAM TO ADDRESS THE CHALLENGE OF TRANSBOUNDARY WATER GOVERNANCE FROM WATER AND FOOD SECURITY PERSPECTIVE

- PROJECT-BASED ANALYSES OF HOW THE POLITICAL ECOLOGY OF PROJECTS HAVE CHALLENGED/ENABLED THE PRINCIPLES OF TRANSBOUNDARY WATER SHARING ENUNCIATED BY THE RULES/CONVENTION
- TRANSBOUNDARY GROUNDWATER GOVERNANCE: TECHNOLOGICAL ALTERNATIVES/IMPLICATIONS OF ENABLING GOVERNANCE FOR APPLICATION OF INTERNATIONAL CUSTOMARY PRINCIPLES
- WATER-FOOD-ENERGY SECURITY NEXUS AND ITS IMPLICATIONS TO TRANSBOUNDARY WATER SHARING PRINCIPLES OFFERING PERSPECTIVES FROM PARTICULAR CONTEXTS OF MEMBER-COUNTRIES
- EMERGING NEW TECHNOLOGIES OF WATER AUGMENTATION, USE, CONSERVATION AND REGULATION AND HOW THESE TECHNOLOGIES IMPACT TRANSBOUNDARY GOVERNANCE PRINCIPLES AND PRACTICES
- WATER QUALITY CONCERNS AND ITS IMPLICATIONS FOR TRANSBOUNDARY COLLECTIVE ACTION AND GOVERNANCE
- CLIMATE CHANGE AND ITS IMPLICATIONS FOR HYDROLOGICAL REGIMES, PLANNING PRACTICES AND GOVERNANCE CHALLENGES – HOW THEY POSE CHALLENGES TO TRANSBOUNDARY WATER SHARING

TECHNOLOGY TRANSFER AND KNOWLEDGE SHARING

- POLICY ADVISE AND GUIDANCE IN LONG-TERM DECISION-MAKING
- SUCCESS STORIES OF TRANSBOUNDARY WATER COOPERATION FOR DIFFERENT AGRO-CLIMATIC CONDITIONS
- NETWORKING AND KNOWLEDGE-SHARING ACROSS THE INTERNATIONAL WATERS COMMUNITY FOR CONTINUOUS LEARNING
- DEVELOP KNOWLEDGE DATABASE FOR BEST PRACTICES
- OPEN-SOURCE PLATFORMS FOR BETTER EXCHANGE OF KNOWLEDGE AND CAPACITY-BUILDING
- PROVIDE COMMON GUIDELINES FOR WATER DATA COLLECTION, SHARING AND ANALYSIS
- GLOBAL KNOWLEDGE-SHARING COMMUNITY WOULD PROMOTE TRUST-BUILDING

CONCLUSIONS

1. IMPLEMENTING INTEGRATED APPROACHES TO WATER MANAGEMENT AT THE LOCAL, NATIONAL, AND TRANSBOUNDARY LEVELS, STRENGTHEN WATER GOVERNANCE, AND ENSURE GENDER AND SOCIAL INCLUSION
2. BASIN LEVEL ORGANIZATION IS NEEDED IN ORDER TO IMPLEMENT IWRM
3. CONFLICT RESOLUTION STRATEGIES NEED TO BE IMPLEMENTED TO HARNESS THE BENEFITS OF COOPERATION
4. MULTI-LEVEL INVOLVEMENT AND PARTICIPATION OF STAKEHOLDERS IS ESSENTIAL
5. CAPACITY BUILDING OF THE RELEVANT STAKEHOLDERS IS PARAMOUNT
6. COOPERATION WITH INTERNATIONAL ORGANIZATIONS – SYNERGY WITH DIVERSE NETWORK WORLDWIDE
7. DATA AND INFORMATION SHARING AND DIALOGUE IS IMPERATIVE AND FORMS A BASIS FOR COOPERATION
8. PROPER COMMUNICATION AND TRUST BETWEEN COUNTRIES AND ORGANIZATIONS IS AN IMPORTANT FACTOR IN COOPERATION

GLIMPSES OF PLENARY SESSION

Glimpses of Plenary Session

Audience during Plenary Session

TECHNICAL SESSIONS

SEMINAR-1

WATER FOR FOOD SECURITY

Background

Food and nutritional security are the foundations of a healthy and decent life. The World Food Summit of 1996 defined food security as existing when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet dietary needs for a productive and healthy life. Water is one of the vital input for agricultural production and productivity and therefore key to food security. Over the years due to increased competition for water from different sectors and improved attention to environmental issues, water for food remains a core issue. To feed an increasing population, food production will have to increase significantly but the amount of water and arable land available remains the same.

Globally agriculture consumes about 70% of the total water used for all purpose. In future, the demand for water is expected to increase in all sector including agriculture. In order to produce more nutritious food with less water, innovative water management technologies are required to be put in place to ensure a greener and more sustainable food production. There is a need for improvement in crop yields through implementation of efficient irrigation strategies, reuse of drainage water, use of water resources of marginal quality, adoption of smarter ways to use fertilizer, use of improved crop protection measures, minimization of post-harvest losses, and creation of more sustainable livestock and marine production. The demand for more food will continue to increase due to population growth. In addition, with improved living standards, the dietary habits may undergo changes calling for foods requiring more water for their production. Simultaneously water demand would also be higher for other purposes including that for drinking water needs, environmental requirements and industrial demands etc. Yet another important factor is related to likely impact of climate change, particularly that leading to occurrence of more and more extreme weather events increasingly pose a threat to agricultural production systems. More frequent and severe droughts and floods are already impacting the total production and productivity of both irrigated and rainfed agriculture. There are reports that agriculture itself is one of the contributors to climate change through its share of greenhouse gases emissions, which in turn affect the planet's water cycle, adding to uncertainties and risks in food production. All related aspects need to be addressed to ensure water and food security which would, inter-alia, include: needed changes in policies; strengthening of institutions and preparation of short term and long term action plan.

The seminar involving experts, professionals and managers deliberated the topic for better understanding of the issues and identifying strategies and action plans to address the challenges in respect of water and food security.

Chair and Co-Chair

Shri S K Haldar, Member (WP&P) Central Water Commission, Chaired the Session. Dr. Man Singh, Project Director, Water Technology Centre, ICAR-India Agricultural Research Institute, New Delhi and Shri K Vohra, Commissioner (SPR), Department of Water Resources, River Development & Ganga Rejuvenation, Ministry of Jal Shakti were the Co-Chairs.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Water for Food Security Lead Paper	Kushvinder Vohra, Commissioner (SPR), Ministry of Jal Shakti M. L. Franklin, Dy. Director, MoJS
2	Water management for more crop and income with special reference to Assam	Ramani Kanta Thakuria, Chief Scientist and B K Medhi, AICRP on Irrigation Water Management, Assam Agricultural University,
3	Valuation of Fresh Water: Parameters and Pricing	Vikas Shah,Chief Operating Officer, Water Health India Private Limited,
4	Narmada Canal System Transforming Western Region	P V Baiju, Former Dy. Director, NCA (Presently Consultant NWDA)
5	Assessment of Irrigation Water Quality Parameters of Kanhan River at Chindawara (Madhya Pradesh) and Nagpur (Maharashtra) District	Sandeep Kumar Shukla, Research Officer, Kailash K. Lakhe, Executive Engineer and Dheerendra K.Tiwari, Chief Engineer, Central Organization, CWC, Nagpur

Recommendations Emerged :

1. Initiatives towards both, the supply-side and demand-side management are necessary for significant impact on water use and agricultural productivity.

2. Public participation in water management besides Government interventions is the key for achieving the goals of food security. Participatory Irrigation Management (PIM) to be implemented using PPP model on case to case basis.

3. To enhance irrigation efficiency, watering based on crop requirement needs to be ensured. Proper mechanism for optimal water use needs to be devised in consultation with the farmers.

4. Restructuring of the Water Users Association (WUA) for water management below distributory is essential. Training and awareness among various stakeholder are key in long term sustainability of the economy, food security and stability of prices. This will help in sensitising the consumers in various water use.

5. Ensuring recovery of appropriate water service charges is an important factor for efficient water management. Necessary actions are required to be taken on priority.

Action Points Suggested

- Participatory Irrigation Management (PIM) be implemented using PPP model on case to case basis.
- Optimal water use mechanism be devised in consultation with farmers.
- Restructure Water Users Association (WUA) and ensure their training and awareness among various stakeholders for sensitising the consumers.
- Action be taken to recover water service charges.

SEMINAR – 2

WATER QUALITY AND PUBLIC HEALTH ISSUES

Background

It is well known that good water quality sustains the eco-system and is vital for healthy society. Numerous human activities impact water quality, including agriculture, industry, mining, disposal of human waste, population growth, urbanization, and climate change. Agriculture can cause nutrient and pesticide contamination and increased salinity. Nutrient enrichment has become one of the planet's most widespread water quality problems and worldwide, pesticide application is estimated to be over 2 million metric tonnes per year. Industrial activities release about 300-400 million tons of heavy metals, solvents, toxic sludge, and other waste into the world's waters each year. An emerging water quality concern is the impact of plastics, personal care products and pharmaceuticals, such as birth control pills, painkillers and antibiotics, on aquatic ecosystems.

As reported by the concerned UN agencies, widespread lack of adequate disposal of human waste leads to contamination of water. Worldwide, 2.5 billion people live without improved sanitation and over 80 percent of the sewage in developing countries is discharged untreated in water bodies. Meanwhile, growing populations will potentially magnify these impacts, while climate change will create new water quality challenges. The issue of poor water quality on human health needs to be integrated in a system-driven context of IWRM Water Safety Plans and Sanitation Safety Plans.

This Seminar deliberated on response measure related to water quality scenario, pollution, prevention-wise resource use, alternate to improve water quality problems. Ideas, examples and initiatives as detailed :

Chair and Co Chair

Shri Shalabh Kumar, Member (WS), Delhi Jal Board, Chaired the Session. Dr Amit Bansiwal, Principal Scientist, NEERI was the Co-Chair.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Economic and Health Impact of Degraded Drinking Water: A Case Study of Ludhiana	Dr Jasdeep Kaur, Assistant Professor, Khalsa College for Women, Sidhwan Khurd, Ludhiana
2	Water Quality and Public Health Issues Fluoride and Fluorosis Linked Disorders 21st Century Challenges	Prof (Dr.) A.K. Susheela & Ashoka, Fellow, PhD, FAMS(India), FASc., Fluorosis Foundation of India, New Delhi
3	An Insight into Trace Metals Distribution and Fractionation in River Ganga	Amit Bansiwal, Rashmi Dahake and Ketki Kulkarni, Scientists CSIR-NEERI, Nagpur
4	Impact Assessment of Mining Activities on Water Quality In Goa Region	Dr Rakesh Kant Kamal, Research Associate, TERI, New Delhi

5	Status of Drinking Water Quality in Rural India	Er Ajay Kumar, Director, Er D Rajasekhar, Deputy Advisor(WQ), DoDW&S,MoJS. Anil Kumar, Technical Officer (WQM) , National Centre for Drinking Water, Sanitation and Quality, New Delhi
6	Mapping and Monitoring of River Water Quality using Mobile Sensing Platforms	Himank Sharma
7	Water Quality Investigation of Yamuna River	Sameer Vyas, ARO, Beena Anand, Scientist, S N Sharma CSMRS, New Delhi. Nikita Chaudhary, Research Scholar, Galgotias University, Greater Noida,
8	Estimation of Water Quality Parameters for Surface and Ground Water	Dr.Bharti Chawre, Scientist-C and Dhirendra Kumar, Scientist-B, CSMRS
9	Critical Analysis of Water Supply Network for Solapur City Suburb using Soft Computing Tools.	Dr. R K Suryawanshi , Prof. Emeritus, Shri Irabatti N R, Research Scholar, COEP, Pune
10	TOC is Revolutionary Parameter to control Waste water treatment	Vijayakumar, SWAN Environmental
11	Status of Trace and Toxic metals in Indian Rivers	Dr Jakir Hussain, Research Officer, Ravi Shankar, Chief Engineer, Dr N.Prabhakar Rao, Sr.Res. Asst., Pankaj Kumar Sharma, Director, Dr Sakshi Sharma, Sr. Res. Assistant, Rakesh Kumar Gupta, Deputy Director, CWC

Recommendations Emerged :

1. Massive health education programme should be introduced into health services at all levels aimed at creating awareness at the grassroots on water quality and health.

2. Immediate steps to be taken in standardization & accreditation of water quality monitoring laboratories in the country. Central and State Surface/Ground Water Departments and other Agencies may be asked to strengthen their respective monitoring networks and integrate among themselves through sharing data for comprehensive monitoring of Surface/ Ground Water Quality. There seems to be overlapping efforts in terms of various government agencies in water quality monitoring which warrants avoiding duplication in water quality monitoring.

3. Water Quality Index (WQI) is a very useful and efficient method for assessing the suitability of water quality. It is also a very useful tool to summarize complex scientific information on water quality into a simpler form for assessment, communicating the information on overall quality of water to the concerned citizens and policy makers. State and Central Government department involved in the water quality monitoring must use this tool for presenting the data in the water quality yearbook.

4. Awareness generation and sensitization on water quality issues should be given the utmost priority by each and every agency to invoke people's active thinking on the issue related to water quality and their participation. Active community participation by forming scientific team at village level and priority to household tap connectivity in the states should be promoted.

5. There is an urgent need of water quality monitoring of reservoirs of national projects by Central Water Commission immediately.

6. Number of water monitoring stations in river should be increased and strengthened. CWC monitoring stations should be established on the river and tributaries confluence points, upstream and downstream of the major cities.

7. Ministry of Jal Shakti should monitor the pesticide level in all river basin of India and ground water aquifers. Also, fractionation of metals in the river sediment analysis should be started in all river basis. Monitoring of metals/metalloids namely Selenium, Uranium etc. should also be included in routine surveys.

8. Speciation of the toxic metals like arsenic and chromium etc. should be monitored by Central and State Govt departments in surface and ground water.

9. Apart from heavy metal pollution, studies on microbial contamination, their disinfection or eradication and prevention by implementing hygiene practices at water sources need to be encouraged for public health concerns.

10. Due to improper or lack of treatment at centralized level, decentralized and advanced household point-of-use water purification/ treatment system application in households should also be considered to reduce health risk at use.

11. The village / habitation-wise fluoride database, with safe and unsafe sources need to be developed and updated once in 3 years.

12. As total prevention and control of Fluorosis is possible through practice of two interventions viz. (i) consumption of safe water, (ii) improving the diet through essential nutrients viz. calcium, iron, vitamin C, E and other antioxidants through vegetables, fruits and dairy products. Every effort needs to be made to popularize the above through IEC strategies and group counseling the families / communities.

13. Importance of safe water for consumption and awareness on adverse effects of fluoride should begin at schools and schoolchildren should have safe water for consumption.

14. As a part of problem identification, people suffering from arsenicosis should be diagnosed and training of medical and para-medical professionals is also required in this regard.

15. Real time water quality monitoring during the Kumbh mela or mass bathing in India should be monitored by CWC.

16. Initiatives should be undertaken to monitor emerging contaminants including PPCPs, POPs, PCBs etc.

17. Comprehensive program on monitoring of micro/nano plastics should be undertaken immediately.

18. Development of indigenous robust and reliable real time water quality monitoring systems including wireless sensors networks. Cloud based platforms should be undertaken.

19. All concerned Ministries/ Departments, particularly the Ministry of Education and Ministry of Health & Family Welfare should be sensitized for use of safe water not only for drinking but also for preparation of food etc especially in schools for children.

20. Careful monitoring of use of recycled/waste water in agriculture should be made as a public health concern.

Action Points Suggested

- Health education at grassroots level be introduced by health services for creating awareness on water quality.
- Steps be taken for standardization & accreditation of water quality monitoring laboratories
- Central Water Commission should monitor Water quality of reservoirs of National projects.
- Ministry of Jal Shakti should monitor the pesticide level of all river basin and ground water aquifers.
- Central and State Govt departments should monitor speciation of the toxic metals in surface and ground water.
- CWC should monitor Real time water quality monitoring during the Kumbh mela or mass bathing.
- Monitoring of micro/nano plastics should be undertaken immediately.

SEMINAR – 3

SHRINKING SPACE FOR HYDROPOWER DEVELOPMENT IN ENERGY SECURITY

Background

India is the 7th largest hydroelectric power producer in the world and has a high potential for hydropower generation. Hydropower is the second largest contributor of energy consumed in the Indian power sector. The most significant hydropower potential in India exists in the three major trans boundary river basins (Ganges, Indus, and the Brahmaputra). However, all these basins have experienced substantial changes in precipitation and air temperature that affected water availability for hydropower generation. India's installed hydro capacity at the end of 2018 was around 45,400 MW, an annual growth of just 1%, the lowest since 2009. Also, between 2008 and 2018, the share of hydroelectric power in India's total installed electricity capacity has been halved from 25% to 13%. Moreover, many hydropower projects with a capacity of nearly 6,000 MW are stalled due to a variety of reasons – from lack of funds to environmental concerns.

It is argued at many forum that the development of a hydropower plant can cost from about Rs 7 crore to 9 crore per MW, which is relatively higher when compared with the that of thermal power or for solar energy, and that the gestation period is also relatively more. However, the hydropower has distinct advantages. Apart from the fact that water used for hydropower generation is non-consumptive in nature and is used for many purposes in the downstream of the project, the running and maintenance cost of hydropower plant is very low, and it is most suited for generation of power needs for meeting the peak time requirements. Therefore, such energy source is most suited for securing energy security in the long run. Yet another positive aspect of hydropower generation is that it is environment friendly. It is therefore, considered necessary that all aspects are considered in proper perspective and hydropower generation is promoted.
The Seminar shared experiences in context of above issues as detailed :

Chair and Co Chair

Dr. R.K. Gupta, Chairman, Krishna River Management Board, Chaired the Session. Shri Jaideep Singh Bawa, Chief Engineer, Central Electricity Authority was the Co-Chair.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Hydro Power Development: Changing Scenario	Jaideep Singh Bawa, Chief Engineer, Veepin Kumar, Deputy Director and Pooran Chand, Assistant Director, CEA, New Delhi
2	Shrinking Spaces In Hydropower : Sustainable Sediment Management	Manjush Mishra, DGM, NHPC
3	Shrinking Space for Hydro Power Development in Energy Security 'Declining Trend in pace of Hydro Capacity Addition in India's Energy Mix in light of Revised Environmental and Land Acquisition norms'	PC Jiloha, Chief Engineer, Arpita Upadhyay, Deputy Director, Central Electricity Authority, New Delhi

4	Necessity of Pumped Storage Hydro Projects in the Present Power System in the Country	P.K Shukla, Chief Engineer, Jaita Chatterjee, Dy. Director, Central Electricity Authority, New Delhi

Recommendations Emerged:

1. With significant increase in installed capacity of the system, especially in thermal & renewable and also due to increasing capital cost as well as tariff of hydro projects, the role of Hydropower Development in Energy Security appears to be Shrinking. However, Hydro Power Sector is on path of revival and has brighter future prospects on account of certain policy interventions by Government of India in March 2019 to promote hydropower development and the "below 2 degree Celsius" commitment of the Paris Agreement.

2. In comparison to other means of renewable energy such as wind and solar, hydropower lends it advantages as a flexible resource in terms of providing peaking capability, ramping capability, frequency response, part-load operation for maintaining reserves, load following – correlation with demand, energy storage capability (Pump Storage Projects), multiple start stop operation, dynamic VAR support – inductive / condenser and black start capability etc.

3. In recent times, there has been an increased focus on environmental issues, especially climate change and therefore, India being an active participant globally has also started taking initiatives towards sustainable development and cleaner environment as the Government of India has set a target of installing 175 GW of Renewable Energy capacity by the year 2022. Also, now as the Large Hydro (>25MW) also classified under RE, hydro plants shall also account for clean energy or green energy funding support.

4. As wind and solar power are variable and intermittent, it was felt that the role of Pumped storage hydro power Plants becomes vital as these plants are capable of balancing the grid for demand driven as well as generation driven fluctuations at a high ramp up/ down rate. These plants are also likely to be in high demand in the ancillary services market in near future.

5. There is need to create greater awareness about the tangible as well as intangible benefits from Hydropower projects. The success stories about these benefits as well as third party evaluation would go a long way in building confidence among the people for greater supports.

6. In light of sluggish growth of the sector, greater emphasis has to be there for pressing the existing capacity into good working condition through renovating programmes.

Action Points Suggested

- Awareness be created about the benefits of hydro projects and its success stories.
- Renovation programme be contemplated for good working condition of existing capacity.

SEMINAR – 4

SUSTAINING CLIMATE CHANGE IMPACTS–CHALLENGES AND OPPORTUNITIES

Background

Global warming and climate change is the most debated issue since the climate change impacts have geographical, political, social and economical ramifications. It is also well established that the poorest people / nation contribute least to the activities leading to the climate change. However, they are the least equipped to deal with the negative impacts of climate change.

Very broadly, the potential future adverse impacts of climate change on water comprise of (a) fast / more frequent / more severe changes such as floods / drought / hurricane etc. and (b) slow changes such as increasing salinity in low lying coasts and eventual inundation due to sea level rise. It is necessary to plan developmental activities in such a way that causative factors of climate change are duly accounted for and side by side humanity need to be well prepared to face consequences of adverse impacts of climate change hazards of increased frequency and/or increased magnitude by timely proactive response so as to minimize loss of life / property. Every developmental activity is associated with certain potential adverse impacts on climate. Such adverse impacts can be considerably reduced by pro-active or planned adaptation by learning from the past and planning for future without retarding economic growth and in maintaining environmental quality. All stakeholders including those at grass root level are required to be sensitized regarding potential impacts of climate changes and adaptation to them as some changes were happening in the past and will also happen in future but rate of adverse changes due to developmental activities can be minimized by adopting environmental friendly lifestyle as well as technologies. Climate change discussions / research need to be passed on to potentially affected parties / nations / people and involve people's participation and localized solutions for mitigating impacts of disasters associated with climate change by proactive response. Concerted efforts are to be made from global to national to local levels by sharing knowledge, technology and past experiences among all stakeholders so as to have climate resilient development by accounting for climate variability as well as proactive disaster preparedness.

The session conducted by addressing the Climate Change impacts, challenges and opportunity to all stakeholders as detailed :

Chair and Co-Chair

Dr K Jayram Ramesh, Former Director General, IMD Chaired the Session. Dr Sharad Kumar Jain, Director NIH was the Co-Chair.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Water and Climate Change: Challenges and Way Forward	Dr Sharad Kumar Jain, Director NIH, Roorkee.
2	Sustaining Climate Change Impacts - Challenges And Opportunities	Dr S D Attri, Dy. Director General of Meteorology, IMD, New Delhi
3	Climate Change in South Asia: An Environmental and Socio- economic Perspective	Anjali Yadav, University of Delhi
4	Enabling Sustainable Water Resource Management for Water Positive Communities Ambuja Cement Foundation Initiatives	Chandrakant Kumbhani General Manager and Brajesh Singh Tomar, DGM, Ambuja Cement Foundation
5	The impacts, variability and uncertainty regarding precipitation associated with climate cycles & its trends and future projections	Er. Hari Om Varshney, NWDA
6	Flood Risk Management of Urban areas – A case study of Chennai Metropolitan area	Pavatharani P ,VPC India
7	The challenges of achieving the Sustainable Development Goal 6: Ensure availability and sustainable management of water and sanitation: A study Social & economic impact of water crises in India	Dr Kaveri Devi Mishra, Associate Professor, AMITY University

Recommendations Emerged :

1. Most of the studies/research have been carried out in the regions outside of India, so there is urgent need for conducting more studies both micro and macro levels locally in the Indian conditions.

2. Climate change discussions/research need to pass to potentially affected parties/people/nations and involve people's participation and localized solutions for mitigating impacts of disasters associated with climate change by proactive response.

3. The developmental plans should be prepared in such a way that causative factors of climate change are factored in and side by side humanity need to be well prepared to face consequences of adverse impacts of climate change hazards of increased frequency and/or increased magnitude by timely proactive response so as to minimize loss of life / property.

4. There is a need to focus on various challenges and to identify suitable strategies to cope up with impact owing to rapidly changing climate. It is also suggested that to tackle climate change impacts, a serious policy framework needs to be put in place to encourage partnership among government bodies, private and public partnership with grass root participation of people.

5. Concentrated efforts are to be made from local levels by sharing knowledge, technology and past experiences among all stakeholders so as to have climate resilient development accounting for climate variability as well as proactive disaster preparedness.

6. All stakeholders including those at grass root level should be sensitized regarding the potential impacts of climate changes and adaptation to them as some changes were happening in the past and will also happen in future but rate of adverse changes due to developmental activities can be minimized by adopting environmental friendly lifestyle as well as technologies.

Action Points Suggested

- Micro and macro levels studies of Climate Change according to Indian conditions should be carried out .
- Sensitize stakeholders on potential impacts of climate changes and its adaptation by environmental friendly lifestyle

SEMINAR – 5

DROUGHT MANAGEMENT – FUTURE CHALLENGES AND STRATEGIES

Background

Drought is a hydro-metrological phenomenon of prolonged period of water scarcity, affecting natural resources, environment, flora and fauna. It results from deficiency of precipitation resulting in insufficient water resources to meet the water demand for drinking, agricultural and other consumption uses and has long term effect on related aspects. The severity of situation becomes many folds due to the effect of climate change on available natural resources. Drought is a highly complex phenomenon, therefore its prevention, mitigation and management requires careful planning and meticulous execution of the prepared plan with proper co-ordination among various stakeholders.

The seminar on "Drought Management – Future Challenges and Strategies" aims at having discussion on the topic at length so as to get a better understanding of drought, its causes, prevention and mitigation. The management of drought, strategies for drought mitigation and amelioration along with future plans for efficiently facing the upcoming challenges shall be deliberated upon in this session amongst experts. The proceedings of the session will help water managers and decision-makers to formulate effective plans/road map for dealing with droughts.

Chair, Co-Chair and Experts

Shri R.K. Sinha, Member (RM), Central Water Commission Chaired the Session. Joint Chairs of the session were Shri J. S. Samra, Former Chief Executive Officer (NRAA) and Shri V. K. Chawla, former Chief Engineer, CWC. Dr R P Pandey, Scientist, NIH, Roorkee and Shri Manoj Khanna, Principal Scientist, WTC, IARI presented the lead papers

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Drought Management – Future Challenges And Strategies	R.K. Sinha, Member (RM), CWC
2	Challenge of Drought Management in India	Dr R P Pandey, Scientist-G and Rakesh Kumar, Scientist-G, NIH, Roorkee
3	Drought Monitoring and Management Strategies for Mitigation and Adaptation	Manoj Khanna, Principal Scientist & In Charge FOSU, WTC, ICAR
4	Japan's Water Resources Development and Drought Response	Yoshito Suga, Dy. Director, Min. of LITT, Japan
5	Agricultural water management interventions for enhancing water resources availability, cropping intensity and various ecosystem services in Bundelkhand region of Central India	Kaushal K Garg, Senior Scientist, ICRISAT Development Centre,Hyderabad Ramesh Singh, Inder Dev, ICAR-CAFRI, Jhansi, UP and Sreenath Dixit, ICRISAT Development Centre, Hyderabad

Recommendations Emerged :

1. There is need to develop comprehensive mitigation and adaptation strategies along with implementable contingency plan.

2. A guideline on drought action plan needs to be formulated.

3. Regular, dedicated Drought Monitoring and Early Warning System (DM&EWS) at State, District and Sub-district level needs to be put in place.

4. Composite Drought Index (CDI) approach is more efficient for drought monitoring as it provides spatial information as well as severity of drought which enables policy makers to allocate proportionate relief/contingency to the effective regions.

5. District-wise or basin-wise vulnerability and risk assessment based on physiographic hydro-meteorological and social factors needs to be carried out to demarcate areas with different degree of vulnerability/risk to drought. This is essential for prioritization of mitigation actions.

6. Proactive drought mitigation measures should be planned based the disaster risk reduction approach to minimize the potential losses or to reduce degree of threat to people and regional economic activities.

7. The drought recurs in various climatic regions with different dimensions of frequency, severity and persistence in successive years. Therefore, region specific mitigation planning is necessary as the same set of mitigation strategies may not be effective in all climatic regions.

Action Points Suggested

- Develop region specific comprehensive mitigation and adaptation strategies along with implementable contingency plan.
- Formulate guidelines on drought action plan.
- Establish Dedicated Drought Monitoring and Early Warning System (DM&EWS) at State, District and Sub-district level.
- District-wise/basin-wise risk assessment be made based on physiographic hydro and social factors and demarcate the areas according to degree of vulnerability.

SEMINAR – 6

FLOOD MANAGEMENT – FUTURE CHALLENGES & STRATEGIES

Background

From time immemorial flood plains are most suitable for human settlement, as evident from the fact that major civilizations such as Indus civilization, Mesopotamia civilization and Egyptian civilization flourished on the banks of rivers. Even today, high density population resides in flood plains of various river basins in India and in other parts of the world. India experiences relatively very high variability in rainfall and hence in riverflow resulting in fury of flood in some parts and drought in other parts of the country almost every year. India is one of the most flood-affected countries in the world in terms of affected geographical area. The adverse impacts of floods include loss of life and property; mass migration of people and animals; and shortage of food, energy, water and other basic needs. The degree of vulnerability to such natural disasters has been highest to the poor who suffer the most as sheer necessity forces them to occupy the most vulnerable areas.

It is vital to understand the interplay between floods, the development process and poverty in order to ascertain the way in which current and future development planning and implementation leads to, or has the potential to increase vulnerability and risk. A population might be poor because it is exposed to flooding, or it might be exposed to flooding because it is poor and occupies the most vulnerable land. Decision makers and development planners at all levels need to be sensitive to this aspect. The capacity of the society to maintain or improve its quality of life in the face of such challenges may be enhanced either by reducing the extent of the challenge or by enhancing their capacity to cope with the challenges. In the 21st century, flood management calls for a paradigm shift from the traditional, fragmented and localized approach to employing strategies to maintain/augment the productivity of floodplains, while simultaneously providing protective measures against losses due to flooding. Flood management is essentially a dynamic concept and the perception includes a number of emerging issues, such as risk management, integrated reservoir management, urban flooding, climate variability and change, and adaptive management.

The seminar on Flood Management – Future Challenges and Strategies discussed the topic at length for better understanding helped the decision-makers, managers and professional in formulating effective plans/ road map in addressing the future challenges Chair,

Co-Chair and Experts

Shri A K Sinha, Chairman, Central Water Commission Chaired the Session and Shri Bibhas Kumar, former Chairman, CWC and M S Dhillon, Chairman, GFCC were the Co Chairs.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Flood Management- Future Challenges and Strategies (**Lead Paper**)	M K Sinha, Former Chief Engineer, CWC
2	Dam break flood inundation studies for Hinglow Dam	Dr. R K Suryawanshi, Emeritus Professor, College of Engineering (COEP), Pune Mosumi Chatterjee, Chief Engineer, WAPCOS, Kolkata and Srujan Gavale, Research Scholar, COEP, Pune
3	Evaluating Flood Mitigation Alternatives Using River Flow Modelling: A Case Study for Vadodara City	Pankaj Mani, Scientist-E,NIH, Patna Rakesh Kumar, Scientist-G and J P Patra, Scientist-C,NIH, Roorkee
4	Rainwater management for a resilient Mumbai and drought resistant Maharashtra of the future.	Dr. Manisha Deshpande, Assistant Professor & Dr D Y Patil Vidyapeeth, Biotechnology & Bioinformatics Institute, Pune,
5	Probability based Rule Levels for Kerala reservoirs	Isly Issac, Asst Director and Shri Rishi Srivastava, Director, CWC, New Delhi
6	Flood Disaster Challenges and Mitigation Strategies-A Case Study of Kerala Flood 2018	Nityanand Rai, Director, Rishi Srivastava, Director and Isly Issac, Asst. Director , CWC, New Delhi
7	Flood Wave Transmission and Flood Forecasting on Downstream of Temghar Project in Krishna Basin	Er. Dhumal Hanumant, Research Scholar Dr. D. Y. Patil Institute of Technology Pune, Dr. Sunil B Thakare, Principal Anantrao Pawar College of Engineering & Research, Pune and Dr. Shrinivas Londhe, Professor , Vishwakarma Institute of Information Technology, Pune

Recommendation Emerged :

1. For effective Flood Management, Integrated approach may be adopted in combination of structural and non-structural measures such as Embankments, channel improvement, flood plain zoning, diversion of flood, attenuation of flood through reservoirs, flood forecasting and flood evacuation plan.

2. Reservoirs can be utilized for flood moderation if their flood cushion is used effectively. Rule curve for all the reservoirs wherever necessary should be prepared and updated timely and followed with decision at operational level. Rule curves of major reservoirs, where flood cushion is not in-built, need to be reviewed to have some dynamic flood cushion. While planning a new water resource projects, storage may be decided considering the provisions for flood moderation. Wherever feasible, a dynamic flood cushion for major part of the season may be provided in the reservoir.

3. Inflow forecasting for the reservoirs may be utilized as an important tool for real time reservoir operations from flood mitigation point of view. This will be particularly useful for cascading reservoirs in a basin where real time operation can be guided through modelling and taking into consideration of instant level and inflow to the reservoir, readiness of project authority to take decisions with regard to variations in the conservational benefits and downstream conditions.

4. It is essential that Emergency Action Plan (EAP) be prepared in the event of dam break/extreme flood situations. Dam break flood inundation, Flood waves analysis and time analysis (time to reach flood peaks) are essential tools to plan emergency action plan and evacuation plan.

Action Points Suggested

- Rule curve with dynamic flood cushion for all the reservoirs should be prepared and updated.
- Emergency Action Plan (EAP) should be prepared for dam break/extreme flood situations.

SEMINAR - 7

GROUND WATER MANAGEMENT – CHALLENGES AHEAD

Background

Groundwater plays a vital role in ensuring safe drinking water and also contributes considerably in irrigation. India is one of the largest users of groundwater resources in the world. Groundwater irrigation has been expanding at a very rapid pace in India. Majority of farmers depend on groundwater exclusively or supplementary source for irrigation as it plays vital role in reducing risk and sustaining income when other sources of irrigation are absent. Growing population, inefficient use of groundwater in irrigation and over-exploitation of groundwater resources particularly in urban areas, to meet growing demands of drinking water have led to groundwater overuse and its contamination. Presently, groundwater management in the country depends merely on water demands in a particular area, not paying attention to its long term availability, quality and natural recharge to the aquifer system.

In India, the primary challenge in groundwater management is the presence of extreme overexploitation of the resource in some parts of the country coexisting with relatively low levels of extraction in others. Frequent dry spells of droughts in the country have also contributed to overexploitation of groundwater resource for meeting water demands of varied sectors and slow down the natural recharge process. The extraction of groundwater from deeper aquifers has also started which cannot be recharged directly by rainfall. Hence, deeper aquifers are also at risk of depletion. Groundwater quality is affected by anthropogenic sources along with geogenic contamination of arsenic, iron, uranium etc at many places in the country. Groundwater needs to be managed efficiently and the sustainability of the same is required to be ensured. Similarly, protection of groundwater sources from anthropogenic contamination need to be taken care especially in urban and industrial areas.

The Seminar provided a forum for researchers, professionals, mangers and policy makers for sharing their experiences and identified measures to address the challenges in ground water management.

Chair and Co Chair

Shri Akhil Kumar, Joint Secretary, DoWR, RD&GR, MoJS, chaired the Session and Shri S Marwah, Regional Director, CGWB was the Co-Chair. Shri U. P. Singh, Secretary, DoWR, RD&GR, Ministry of Jal Shakti opened the session. Mrs. T Rajeshwari, Additional Secretary, DoWR, RD & GR, MoJS and Shri K.C. Naik, Chairman, CGWB also graced the occasion.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Ground Water Management - Challenges Ahead	G.C. Pati, Member (Scientific), CGWB, New Delhi
2	Groundwater salinity causes and remediation, a case study from Mewat, Haryana	Gopal Krishan, Scientist-C, NIH Roorkee
3	Cross-sectional diversification for sustainable intensification: Addressing the ground water resource imbalance n India	Prem Chand, Scientist, ICAR-NIAEPR, New Delhi
4	Assessment of microbial and heavy metal contamination of ground water through leaching of sewage waste of major drains in Delhi	Tanu Jindal, Group Additional, Pro Vice Chancellor, Amity University, Noida
5	Ground water Management - Challenges ahead	Rajendra Kumar Agrawal, Superintending Engineer, WRD, Govt. of Chhattisgarh

Recommendations Emerged :

1. Groundwater is the major contributor in irrigation as well as drinking and domestic water supply sectors in rural India. Sustainability of the resource at shallow depth is the biggest challenge in groundwater section as majority of small & marginal farmers are solely dependent on it.

2. There is bigger dependency of the stakeholders on the groundwater resource and majority of abstraction structures are privately-owned in the country. Extensive withdrawal and over-exploitation of the resource is a matter of concern. There is need to regulate the withdrawal of groundwater and norms shall be setup for groundwater use in irrigation sector based on area-specific available groundwater resources and hydro-geological disposition of the aquifers.

3. Adoption of cropping pattern shall be based on the available groundwater resource in areas being irrigated with groundwater sources. An advisory may be issued by the States at district-level indicating the crop types which can be irrigated through groundwater based on estimates of replenishable groundwater resource of India.

4. Capacity building and institutional strengthening of State Groundwater Agencies needs focused attention. Further, collection, validation and sharing of data/information on the resource can strengthen the States in planning policies/schemes on groundwater development and recharge to meet the future water demands.

5. Aquifers have high vulnerability to the pollution and once contaminated, their remediation is, either irreversible or long- term process. Presently, groundwater is contaminated through anthropogenic pollution in urban and industrial areas. Landfill, unlined drains and direct pumping of waste water in groundwater systems are to be mapped, monitored, regulated and penalized.

6. To meet the present management challenges of over-exploitation and quality deterioration, managed aquifer recharge can be best solution. The component of rainwater harvesting and artificial recharge to the aquifers shall be included in groundwater development plan / scheme based on scientific studies of aquifer mapping & groundwater modelling of area of interest.

Action Points Suggested

- Regulate withdrawal of groundwater and norms be setup for Area-specific utilization of groundwater for irrigation.
- District wise advisory be issued by the States for crop type which be irrigated through groundwater.
- Contamination of ground water due to landfill, unlined drains and direct pumping of wastewater should be mapped, monitored, regulated and penalized.
- Rainwater harvesting and artificial recharge to the aquifers be included in groundwater development plan/scheme based on scientific studies

SEMINAR- 8

INTER BASIN WATER TRANSFER – PLANNING TO IMPLEMENTATION

Background

Precipitation in India, characterised by large variations – both in space and time, has led to a situation where some of the river basins have relatively more water than the overall needs of the basin, while others have relatively lesser water for meeting all the projected water needs. The excess water in the 'surplus basin' which often results in flood and resulting miseries to the people of the basin can be gainfully utilized for benefit of the society by transferring such excess water to 'deficit basins' leading to win-win situation for all. The Inter Linking of Rivers programme which consists of about 30 link projects aims at transferring such surplus water to deficit basin or the region.

However, like any other water resources development programme, this programme also faces several challenges. It is necessary that all aspects are examined thoroughly and all concerns are addressed carefully with the objective of arriving at a project configuration which is beneficial to all the stakeholders.

The session deliberated present scenario of Inter Basin Water Transfer proposals to address the challenges and making the programme a success story.

Chair and Co-Chair

Shri A. D. Mohile, Former Chairman, CWC Chaired the Session. Shri M.K Sinha, Former Chief Engineer, CWC was the Co-chair.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Issues involved in Environmental Clearance of Ken-Betwa Link Project - **(Lead Paper)**	Rajesh Kumar Jain, Chief Engineer, NWDA
2	Rural Renaissance Through Linking of Rivers	K Simhachalam Naidu, Asst Engineer, NWDA
3	Inter Basin Water transfer -A solution to water stressed middle portion of Karnataka state	Thirumalesha D V, AE, WRD, Govt. of Karnataka
4	Godavari (Inchampalli / Janampet) – Cauvery (Grand Anicut) link project for the benefit of southern states	Dr. R N Sankhua, Chief Engineer (S), K Simhachalam Naidu, Asst.Engineer, NWDA, Hyderabad
5	Diversion of west flowing rivers for the benefit of uplands in Maharashtra	Dr. R N Sankhua, Chief Engineer (S), NWDA, Hyderabad K Simhachalam Naidu, Asst. Engineer, NWDA
6	Eastern Rajasthan Canal Project (ERCP) Future Life Line of Rajasthan	Harish Kumar Vasdani, SE, WRD, Govt. of Rajasthan

7	Eternal and Abundant water supply for India	Arun Bandi, Pune
8	Inter-Basin Water Transfer Planning to Implementation Solution to water Crisis in India	Ujjaval Joshi, Venkatesh Ramachandran and Bharat Goel, Xylem

Recommendations Emerged :

1. The river interlinking projects are essential for sustenance of rural economy for equity in water use, for drought mitigation and for achieving sustainable use of groundwater in India. These water transfer projects would be very critical for water security, food security, energy security and socio-economic development.

2. Environmental, wildlife and forestland diversion clearances are crucial aspects in ILR projects and needs to be considered carefully and planned for obtaining clearance.

3. There is a need to make the whole process of Interlinking of Rivers (ILR) workable and make the targets of ILR time-bound. Co-operation among various stakeholders for ultimate utilization of water for benefit of the country is essential.

4. Links physically located in single state, either inter-basin or intra-basin, have an important role but the hidden inter-state aspects and also the environmental and economic aspects require careful consideration.

5. Out of box thinking in regard to national water planning is good. However, such proposals, even at a conceptual stage need to be technically feasible and should be quantified in terms of estimation of resource requirement in an approximate way.

Action Points Suggested

Make the process of Interlinking of Rivers (ILR) workable and time-bound

SEMINAR - 9

RIVER & RESERVOIR SEDIMENT MANAGEMENT AND ITS IMPLICATIONS FOR RIVER RESTORATION

Background

Sediment transport, bank erosion and associated channel mobility represent key physical processes of river, and their understanding is of crucial importance for defining river restoration and management strategies. Most alluvial rivers have experienced increased sedimentation or bed load deficit, both due to natural processes and series of human interventions in the river catchment or on river itself. Rapid urbanization in flood plains, encroachment of river beds, changes due to human activity and deforestation in catchment area of rivers are causing sedimentation in rivers. Problem of sedimentation is somewhat moderated by trapping sediment in reservoirs. However, it results in loss of reservoir storage thereby reducing its benefits and reduced serviceable life. Common practices carried out by river management agencies demonstrate that sediment management has rarely been based upon best practices developed on scientific knowledge. For these reasons, a different approach to sediment management is desirable, incorporating: (i) knowledge and management of sediments at the basin scale; (ii) a wider application of available scientific knowledge. The sediment supplied to and transported by rivers is the fundamental driver of river condition, affecting water quality, thermal regime, habitat and aquatic communities, river stability, and natural hazards. Effective management of river systems therefore requires knowledge of water and sediment interactions.

The seminar provided a forum to exchange concerns and experiences on various aspects and helped in identifying appropriate techniques and technologies for addressing the serious issues of river and reservoir sediment management.

Chair and Co-Chair

Dr. (Mrs.) V V Bhosekar, Director, CWPRS, Pune was the Chairperson of the Session and Shri Amrendra Kumar Singh, Chief Engineer, EMO, CWC was the Co-Chair.

The papers presented during the Session were:

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	River and reservoir sediment management and its implications for river restoration **(Lead Paper)**	D K Sharma, Chairman, BBMB, Chandigarh [Presentation by Arvind Kumar Sharma, Director (BBMB)]
2	Sustainable Sediment Management in Indian River Basins	Ravi Shankar, Chief Engineer, Shobhika Singh, AD, and Devendra Patel, AD,CWC, New Delhi.
3	Effect of downward seepage on the flow hydrodynamics of a sinuous channel	Jyotismita Taye, PhD Student Bimlesh Kumar,Associate Professor, IIT Guwahati
4	A Study on The Bank Erosion & Sediment Transport on Bhagirathi Channel, India	Mainak Chakraborty, MS Scholar, K. Murali, Professor and V. Sriram, Associate Professor, IIT Madras

5	Climatic control on suspended sediment characterization in Melt water from Gangotri Glacier	Manohar Arora, Scientist D and Jatin Malhotra, SRA, NIH, Roorkee
6	Characteristics and Uses of Sediments from Ganga and Brahmaputra	Ravi Shankar, Chief Engineer, Shobhika Singh, AD, Devendra Patel, AD and Rekhraj Meena, AD, CWC
7	Sedimentation Water Storage Reservoir – Indian Perspective	A Majumdar, Dy. Director, CWC

Recommendations Emerged :

1. There is a need to approach the sediment-induced problems in an integrated way.

2. Sediment management measures for restoration of reservoirs and rivers capacities may be adopted; which may inter-alia include

    a. Catchment area treatment;
    b. Construction of check dams;
    c. Controlled construction activities of roads and houses in hilly areas.
    d. Occurrence of landslides / landslips especially in hilly areas with heavy rainfall need to be controlled by proper slope stability measures
    e. River training works such as bank protection, spurs etc. should also be made for the vulnerable reaches to check the river bank erosion.
    f. Submerged Vanes & Bundling for localized aggradations
    g. Boulder / Gravel / Sand Mining should be done as per "Sustainable Sand Mining Management Guidelines – 2016" of MoEF & CC.
    h. Routing of sediments towards downstream of Reservoir: This includes sediment by pass channel and tunnel sluicing and density current venting.
    i. Sediment removal from the Reservoir by flushing, sediment redistribution inside the reservoir, sediment replenishment, dredging and syphoning.
    j. Increase of storage capacity of Reservoir as per site conditions

3. The sediments should be beneficially used after proper investigation about quality etc: for various purpose which may inter-alia include: (a) Land Reclamation, Improvement and Filling (b) Capping of contaminated sites, filling on barren lands (c) Construction and Protection Materials- Brick Making, Aggregates in concrete, Flood protection works like embankments, geobags etc. (d) Top Soil Enhancement and Agricultural use (e) Habitat Creation and Restoration (f) Beach Nourishment and Shore Protection (g) River Training Measures with dredged sand.

Action Points Suggested

- Sediment-induced problems be approached in an integrated way.
- The sediments should be beneficially used after proper investigation about quality for various purposes

SEMINAR - 10

RIVER BASIN MANAGEMENT – MODELLING TOOLS

Background

River basins have been identified as most appropriate units for planning, development and management of water resources in a sustainable manner and for ensuring optimal benefit to the society. However, the planning and management of the water resources on a basin scale has its own complexities as several factors and constraints are required to be taken into consideration. Some of the important aspects of planning and management at basin scale include: (a) understanding the hydrological processes; (b) identification and projection of diverse needs; (c) identification of the alternative approaches; (d) analysis of different scenario in social, technical and economical context; (e) selection of most appropriate alternative. Required analysis requires large set of data on all related aspects, their processing & checking for consistency and thereafter, carrying out the studies. In view of multiple objectives and several associated constraints, a suitable model or set of models would be required which can evaluate different scenario and help in judicious decision making.

The seminar discussed various tools suitable for river basin management to ensure equitable apportionment of benefits from the available resources among various stakeholders in a sustainable manner.

Chair and Co-Chair

Shri . R.K.Jain, Chairman, Godavari River Management Board Chaired the Session and Dr. S.K. Jain, Director, NIH, Roorkee was the Co Chairman.

The papers presented during the Session were:

S. No	Title	Name of Author (s) Shri/Smt/Ms
1	River Basin Management - Modelling Tools	Dr. R N Sankhua, Chief Engineer (S), NWDA, Hyderabad
2	Analysis of Developmental Scenarios in Ganga River Basin using a Strategic River Basin Planning Tool (GangaWIS)	Suman Gurjar, Scientist-C, Jyoti Patil, Scientist - C Dr. M. K. Goel, Scientist-G, NIH, Roorkee
3	Snowmelt Runoff Modelling in A Sub-basin of River Ganga	Dr Anil Kumar Lohani, Scientist-G Dr. Sanjay Kumar Jain, Scientist-G, NIH, Roorkee
4	River Rejuvenation by Adopting Continuous Stream Storage Approach in Mula-Mutha Basin using Geo-spatial & Simulation Tools	Dr. R K Suryawanshi, Emeritus Professor, S H Gavhale, Research Scholar, College of Engineering Pune
5	The Impact of Upstream Land Use Land Cover Change on Downstream Flooding- A case of Kuttanad and Meenachil River Basin , Kerala, India	Sonu TS, Architect Planner, Dr Mohammed Firoz, Architect Planner, Dr Anjana Bhagyanathan, Landscape Architect, NIT, Calicut

6	Water Resources Reassessment of Composite Basin of West Flowing Rivers from Tadri to Kanyakumari	Isly Issac, Asst. Director Rishi Srivastava, Director, CWC, New Delhi

Recommendations Emerged :

1) Easy availability of quality data is a big constraint in taking up hydrological modelling. HP-I, HP-II, India WRIS, efforts by various State Govts. Etc. have made a difference. NHP is likely to improve the situation with the help of NWIC further but still a lot needs to be done.

2) There is a need to develop indigenous modeling tools to address the real - life problems.

3) Governments and administrators should involve all stake-holders at an early stage of water resource development. Dialogue is necessary between project planners and projects managers and this dialogue will be most useful if focused on problems arising in practice.

4) Low flow conditions in rivers and streams are of fundamental importance for good ecological status of the watercoureses and predetermined minimum flows should be ensured while planning and managing water control structures.

5) Apart from hydrological modelling, the river basin management needs to be guided by modelling of other important aspects also such as agronomy, demography, socio-economic, environmental aspects, climate change scenarios, multi-purpose benefits etc.

6) Scenario based modelling approach could be used by policy makers and decision makers to better understand the consequence of decisions.

7) Integrated and optimal operation of reservoirs both for flood moderation and conservation benefits is crucial as temporal distribution of water and inadequate storage often leads to sub-optimal benefits from these reservoirs and may adversely affect other stakeholders in the basin.

Action Points Suggested

- Develop Indigenous-modeling tools to address the real - life problems.
- Predetermined minimum flows should be ensured while planning and managing water control structures.

SEMINAR – 11

IMPROVEMENT AND INNOVATION IN REUSE AND RECYCLE PRACTICES AND TECHNOLOGIES

Background

Population explosion, coupled with improved life style of people, results in increased generation of wastes in urban as well as rural areas of the country. Growing water scarcity throughout the Indian States has caused a variety of devastating economic and environmental problems, including job loss, agricultural and landscape deficiencies, local waterway damage, and diminishing water quality. Water recycling, also referred to as water reuse or water reclamation, is an effective method of treating captured or conveyed wastewater and redistributing it to benefit other water-dependent applications. Unlike traditional approaches where water is merely discharged as waste after use, water recycling provides a reliable local water supply, helping improve water conservation, cut energy use and costs, minimize diversions from local water bodies and prevent water pollution. Reuse of water is very important intervention to mitigate effects of depleting water availability. The adoption and transfer of the technologies from the developed countries without adapting them to the local or regional perspective would be fallacious on the part of the developing countries. Therefore, the technical aspects for a waste management would have to take into account many points for planning and implementation of strategies according to situation of the country. It would call for the strengthening of the management sector which has to go hand in hand with technical planning.

Lack of awareness at household and community level and reluctance in the use of grey water due to socio-cultural norms, beliefs and practices are some of the specific issues which need to be addressed. The community along with planners and implementers need to initiate building structures at household and community levels for reuse of grey water and its use for point recharging.

The seminar facilitated an excellent forum for exchange of ideas, sharing of experiences and in identifying most appropriate approach including the required techniques and technologies to address the issues

Chair and Co-Chair

Shri Manoj Kumar Singh, Principal Secretary, Govt of Uttar Pradesh Chaired the Session and Shri D P Mathuria, Executive Director, NMCG and Shri Lahnsteiner Josef, VA Tech WABAG was the Co Chair.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Re-use of Treated Waste Water in Uttar Pradesh	Manoj Kumar Singh, Principal Secretary, Govt of Uttar Pradesh
2	Reuse of Water: Reflections from India's National Water Policies	D P Mathuria, Executive Director, NMCG
	Part-1 Joint Session, India-EU	
3	Added value of the European policy action to foster water reuse	Dr. Bernd Manfred GAWLIK
4	Review and Comparative Assessment of the EU and Indian States Policies on Treated Wastewater Reuse (TWWR)	Nitin Bassi On Behalf of the IEWP/GIZ PMU and ToC
	Part-2 Joint Session, India-EU	
5	How to set up and implement feasible water reuse schemes? Lessons learnt from Europe	Yvan Poussade, Senior process engineer, Veolia and Director, Water Reuse Europe
6	Industrial Water Reuse and Recycling Key Issues	Josef Lahnsteiner, Director, Patrick Andrade, COO, Rajiv D. Mittal, MD & CEO VA TECH WABAG
7	Poor service delivery from Wastewater Treatment Plants	Madhav Kumar
8	Treated wastewater as an alternative water source: the Flanders experience	Paul Campling - Vito
9	Isolation of heavy metal resistant bacteria from chromite mines for bioremediation of wastewater	Dr. Sachidulal Raychaudhuri, Principal Scientist, Mausumi Rayhaudhuri, Principal Scientist Vijay Kumar Malesu, SRF, ICAR-IIWM
10	Advanced Oxidation Nanotechnology for achieving ZLD, enhancing water reuse efficiency and decentralized treatment option in Water Wise Cities	Dr. Nupur Bahadur, Fellow, The Energy and Resources Institute (TERI), New Delhi
11	A Recapitulation of Waste Water Treatment through Nanotechnology	Vaishnv B, Dishant Loliyana and Tahar Kanchwala, Parul Institute of Technology
12	Towards Comprehensive Treated Wastewater Reuse Policy Development in India	Jeremy Bird
	Business Session	
13	Reuse Of Treated Wastewater In India Market Overview and Economic Implications	European Business & Technology Centre
14	Wastewater in India + EU- European Investment Bank	Donal Cannon, Head of EIB Regional Representative for South Asia
15	Reclamation of Water From Petroleum Refinery Wastewater – A Technological Challenge	Aashti Hamid, M.S. University of Baroda

16	Water management technology	Ralph Moreau, Flanders Investment & Trade
17	Industrial water reuse: from a challenge to an opportunity	Yvan Poussade, Veolia Technical & Performance Department
18	Case study Torreele (Flanders): Treated wastewater for managed aquifer recharge	Paul Campling (VITO), Emmanuel Van Houtte (IWVA), Johan Verbauwhede (IWVA), Marjoleine Weemaes (Aquafin
19	Vacuum Membrane Distillation (VMD) Pilot Plant tests at IOCL, Panipat	S. B. Pillai, F. Hell, J. Lahnsteiner, Y. P. Koganti, D. Kumar, VA Tech Wabag Ltd.
20	Potable Water Reuse - A Sustainable Water Management Option	Josef Lahnsteiner, Director, VA TECH WABAG, Suraj Pillai, Process Engineer, Rajneesh Chopra, Global Head BD, VATECH WABAG Ltd, Pierre van Rensburg, Strategic Executive, City of Wind hoek, Namibia ,Stefan Panglisch, Professor Duisburg-Essen University, Germany
21	Eco-friendly Desalination & Water Purification (Non polluting Greenfield technology)	Anil Sharma, Representative, WME GMBH, Germany.

Recommendations Emerged :

1. Due to low demand and lack of supporting policy environment, a significant quantum of treated waste water is mixed with the untreated one and discharged into water bodies. Experiences and approaches of other countries which are at an advanced stage with promoting reuse of treated waste water, can help in strengthening the existing policies, as better planning and more effective implementation.

2. Comparative assessment with EU can be helpful in providing necessary directions and guidelines for developing a comprehensive National TWWR policy for India

3. Water recycling and reuse solutions have to be economically, technologically and socially sustainable. These three factors are interlinked and should be the decisive criteria for water management.

4. Economic sustainability should not only mean short pay-back periods of 3 to 5 years, Industries must accept longer return on invest periods (at least 10 years) in order to promote water reuse and overall sustainability that includes industrial, agricultural, urban and potable water supply reliability, which is also of great social relevance.

5. Social acceptability is important especially in developing countries and emerging markets, and incorporates the creation of jobs and subsequently improvements in the health situation and the overall standard of living.

6. Adequate pre-treatment (normally by conventional technologies) is decisive for the successful operation of advanced technologies such as membrane filtration and thermal processes.

7. Financing is a further decisive factor in realizing water recycling projects and innovative, tailor-made financing models will increasingly be employed.

8. Treated domestic and municipal used water can be utilized safely and economically for potable reuse. Potable reuse constitutes a great opportunity for a safe and reliable drinking water supply - a sustainable solution for a better life.

9. Nanotechnology has emerged as one of the leading new innovative technologies with a great potential for treating waste water in a more effective and efficient manner than methods that have been previously used.

10. Advanced Oxidation Nanotechnology has been developed for achieving zero liquid discharge(ZLD), enhancing water reuse efficiency and decentralized treatment option in Water Wise Cities.

11. Microbial bioremediation of urban sewage is a suitable option when conventional sewage treatments are energy intensive and costly. The Isolated bacteria Pseudomonas aeruginosa can be used for development of microbial filter for bioremediation of urban sewage.

12. Separation of domestic sewage and storm water disposal system is need of the hour to preserve quality of storm water and avoid excessive treatment cost.

Action Points Suggested

- Use of nanotechnology for treating wastewater in a more effective and efficient manner should be explored.
- Separate domestic sewage and storm water disposal system to preserve quality of storm water.

SEMINAR-12

MOVING TOWARDS INTEGRATED PLANNING AND MANAGEMENT OF WATER RESOURCES AND INSTITUTIONAL ARRANGEMENTS

Background

"Integrated Water Resources Management (IWRM)" is a process which promotes the coordinated development and management of water, land and related resources in order to maximise economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems and the environment (Global Water Partnership, 2000). Water resources in India face numerous challenges such as highly uneven distribution in space and time, nearly 80% of the annual rainfall takes place in only 3 to 4 months, Brahmaputra - Barak - Ganga system accounts for about 60% of total surface water resources, western and Southern regions experience severe deficit in water availability during lean season, drought - flood - drought syndrome is witnessed years after years. Due to above, there is a pressing need to explore and evolve a framework for efficient management of Indian water resources in a natural boundary.

The key elements to a successful Integrated Planning & Management of Water Resources initiative are:

(a) A long-term vision for the river basin
(b) Integration of policies, decisions and costs across sectoral interests
(c) Strategic decision-making at the river basin scale, which guides actions at sub-basin or local levels
(d) Effective timing, taking advantage of opportunities as they arise while working within a strategic framework
(e) Active participation by all relevant stakeholders in well in formed and transparent planning and decision-making
(f) Adequate investment by governments, the private sector, and civil society organisations in capacity building for river basin planning and participation processes
(g) A solid foundation of knowledge of the river basin and the natural and socio-economic forces that influence it.

Success of integrated planning and management of water resources largely depends on enabling institutional framework. River basin is considered as the most scientific, suitable and hydrological unit for water resources management. The River Board Act, 1956 provides for establishment of river boards for management of water resources in a river basin. However, no such institution has been established so far.

The seminar evaluated the present status and valuable suggestions for future course of action to steer ahead.

Chair and Co-Chair

Ms. T. Rajeshwari, Additional Secretary (DoWR,RD&GR), Ministry of Jal Shakti Chaired the Session. Dr. Jonathan Quebbeman, RTI International, USA and Shri. S. K.Haldar, Member (WP&P), CWC, New Delhi were the Co-Chair.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Integrated Urban Water Management Approach For Ujjain, Madhya Pradesh	Avani Mulye, Environmental Planner, School of Planning & Architecture, New Delhi
2	Ensuring an effective Transboundary River basin Management through community Based Water governance in the Mahakali River Basin.	Mukunda Upadhyay Programme Officer-Disaster Risk Reduction, Oxfam India.
3	An Agenda for Sustainable and Integrated Water Resources Development and Management in India	Chaitanya K S, Dy. Director, CWC, New Delhi
4	Role of Mutual Cooperation among concerned states in inter-state river water dispute resolution	B P Pandey, Member Secretary, GRMB, Hyderabad and Preeti Choudhary, Dy. Director, ISM, CWC,

Recommendations Emerged :

1. Availability of relevant data, proper capacity building, communication between stakeholders, correct tools, models and forecasts are pre-requisite for IWRM.
2. Appropriate institutional arrangements, considering river basin as management unit should be set up in accordance with appropriate legal framework consisting of desired acts, laws, policies, guidelines etc. for implementation of IWRM.
3. International cooperation and learning of lesson from successful case studies such as Danube, Mekong River Basins etc. should be considered.
4. Under India-EU Water Partnership, River Basin Plan of Tapi river is being developed involving CWC and all party states (Maharashtra, Gujarat and Madhya Pradesh). Lessons from the efforts should be analysed for modifying and extending such exercise for other basins.
5. The emerging concept of Integrated Urban Water Management (IUWM) is subset of IWRM focusing on specific needs of urban areas and this should be duly considered while preparing plan for IWRM
6. Water, Energy and Food Nexus is one of the effective measures for analysis of requirements for Sustainable and Integrated Water Resources Development and Management in India.
7. Sustainability of vital ecosystem is essential for development and management of water resources at river basin level.
8. Facilitation exercise for generating informal dialogues amongst various stakeholder groups of the basin should be encouraged to generate better outcomes.

Action Points Suggested

- Institutional arrangements for river basin management should be set up for implementation of IWRM.
- Integrated Urban Water Management (IUWM) of IWRM focusing on specific needs of urban areas be considered for planning IWRM.

SEMINAR -13

MICRO IRRIGATION FOR IMPROVED AGRICULTURAL ECONOMY

Background

Water is a vital input for agriculture and hence for crop production. With increasing demand of water for various purposes, the relative share of water in future for irrigation is bound to be lesser than the present share. Therefore, it becomes necessary to use the water for irrigation more judicious and efficiently. Apart from saving water, the efficient use of water also results in savings in cost of agriculture. Micro irrigation Techniques have been found to be highly efficient in respect of water use and also economical in the long run.

Several studies have indicated that in recent years, micro irrigation technique is gradually gaining popularity among the farmers due to its positive impact on crop yield, water saving and net profit in farming. The present area under micro irrigation is around 8.6 million hectare, out of which drip is in 3.8 million hectare and sprinkler is in 4.8 million hectare, whereas the theoretical potential area under drip excluding its potentiality in cereals, pulses and flowers and sprinkler excluding its potentiality in sugarcane, fruits and plantation crops is 27 million hectare and 42.5 million hectare, respectively.

Economic viability under micro irrigation is an important aspect for its acceptability by farmers. In spite of relatively higher initial investment in the system, several reports have indicated that the micro irrigation technique not only contribute to higher water use efficiency but also contribute immensely in boosting the agriculture economy. Experimental evidence available nationwide suggests that increase in net profit under MI in different crops like tomato, capsicum, cabbage, okra, groundnut, cotton etc. varies from Rs. 30,000 to Rs. 2,22,000 per ha which is 35–65% higher than that under surface irrigation in the crops. The study conducted at ICAR-Indian Institute of Water Management (ICAR-IIWM) on micro irrigation for rice-based cropping sequence indicates that drip irrigation could save 40% irrigation water without affecting the yield of rice under surface irrigation. Further cultivation of commercial crops (Capsicum and Baby corn) in sequence after rice (rice-capsicum-baby corn) generated the net profit of Rs. 280000 per ha with benefit-cost ratio of 3.1. Another study conducted on use of drip irrigation in pre-bearing mango orchard with pineapple as inter crop reported that the yield of pineapple of 17.5 t ha-1 generated net profit of Rs. 1,40,000 ha-1 from the orchard.

The seminar provided a forum for scientists, professional and user groups to discuss thread-bare the future course of aspects of use of micro irrigation techniques including the possibilities of bringing down the initial investments.

Chair

Dr M Dinesh Kumar, Executive Director, IRAP, Hyderabad Chaired the session.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Micro Irrigation Technologies: Do they Hold Large Promises for Agricultural Productivity Improvements in India? **(Lead Paper)**	Dr.M. Dinesh Kumar, Executive Director, IRAP, Hyderabad.
2	Role of Drip Irrigation in Horticulture Development in Arid Region	Praharsh M Patel, Pre-Doctoral Fellow, IWMI-Tata Water Policy Program
3	Enhancement of irrigation water use efficiency through pressurized pipe irrigation network coupled with micro irrigation A Case Study parwan multipurpose major irrigation project Jhalawar Rajasthan	Dheeraj Johari, OSD, WRD, Govt. of Rajasthan
4	Improving Water Use Efficiency in Community Irrigation Projects	Abhijeet Surve, Manager ,Netafim Irrigation India Pvt. Ltd.
5	Best Practices In Water Management Sector A Success Story of Narmada Canal Project Sanchore Jalore Rajasthan	Girish Lodha, Chief Engineer, WRD, Govt. of Rajasthan

Recommendations Emerged :

1. Yield improvement, labour saving and income rising benefit of micro irrigation system needs to be propagated among all the farmers in water-scarce regions.
2. The assessment of real saving benefits of micro irrigation should be based on proper water accounting at the system level that takes into account consumptive and non-consumptive uses of the water applied in the field under different irrigation methods.
3. Farmers' contribution in community based micro irrigation system should be mandated.
4. Pipe based water conveyance system coupled with micro irrigation system should be promoted in canal command areas, based on economic viability consideration.
5. Adoption of micro irrigation should be made mandatory in public irrigation systems of arid and semi-arid, water scarce regions as is being done in Rajasthan
6. Water and electricity pricing and water supply/power supply policies in agriculture sector need to be designed in such a way that while introducing micro irrigation systems, private benefits are aligned with societal benefits.

Action Points Suggested

- Farmers' contribution in community based micro irrigation system should be mandated.
- Pipe water conveyance coupled with micro irrigation should be promoted in canal command areas.
- Micro irrigation should be made mandatory for public irrigation of arid and semi-arid regions.

SEMINAR -14

INNOVATIONS IN WATER MANAGEMENT

Background

In view of research in the area of water resources and related subject, several techniques and technologies have been developed. In particular the techniques developed in the area of computer science and information technology have made the processing, analysis and evaluation of data and information relatively very easy. Many of these techniques & technology, such as analytical tools, computer software, automation and remote sensing technologies have already been applied for better planning and management. However, there is need for their wider application and also the application of newer techniques and technologies. For example, several hydrological models have been developed and these have potential of projecting the hydrological profile use accurately with greater details. Similarly, simulation models can be effectively used for generation of alternative scenario which would lead to better decision making process.

The objective of the seminar provided a platform to deliberate about innovative practices, latest development and the experience of the users can be shared, which helped in deciding the use of such techniques and technologies for improving the water management.

Chair and Co-Chair

Dr. T B S Rajput, Former Principle Scientist, IARI Chaired the Session and Dr. Sahdev Singh, ICID was the Co-Chair

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Transfer of water saving technologies to farmers field for bridging the gap from lab to land -a case study (**Lead Paper)**	Dr. Neelam Patel, Principal Scientist, WTC, ICAR, CATAT-IARI, New Delhi
2	Land Drainage Technology and Policy Implications on Large Scale Reclamation of Waterlogged and Saline Lands in Irrigation Projects	DS Bundela, Head, MJ Kaledhonkar and PC Sharma, ICAR- CSSRI, Karnal, Haryana
3	Use of Drone for Efficient Water Management – A Case Study	Pravin Kolhe, Superintending Engineer T N Munde, Chief Engineer, WRD, Govt. of Maharashtra
4	Assessment of long-term changes in lakes and natural drainage patterns of Bengaluru city using historical satellite images	Ramachandra Hebbar, Scientist-SG; V. Poompavai, Scientist-SE; R. Sudha, Scientist-SG; T.R. Nagashree, Scientist -SE, S. Ramasubramoniam, Scientist-SE, K.S. Ramesh, Scientist-SG; K. Ganesha Raj, Scientist-G and GM; Uday Raj, Scientist-H & CGM, NRSC/ISRO, Seema Garg, IFS, CEO; C.K. Shivanna, IFS, Former CEO; Ramacharya, Former DD; Honniah, Asst. Exec. Engineer; R. Velumani, Executive Engineer; & K.P. Akash, Project Scientist KLCDA

5	Innovation in Water Management-Har Ghar Jal	Praveen Kumar, Joint Managing Director, JANAJAL and Shri Parag Agarwal, Founder and CMD, JANAJAL
6	Integrated Water Management System: A Case Study on Upper Wardha Project, India	B. Khapre, Ashok Karva and V. D. Loliyana, Mechatronics Systems Pvt. Ltd., Pune, Maharashtra.
7	Manna Irrigation Intelligence Software	Harish Kumar P, Head Marketing & Business Development, Rivulis Irrigation India Pvt. Ltd
8	Real Time Assessment of Volume of Water Stored in Reservoirs Using Satellite Remote Sensing Technique	Rishi Srivastava, Director, Karishma Bhatnagar Malhotra, Asst. Director Ashish Awasthi, Dy.Director, CWC, New Delhi
9	Framework for Irrigation Canal Automation	Mukesh Arora, Scientist-C; A R Khaladkar, Scientist-B; & Dr Neena Issac, Scientist-E, CWPRS, Pune
10	Water accounting from space: an assessment of satellite derived bathymetry in estimating storage of reservoir across three dams in India	Ameya Gode, Director, Silvanus Earth Observation, Pune, Selva Balan, Research Scholar, DIAT & Scientist, CWPRS, Pune, Sunil Kumar, Director, CWC, Siddhartha Mitra, NWA, PuneK.K.Shini, Deputy Director, Kerala Engineering Research Institute.
11	Water Resource Management by creating synergy between the water management t eam and common people.	Nirja Roy, Student, Amity University
12	Baseline studies for Improving Water Use Efficiency of Medium Irrigation Projects of Telangana Sate of Southern India	B Krishna Rao, Director (A&R) Water and Land Management Training and Research Institute, Hyderabad, Telangana

Recommendations Emerged :

1. The farm pond, by suitably designing, can be used for storage of rain water during the rainy season. Once that water is used, during the remaining period, the same pond can be used for cultivation purpose.
2. Using drone technology, crop area could be assessed, the growth of crop can be monitored and unauthorized use of water can be deducted. This is found to be a very cost effective methodology.
3. Sub-surface drainage for managing the water logging and salinity issues in the agricultural field, may be judiciously applied considering local geo hydrology and topography to manage the cost of drainage systems.

4. Remote Sensing, GIS and Google Earth Engine techniques can be suitably applied for conservation of lakes, in particular urban area, and reservoirs including near real-time assessment of storages and estimation of crop water requirement at a particular instance. Asset management of distribution networks can be made more responsive using these techniques.

6. The water demand & supply for drinking, irrigation and other purposes could be efficiently managed by developing suitable APP.

7. By application of SCADA, reservoir operation for flood forecasting & flood warning and for regulation of irrigation water through canals & pipelines could be efficiently managed.

Action Points Suggested

- Drone technology be utilised for assessing crop area, growth rate and unauthorized use of water.

- Remote Sensing, GIS and Google Earth Engine techniques be suitably applied for the conservation of lakes.

- Suitable APP should be developed to manage water demand & supply for drinking, irrigation and other purposes

SEMINAR -15

RAINWATER HARVESTING FOR SUSTAINABLE WATER SUPPLY

Background

Water conservation is an age old practice adopted all over the world, which includes from large reservoir to small pond or contour bunding made in the field with the objective of using water for various purposes including that for ground water recharge. The processes of rainwater harvesting vary from one region to other with environs and different techniques are employed as per the terrain conditions. The traditional methods of rainwater harvesting followed in different States are based on the traditional wisdom passed on to the generations after generations over the time period. Rainwater harvesting is an efficient means of water conservation and also for ground water recharge.

Rainwater harvesting structures can be grouped into three categories, viz., storage structures, recharge structures and a combination of storage and recharge structures. Rainwater harvesting can also be used to sustain the water supply for irrigation or domestic or industries. Central Ground water Board (CGWB) had taken up various studies from VIII to XI plan to initially experiment and thereafter demonstrate the efficacy of the various structures suitable for different terrains. On the basis of the studies, a master plan on regional scale, manual on artificial recharge and brochures on rainwater harvesting have been prepared and hosted on CGWB website.

The water stress is increasing day by day and our country is also moving from water surplus to water stressed. Union Government as well as various State Governments have laid due emphasis on water conservation / augmentation through rainwater harvesting and other techniques. The work has been initiated in Mission mode under Jal Shakti Abhyan by dovetailing many schemes of various ministries towards water conservation / augmentation.

The seminar shared the experiences to identify measures to further improve the technique more popular.

Chair and Co-Chair

Shri Sriram Vedire, Advisor to Minister, Ministry of Jal Shakti Chaired the session while Dr. G C Pati, Member, CGWB was the Co-Chair.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Rainwater Harvesting for Sustainable Water Supply	Sriram Vedire, Advisor to the Minister, Ministry of Jal Shakti
2	Rainwater harvesting for sustainable water supply - Lead Paper	Sanjay Marwah, Regional Director, CGWB
3	Impact Assessment Studies of Select Artificial Recharge Studies conducted by Central Ground Water Board	S Suresh, Scientist-D (Sr.Hg), Nandakumaran. P Member, A. Subburaj, Superintending Hydrogeologist, CGWB, India
4	Water Harvesting Through Spreading Channels, & Step Wells	K B Trivedi, Deputy Executive Engineer (Retired), Govt. of Gujarat,
5	Vattatha Uravakkay Jalasamrudhi-A model initiative on Water Conservation	Nizamudeen A, Land Use Commissioner, Kerala State Land Use Board
6	Impact Assessment study of Artificial Recharge structures constructed by CGWB in Karuvattar Watershed, Tamil Nadu	Senthilkumar M. Shri Suresh S. Central Ground Water Board

Recommendations Emerged :

1. Usage of GIS, Satellite and Information technology - Geo-Tagging, Drone and Satellite survey, GIS data & tools, Mobile App, Web portal should be promoted.

2. Need of hour is that the government should act as facilitator and stakeholder's participation should be ensured.

3. Water harvesting through conservation by constructing Contour Trench/ Bund, Check Dams, Structures, Percolation Tanks, Cement Plug and Farm ponds plays important role and hence such conservation practice should be promoted.

4. A nodal agency needs to be identified by State Government, which will maintain a scientific database for Water augmentation/conservation structures.

5. While evaluating the cost effectiveness, it has been observed that desilting of tank, recharge wells provided with the structures and recharge wells with percolation pond is more economic in comparison to check dam with recharge well.

6. Affected members of the community should be involved in the development of conservation planning goals and throughout the implementation process. Involving the community in goal development and implementation serves an important public education function and can greatly enhance the success of conservation programs.

7. Extensive awareness programmes should be done at all stages, viz, planning, execution, monitoring, etc.

Action Points Suggested

- Promote the use of GIS data & Tools, Satellite and Information technology - Geo-Tagging, Drone and Satellite survey, Mobile App, Web portal etc.
- Promote water conservation by constructing Contour Trench/ Bund, Check Dams, Structures, Percolation Tanks, Cement Plug and Farm ponds.
- Nodal agency be identified by State Governments to maintain scientific database for Water augmentation/conservation structures.
- Affected members of the community should be involved in the conservation planning goals and its implementation process.

PANEL DISCUSSION -1

WATER SCARCITY- CHALLENGES AHEAD

Background

The Water Resources in India is characterised by very high degree of variability – both in space and time. However, the overall water availability is considered to be more or less same. However, with growing population the per capita water availability is getting reduced day by day. The growing population coupled with the process of urbanisation and need for industrialisation has led to increased demand of water for various purposes. As a result, the creation of facilities for meeting the fast increasing demand of water has been taken up by the Government Departments as well as by private agencies. It is found that many such facilities have been created without proper planning and particularly without consideration of the sustainability of the resources, leading to problems of over-exploration, particularly that of ground water resources. Further, mostly the facilities are not being operated efficiently. Yet another serious challenge is related the deteriorating water quality. The projected impacts of Climate Change in the form of increase in the intensity of extreme events would definitely add the complexity and challenges in water planning and management.

The session deliberated on various issues related to Water scarcity, future challenges and intensity measures to address these challenges.

Chair and Co-Chair

Shri U.P. Singh, Secretary, DoWR, RD&GR, Ministry of Jal Shakti Chaired the Session. Shri R.K. Jain, Chairman, GRMB, Hyderabad was the Co Chair. His Excellency Dr.Ron Malka, Ambassador of Israel, Dr. Man Singh, Project Director, ATC, ICAR, Shri Harish Kumar Varma, Executive Director, ICID, New Delhi Shri Vijay Saran, Chief Engineer, CWC and Shri M. Lal, CWC were the Panelists.

The papers presented during the session were :

S. No	Title	Name of Author (s) Shri/Smt/Ms
1	Water Scarcity – Challenges Ahead in the context of Israel	H E Dr. Ron Malka Ambassador of Israel
2	Creation of Countrywide Networks of Irrigation and land Drainage infrastructure with the support of ILR	Dr Man Singh, Project Director, WTC, ICAR-IARI, New Delhi
3	The Global Framework on Water Scarcity in Agriculture in a Changing Climate	Harish Kumar Varma, Executive Director, ICID, New Delhi
4	Water Scarcity- Challenges- How to deal with the resistance to construction of dam for creating sufficient water storage required for socio-economic development of India	M. Lal, Chief Engineer, Central Water Commission

Recommendations Emerged :

1. Water demands are to be met from the available resources by both demand and supply sides management. Improving water use efficiency in irrigation and agricultural practices, use of water efficient crops, application of technologies and administrative reforms through the participation of water user associations are few amongst the major aspect which need to be considered for demand side management.

2. There is need to create maximum possible storages and infrastructure for inter-basin water transfers in view of high temporal and spatial variations in water availability, which is likely to further increase under climate change scenario. Various technical, financial and socio-environmental challenges need to be dealt for achieving the same. In view of massive protests against large storage, bond building process with the affected people needs to be initiated at early stage of the projects to understand and address their issues appropriately to minimize the protests and discourage the anti-dam activists.

3. There is need to create country-wide network of Irrigation and drainage infrastructure with massive investments to enhance incomes of farmers and make them independent of monsoon and climate change conditions.

4. Water scarcity in agriculture is a global challenge. In order to address this challenge, a global framework on water scarcity in agriculture in changing climate (WASAG) has been established by more than 80 ministers of agriculture at 9th Berlin Conference in January, 2017 with the aim to bring together key stakeholders across the globe and across sectors to tackle the collective challenge of using water better in agriculture to ensure food security to all. WASAG at present is having 67 partners from 22 countries. India, as a country and its institutions should also became partner of WASAG and support and benefit from its activities to achieve water related targets of Agenda 2030 of sustainable development and jointly address the pressure of global change impacts on water scarcity in agriculture.

5. The Israel has been managing their scarce water resources very well. They have taken major policy initiatives like measurement of all water uses including agriculture, appropriate pricing and water transfer from surplus to deficit regions, etc. They have implemented technologies like cloud seeding, sea water desalination, recycle and reuse of sewage water, micro irrigation, satellite/ drone assisted precision agriculture to enhance their water resources and efficiency of water uses. All these interventions are relevant for Indian context also.

Action Points Suggested

- Create maximum storages and infrastructure for inter-basin water transfers and address the concerns of affected people at early stage.
- Create country-wide network of Irrigation and drainage infrastructure to enhance income of farmers.

PANEL DISCUSSION-2

INTEGRATING VALUE CHAIN FOR AGRICULTURAL WATER MANAGEMENT

Background

According to a definition by Food and Agriculture Organisation, a 'value chain' or 'supply chain' in agriculture identifies the set of actors and activities that bring a basic agricultural product from production in the field to final consumption, where at each stage value is added to the product. Water being a major element of the chain, all aspects related to water management are bound to impact all aspects and need to be looked in totality.

The panel discussion has provided a platform for experts & professionals from all related field of agriculture and water management to discuss all related issues and plan strategy to address the issues for overall benefit to the society.

Chair and Co-Chair

Dr Manoj Khanna, Principle Scientist, WTC, ICAR was the Chair of the session.

The papers presented during the session were : :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Integrating Value Chain for Agricultural Water Management **Lead Paper**	Dr. Neelam Patel, Principal Scientist, Water Technology Centre, IARI New Delhi
2	Sustainability and Policy Issues in Groundwater Irrigation: A Case of Punjab State	S.K. Srivastava, Scientist (Agril. Economics) ICAR-National Institute of Agricultural Economics and Policy Research
3	Solar Powered Mega Community based Integrated Irrigation Project Kandi Canal, Talwara, Hoshiarpur, Punjab	Dr Sangita Ladha, Jain Irrigation.

Recommendations Emerged:

1. The concept of integrating value chain offers a framework to adopt both supply side measures (water augmentation measure) and demand side measures (water pricing, energy pricing, water market, crop choice etc.) together for improving management of agricultural water. The objectives of water planning should be clearly specified and should be integrated with other agricultural practices. There is need to have a trade-off between water security and economic security.

2. Regional mapping of value chain of agricultural water management is the need of the hour.

3. District Irrigation Plans developed under Pradhan Mantri Krishi Sinchai yojana (PMKSY) could be upgraded to integrate value chain.

4. Decision making across value chain shall be data driven. Efforts shall be extended to improve data collection infrastructure in the country.

5. Adoption of efficient water management system to reduce the water foot print of blue water in crop production is essential for agricultural value chain.

6. Cropping pattern may be finalized for different canal commands based on facility of existing value chain and taking care of blue & green water.

7. Value chain should be strengthened and defined to increase the primary and secondary processing. First step of value chain (production system), consumes more than 90% of water in comparison to other steps of value chain. Hence, production should be optimised in terms of water foot print.

8. There is need to change from "Supply" based system to "Demand" based system. However, demands have to be based on a pre- defined efficiency level as per local agro climatic conditions.

9. The water distribution system in canal command area should be modernised including the use of underground piped network and integrating last mile connectivity with pressurized irrigation systems such as sprinkler and drip irrigation systems based on crop to be grown. All Accelerated Irrigation Benefits Programme (AIBP) assisted projects should be future ready for micro irrigation and all outlets under "Har Khet ko Pani" should be pressurized outlets.

10. Gap between Irrigation Potential created and Irrigation Potential utilised to be bridged with Integrated water resource management with Piped Network and Micro Irrigation.

Action Points Suggested

- Regional mapping of value chain of agricultural water management should be introduced.
- District Irrigation Plans developed under Pradhan Mantri Krishi Sinchai Yojana (PMKSY) should be upgraded to integrate value chain.
- Cropping pattern be finalized for canal commands based on facility of existing value chain and taking care of blue & green water.
- Accelerated Irrigation Benefits Programme (AIBP) assisted projects should be modernised for micro irrigation and all outlets under "Har Khet ko Pani" should be pressurized outlets.

PANEL DISCUSSION-3

WATER RESOURCES SUSTAINABILITY FOR INDUSTRIAL GROWTH

Background

In India, water demand for industrial uses is relatively lesser as compared to the overall demand for various purposes. As per an estimate included in the Report of the "National Commission on Integrated Water Resources Development", it is only about 6%. However, the industrial growth is coupled with urbanisation and therefore, increased demand for drinking and municipal water supply. Further, the water for industrial need and that for drinking and municipal supplies are required to be planned for almost 100% dependability. It is also pertinent to note that there are reports of industrial pollution, adversely impacting the quality of river water as well that of the ground water. Simultaneously, climate change poses fresh challenges with its impacts on the hydrologic cycle. As a consequence, conflicts across competing uses and users are likely to grow further in future.

The panel discussion provided a platform for the professionals from industries and water sector and the scientists to deliberate on emerging challenges and related issues and to suggest the ways and means for addressing these challenges.

Chair and Co-Chair

Shri G. Asok Kumar, Mission Director, NWM Chaired the Session and Co Chaired by Shri Anshuman, Associate Director, Water resources, TERI. The panelists were Shri Mahendra Modi, IPS, DGP (Technical Services) UP, Shri Deb Mukherjee, Bengal Chamber of Commerce and Industry; Ms. Annelieke Margreet Laninga, Water Governance Consultant, WB ; Ms Tushara Shankar, Head CSR, UBL ; Shri Rajeev Singhal, Director, CWC ; Swapna Patil, Manager WW ; Shri Campling Paul, VITO ; Mr Rene van Markel UNIDO ; Kirtika Arora, FICCI. Shri U.P Singh, Secretary, DoWR, RD & GR, Ministry of Jal Shaki also joined the session.

The papers presented during the session were : :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Water Resources Sustainability for Industrial Growth	Anshuman, Associate Director, Water resources, TERI
2	Fast Raising of Water Level with Innovated and Replicable Technique	Mahendra Modi, IPS DGP (Technical Services) UP
3	Collective action for Water Resources Sustainability & Industrial Growth	Annelieke Margreet Laninga, Water Governance Consultant, WB
4	Water Use Efficiency and Water Conservation- The UBL Way	United Breweries Limited
5	Water Resources Sustainability for Industrial Growth	Rajeev Singhal, Director, CWC
6	Water Resource Sustainability	Swapna Patil, Manager WW
7	A European perspective on reducing the abstraction of fresh water for Power Plants	Campling Paul, VITO

8	Industry Opportunities for Responsible Water Use	Rene Van Markel UNIDO representative
9	Role of Industry and Business in Sustainable Water Management	Kirtika Arora, FICCI
10	Coal Mining - A Way To Water Conservation And Artificial Recharge	Dr. Rambabu Singh Deputy Manger (Geology) CMPDIL, RI-V, Bilaspur

Recommendations Emerged :

1. In India mostly rivers are Inter-State and in a state of flow, no State can claim exclusive ownership of its waters or assert a prescriptive right so as to deprive other States of their equitable share. Water Quantity and Quality are to be managed by :

    i. Creating Regulatory Authority for Water
    ii. Drainage system/pattern of water
    iii. Cooperative Management of Water resources
    iv. Integrated River Basin Development
    v. Public Policy Structure
    vi. Metering and Pricing the water

2. Agriculture is consuming water to the extent of 85 %. So, water is to be effectively managed by increasing water productivity, water efficiency and effectiveness. Tendency should be *More crop per drop*, which is a program by the Government to achieve it.

3. Bureau of Water use Efficiency may be contemplated. Agriculture consumption of water can be reduced by changing irrigation methods, changing cropping pattern, efficiently using water etc. Water requirement or consumption by industries can be reduced by

    - Increasing Water Use Efficiency
    - Third Party Audit
    - Using water saving efficient technologies
    - Innovative technologies should be explored and promoted which could significantly reduce water and chemical uses. Use of Multi Stakeholder platform to facilitate access to innovative and low cost technologies
    - Re-engineering the process of industries
    - Assessment and reducing the consumption of water through water foot-print
    - Recharge, reduce, recycle, reuse should be ultimate goal. Recycle/ reuse of wastewater with an ultimate goal to achieve zero liquid discharge (ZLD)
    - Water related data disclosure; Awareness Programme need to be conducted
    - Government can promote industries by incentivising those industries who work in the area of conservation of water
    - Establish and improve the benchmarks for Industrial water use, pollution abatement, wastewater reuse

4. The concept of industrial symbiosis is required to manage available water resources. Setting up of institute which will provide information on industries specific good practices in water use in the form of Bureau of water use efficiency can be considered.

5. Subsidies should be given towards technological development for eco-friendly solutions for water conservation.

6. Alongside rainwater harvesting, mine water can also supplement to the artificial recharge of aquifers.

7. Abandoned quarries and pits could turn into mine pit lakes which often act as lifeline to the local population and also serve as surface water bodies for recharging of water table in the surrounding areas.

Action Points Suggested

- Bureau of Water Use Efficiency be contemplated and agriculture use of water be reduced by changing irrigation methods and cropping pattern.
- Subsidies should be given to technological development for eco-friendly solutions for water conservation

PANEL DISCUSSION- 4

CHALLENGES IN ACHIEVING SUSTAINABLE DEVELOPMENT GOALS FOR URBAN WATER SUPPLY AND DRAINAGE

Background

Through Goal 6 of the Sustainable Development Goals (SDG), the countries of the World have resolved to achieve universal access to safe drinking water and adequate sanitation and hygiene to all in the next fifteen years. As a result of ever increasing urban population, particularly in metropolitan cities, the challenges in ensuring needed water supply are many. In majority of the cases, the water availability in the city is far less than the demand. To meet the increasing demand, water has to be made available through long distance canals or pipes etc. from reservoirs created for the purpose. In many cases, such arrangement requires Inter-State cooperation. Obviously, all these aspects are required to be addressed after considering all possible options – from demand side management to improving efficiency to tapping all possible ways for augmenting the usable water, including the recycling and reuse of water.

The panel discussion deliberated on all related aspects to address the challenges in achieving Sustainable Development Goals for urban water supply and drainage.

Chair and Co-chair

Mrs Isher J Ahluwalia, Chairperson, Indian Council for Research on International Economic Relations (ICRIER) Chaired the Session and Shri V S Thind, Former Chief Engineer, Delhi Jal Board was the Co-Chair. Shri R S Tyagi, Former Member, DJB and Shri Vinod Singh were the Panelists.

The papers presented during the session were : :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Water Availability in Urban areas : Need for Small Interventions on a Mass Scale	Urmila Shukla (IAS) Director, Vivek Bhatt, Associate Professor, MP WALMI, Bhopal
2	Sustainable Water Management to avert the Water Crisis in India	Rajesh Jain, Managing Director, Enhanced Wapp Systems India Pvt. Ltd., Gurugram, Haryana

Recommendations Emerged :

1. A distinction was made between water as a natural resource which has to be conserved and protected, and water as a commodity delivered at the doorstep which requires investments in infrastructure requiring appropriate service charges for ensuring sustainability of the same.

2. Reduce, Recycle and Reuse of water has to be enforced at the stage of planning for development.

3. Revival/restoration/protection of water bodies/lakes/ponds is need of the hour. Safeguard against encroachment of surface water and also against contamination by not discharging untreated waste water in the water bodies need to be enforced.

4. Excessive use of groundwater has to be curbed through appropriate policies. Groundwater recharge is very important.

5. Groundwater contamination is a very serious issue in urban areas. Leachate coming from garbage hills of mixed waste leads to ground water contamination. Solid waste management should be brought back into Atal Mission for Rejuvenation and Urban Transformation (AMRUT) for an integrated approach.

6. Segregation of water in different categories (i.e. Grey/Black/Fresh) should be done at household/Village level so that recycling and reuse can be cost effective.

7. Strengthening institutions of service delivery and improving governance is crucial for water delivery. Infrastructure is necessary but not sufficient.

Action Points Suggested

- Enforce, Reduce, Recycle and Reuse water practice at the stage of planning.
- Enforce safeguard against encroachment of surface water bodies and also against contamination by not discharging untreated wastewater into water bodies.
- Appropriate policies should be framed to curb excessive use of groundwater.
- Solid waste management be brought under Atal Mission for Rejuvenation and Urban Transformation (AMRUT).

PANEL DISCUSSION- 5

DEVELOPMENT OF WATERWAYS AND NAVIGATION

Background

Inland Water Transport (IWT) Systems have been used for centuries and many countries have developed such systems which are operational. IWT handles 46% of the nation's inland freight in the Netherlands; 32% in Bangladesh, 14% in the United States, 9% in China and less than 1% in India. The Inland Water Transport (IWT) mode is widely recognized as a fuel efficient, environment friendly and cost-effective mode, especially for bulk goods.

India has an extensive network of Inland Waterways in the form of rivers, canals, backwaters and creeks and therefore, there is considerable scope of expanding the activities. However, the proposals need to be examined with due consideration of the fact that there is wide variation in availabilities of water in time and space and hence the variation in depth of Water. Further, in case of most of the Canals, there are committed uses of water and these are to be duly considered.

The session discussed relative aspects for Development of Waterways and made appropriate recommendations related with eco-friendly mode of transport.

Chair and Co-Chair

Dr. Amita Prasad, Chairperson, IWAI Chaired the Session and Co chair was Shri Pravir Pandey, Vice Chairman, IWAI. The Panelists were Prof. Nayan Sharma, Adjunct Professor, CTRANS, IIT, Roorkee, Shri Saibal Ghosh, General Manager, Farakka Barrage Project, Prof. K. Murali, Oceanography Deptt., IIT, Madras and Shri M.U. Ghani, Former Member, GFCC

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Use of innovative low-cost technology for sustainable fairways by harnessing stream energy	Prof. Nayan Sharma Adjunct Professor, CTRANS, IIT, Roorkee
2	Effect of Ship Induced Wakes on the Bank of River Hooghly, India	N K Anand , M. Chakroborthy, MS Scholar, V. Sriram Associate Professor and K. Murali, Professor, Ocean Engineering Department, IIT Madras
3	An Innovative Solution to Provide Unhindered Traffic Flow Across Existing Pontoon Bridges on the River Ganges.	S K Gangwar, Member (Technical), Inland Waterways Authority of India

Recommendations Emerged :

1. Waterways and navigation have historical connection with mankind in the same manner as ancient civilisations flourishing on the banks of rivers. With the pressures on other modes of transportation increasing day by day, waterways & navigation offers a promising alternative in terms of cost-effectiveness, environment-friendliness and viability. It is especially suited for bulk transportation of non-perishable goods.

2. Due to its high freight carrying capacity, it has the potential to ease off the traffic on roads and railway. The contribution of navigational mode of freight transportation may be targeted to be 15-20% from the present around 1.5-2% of the total freight transportation through all modes.

3. Provision of adequate draft/navigable depth and river reaches being free from encroachments, sedimentation and floods are the essential requirements for successful operation of waterways. As such, latest technological interventions and innovations are required to be adopted for maintaining the waterways with greater viability and sustainability.

4. Impetus to the development of National Waterways-1 on Ganga through World Bank assisted Jal Marg Vikas Project and O&M of Multi-Modal Terminals through PPP mode has been adopted for better viability of the sector.

5. R&D and involvement of technological institutes have ushered in cost effectiveness in controlling and removing obstructive sedimentation through innovative techniques like bottom panelling, submerged vanes etc. utilising the Stream Energy Harnessing Techniques.

6. Concept of complimentary dredging may be given utmost priority over traditional dredging to make the navigation facilities more cost effective and efficient.

7. Technological innovation has also offered quick and hassle-free operation & maintenance of navigation locks and navigation across temporary pontoon bridges etc.

8. There is lot of scope in further developing the navigational relationship with our neighboring countries like Nepal, Bhutan, Bangladesh and Myanmar for their fast-commercial development. Waterways are invaluable in establishing strategic connections also as has been proved in case of Kaladan Project involving neighboring Myanmar to serve NE territories.

9. Transportation of goods trucks through Ro Ro Vessels greatly reduced the time and cost of transportation specially to cross the river and may be encouraged in a better way.

10. Development of waterways may be further accelerated through learning from the success stories around the world with a befitting political and administrative will.

Action Points Suggested

- Complimentary dredging be given priority over traditional dredging to make the navigation facilities more cost effective and efficient.
- Transportation of goods trucks through Ro Ro Vessels should be encouraged.

PANEL DISCUSSION- 6

WATER RESOURCES DEVELOPMENT FOR RURAL ECONOMIC GROWTH

Background

It is well established that agriculture in India is extremely important not only for 'food security' but also from the view point of employment and livelihood. Agriculture remains the predominant occupation in terms of number of people employed. The Economic Survey 2018-19 states that agriculture and allied sectors are critical in terms of employment and livelihoods for the small and marginal farmers, who dominate the agriculture ecosystem in India. It further states that to attain the Sustainable Development Goals (SDG) of ending poverty and bringing in inclusive growth, activities related to agriculture need to be closely integrated with the SDG targets and that agriculture is dependent highly on water. Obviously, the rural economic growth and the water resources development and management are closely linked. Sustainable development of the water resources and adoption of improved management practices are key to rural economic growth.

The session deliberated on various issues and identified actions points for expeditious implementation.

Chair and Co-Chair

Shri Amarjeet Sinha, Secretary, MoRD Chaired the Session and the Co-Chair was Dr Alok Sikka, IWMI. The panelists were Dr. Tushar Shah, Sr. Fellow IWMI; Shri Raghvendra Pratap, Director, MGNREGS; Shri K Vohra, Commissioner, MoJS; Shri B Rath, NRAA, MoAg; Shri K C Naik, Chairman, CGWB and Shri Rajeev Ahal, Director, NRM.

The papers presented during the session were :

S. No	Title	Name of Author (s) Shri/Smt/Ms
1	Economic livelihoods increase in Rural areas	Kamaran Rizvi
2	Importance of Irrigation/WRD for Rural Development	Kushvinder Vohra, Commissioner (SPR), Ministry of Jal Shakti.
3	Water Resources Development – Tool for economic growth of rural areas in the rainfed ecosystem	Bisweswar Rath, Technical Expert (Water Management), National Rainfed Area Authority
4	Water Resources Development for Rural Economy Growth	R K Agrawal, Superintending Engineer, WRD, Govt of Chhattisgarh
5	Water Resources Conservation Management : NABARD's Initiative & Experiences	Dr. A R Khan, NABARD
6	Water Harvesting structure for Rural Economic Development and Upstream-downstream linkages	Mr. D K Manavalan Mr. Indra Raj

Recommendations Emerged :

1. Special emphasis should be given on building the capacities of communities, especially *Panchayats* to become better 'demand centres' and take advantage of the provisions of MGNREGS. More emphasis should be given on '*non-wage*' benefits of MGNREGS as it would help: [a] avoid alienating the well-off and influential farmers; [b] durable asset creation; and [c] eventual crowding-out demand for minimum-wage work. MGNREGS interactions with local labour markets should also be kept in mind.

2. The PMKSY vis a vis Har Khet Ko Pani should focus on un-irrigated half of India's agrarian landscape, prioritizing Irrigation Deprived Districts and Adivasi farm holdings. Implementation of PMKSY may be supported through independent, third-party reviews; credible civil society organizations, philanthropic trusts, NGOs and CSRs can play a crucial role in this.

3. Sustainable water resources development and its efficient use in irrigation sector with higher productivity is the backbone of rural economic growth. Promotion of knowledge and skill based agriculture and post-harvest on-farm value addition may positively affect related non-farm rural economic growth.

4. Planning from Basin to sub-basin upto micro-watershed level with institutional mechanism at local, district and state level; rainwater harvesting should be implemented in scientific and sustainable manner for food security of the Nation. During such planning, influences of such rainwater harvesting structures on downstream storage structures should also be taken into account.

5. Conservation/ rainwater harvesting and re-use of Water may be mainstreamed in all schemes/ programmes of Govt. with emphasis on community education and engagement–through a mass movement. Cultivation of low water consuming crops should be incentivized.

6. Water required for more integrated approach to tackle India's water challenges. Water budgeting at local level should be encouraged.

Action Points Suggested

- The PMKSY should focus on un-irrigated agrarian landscape, deprived districts and Adivasi farm holdings.
- Incentivize cultivation of low water consuming crops and encourage Water budgeting at local levels.

PANEL DISCUSSION- 7

RE-ORIENTATING THE WATER EDUCATION TO ADDRESS THE WATER RELATED CHALLENGES

Background

Ever increasing challenges related to water resources development and management including management at micro level are well known. All related issues are getting more and more complex with time. A key element for addressing the challenges is 'education and awareness'.

Through scientific education at different level, raising awareness through mass communication programmes and joint efforts between water-related Institutes worldwide at different level involving people of all age group, efforts are being made to educate the generation about sustainable development, and preparing them to be careful thinkers. However, the education in areas related to water must be planned with the objective of creating capabilities in the professionals in addressing the future challenges. The water education must be re-oriented to go beyond the teaching of hydrological sciences, water planning and design of hydraulic structures etc. and be both multidisciplinary and interdisciplinary. This approach should include advancing scientific knowledge through the training of scientists as well as increasing knowledge on water issues through courses aimed at water professionals and decision-makers. Water education should also reach out to media professionals so that they can communicate water issues accurately and effectively. This should also include community education strategies to promote community-wide water conservation, as well as enhance skills in local co-management of water resources.

The panel discussion provided a platform to the academia, scientists and professionals for sharing their experiences and getting valuable suggestions.

Chair and Co-Chair

Shri A B Pandya, Secretary General, ICID Chaired the Session and Shri M E Haque, Former Member, CWC was the Co Chair. The Panelists were Shri Ghanshyam Jha, Former Chairman, CWC, Dr. Yella Reddy, ICID, Dr. Ashish Pandey, IIT and Shri Y Paithankar, Chief Engineer, NWA.

The papers presented during the session were :

S. NO.	Title	Name of Author (s) Shri/Smt/Ms
1	Reorienting the water education to address the water related challenges	Avinash C Tyagi, Vice President, India Water Partnership (Presented by Dr. Veena Khanduri, Executive Secretary, India Water Partnership)
2	Water Education – A Point for Consideration	M E Haque, Former Member, CWC

Recommendations Emerged :

1. There should be a right mix of knowledge and skills required to learn in the students' curriculum rather than focusing excessively on acquiring knowledge..

2. There is a need for closer interaction between Academia and Professional. The interaction should be two-way and on genuine issues affecting the water sector, aimed at addressing the present disconnect between the two.

3. The faculty on water related departments should preferably have faculty from amongst other professionals also.

4. Important components of water governance should be appropriately taught to students.

5. There is a need to incorporate social engineering aspects also in the curriculum for water education to appreciate the socio-economic aspects of water planning and management.

6. Water education is necessary to be imparted at various levels, right from the farmers level to the policy planners including media and general public, by designing suitable and appropriate content for every level.

7. Disambiguation of basic principles of water planning and management in public discourse is an urgent need to steer the healthy public dialogues on better scientific and rational terms.

Action Points Suggested

- Important components of water governance should be taught to students.
- Incorporate social engineering aspects in the curriculum for water education.
- Water education be imparted at various levels such as farmers, policy planners, media and general public by designing appropriate content for each level.

PANEL DISCUSSION- 8

BRIDGING THE GAP-LAB TO FIELD

Background

Considerable progress has been made in the area of water resources development and management in India where the technique and technologies available at relevant time were adopted. However, a lot still remains to be achieved. At the same time, it is found that there has been considerable research in the area of water resources development and management across the world, particularly in developed countries. Such research is primarily directed towards better planning and improved efficiency. The research and academics industries in India have also made considerable progress in these area. However, the application of findings of such research outcomes is relatively very slow. There is urgent need to adopt such findings in planning & operation of the water resources projects to ensure optimum and efficient utilisation for the benefit of the Society.

The panel discussion concentrated on a comparative evaluation of strategies adopted and best approach for developing countries.

Chair and Co-Chair

Dr Man Singh, Project Director, WTC, IARI Chaired the Session and Dr M K Sinha, Executive Member, Narmada Control Authority was the Co Chair. Shri Anuj Kanwal, Director (WS&RS); CWC, Shri S K Sinha, Director (Training), CWC; Shri D K Singh, Principal Scientist, WTC, ICAR-IARI were the panelists.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Transfer of water savings technologies to farmer's field for bridging the gap from lab to land- a case study	Dr. Neelam Patel, Principal Scientist T.B.S. Rajput, Former Principal Scientist, S.S. Parihar, Principal Scientist and SRF, J.P.S. Dabas , Mairaz Hussain and Anil Gautam ,WTC, IARI, New Delhi
2	Enhancing Irrigation Efficiency: Issues and Options	Dr D K Singh, Principal Scientist, WTC, ICAR-IARI, New Delhi
3	Transforming Tribal Farming from Subsistence to Sustainable: A Case study of enhanced water productivity and profitability in Southern Telangana	Dr.K Sreenivas Reddy, Principal Scientist, ICAR-CRIDA, Hyderabad

Recommendations Emerged :

1. There is need for enhancing the technical capabilities of field and practising professionals of different areas of water development and management to address the ever increasing challenges.
2. Training and capacity building program for farmer/stakeholders in the latest technology for optimal use of water with a view to enhance water and agriculture productivity should be undertaken.
3. To promote faster adoption of new technologies, incentives such as crop insurance and water charges based on water metering should be adopted.
4. Modern electronic and mass media avenues should be used and further promoted for knowledge dissemination through success stories about water management technologies and their benefits.
5. The scientists in research organization and academia should be encouraged to take up research on field problems through enhanced grants for research.
6. Transfer of laboratory/controlled environment based outcome to field require additional efforts on the part of developing as well as safety nets for the field implementing groups. Financial, logistical and manpower resources should be factored while taking up such exercises.
7. There must be emphasis on pro active coordination amongst R&D institutions, line departments and stakeholders
8. More investment on development of on-farm irrigation infrastructure and it's O&M should be promoted.

Action Points Suggested

- Undertake training and capacity building program for farmer and stakeholders in latest technology for optimal use of water.
- Crop insurance and water charges based on water metering should be adopted.
- Research organization and academia should be encouraged to take up research on field problems by enhancing grants for such research.
- Investment on development of on-farm irrigation infrastructure and it's O&M should be promoted.

PANEL DISCUSSION- 9

WATER QUALITY ISSUES –TREATMENT OPTIONS & EXPERIENCES (With Special Reference to Geogenic contaminants in drinking water and treatment options)

Background

India has made considerable improvements over the past decades in both the availability and quality of municipal drinking water systems, however its large population and increased demand has put severe stress on water resources both in urban and rural areas. In addition to drinking water, many other water sources are also found to be contaminated with both bio and chemical pollutants. It has been estimated that over 21% of the country's diseases are water-related. Lack of clean drinking water has put over 11.5 million people of India at a high risk of a bone crippling disease, fluorosis. At least 10 States are suffering from arsenic contamination causing Arsenicosis. Available data suggests that pollution levels have increased in surface water as well as groundwater. It is assessed that more than 100 million people in urban areas exposed to poor water quality. The appropriate treatment of waste water and its re-use for various purposes is an important measure for addressing these issues.

Currently, India has the capacity to treat approximately 37% of its wastewater. Moreover, most sewage treatment plants do not function at the full capacity and do not conform to the standards prescribed. The re-use of wastewater after appropriate treatment contributes to water sustainability and can thus be one of the solutions to the growing scarcity of fresh water in India.

The Panel Discussion deliberated all related issues for identifying measures and addressing the issues in appropriate manner.

Chair and Co-Chair

Dr Rakesh Kumar, Director, CSIR, NEERI Chaired the Session and Dr. Deepankar Saha, Former Member, CGWB was the Co-Chair. Dr. Pawan Labhasetwar, HoD, WTC CSIR-NEERI, Nagpur; Dr. G.K.Khadse, Scientist, CSIR-NEERI, Nagpur; Dr. Raman Sharma, Scientist, CSIR-NEERI, Nagpur and Dr. Noor Afsan Khan, Scientist, CSIR-NEERI, Nagpur were the panelists.

The papers presented during the session were :

S. No	Title	Name of Author (s) Shri/Smt/Ms
1	Water quality concerns and improving performance of conventional treatment plants	Dr. Pawan Labhasetwar, Scientist and Head, Water Technology and Management Division, CSIR-National Environmental Engineering Research Institute (NEERI)
2	Water Quality and Health Concerns	Dr. Noor Afshan Khan Senior Scientist , CSIR-NEERI
3	Geogenic Contaminants in Groundwater Removal Techniques and Experiences	Dr G.K.Khadse, CSIR-National Environmental Engineering Research Institute

4	Alternate Aquifer Based Water Supply in Affected Habitations	Dr.Dipankar Saha
5	Decentralised Sewage Treatment and In-situ drain treatment	Dr. Raman Sharma, Senior Scientist, CSIR-National Environmental Engineering Research Institute

Recommendations Emerged :

1. In order to ensure drinking water safety, the drinking water sources are to be tested for water quality parameters with geogenic origin and also microbiological parameters.

2. Drinking water exceeding permissible standards for water quality parameters needs suitable treatment or selection of alternate safe water sources for drinking water supply.

3. Contaminated drinking water sources are to be discriminated with suitable marking.

4. Treatment units installed for removal of different contaminants are to be evaluated by reputed independent agency.

5. Proper operation and maintenance of water treatment units are to be ensured by water supply authority in the state.

6. It should be ensured that the water treatment units are used by the people and the units should not stand idle.

7. Public awareness campaigns are to be organized in this regard.

8. Considering degradation in source water quality, protection of water sources and upgradation/retrofitting of conventional water treatment plants are needed .

9. Water distribution system needs identification of the weakest links and unauthorized connections to avoid degradation in water quality prior to reaching households.

10. One should ensure drinking water safety from catchment to consumers based on water safety principle.

11. Safe household water handling practices should be inculcated among water users at household level.

12. Water should be tested for emerging contaminants like pharmaceutical and personal care products.

13. Decentralized sewage treatment plants should be preferred options which can also promote enhanced safe reuse of treated sewage.

14. Natural sewage treatment technologies are better suited over conventional treatment systems in decentralized option to minimize operation and maintenance failure.

Action Points Suggested

- Ensure drinking water safety by testing the quality parameters with geogenic origin and microbiological parameters.
- Contaminated drinking water sources should be discriminated with suitable marking.
- Water Supply Authority of the State should ensure operation and maintenance of water treatment units promptly.

PANEL DISCUSSION-10

TECHNOLOGICAL INNOVATION AND BIG DATA FOR WATER SECURITY, EMERGING DIRECTIONS AND PROSPECTS

Background

Big data is associated with high volume and variety of data which requires new techniques and technologies to capture, store and analyse it and is used to enhance decision making and analysis.

Big data has vast potential to revolutionize not only research and science but also technology. Big data using artificial intelligence is showing great promise to plan water resources systems optimally, to analyse climate change impact, to detect changes in ecosystem through remote sensing, to predict natural and manmade calamities, to schedule irrigation plans and to mitigate environmental pollution etc.

However, limited studies are available worldwide in reviewing the application of big data analysis in diverse areas other than information technologies. A modest beginning has been made water sector in India in the form of collection of precipitation data and water level data using sensor for recording and satellites for transmission. There is considerable scope for expansion and making up these data more friendly.

The Panel Discussion shared the experience of technological innovations and evolving best practices out of it.

Chair and Co Chair

Shri N K Mathur, Former Member, CWC Chaired the Session with Dr V V Rao, NRSC as Co-Chair. Dr R N Sankhua, Chief Engineer (South),NWDA; Shri Ravi Shankar, Chief Engineer (P&D), CWC, New Delhi; Ms Upasana Dutta, Joint Director - Emerging Solutions and e-Governance (ES&EG) Group, C-DAC; Dr Abdul Hakeem, Scientist, NRSC, Hyderabad were the panellists.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Technological Innovation and Big Data for Water Security, Emerging Directions and Prospects	Dr R N Sankhua, Chief Engineer (South), NWDA
2	Technological Innovation and Big Data for Water Security, Emerging Directions and Prospects	Dr. V Venkateswara Rao, Group Director, Water Resources, NRSC.
3	Urbanization Water scarcity, Climate change, Digital proliferation, Security	Vinod Singh, Director, Water Asia Jacob Engineering

Recommendation Emerged :

1. Big data is associated with high volume and variety of data which requires new technologies and techniques to capture, store and analyse it and is used to enhance decision making and analysis.

2. Big data has vast potential to revolutionize not only research and development but also technology. Big data using artificial intelligence has considerable potentials for (i) planning water resources systems optimally (ii) analysing climate change impact, (iii) detecting changes in ecosystem through remote sensing, (iv) predicting natural and manmade calamities, (v) scheduling irrigation plans, and (vi) mitigating environmental pollution etc.

3. Big data is creating a new generation of decision support data management.

4. Automatic sensor and monitoring system being installed at large no. of sites are providing large amount of real time data. These sensors with computational technology in terms of big data can be used to track river, which may be utilised for real time flood forecasting, crop assessment and yield forecast, monitoring of e-flow, pollution of river water, dust storm forecasting etc.

5. As water-related data sets have a variety of formats with different observation methods generated from different organizations, either a general standardized format for data exchange or an open sourced data management tool that glues all relevant scripts for read and write of different data formats can benefit the water resources engineers and research community on handling data sets.

6. A National Water Data Policy is needed for standardization/integration/storage of data with synergy with National Water Policy, 2012 and this should be enforced.

7. Big data analysts, high end computing facilities and domain experts of water resources sector have to come together for solving the problem of sector.

Action Points Suggested

- National Water Data Policy for standardization of data with synergy with National Water Policy-2012 should be enforced.
- Big data analysts, high-end computing facilities and domain experts of water resources sector should come together for solving the problem of sector.

PANEL DISCUSSION-11

LEARNING FROM BEST PRACTICES IN WATER MANAGEMENT

Background

There has been a rich historical tradition of irrigation systems and age old practice of community managed sustainable irrigation systems are found all over India. Further, with increase in demand of water for various purposes including that for irrigation, several water resources projects including scheme for utilizing the ground water have been planned and implemented. With time, the water demand is increasing and many type of the projects/schemes are under stress. Improving the management practice particularly increasing the water use efficiency, is the need of the hour.

The panel discussion shared the experiences and best practice adopted by various projects/schemes from time to time for improving the performances of the existing system and also devising policies and methodology for future projects/schemes.

Chair and Co-Chair

Shri Rajendra R Pawar, Secretary, CAD, Govt. of Maharashtra Chaired the Session with Shri K.P. Bakshi, Chairman, MWRRA, Dr Yella Reddy, Vice President, ICID; Shri Pradeep Kumar, Former Member, CWC; Shri G R Kulkarni, Former Chairman, M.J.Fulepanivaparsantha Ozar (waghad medium irrigation project); Dr Rajbir Singh, Director, ICAR-ATARI were the panellists.

The papers presented during the session were :

S. NO.	Title	Name of Author (s) Shri/Smt/Ms
1	Learning from the best practices in Water management **Lead Paper**	B. A.Chivate, Director (Tech) A.B.Pandya Secretary General, ICID, India
2	Learning From Best Practices In Water Management	Dr Yella Reddy, Vice President, ICID
3	Status and importance of traditional water conservation system in present scenario	Sameer Vyas, Asst. Research Officer, Beena Anand, and Shri S.N. Sharma, Scientist-C,CSMRS, New Delhi
4	A Hydraulic Wonder –The Medieval Water Supply System at Burhanpur, MP	Sharad D.Mande,Pune Nandkishor M. Dewda, Burhanpur
5	Canal Automation for Smart Digital Irrigation Management: A Case Study on Narayanpur Left Bank Canal, Karnataka	B. Khapre, Shri Sidharth Charkha, Ashok Karva and Shri Viraj D Loliyana, Hydrology Expert, Mechatronics Systems Pvt, Ltd, Pune,
6	Remote Sensing Technique Based Performance Evaluation of Kanchi Irrigation Project in Jharkhand	Biswajit Chakravorty, Scientist-G Dr Pankaj Mani, Scientist-E,CFMS,NIH, WALMI Complex, Patna
7	Strategic Planning, Management and Implementation at Basin-wide scale	Jeremy Bird
8	WUA for increasing Channel Water productivity	G R Kulkarni, Nasik, Maharashtra
9	River Basin Planning Water Strategy, Planning and Delivery – Overview	Dr Martin Griffiths

Recommendations Emerged :

1. Efforts should be made to involve farmers in various aspects of management of irrigation systems like collection of user charges and O&M etc. for long-term sustainability of such schemes. PIM act should be publicized and Water User Association should be empowered and trained for proper distribution and management of water. WUA should also be trained for marketing and processing of farm produce. Water charges collected by WUA should be retained at WUA level for maintenance as is being done in Maharashtra.

2. PIM act should be publicized and Water User Associations should be empowered and trained for proper distribution and management of water.

3. PIM is not limited to handing over irrigation facilities to the WUAs, it is beyond that. The ultimate test of PIM is whether the farmer is benefitting from agriculture or not. Hence PIM should encompass the marketing aspects as well to ensure proper return to the farmers from agricultural operations.

4. Independent water regulator is needed in all states for fair water pricing, equitable distribution, water use efficiency and dispute resolution in irrigation as well as other water sectors.

5. Widespread implementation of GIS based Canal Automation Technology for smart digital irrigation management will contribute immensely to judicious and equitable use of water among farmers and increased water use efficiency.

6. Extensive use of Remote Sensing for performance evaluation of irrigation and other water resource projects should be encouraged to assess the health and performance of infrastructure and to identify the action to be taken for improvement.

7. Data creation, updation and sharing should be given priority. Proper data sharing policy should be implemented by each state (Central Govt. already has a data sharing policy).

8. Water conservation is a key element of any strategy that aims to alleviate the water scarcity crisis in India. There is urgent need to evaluate the status of our existing ancient water conservation structures and make efficient planning to revive these structures.

9. Gap between potential created and utilized is quite substantial. Steps should be taken to reduce the same by simultaneous development of command area so that water reaches tail end farmer. Command area development section of the WRD should be strengthened.

10. Emphasis should be given to micro irrigation and less water intensive crops to increase water use efficiency.

11. Emphasis should be given to improve the surface water quality available for irrigation.

12. Solar pumping scheme can be undertaken to provide safe drinking water through community driven approach in rural communities where the traditional gravity schemes are not feasible.

Action Points Suggested

- PIM act should be publicized and Water User Association be empowered and trained for proper distribution and management of water.
- WUA should be trained for marketing and processing of farm produce.
- Independent Water Regulatory should be formed in all States for fair water pricing, equitable distribution, water use efficiency and dispute resolution in water sectors.
- Revive existing ancient water conservation structures.

PANEL DISCUSSION-12

INDO UK BILATERAL COLLABORATIONS ON WATER QUALITY RESEARCH

Background

India (DST) and UK (NERC & EPSRC) jointly agreed to launch a collaborative research programme on improving Water Quality and mounted a joint research initiative with a committed investment of £4.2 million from each side having special thrust on addressing threats due to emerging contaminants (PPCP) online river water quality monitoring and sensor technology. The agreed level of Co-funding is £ 4.2 million (Rs.3475 Crore approx) each from Department of Science & Technology (DST) and Natural Environment Research Council (NERC), UK, spread over a maximum period of three years.

The Department of Science & Technology (DST) and the UK's Natural Environment Research Council (NERC) and Engineering and Physical Sciences Research Council (EPSRC) invited research proposals to improve water quality by providing a better understanding of the sources and fate of different pollutants. The aim of this programme is to tackle India and UK's water quality issues and secure the provision of clean water, rejuvenate rivers and restore ecosystems. This joint programmes envisaged to support research for improved understanding of the sources, transport, transformation, interactions and fate of pollutants, and determining the risks they pose to both people and the environment.

The Panel discussion deliberated various programme is to improve water quality in India by providing a better understanding of the sources and fate pollutants to address these challenges.

Chair and Co Chair

Dr Sanjay Bajpai, Head Technology Mission, DoS&T Chaired the Session and the Panellists were Dr Anupama Sharma, NIH, Roorkee; Dr Abdulaziz Anas, CSIR, National Institute of Oceanography; Prof Ligy Philip, IITM; Dr Indumathi M Nambi, IITM, Chennai; Dr S Asokan, Prof IISc, Bangalore.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Rehabilitation of Vibrio Infested waters of Vembanad Lake: pollution and solution (Revival)	Dr Abdulaziz Anas, CSIR, National Institute of Oceanography
2	Impact of Rainwater Harvesting on Groundwater Quality in Fluoride Affected Regions	Dr Anupama Sharma, NIH, Roorkee
3	Indo –UK Joint Research Antimicrobial resistance and pollutants: interactive studies and novel sensor technologies	Dr Indumathi M Nambi, IITM, Chennai
4	Indo-UK Water Quality Research Programme - Fate and Management of Emerging Contaminants (FaME)	Prof Ligy Philip, IITM, Chennai

Recommendations Emerged :

1. The mechanism of transport and treatment of geogenic and anthro gogenic including emerging antaminants need to be fully understood and the community must be equipped to deal with situation.

2. The awareness programme for the community and capacity building for the same is of paramount important and necessary programme must be taken up on priority at appropriate scale. The awareness programme and capacity building programme should inter-alia, include aspects of handling emergency situations during disasters.

3. Water quality standards for drinking water as well as for irrigation need to be developed along with low cost detention kits for detecting the water quality should be developed and put in use to ensure safe water supply for drinking and other purposes.

Action Points Suggested

- Community must be equipped to deal with situation for treatment of geogenic and anthro gogenic including emerging antaminants.
- Awareness and capacity building programmes should include handling of emergency situations during disasters.
- Low cost detention kits for detecting the water quality for drinking and irrigation need to be developed.

BRAINSTORMING SESSION-1

ADDRESSING THE EVER INCREASING COMPLEXITIES IN ADJUDICATION OF WATER DISPUTES

Background

The process of adjudication of water disputes is generally based on the claims of the party States in respect of water availability and water demand for various purposes. However, it remains a fact that neither the water availability nor the demand of water for various purposes can be defined in terms of a definite quantity. The variations in respect of availability of water in time and space have led to serious challenges in implementation of the Award. These aspects are getting more and more complex in view of emerging issues, particularly those related to environmental security and likely impact of climate change on water resources. It has been projected in many scientific literature that climate could impact (a) the future water availability scenario, as well as (b) the future demand of water resulting from different agro-climatic scenario. Such aspects are rarely projected by the party States before the Tribunal set up for adjudication of the water disputes. However, these issues are very important and cannot be simply ignored

The brainstorming session deliberated the issues and evaluated views of the participants for addressing the same in appropriate manner.

Chair and Co-Chair

The Session was chaired by Shri Suresh Chandra, Former Chairman, CWC, and co-chaired by Dr. Srinivas Chokkakula, Centre for Policy Research, New Delhi. The experts in the session were Shri A.B.Pandya Secretary General, ICID; Shri R.S.Prasad, Former Chairman, CWC and Assessor, KWDT-II; Shri M S Agrawal, Former Chairman, GRMB and assessor, VWDT; Shri R.K.Jain, Chairman, GRMB and CEO,PPA, Hyderabad; Shri Vivek P Kapadia, Chief Engineer and Addl. Secretary, WRD, Gujarat, Dr Avdhesh Pratap Singh, Professor, CSS University, Meerut; and Shri Rajendra Pawar, Secretary (CAD), Irrigation Research Division, Govt. of Maharashtra.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Role of Water Disputes Tribunals in Water Dispute Resolution	Suresh Chandra, Former Chairman, CWC
2	Addressing the ever increasing complexities in Adjudication of water disputes **Lead paper**	M.E, Haque, Former Member, CWC A.B.Pandya, Former Chairman, CWC S.M.Hussain, Former Chairman, CWC R.K.Gupta,Former Member Secretary, Polavaram Project Authority and Chief Engineer, CWC
3	Inter-State River Water Disputes (Amendment) Bill 2019: The Good, the Bad, and the Ugly	Dr. Srinivas Chokkakula, Centre for Policy Research, New Delhi

4	Water Governance and River Health	Dr Avdhesh Pratap Singh, Professor, CSS University, Meerut
5	Legal & Institutional complexities in sharing of water resources	S. Narasimha Rao, Chief Engineer, Irrigation and CAD Dept., Govt of Telanagana
6	Inter State River Water Dispute Resolution Through Tribunals	B.P.Pandey, Member Secretary, GRMB, Hyderabad

Recommendations Emerged :

1. Resource distribution/sharing requires collective and conscious convergence. India direly needs to develop collective and conscious convergence and then only can we ensure a cogent proposition in the field of resource management.

2. In resources sharing, demand supply patterns are subject to change with time and thereafter review of adjudicated issues become necessary. In absence of it, recurrence of disputes take place. As of now, once issue adjudicated is delivered to be settled and the balance is left on execution which is the main reason for making issue more complex. Method and philosophy of adjudication and principle of jurisprudence need to be regalvanised in this context.

3. Water utilization in all form, particularly that through of minor irrigation schemes of basin States (which is quite substantial but generally not accounted for) must be correctly assessed.

4. Before matter is referred to and considered by the Tribunal, the following aspects needs attention:-

   a) Critical evaluation of the technical aspects of the claims of the party States.
   b) Identification of various alternative plans to address the issues.
   c) Evaluation of the identified plans from technical, social, economic and legal considerations.
   d) Seeking the views of all concerned parties on the identified plans (through an interactive and continuous process)
   e) Identification of the most appropriate configuration of the plan which ensures sustainable development and management of water resources and also enables optimum benefits to the society.

5. An appropriate mechanism must be put in place to ensure implementation of Tribunal awards.

6. A comprehensive water law is required to be introduced.

7. To address the legal complexities and other ambiguities, academic and training institutions may introduce in its curriculum some hybrid courses clubbing water engineering with legal aspects in the similar line of courses like bio-medical and agricultural engineering etc.

Action Points Suggested

- Water utilization in all form, particularly of minor irrigation schemes of basin States must be correctly assessed.
- Ensure implementation of Tribunal awards and Introduce comprehensive water law
- Academic and training institutions should introduce legal complexities and other ambiguities in its curriculum.
- Hybrid courses clubbing water engineering with legal aspects should be introduced.

BRAINSTORMING SESSION-2

FOCUSED ROLE OF FEDERAL GOVERNMENT IN ENSURING SUSTAINABLE WATER RESOURCES DEVELOPMENT

Background

Challenges in water development and management are many and well known. With population growth, urbanization and industrialization, the challenges in water management are getting more and more complex. Sustainability of the Water resources, particularly the ground water resources has, in recent times, emerged as serious issue. Likely impact of climate change would, undoubtedly, add to the complexities. Several actions have been initiated from time to time at various level of governance i.e., by the Union Government, State Governments, and local administration. However, a unified strategy is required to be adopted to get the desired results and achieve the objective of addressing the future challenges in water management effectively. In this regard, the Union Government has to play a very important role in view of the fact that: (a) several of the future challenges would be impacted and / or influenced by the external forces, particularly the climate change, the global economy, technological innovations and demography etc. and (b) growing Inter-State and International issues would have to be addressed expeditiously.

The Session deliberated views of the experts, professionals and decision makers for identifying the area required focus and urgent attention.

Chair and Co Chair

Shri A.B.Pandya, Secretary General, ICID Chaired the Session while Shri Navin Kumar, Member (WR), CWMA & Chairman, CWRC was the Co-Chair. Experts were Shri Rajendra Pawar, Secretary, WRM & CAD, Maharashtra; Shri A D Mohile, Former Chairman, CWC; Shri H K Sahu, Former Chairman, GRMB; Shri R K Jain, Chairman, Godavari River Management Board; Dr. Sachidananda Mukherjee, Associated Professor, NIPEP

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Focused role of the union government in addressing the future water challenges	M.E, Haque, Former Member, CWC A.B.Pandya, Former Chairman, CWC S. M.Hussain, Former Chairman, CWC R.K.Gupta, Former Member Secretary Polavaram Project Authority and Chief Engineer, CWC
2	Focused Role of Federal Government in Ensuring Sustainable Water Resources Development	Navin Kumar, Member (WR), CWMA & Chairman, CWRC
3	Focussed Government Roles For Sustainable Water Resources Development	Dr. B. Ravi Kumar Pillai, Commissioner, DoWR,RD&GR Ministry of Jal Shakti

Recommendations Emerged :

1. The future challenges in water resources development and management would be more complex and for addressing these challenges, serious and sustained efforts are required with cooperation of all stakeholders.

2. In view of the fact that: (a) several of the future challenges would be impacted and / or influenced by the external forces, particularly the climate change, the global economy, technological innovations and demography etc. and (b) growing Inter-State and International issues would have to be addressed expeditiously, the Union Government has to play a very important role in: (i) comprehensive planning for addressing the challenges; (ii) coordinating the needed actions; (iii) guiding the various stakeholders; (iv) ensuring capacity building of the professionals involved at all levels of governance and (v) making available avenues for exchange of concerns and ideas at regional and national level.

3. The constitutional provisions and the functions of the Department of Water Resources, River Development and Ganga Rejuvenation of the Union Ministry of Jal Shakti (as defined in the allocation of Business Rules) and considered adequate for addressing the future challenges. However in addition to initiatives already made from time to time, there is need for focused attention on some specific area which *inter alia* include (a) Improving the quality of hydrological observation and water consumption data and adoption of prescribed standard procedure by all agencies namely the Union Government, the State Government and Project Authorities and (b) Promotion of research and studies on a much larger scale with emphasis on: (i) research in the area of water related policies and their impact on the society; (ii) research in the field of water planning including the dynamic nature of planning, particularly in view of likely impact of the climate change on water resources and (iii) research on the impact of external factors such as demography, climate change, the global economy, changing societal values and norms, technological innovation, laws and customs and financial markets etc. on water resources management.

4. With the objective of ensuring overall improvement in the management practices, the Union Government must assert and play pro-active role particularly in respect of: (a) Generation of Future Scenario of Water Availability and Demand on a non-partisan basis; (b) Preparation of basin wise comprehensive plans on the principles of Integrated Water Management without any further delay by appropriately strengthening and streamlining the concerned units; (c) Adopting the practice of water accounting for the current status and trend analysis; and water auditing with the objective of improving the management practices; (d) Undertaking appropriate studies using all available information including that in respect of river flow forecast and planning advisories for equitable utilization at various levels; (e) Strengthening and streamlining of the monitoring mechanism for in-depth evaluation of schemes at different stages of implementation and initiating course-correction measures, wherever necessary; and (f) Promoting avenues for exchange of concerns and ideas.


INNOVATIONS
6th INDIA WATER WEEK 2019

BRAINSTORMING SESSION-3

RESEARCH NEEDS IN WATER SECTOR

Background

Water is a basic need for sustaining life on earth. It is needed by the human beings for survival, sustenance and economic development including day-to-day chores. It is now well recognized that the development and management of water resources need to be carried out in an integrated manner. However, such integrated approach is complex and requires much more than only integration within the water domain itself. The new concepts bring with them a call for unified policies, participatory processes, integrated information and a greater emphasis on social and environmental concerns. For sustaining efficient water resources development and management, sustained research and development is necessary. The R&D efforts should not be limited to merely technological aspect but also cover the action research, policy analysis and research on social aspects of water management. In general, research and development activities are required to discharge two important functions. The first is to effectively solve the problem and second is to give a continuous feedback to the policy makers for changing water policies towards improved water development and management. There is an urgent need to store and disseminate water wisdom to utilize the knowledge. Research is an essential element of this knowledge support to the working executives. The various emerging research subjects in the water sector need to be prioritized for timely solution of water resources problems.

Thus, the formulation of research priorities has a profound effect on the conduct of research and the likelihood of finding solutions to problems. For example the real time simulation for flood plain zoning and hazard mitigation is the predominant need today and is being researched by Google in collaboration with CWC. The key enabling factors and barriers for research and innovation need to reach the market as well. The brainstorming session joined Stakeholders such as investors, innovation hubs, industrial partners for their views on the research needs in water sector.

Chair and Co-Chair

Shri S. Masood Husain, former Chairman CWC Chaired the session with Shri S.L Gupta, Director, CSMRS as Co Chair. Experts were Dr. (Mrs) V. V. Bhosekar, Director CWPRS; Shri Y.K. Sharma, Former Member, CWC; Shri A.K. Ganju, Former Member, CWC and Shri Naveen Mathur, CEO, Maithri Aquatech Private Limited.

The papers presented during the session were :

S. No	Title	Name of Author (s) Shri/Smt/Ms
1	Research Needs In Water Sector	S. Masood Husain, former Chairman CWC
2	The rise of thirsty Cities	Naveen Mathur, CEO, Maithri Aquatech Private Limited

Recommendations Emerged :

1. Emerging challenges in respect of water resource development and management call for serious effort for sustainability enhancing the research activity in respect of water related issues.

2. The research areas should address all aspects of planning and management of water resource, particularly that for addressing the policy and governance issues.

3. Water management being intra-disciplinary in nature, the involvement and cooperation of all stakeholder is considered essential and hence joint research projects should be promoted.

4. Research should be carried out in structured and methodical manner to ensure that the outcome of the same are appropriately implemented for the benefit of society.

5. Since the access to adequate and quality data is basic requirement for undertaking the research, due emphasis must be laid on proper policy and programme for obtaining data and ensuring the availability of same for research activity.

Action Points Suggested

- Joint research projects be promoted involving all stakeholders of water management.
- Research be carried out in structured and methodical manner and implement the output for the benefit of society.

BRAINSTORMING SESSION- 4

E-GOVERNANCE IN WATER SECTOR

Background

Water related issues are close to lives and livelihoods of every citizen as water is
(a) essential for life
(b) needed for food security
(c) very important input for overall economic development.

Thus every citizen is a stakeholder in water development and management and hence there is aspiration of not only being informed but also being heared and be a part of decision making and implementation. Through e-Governance, all related information can be shared and views of all concerned citizens can be sought which in turn would help in better communication, and partnership in addition to better management. Apart from ensuring ease of doing business and ensuring transparency to the system, the e-Governance in water sector can provide efficient gathering, managing and reporting of water resources data for promoting effective public participation. It has gone beyond convention to cover complex issues like water resources monitoring, optimizing water demand primarily for agricultural as well as industrial use. However, in view of sensitivities associated with some aspects of water management, particularly the trans-boundary issues or Inter-State matters, due care and caution is called for. E- Governance has a major role to play in disaster management and advanced warning systems wherein the stake holders not only need to be aware of the protocols but also are part of the whole disaster management exercise.

The brain storming session compiled the suggestions of the participants to implement the concept of e-Governance in water sector to achieve better management.

Chair and Co-Chair

Shri N K Mathur, Ex-Member CWC Chaired the session with Dr. (Mrs.) Ranjna Nagpal, DDG, NIC as the Co-Chair. The experts were Shri Ashok K Kharya, Chief Engineer, CWC ; Shri Bhopal Singh, Chief Engineer, CWC.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	E-Governance in Water Sector-An Introspection (Lead paper)	Dr R N Sankhua, Chief Engineer (South) NWDA, Hyderabad
2	E-Governance Solutions Implemented in Water Resources	Dr. Ranjna Nagpal, Dy. Director General, NIC
3	E-Governance in Water Sector Issues & Challenges	D S Chaskar, Superintending Engineer (HOC), MTBO, CWC, Gandhinagar
4	Enterprise Information Management System: A need for sustainable water resources sector	B Khapre, Shri Ashok Karva and V. D. Loliyana , Mechatronics Systems Pvt. Ltd., Pune

5	Remote management of community water treatment plants	Parag Agarwal, CMD, JANAJAL Praveen Kumar, Jt. Managing Director, JANAJAL
6	State Ground Water GIS	Vivek Chauhan, ESRI, India

Recommendations Emerged :

1. The need of governance in water sector through electronic mode was duly emphasized, particularly in view of the fact that most of the data being generated is in silos and they do not talk to each other and hence the governance of data in the water sector itself is the most crucial factor for leveraging e-governance.

2. Data integrity is the key to successful implementation of e-governance for achieving the objectives of translating benefits to the end users i.e. public at large.

3. There is urgent need of uniform data protocol in the water sector. However, the e-governance solutions should be smart enough to synthesize the data in accordance to standardized protocol irrespective of data collection, which is often in localized units.

4. The data sourcing agency should be solely responsible for its repository and providing access to all the other stakeholders in water resources for decision support system.

5. Attention needs to be drawn towards taking multiple stakeholders on board for collaboration and integration of data through analytic tools. Use of GIS is must in water sector for better realization of water sector data.

6. Although certain progress has been made in promoting e-governance from government to citizens (G2C), a lot of work is yet to be done for e-governance from citizen to government (C2G approach).

7. Many facts of e-governance are required to be taken at a common platform so as to reduce reaction time of government, encourage public participation, reduce digital divide etc.

8. Most of the water data should be freely available to farmers. Coordination among cross domain sector should be main focus of e-governance.

Action Points Suggested

- Uniform data protocol of e-Governance solutions for water sector should be evolved.
- Use GIS in water sector and involving stakeholders for collaboration and integration of data through analytic tools.
- E-Governance be implemented at common platform to reduce reaction time of government, encourage public participation, reduce digital divide etc.

SPECIAL SESSION – 1

REJUVENATION OF THE RIVER GANGA – FROM PLANNING TO ACTION

Background

Ganga river basin which accounts 25% of India's water resource and home to 43% of India's population is grappling with pollution due to discharge of untreated municipal sewage and industrial effluents.

Government has been continuously working towards cleaning of river Ganga since 1985 through various programmes viz.

Ganga Action Plan –I (GAP-I, 1985) and GAP-II (1993),
National River Conservation Plan (1995),
National Ganga River Basin Authority (2009)- a separate authority under Chairmanship of Hon'ble Prime Minister of India;
National Mission for Clean Ganga established as implementing body for this authority at center.
"Namami Gange" the flagship Program, was launched in May'2015 with a vision to restore the wholesomeness of the river defined in terms of ensuring "Aviral Dhara" (Continuous Flow"), "Nirmal Dhara"("Unpolluted Flow"), Geologic and ecological integrity. The Special Session on "Rejuvenation of the river Ganga- from planning to action" has planned to make the participants aware about the programme and achievement.

The session emerged from the participants is helpful for making the program more effective.

Chair and Co-Chair

Shri Rajiv Ranjan Mishra, Director General, NMCG Chaired the Session while Dr Rakesh Kumar, Director, CSIR-NEERI, and Shri Dirk Steffes-enn, Deputy Head, Economic Cooperation and Development, German Embassy were the Co-Chairs.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Rejuvenation of The River Ganga – From Planning To Action	G. Asok Kumar, Executive Director (Projects), NMCG
2	Ganga Cultural Documentation Project	Batnagar, INTACT
3	Rejuvenation of river Ganga- from Planning to action	D.P. Mathuria, Executive Director (Tech.), NMCG
4	Factors leading to disposal of toxic and hazardous sacred waste and its effect on urban river contamination: Case of Adi Ganga, Kolkata, India	Srijita Chakrabarty , Architect - Urban Manager
5	Rejuvenation of river Ganga	Dr. Martin Grifith
6	Share Benefits – share interests	Jermy Bird
7	NMCG Preparedness for RBO	Rajive Kishor, Executive Director, NMCG

8	Environmental Flow Assessment for Reach of River Ganga from Haridwar to Unnao	N N Rai, Director, CWC, New Delhi
9	Rejuvenating River Yamuna by Assessment and Implementation of Environmental Flows	Anupma Sharma,Scientist- E, Vishal Singh, Scientist -C, Dr. Sharad K. Jain, Director, Manohar Arora, Scientist-D, Pradeep Kumar, Scientist –C, Ajay Ahirwar, Research Scientist, Rajesh Singh, Scientist-C, Shailendra K. Kumre, Research, Associate, NIH, Roorkee
10	Challenges in the Implementation of E-flows in Ganga Basin	Bhopal Singh, Chief Engineer, CWC Deepti Verma, AEE, Chief Office, UGBO, CWC
11	Bringing EU and Indian approaches together for E-Flow assessments within the India EU Water Partnership	Dr. Jyoti Nale Project Advisor, India-Europe Water Partnership
12	River Rejuvenation by Adopting Continuous Stream Storage Approach in Mula-Mutha Basin using Geospatial & Simulation Tools	Dr R K Suryawanshi, Prof. Emeritus, S H Gavhale, Research Scholar, College of Engineering, Pune

Recommendations Emerged :

1. E-Flows should be season wise (such as monsoon, non-monsoon etc.) and also reach wise where there are various water diversion/storage structures located along the length of river.

2. E-flows as decided should be maintained in every reach of the river Ganga.

3. Monitoring of 11 projects in the river Ganga upto Unnao for E-flow releases has been commenced from 1st January, 2019. It is found that some of the projects on the river Ganga upto Unnao are not meeting the e-flow norms particularly during lean period mainly because of commercial interest and scarcity as these projects were not planned and accounted for the recente flow norms. It is considered necessary that the project authorities must take necessary policy decisions for adhering to e-flow norms and initiate immediate requisite measures like revising Power Purchase Agreement (PPA) and improving water use efficiency.

4. The project authorities should take immediate necessary action for installation of automatic data acquisition and transmission system for data transfer.

5. Continuous Stream Storages (CSS) is effective and implementable method for river rejuvenation.

6. Increasing irrigation efficiency by 10% (from 30% to 40%) can achieve river rejuvenation for all streams by CSS, maintaining the present deficit level in Mula-Mutha Basin. For future water demands, irrigation efficiency can be further increased to 50% maintaining the river rejuvenation requirement.

Action Points Suggested

- E-Flows be assessed season wise and reach wise.
- Decided E-flows should be maintained in every reach of the river Ganga.
- Project authorities should take immediate action to install automatic data acquisition and transmission system.
- Indigenous or exotic deciduous tree species should be planted along riverbanks

SPECIAL SESSION – 2

WATER CULTURE AND SOCIAL HARMONY

Background

Water is essential for life and key to all aspects of development. Water security is very important for ensuring food security as well as for maintaining ecology. At the same time water security plays an important role in poverty alleviation and social harmony. On the other hand a harmonious society enables in getting optimal benefits from the water resources development projects / schemes and their efficient management, and also in ensuring sustainability of the resources. However, the aspects of social harmony are described only in qualitative terms. The planning process does not take into consideration this important aspect. Similarly, the process of evaluation of the projects has no index or criterion to address this aspect.

The special session discussed important aspect and suggestions for identifying measures to account for planning and evaluation process.

Chair and Co Chair

Shri Nitishwar Kumar, JS (A), Ministry of Jal Shakti Chaired the session and Shri Atul Jain, General Secretary, Deen Dayal Institute was the Co-Chair. Prof Janakrajan, Tata Institute of Social Science and Shri Pranjal Deekshit, Assistant Professor, School of Habitat Studies, TISS were the eminent experts of the session.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Degradation leading to Depletion of Our Biosphere – Would SDGs help nourishing the Biosphere? Know More To Act, No More Neglect	S Janakarajan, Professor MIDS (retd.) President, South Asia Consortium for Interdisciplinary Water Resources Studies
2	Impact Assessment of Bunds in the Upstream Reaches of Belpada Creek by using Hydraulic Modelling	N Vivekanandan, Scientist-B, C. Srishailam, Scientist-C, Archana S. Shinde, Assistant Research Officer and R.S. Jagtap, Joint Director, CWPRS, Pune
3	Cleaning and Revival of Morna River at Akola, Maharashtra	Suresh T Hunge, City Engineer, AMC, Akola, Vinayak Koundanya, Former Executive Director, WAPCOS, New Delhi Neha S Hunge, Final Year Civil S P Engg College, Mumbai
4	Water: A Conduit for Sustainable Future and Social Harmony	Meena Narula, Country Director, Water for People India

Recommendations Emerged :

1. It has been emphasized that there is definite role of religion in creating the values and emotional bonding with water. Atharva Veda also emphasised that the "the pathway to prosperity lies in the intelligent use of the water within the limits of endowments of the particular region". Emphasis to use water judiciously as our part of age old culture since Veda era needs to be embedded into our priority, awareness and policy making. Awareness generation at all level is the key as water resources will remain scarce commodity in Indian condition.

2. The increasing incidence of the extreme events in the context of the Climate Change with a special reference to Kerala Floods and recurring droughts in some of the parts show that these developments pose a serious challenge for the policy framing.

3. Water has in-built local challenges which are to be managed locally and these aspects are to be duly recogonised while formulating policies in respect of water.

4. Community Participation is a must. Adopting indigenous practices at local level by involving local expertise and available resources can do wonder as depicted by Churu District of Rajasthan, North Eastern and others parts of India.

5. Our Policy making has become Growth driven at the cost of environment and water. Policy emphasis has become more technology oriented and less science driven. Science has taken a back seat in today's policy making which is very unfortunate. We need to take a break from the Business as usual approach. If illiterate women of Bundelkhand can solve the local water harvesting issues, one has to adopt these local measures in policy making as well.

6. In India, there is huge divergence between policy and its practice. That gap needs to be bridged immediately. Examples include urban flooding in Mumbai, Chennai, Kerala.

7. Initiatives like Nal (Tap) se Jal (water) is commendable. However, it needs to be ensured that the supply side is well managed.

8. India is largest extractor of Ground Water in the whole world and there is need for a balanced approach in adopting measures which can enhance balanced and conjunctive use of surface and ground water.

Action Points Suggested

- Formulate policies of water by considering its in-built local challenges.
- Ensure well managed supply side for initiatives "Nal se Jal"

SPECIAL SESSION – 3

BILATERAL COOPERATION FOR MUTUAL BENEFITS (INCLUDING SUCCESS STORIES)

Background

Water is a common pool resource and does not recognise political and social boundaries as it flows past. However, the management and developments have to follow the political and administrative boundaries involving issues of land, developmental priorities as perceived by the societal groups. In this context, it is inevitable that we have to share the common resource of water across the boundaries. India has been in a particular situation where we find ourselves in upper, middle and lower riparian situations for our major river basins. Even within the country, the states having their exclusive jurisdictions over issues like land, water and agriculture with water resources distributed across multiple boundaries, bilateralism has a role to play in many situations within the country as well. Overall, as per FAO estimates about 3600 treaties have been signed on water since 805AD.

This aspect has been well recognised since early days of water management in the country. Central Board of Irrigation and Power was set up in 1927 with one of the aims to discuss and clear major projects involving multiple states on a bilateral basis. Presently, we already have agreements between states out of which a significant number are essentially bilateral. Even though the following discussion focuses on the international level bilateralism, the same is applicable to inter-state arrangements as well. However, in case of interstate arrangements, legal recourse in form of judicial and quasi-judicial resolutions is feasible, which is not so easily available for international agreements.

Bilateral concept is used more in the context of trans boundary arrangements for sharing water resources and in this context as well, we have good experiences to share. India has successfully entered into bilateral cooperation with neighbouring countries in the area of water resources. Treaties like Indus treaty of 1960 between India and Pakistan and Ganga water sharing treaty of 1996 are excellent examples. Both of them have withstood the test of time. It is interesting to note that both the treaties exemplify two different approaches with Indus case providing for a geographical distribution of the basin resources and Ganga case providing for a dynamic distribution of the current flows at various periods of time in a hydrological year. The Mahakali treaty between India and Nepal has also come into effect from 1997. Similarly other water related issues with neighboring countries have also been bilaterally addressed.

An overview of success stories of bilateral Cooperation along with various aspects of bilateral treaties and other arrangements and opportunities and pitfalls encountered on the way of negotiations and implementation are deliberated during the session.

Chair and Co Chair

Shri A B Pandya, Secretary General, ICID Chaired the Session. Shri J Chandrashekara Iyer, Commissioner (INDUS), DoWR, RD & GR, MoJS; Shri P K Saxena, Commissioner, DoWR, RD & GR, MoJS and Shri T S Mehra, Commissioner (B&B), DoWR, RD & GR, MoJS were the eminent experts of the session

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Co-operation with China and Bhutan in Water Resources	T.S. Mehra, Commissioner (B&B), DoWR, RD & GR, Ministry of Jal Shakti
2	Bilateral Co-operation for mutual benefits in Hydro Power Sector	Jaideep Singh Bawa, Chief Engineer, CEA, Dr Veepin Kumar, Deputy Director, CEA, Pooran Chand, Assistant Director, CEA,
3	Finding harmonies for cooperation- A review of legal collaborations on the River Brahmaputra	Arundhati Deka, Research Associate, and Vishaka Gulati, Research Scholar, Department of Humanities and Social Sciences, IIT Guwahati,

Recommendations Emerged :

1. India has always believed in bilateral arrangements for sharing common water resources between its hydrologically connected neighbours. Historically, the bilateral arrangements with Nepal, Bhutan, China and Bangladesh have worked well and many successful milestones in the form of treaties, agreements, MoUs and Joint Mechanisms with these countries bear sound testimony to it. This may be continued in future with an appropriate pace, diligence, water-diplomacy and foresightedness.

2. Confidence-building measures at Government level on both the sides are crucial as well as congenial so as to thwart away any trust-deficit and public hindrances which may have adverse bearing on the bilateral co-operation.

3. Sincere political wills and consequent actions on both the sides for proper, smooth and conducive bilateral co-operation is essential and beneficial to both the countries and their people.

4. Appropriate IEC measures in a true and transparent manner regarding the sensitive issues concerning both the countries may be resorted to in order to prevent any misconceptions among the people on either side which may turn into hindrances and law & order problems.

Bilateral arrangements need operational mechanisms and each case will need specialised mechanisms operated by professionals for sustainable operation of the treaty and agreement provisions.

Action Points Suggested

- Transparent IEC measures of sensitive issues concerning both the countries should be resorted to prevent misconceptions among the people on either side.
- Provision for specialised mechanisms operated by professionals should included in Bilateral treaty and agreement for sustainable operation.

SPECIAL SESSION – 4

WATER AND HERITAGE

Background

The grave situation around the scarcity of water and also the deteriorating water quality issues are well known. In India, with a large population and high density of population, water conservation measures have to be centric to the people.

India with its geographical diversity consists of regions with varied availability and sources of water. This natural history has influenced cultural practices over centuries. Traditions of water conservation were highly sophisticated and deeply imbedded in the local communities. As cities have expanded, connection with nature has become diluted and migrant populations have little or no connect with the land they inhabit. The loss of context both natural and cultural is one of the reasons for the intense environmental pollution invading our nation.

The way to a sustainable society lies within the memory and culture of its people. The Session made a platform to bring together professionals from diverse backgrounds presenting their views as also good practices of how these could help us in moving forward towards sustainable use of water.

Chair and Co-Chair

The session was chaired by Shri A B Pandya, Secretary General, ICID and Dr. Vivek Saxena, IUCN was the Co-Chair.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Linking Nature, Culture and Community	Nupur Prothi Khanna, Beyond Built.
2	"Nature-based Solutions: Bringing Science and Traditional Knowledge Together"	Dr Vivek Saxena Country Representative, IUCN India
3	Water & Heritage	Pankaj Sathija, TATA Steel
4	Water & Heritage- Sparsh Ganga	Arushi Nishank, Sparsh Ganga
5	Water & Heritage	Meena Narula, Country Director – Water For People India
6	Linking Water & Heritage	Divay Gupta, Principal Director. Architectural Heritage Division
7	A Landscape Approach	Nidhi Madan, Hon. Secretary, ISOLA, Landscape Architect, BBPL
8	Water & Heritage- The art of natural cooling	Monish Siripurapu, ANT Studio
9	Water & Heritage	Ms Anupama Madhok, Advance Water Digest Pvt. Ltd

10	Contemporizing The Water Heritage of India	A. Mridul Architect, Jodhpur
11	Irrigation- Heritage India	Dr T.B.S. Rajput, Adjunct Professor, IARI, New Delhi

Recommendations Emerged :

1. Professional organizations such as ICID, IUCN, ICOMOS, ISOLA and INTACH can contribute and should be associated in the process of revision in policy and protection measures considering both Natural and Cultural Heritage.

2. Guidelines should be prepared under Corporate Social Responsibility (Schedule 7, (vi) Ensuring Environmental Sustainability) to link Corporate Intent, Financial resources with on-ground revival of water heritage with professional conservation professionals as facilitators to ensure timely and quality work.

3. The historic practices of nature and culture conservation should be promoted and appropriate fund should be allocated for experimentation tie up these traditional practices with engineering and technology for innovative solutions relevant to the Indian context.

4. Heritage structures and practices are living examples of sustainability principles and contain lessons for new projects/systems to be put in action. It is necessary to maintain and publicize the experience and features for future generation to come.

Action Points Suggested

- Guidelines should be prepared under Corporate Social Responsibility to link Corporate Intent, Financial resources for revival of water heritage.

- The historic practices of nature and culture for water conservation be promoted by allocating fund for experimentation of these traditional practices

SPECIAL SESSION – 5

SESSION FOR SCHOOL CHILDREN

A special Session for school children was organized on the concluding day of India Water Week 2019. More than 400 children participated in the interactive session. The session highlighted the importance of India Water Week. The children from several schools of NCR region performed skit on various water related issues in India. The skit was followed by interactive question and answer sessions. The Special Session facilitated to increase greater awareness on various water resources issues among children as well as understanding their views on these issues.

SPECIAL SESSION – 6

PARTICIPATORY IRRIGATION MANAGEMENT

Background

Indian Network of Participatory Irrigation Management (India NIPM) was established in February 1998 by erstwhile Ministry of Water Resources, Government of India as a non-profit organization with a mission to promote Participatory Irrigation Management (PIM) in the country through efforts outside the government system. Department of Water Resources, River Development and Ganga Rejuvenation, Ministry of Jal Shakti in association with Indian Network of Participatory Irrigation Management (India NIPM) has decided to conduct a Special Session with 2 topics for the Members of the Water Users Association to provide them a platform to discuss the issues affecting the development and strengthening of Water Users Association.

Session -1 :"Implementation of non-structural components of 99 prioritized Major and Medium Irrigation – AIBP Projects"

Chair and Experts

The session was chaired by Dr B RK Pillai, Commissioner (CADWM), DoWR,RD&GR, Ministry of Jal Shakti. Other prominent experts were Shri U P Singh, Secretary, DoWR,RD&GR, Ministry of Jal Shakti; Shri Phanish Sinha, President, India NIPM; Dr.Sanjay Belsara, Vice President, India NIPM; Shri Y D Sharma, Secretary, India NIPM and Shri G S Jha, Former Chairman, CWC.

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	Mukhyamantri Jal Swavlamban Abhiyan	Case Study of Rajasthan
2	Support System for Developing Robust WUAs	Shri Mohan Sharma
3	Towards a Healthy Karula river	A Case study, Karula River Khanpur
4	An Overview of Status Of 99 Prioritized Projects	Puneet Kumar Mittal (SJC, CAD, Ministry of Jal Shakti)
5	सहभागी सिंचाई प्रबंधन	
6	जल संरक्षण - पुरानी और नई तकनीक	डॉ. भारती चावरे, Sc-C (CSMRS) कोषाध्यक्ष, India NPIM

Session-2 " Role of Water Users Association in Water Conservation"

Chair and Panelists

The session was chaired by Dr B RK Pillai, Commissioner (CADWM), DoWR,RD&GR, Ministry of Jal Shakti. The panelists were Shri Phanish Sinha, President, India NIPM; Dr.Sanjay Belsara, Vice President, India NIPM, Shri Y D Sharma, Secretary, India NIPM; Shri Bhrati Chawre, Shri Nitin Kaushal , Dr. C M Tejawat, Shri Rama Kant Arya and Shri B M Sharma.

SESSION BY JAPAN

Chair and Co-Chair

The Session was Chaired by Mr. Kazuhiro Kiyose, Counselor, Economy, Embassy of Japan and Mr. Yoshito Suga was the Co-Chair

The papers presented during the session were :

S. No.	Title	Name of Author (s) Shri/Smt/Ms
1	JICA's Operation in India for Water Sector development	Kengo Akamine, Senior Representative, JICA India Office
2	Toshiba Water Solutions Committed to India	Toshiba Water Solutions Pvt. Ltd. 25st September 2019
3	Presentation by Kuraray	Kurare India Pvt. Ltd, New Delhi
4	Japan's Policy on Water Cycle	Secretariat of Water Cycle Policy Headquarters, Cabinet Secretariat of Japan
5	MICROZA-UF Membrane technology for Sewage Water Recycle	Asahi KASEI Corporation
6	Development of Solar-Powered Groundwater Desalination & Purification System	AGC Inc.
7	Universal Water Storage System –Solving the global water problems through by adopting on-site water storage.	Totetu Mfg. Co.Ltd

NEWSLETTERS

24th September 2019 | New Delhi

6th IWW 2019

INDIA WATER WEEK 2019
WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES
24th - 28th SEPTEMBER, 2019 | VIGYAN BHAWAN NEW DELHI, INDIA

सत्यमेव जयते
Ministry of Jal Shakti
Department of Water Resources,
River Development & Ganga Rejuvenation

The Hon'ble President of India to launch INDIA WATER WEEK-2019

"6th India Water Week 2019 – A Multi disciplinary conference" will be inaugurated by The Hon'ble President of India, Shri Ramnath Nath Kovind on 24th September, 2019 in New Delhi.

In the august presence of Shri Gajendra Singh Shekhawat, Hon'ble Union Minister, Ministry of Jal Shakti, Shri Rattanlal Kataria, Hon'ble State Minister, Ministry of Jal Shakti and their notable personalities, President Kovind will give the inaugural speech at Vigyan Bhawan and set the 5 day conference in motion.

The Hon'ble President has been an active voice with regards to the subject of water and has always supported the water initiatives launched in the country. Addressing the joint session of Parliament, including the first session of the 17th Lok Sabha, President Kovind raised his concern about the growing water crisis as one of the biggest challenges of the 21st century. He mentioned how the traditional and effective practices of water conservation are fading with time and how humans are destroying the natural ecology and building houses and complexes over ponds, lakes, parks etc. He also talked about the alarming aspect of how the water crisis is more likely to exacerbate due to climate change. He talked about how the need of the hour is to launch a water conservation and management campaign and make it a Mass Movement just like 'Swachh Bharat Abhiyan'. He also highlighted the aspect of sustainability and saving the precious resource of water for future generations.

The Hon'ble President of India also stated that the Central government is fully committed to ensuring the uninterrupted flow of river Ganga and making it pollution-free under 'Namami Gange'. It is also keen on cleaning up major rivers like Cauvery, Periyar and Narmada. He also said that under the Namami Gange scheme, his government will further accelerate the campaign for the closure of drains releasing effluents in the river Ganga.

The subject of water has been brought to the centre stage by the current government by the creation of 'Ministry of Jal Shakti'. The newly formed Ministry of Jal Shakti has been making continuous efforts in the water sector with regards to the subject of water scarcity prevailing in the country.

Water is essential to life. It is fundamental to the economy and ecology – and to human equity. The India Water Week provides a stage for dialogue between various private players, bureaucrats, Ministers, researchers, scientists, government organisations and departments and entrepreneurs, to discuss the issue of water becoming more critical in view of climate change and related environmental concerns. It also pans out various solutions for better and more efficient use of water in the Indian agricultural and industrial sector.

Being a natural resource, water seldom flows according to administrative boundaries and sharing of water among the administrative units is always challenging.

6th IWW 2019

INDIA WATER WEEK 2019

WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES

24th - 28th SEPTEMBER, 2019 VIGYAN BHAWAN NEW DELHI, INDIA

The likelihood of conflicts due to water related issues could increase as the population in the 21st century continues to grow with the added manifestation of climate change. Water cooperation is vital for peace, progress and prosperity.

It is in this context that the Ministry of Jal Shakti, Government of India, Department of Water Resources, River Development and Ganga Rejuvenation is organising the 6th India Water Week.

A regular event since 2012, India Water Week is a forum where the Ministry of Water Resources, River Development & Ganga Rejuvenation, Government of India discusses and talks with eminent stakeholders through seminars, exhibitions and sessions, to build public awareness and to get the support to implement key strategies for the conservation, preservation and optimum use of available water. The 5th edition was held in partnership with the European Union as an International partner and The Netherlands as International Sponsor.

The 6th India Water Week revolves around the theme of "Water Cooperation – Coping with the 21st Century Challenges". Being one of the largest water resource events in the country, it will witness the participation of more than 1,500 delegates from across the world. The highlights of the event would be an exhibition covering an area of 3,000 sq. m. as well as number of specialised add-on events.

The 5-day event is a multi-disciplinary conference and a concurrently running exhibition enriching the theme and showcasing the technologies and solutions available for the areas under deliberation of the meet. It will encompass 4 Special sessions followed by 4 Brainstorming sessions, 12 Seminars and 12 Panel discussions where people from across the globe will hold discussions and strategies concerning the major challenges and issues faced by the people of the country with regards to the water sector. The sessions will aim at the subject of Water for Food Security and Rejuvenation of River Ganga – from planning to action, water and heritage, water quality issues – treatment options and others.

The International partners for the 6th Indian Water Week are the European Union and Japan. It is also being supported by the Indian Union Ministry of Jal Shakti, Ministry of Agriculture and Farmers Welfare, Ministry of Power, Ministry of Urban Development, Ministry of Rural Development, Ministry of Environment, Forests and Climate Change and NITI Aayog. Andhra Pradesh, Maharashtra, Kerala, Karnataka, Rajasthan, Gujarat, Madhya Pradesh, Telangana and Tamil Nadu are this years Partner States. Various Central and State Government departments, exhibitors, sponsors, international organisations, research organisations, institutes, non-governmental organisations and private players will be participating in the conference.

INDIA WATER WEEK

Water is the harbinger and sustainer of all life on the planet, especially the humankind. With the growing population and improvement in economic status, the demand for available water resources is also increasing. As a result, there is an urgency to conserve and utilize the limited availability of water resources in an optimum and efficient manner to satisfy larger needs.

The Ministry of Jal Shakti, Department of Water Resources, River Development and Ganga Rejuvenation, Government of India has therefore created a unique platform, INDIA WATER WEEK, for deliberating all the related issues for better management of water resources. Conceptualized and organized for the first time in 2012, the India Water Week is a regular forum where the

International Partners

European Union Japan

Sponsors

सत्यमेव जयते
Department of Science and Technology
Ministry of Science and Technology
Government of India

सत्यमेव जयते
MOAFW
Government of India
Ministry of Agriculture and Farmers Welfare

www.indiawaterweek.in

6th IWW 2019

INDIA WATER WEEK 2019

WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES

24th - 28th SEPTEMBER, 2019 VIGYAN BHAWAN NEW DELHI, INDIA

2012 at Vigyan Bhawan, New Delhi with the theme "Water Energy & Food Security: Call for Solutions". This Conference was attended by about 1000 national and international delegates and an exhibition covering an area of 3000 sq.m as well as 5 specialized add-on events are other highlights of the event.

The second event namely, India Water Week-2013 was organized with the theme "Efficient Water Management: Challenges and Opportunities" during 8th-12th, April 2013 at Vigyan Bhawan, New Delhi with the participation of about 1400 national and international delegates and an exhibition focusing on dam rehabilitation and water management technologies. Both the events were characterized by participation of key international organizations like Global Water Partnership, the World Bank and Indian Water Resources Society etc. through special events as a part of the main event.

The third event, India Water Week 2015 was organised with the theme "Water Management for Sustainable Development" during 13-17 January, 2015 at Vigyan Bhawan/Pragati Maidan with the objective of deliberating all related issues, sharing experiences, showcasing technological advancements/achievements, learning from best practices and identifying the best course of actions for future. Australia was associated as a partner country for organization of India Water Week-2015. About 1450 delegates including 110 delegates from other countries participated in the conference and exhibition.

The Fourth edition of India Water Week viz. India Water Week – 2016 was organized from 4th – 8th April, 2016 with the theme "Water for all: Striving Together" in Vigyan Bhawan/Pragati Maidan, New Delhi. Israel was associated as a partner country in of India Water Week-2016. About 1500 delegates including about 100 delegates from other countries participated. Concurrently an exhibition was organized from 5th – 8th April, 2016 at Pragati Maidan to showcase the technology available in the water sector. Products and services were displayed by 52 companies and agencies working in the field of planning, conservation, utilization and management of the water resources. School children and academicians also joined exhibition showcasing their efforts.

The Fifth edition of India Water Week viz., India Water Week - 2017 was organized from 10th-14th October, 2017 with the "Water and Energy for Inclusive Growth" in Vigyan Bhawan. Hon'ble President of India inaugurated 5th India Water Week-2017 on 10th October, 2017. About 1500 delegates including 40 delegates from other counties participated in the conference of India Water Week-2017. European Union was the international partner and The Netherlands was the international sponsor of the conference. Concurrently an exhibition was organized from 11th – 14th October, 2017 in the lawn of Indira Gandhi National Centre for Arts (IGNCA). Products and services were displayed by 38 companies in the exhibition.

Now, the Sixth event in the series, viz., India Water Week-2019 with the Theme "Water Cooperation – Coping with 21st century challenges" focusing on aspects related to cooperation for water amongst all stakeholders and managing the related challenges in the present century is proposed to be organized during 24th - 28th September, 2019 in Vigyan Bhawan, New Delhi. The exhibition is proposed to be

Sponsors

Media Partners

6th IWW 2019

INDIA WATER WEEK 2019

WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES

24th - 28th SEPTEMBER, 2019 VIGYAN BHAWAN NEW DELHI, INDIA

organized in the lawn of Indira Gandhi National Centre for Arts (IGNCA) near Vigyan Bhawan during 25th - 28th September, 2019 to showcase the technology available in the water resources sector.

The India Water Week-2019 is a platform to elicit ideas and opinions from global-level decision makers, politicians, researchers and entrepreneurs in the field of water resources development and management for mutual benefit and goodwill. The event will have the following major components:

A large group of international and national persons of eminence are being invited for sharing their experiences in the field of Water and Power management, Technical and Sociological interventions for achieving water and energy security in their individual areas and manage the assets created on a participatory basis.

In addition, there will be Special Sessions involving dignitaries, delegates, politicians, experts from the fields related to the event. Expert professional bodies and think tanks are invited to put up Side Events addressing specific issues under the theme.

European Union and Japan – The International Partners for the 6th India Water Week

European Union

Japan

The European Union and Japan are the international partners for the 6th India Water Week. Various experts and industrialists from the European Union and Japan will be participating in the conference, with an aim to avail potential business opportunities in India to improve the efficiency of water management in India.

India and the European Union have a powerful association with regards to the water sector. In the year 2016, a Memorandum of Understanding was signed between the Republic of India and the European Union on an EU-INDIA Water Partnership. Giving a boost to the scientific, technological and management qualities of India and EU in the subject of water management was the main aim of the EU-INDIA Water Partnership. The foundation of the MOU is based on quality, harmony and mutual growth.

The EU has been supporting the government's initiative of rejuvenating the holy river Ganga and the transfer of European technologies to India in order to get them tested and customised as per Indian needs.

India and the EU have taken up 7 innovative research projects together in order to find a solution to the water issues in India which are India-H20, Lotus, Pani Water, Avitr, Saeaswati 2.0 and spring. In total, 130 entities will be part of these seven projects.

The other international partner for the event, Japan is committed to working to promote peace, stability and prosperity, through economic growth and development in the Indo-Pacific region. The bond between India and Japan has been strong since the beginning. Both India and Japan acknowledge the importance of water and sanitation.

The Japanese government aid agency JICA has also increased its focus on funding water and sanitation facilities in India, extending its support to Swachh Bharat Abhiyan, the flagship programme of PM Narendra Modi. It has also provided ODA loans for the construction of the Bengaluru Water Supply and Sewerage Project and the construction of the Chennai Seawater Desalination Plant and is also heavily investing in other important projects such as the Guwahati Water Supply Project and Guwahati Sewage Project in Assam.

After the Swachh Bharat Abhiyan, Japan's second priority in India is to help improve the water scenario in the country. Toshiba Water Solutions Pvt. Ltd., Totestu MFG. Pvt. Ltd, Sekisui DLJM Moldings Pvt. Ltd., Kuraray India Pvt. Ltd., AGC Inc., Daiki Axis and Asahi Kasei Pvt. Ltd, are the water industry players from Japan who will also participate in the 6th India Water Week 2019.

25th September 2019 | New Delhi

6th IWW 2019

INDIA WATER WEEK 2019
WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES
24th - 28th SEPTEMBER, 2019 | VIGYAN BHAWAN NEW DELHI, INDIA

सत्यमेव जयते
Ministry of Jal Shakti
Department of Water Resources,
River Development & Ganga Rejuvenation

Water is the Life Giver on Earth: Hon'ble President of India Shri Ram Nath Kovind

(L to R) Hon'ble Secretary, DoWR, RD & GR, Ministry of Jal Shakti, Shri U.P. Singh, Hon'ble Union Minister, Ministry of Jal Shakti, Shri Gajendra Singh Shekhawat, Hon'ble President of India, Shri Ram Nath Kovind, Hon'ble Minister of State, Ministry of Jal Shakti, Shri Rattanlal Kataria, and Chairman CWC, Shri A.K. Sinha

The Hon'ble President of India, Shri Ram Nath Kovind, inaugurated the 6th India Water Week 2019.

Other eminent personalities present at the event were the Hon'ble Union Minister, Ministry of Jal Shakti, Shri Gajendra Singh Shekhawat, the Hon'ble State Minister, Ministry of Jal Shakti, Shri Rattanlal Kataria, the Hon'ble Secretary, DoWR, Ministry of Jal Shakti, Shri U.P. Singh, Chairman Central Water Commission, Shri A.K. Sinha and the others.

President Kovind started his address by posing a question to the audience "Can we imagine life without water? Water is the life giver on earth and is a great source of energy and the elixir of life. I am happy to attend the 6th India Water Week and I hope all of us will engage in meaningful discussion and help find solutions to address water related issues in India. Our Vedas and Indian scriptures have highlighted it's importance."

"Over the ages, great civilisations developed alongside water, be it the Indus Valley Civilisation, Egyptian, Chinese or be it cities like Varanasi, Madurai, Paris or Moscow, they are all next to rivers. Where there was water, humanity survived and thrived. Nowadays, we humans search for water and at the same time we have been negligent of the precious resource. When a child is born, the parents start planning for his/her future, they start taking efforts in order to fulfil the child's future needs but they never think about their child's need for safe and clean drinking water for survival. We owe it to the future generations who make water conservation their priority", he added.

The Hon'ble President stated that water issues are too multi-faceted and complex to be solved by the government or a nation alone. All nations and their water committees must come together to build a water sustainable future. He mentioned that almost 40% of the world's population lives in water scarce areas and that climate change and related environmental concerns have made it much worse. He quoted, "Despite the challenges, I am happy to know that the government of India has made provisions to

6th IWW 2019
INDIA WATER WEEK 2019
WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES
24th - 28th SEPTEMBER, 2019 VIGYAN BHAWAN NEW DELHI, INDIA

provide safe and clean drinking water to all citizens as its prime motive. To ensure better development and sanitary conditions, the government merged several departments and ministries and created the new Ministry of Jal Shakti which will provide a single window process for all water related issues."

President Kovind highlighted the aspect of 'Jal Jeevan Mission' and termed it bold and ambitious, as presently only 18% of rural Indian households get piped water. He informed that the mission will focus on integrated demand and supply side management of water at the local level and will create infrastructure for rainwater harvesting and groundwater recharge. He was confident that widespread participation of people will help the govt. achieve this goal. He also said that the PMKSY Yojana is a major initiative for farmers under the vision of the Prime Minister Shri Narendra Modi.

The Hon'ble President of India, Shri Ram Nath Kovind, inaugurated the 6th India Water Week 2019.

He stated that India is blessed with many rivers and that cleaning these rivers has been a prime task that the government has been working on actively under the National Mission for Clean Ganga (NCMG). NMCG maintains the cleanliness and aims at cleaning the holy Ganga and other rivers. And that it will be a joint effort of everyone. He requested the citizens to not immerse idols in the river bodies or opt for environmentally friendly idols during festivals like Ganesh Chaturthi and Durga Puja.

Shri Gajendra Singh Shekhawat felicitating the Hon'ble President of India, Shri Ram Nath Kovind

He also mentioned how India is on the verge of becoming ODF free and the spirit must be maintained for the Jal Shakti Abhiyan. The Hon'ble President also advised people to not forget the old methods of conservation but rather merge both the new and old technologies and create a more efficient system for suitable ways of conserving water. The Hon'ble President of India concluded his address by wishing success to India Water Week 2019.

Shri Gajendra Singh Shekhawat in his inaugural address mentioned that India Water Week is a platform to gather and discuss possible ways to find solutions pertaining in the waters sector. He quoted the

INDIA WATER WEEK 2019

WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES

24th - 28th SEPTEMBER, 2019 VIGYAN BHAWAN NEW DELHI, INDIA

The Hon'ble President of India, Shri Ram Nath Kovind, delivering his address at the 6th India Water Week 2019.

Rigveda saying, "Water has nectar like properties and possesses healing medicinal powers". He highlighted the aspect of considering water as a sacred commodity in the Indian culture and how it is a significant molecule in the field of science and spirituality.

Shri Gajendra Singh Shekhawat delivering his address at the 6th India Water Week 2019.

The Union Minister also mentioned how cooperation and integrated effort is an essential aspect of sustainability and that every stakeholder at every level must come together to plan out a sustainable India for the future generations. Shri Shekhawat ended his address by extending a vote of thanks to all the national and international audience, representatives from all the key sectors, Ministry partners etc.

Shri Rattanlal Kataria mentioned how water is an important aspect

Shri Rattanlal Kataria delivering his address at the 6th India Water Week 2019.

of our life and that India comprises 17% of the world's population with just 4% of freshwater resources. Shri Kataria talked about how there are many problems with regards to water but then we will have to fight against the odds. He highlighted the aspect of wastewater treatment technologies and reuse of the same and stated that it should be given prime importance.

Shri U.P. Singh gave a detailed note of India Water Week and hoped that the 5-day conference would result in finding out solutions to water related issues in India.

The inaugural session witnessed the participation of almost 1,500 industry members, government representatives, private players and others.

Shri U.P Singh delivering his address at the 6th India Water Week 2019.

6th IWW 2019
INDIA WATER WEEK 2019
WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES
24th - 28th SEPTEMBER, 2019 VIGYAN BHAWAN NEW DELHI, INDIA

(L to R) Hon'ble Secretary, DoWR, RD & GR, Ministry of Jal Shakti, Shri U.P. Singh, Secretary General, ICID, Shri A.B. Pandya, Hon'ble Secretary, DWS, Shri Parameswaran Iyer, Ambassador of Germany, Mr. Walter Linder, Hon'ble Justice T.S. Doaba and Ambassador of Japan, Mr. Kenji Hiramatsu.

Water: A human right that must be maintained

Hon'ble Secretary, DoWR, Ministry of Jal Shakti, Shri U.P. Singh commenced the plenary session by addressing the issue of scarcity of water resources in India, wherein 4% of freshwater reserves are catering to the needs of 17% of the world's population. Since the distribution of rainfall is not uniform throughout the country, the issues of water scarcity are extending towards groundwater reserves as well.

He mentioned that certain Indian states are heading towards scarcity because of the depletion of natural resources. Shri U.P. Singh shed light on several policies introduced by the government to the forefront, that tackle issues such as water usage, regulation, more coverage area for irrigation (PMKSY), etc.

Participants at the 6th India Water Week 2019.

The Hon'ble Secretary, Department of Drinking Water and Sanitation, Ministry of Jal Shakti, Shri Parameswaran Iyer spoke about the Jal Shakti Abhiyan and Jal Jeewan Mission. He drew parallels between the Swacch Bharat Abhiyan and Jal Andolan where delivery of services includes all levels of society which ensures the success of the movement. Inclusivity promotes ownership, hence every individual feels responsible for the management and conservation of water.

He shed light on the aims of the Jal Shakti Abhiyan, which is focused on the water stressed districts in Western India. The methods being used for relieving the water deficit are rainwater harvesting, reuse, recharge, watershed development, intensive afforestation etc.

Mr. Iyer also discussed the Jal Jeevan Mission which is working towards providing 100% household water supply in 5 years. The 4 pillars of the mission as are source sustainability, piped water supply, reuse of grey water and operation and maintenance. His Excellency, the Ambassador of Germany, Mr. Walter Linder, commenced his address by talking about the most pressing issue of climate change. He talked about how industrialisation and development have led to the destruction of natural resources of the world. Public participation and cognizance of the climatic situations at hand are essential. Since India is home to 17% of the world's population, solutions devised by India as a country will be helpful and implemented by other countries facing similar issues.

His Excellency, the Ambassador of Japan, Mr. Kenji Hiramatsu, talked about the advanced water conservation and management policies being implemented in Japan and the association of India and Japan for conservation and management of water in India.

Hon'ble Justice T.S. Doaba talked about water as a basic human right. He stated that clean water should be available in every household.

Hon'ble Secretary General ICID, Shri A.B. Pandya, informed the gathering that most of the Indian states attain their water from transnational sources. He mentioned that the International and regional cooperation are extremely important in the water sector. He called international cooperation of water sources as a precondition for sustainable growth. According to Mr. Pandya, informed water diplomacy is the need of the hour to manage water. Innovation, adoption and communication between countries can lead to a productive solution for conflict ridden water areas. Bilateral and multilateral agreements, financial motivation and unbiased guidance can lead to improved international cooperation and organisation of water basins.

Shri U.P. Singh concluded the session by bringing out source sustainability and cooperation as the proactive solutions to the water issues at hand. He stated that the focus is to be shifted from conflict to positive management of the limited resources of water we have. Further, demand management and conventional and feasible storage of water should be given prime importance.

More informed and comprehensive discussions about the management and conservation of water will be taking place throughout the 6th India Water Week.

WATER DIGEST | WD NEWS
The 6th India Water Week 2019 quotidian newsletter has been designed and curated by Advance Water Digest Pvt. Ltd. • www.thewaterdigest.com

26th September 2019 | New Delhi

6th IWW 2019
INDIA WATER WEEK 2019
WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES
24th - 28th SEPTEMBER, 2019 | VIGYAN BHAWAN NEW DELHI, INDIA

सत्यमेव जयते
Ministry of Jal Shakti
Department of Water Resources,
River Development & Ganga Rejuvenation

SHRI GAJENDRA SINGH SHEKHAWAT,
HON'BLE UNION MINISTER,
MINISTRY OF JAL SHAKTI,
INAUGURATED THE EXHIBITION
AT THE 6TH INDIA WATER WEEK

L to R - Mr. M. K. Srinivas, Director General, NWDA, Mr. Rajiv Ranjan Mishra, Director General NMCG, Ms. T. Rajeshwari (IAS) Additional Secretary, DoWR RD & GR, Shri Gajendra Singh Shekhawat Hon'ble Union Minister, Ministry of Jal Shakti and Shri Rattanlal Kataria, Hon'ble State Minister, Ministry of Jal Shakti

Hon'ble Union Minister, Ministry of Jal Shakti, Shri Gajendra Singh Shekhawat inaugurated the exhibition at the 6th India Water Week, where almost 60 exhibitors showcased their technologies. Other eminent guests present at the inauguration were Hon'ble State Minister, Ministry of Jal Shakti, Shri Rattanlal Kataria, Hon'ble Secretary, DoWR, Ministry of Jal Shakti, Shri U.P. Singh, Hon'ble Additional Secretary, (Wing Head) (RD & PP), Ministry of Jal Shakti, Ms. T. Rajeshwari, Director General, NWDA, Shri M. K. Srinivas and Director General, NMCG, Shri Rajiv Ranjan Mishra.

Cooperation For Sustainable Water Management Emerges As Core Theme on 2nd Day of IWW

Water Scarcity – Challenges Ahead

The second day of India Water Week 2019 was started off with a panel session with eminent members, His Excellency Dr. Ron Malka, Ambassador of Israel to India, Dr. H.K. Varma, Executive Director, ICID, Dr. Man Singh, Project Director, Water Technology Center and Shri R.K. Jain, Chairman, GRMB. The key speaker, Dr. Ron Malka stated that if a country like Israel, which is mostly desert and semi-arid, can attain water security, then India with its abundance of water, can definitely do the same. He showcased how his country achieved this by increasing water sources, optimising water efficiency, enacting regulations & laws and promoting awareness & education. Dr. H.K. Varma highlighted the pivotal role of ICID as a member of the Steering Committee of the The Global Framework of Water Scarcity in Agriculture (WASAG). In his talk, Dr. Man Singh stated he was convinced that India is not facing water scarcity in the conventional sense of the term, rather that there is need for imaginative and innovative solutions in the area of water to mitigate the issues. Shri R.K. Jain spoke about the issues regarding the

6th IWW 2019
INDIA WATER WEEK 2019
WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES
24th - 28th SEPTEMBER, 2019 VIGYAN BHAWAN NEW DELHI, INDIA

interlinking of rivers and how a shared mission of cooperation was the way forward if India is to solve the challenges in water as a country.

Drought Management – Future Challenges and Strategies

This session revolved around the theme of "Drought Management – Future Challenges and Strategies". Drought is a hydro-metrological

phenomenon of prolonged period of water scarcity, affecting natural resources, and the environment, flora and fauna.

The speakers for the session were Shri R.K. Sinha, Member (R&M), CWC (Chair), Dr. J.S. Samra, Former DG, NRAA, Shri V.K. Chawla, Former CE, CWC (Co-chair), Dr. R.P. Pandey, NIH and Shri Manoj Khanna.

The session focused on the concept of droughts and how these affect the current scenario in the country. Chairing the session, Shri R.K. Sinha highlighted the concept of Drought Management in India and how different strategies for drought mitigation can efficiently help in facing future challenges.

The speaker panel shed light on the various drought indicators used for CDI development and how the aspect of drought mitigation also plays an important role. The key topics discussed in the session were schematic methodology, real time weather monitoring, climate division-based litigation, data collection etc.

The session formulated the effective plans/roads for dealing with droughts.

Challenges in Achieving Sustainable Development Goals for Urban Water Supply and Drainage

The speakers for this session were Mrs. Isher J Ahluwalia (Chair), Shri V S Thind (Co-chair), Retd. Engineer, DJB, Mr. Rajesh Jain, Mr. R.S. Tyagi, Former Member Water Supply, DJB.

The session focused onwater management in the country and efficient water conservation practices to achieve the same. The speakers talked about the concept of suitable water management to avert the water crisis in the country and a proper management approach for the agricultural sector. Shri R.S. Tyagi stated that water is a natural resource and a precious commodity for the people, but humans are polluting these resources instead of prioritising them. He mentioned that urbanisation is not bad, it's just that people don't really plan well and hence the problem arises.

Co-chairing the session Mr. Thind stated that people should inculcate a positive approach towards the aspect of reusing and recycling water and the conservation of the same.

Water Resources Sustainability for Industrial Growth

The session was chaired by the Mission Director, National Water Mission, Government of India, Shri G Asok Kumar with Mr. Anshuman, Associate Director, Water Resources Division, TERI.The inaugural address for the discussion was given by Chairman, TERI Governing Council, Shri Nitin Desai. The discussion encouraged the dissemination of information and cooperation in managing water resources. The emphasis of the panel discussion was

on cooperation, as well as creating more efficient systems of using water for industrial and agricultural purposes.

Shortly after the address, the policy brief of "Critical Policy Interventions to Fast Forward Micro Irrigation in India" was launched. The brief gives a roadmap towards management of water through micro irrigation. Mr. Anshuman talked about creating a circle economy where regenerative approaches by intention and well-planned design would lead to better management of water resources. The discussion sawenthusiastic participation and deliberation over the impact of industrial pollution and climate change on the hydrological cycle.

Reorienting Water Education to Address Water Related Changes

6th IWW 2019
INDIA WATER WEEK 2019
WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES
24th - 28th SEPTEMBER, 2019 VIGYAN BHAWAN NEW DELHI, INDIA

The session was chaired by Secretary General, ICID Shri A.B.Pandya. The panel also included former member CWC, Shri M.E. Haque, Shri. Y. Paithankar, Shri. G.S. Jha, Dr. Yella Reddy and Dr. Ashish Pandey. The session had speakers discussing issues related to data misuse in the water industry. Certain examples of misuse of data were brought to the forefront. Measures for transferring the academic knowledge of water use and management into practical application were suggested. This discussion also highlighted the impediments in water education in the country. Dr. Yella Reddy pointed out that if the subjects and information taught in school would be implemented in the future, the stages for education about water get easier. He also suggested an idea to introduce 'water credit' like we have 'carbon credit', where farmers could be paid for small conservations in water while using water for agricultural uses. The inclusion of women along with young professionals in the agricultural water movement was also talked about.

Water For Food security

The session was chaired by Shri. S.K. Haldar, Member (WP&P), CWC. The panel also included Dr. Man Singh, Director WTC and Shri K. Vohra, Commissioner (SPR) DoWR.

The speakers talked about food security in the water sector as in the future the population is going to swell which will result to double food production in limited land resources.

Shri S.K. Vohra highlighted the problems in the irrigation sector. The panel stated that there is a dire need for the farmers to start reusing grey, black and desalinated water for irrigation purposes rather than exploring the groundwater.

Technological innovation & Big Data for Water Security, Emerging Directions and Prospects.

The session was chaired by Shri N.K. Mathur, Retd. Member, CWC. The other speakers for the panel discussion were Dr. V.V. Rao, NSRC, Dr. R.N. Sankhua, CE, NWDA and Ms. Upasana Dutta, Joint Director ES and EG Group, C-DAC.

Dr. R.N. Sankhua highlighted the need of transparency around water data in almost every aspect and briefed that the rise of big data & new measurement technologies can transform the way water is managed in the future.

The session imparted information with regards to making the water data more friendly and accessible.

Groundwater Management - Challenges Ahead

Shri U.P. Singh, Hon'ble Secretary, DoWR, Ministry of Jal Shakti delivered the opening remarks stating the importance of groundwater and that is the solution for all water problems for the session themed "Groundwater Management – Challenges Ahead".

The panel included Shri K.C. Naik, Chairman, CWC, Shri S. Marwah, Regional Director, CGWB, Shri G. C. Pati, Member, CGWB. The importance of "Water Meeting" to monitor the water supply in every household emerged as a common talking point in the session and that the extraction of groundwater should be done wisely.

Concluding the event, Shri K.C. Naik stated that conserving water is everyone's responsibility and they should try their best.

6th IWW 2019

INDIA WATER WEEK 2019

WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES

24th - 28th SEPTEMBER, 2019 VIGYAN BHAWAN NEW DELHI, INDIA

Bilateral Cooperation for Mutual Benefits

The special session saw Secretary General ICID, Shri A.B. Pandya, Commissioner, MoJS, Shri J.C. Iyer, Commissioner, INDUS, Shri P.K. Saxena and Commissioner, MoJS, Shri T.S. Mehra heading the session. The session elaborated on the cordial relations of India with Nepal, Bangladesh and other neighbouring countries sharing a water body. It also shed light on several success stories such as the Gandak Barrage, Mahakali Treaty, 1996, Pacheshwaar Multipurpose Project etc. The solution that surfaced after the session for conflict ridden water areas was cooperation through agreements.

New Delhi Witnesses First Award Ceremony Organised By National Water Mission

The National Water Missions Awards ceremony was held on 25th September, 2019 at Vigyan Bhawan in the august presence of Shri G Asok Kumar, Mission Director, NWM and Shri U.P. Singh,Hon'blr Secretary, DoWR Ministry of Jal Shakti. The awards aim to appreciate and acknowledge the efforts of various organisations and companies working towards water conservation management and sustainability. The occasion was graced by the Hon'ble Union Minister of Jal Shakti, Shri Gajendra Singh Shekhawat as the Chief Gues' and Shri Rattanlal Kataria, Minister of State for Jal Shakti as the Guest of Honour.

The Jury Committee meetings were held under the chairmanship of Shri Shashi Shekhar, Former Secretary, MoWR, RD & GR to shortlist the applicants.

Shri Gajendra Singh Shekhawat, Hon'ble Union Minister, Ministry of Jal Shakti speaking at the NWM Award ceremony

WATER DIGEST | WD NEWS

The 6th India Water Week 2019 quotidian newsletter has been designed and curated by Advance Water Digest Pvt. Ltd. • www.thewaterdigest.com

27th September 2019 | New Delhi

6th IWW 2019
INDIA WATER WEEK 2019
WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES
24th - 28th SEPTEMBER, 2019 | VIGYAN BHAWAN NEW DELHI, INDIA

सत्यमेव जयते
Ministry of Jal Shakti
Department of Water Resources,
River Development & Ganga Rejuvenation

Looking back and forward: Relying on tech and traditions for water crisis solutions

L to R Shri R K Jain, Chief Engineer, NWDA, Shri A D Mohile, Former Chairman, CWC and Shri M K Sinha, Former Executive Member, NCA

Inter-Basin Water Transfer – Planning to Implementation

The session was chaired by Shri A.D. Mohile, Former Chairman, CWC. The other people on the panel were Shri M.K. Sinha, Former Executive Member, NCA and Shri R.K. Jain, Chief Engineer, NWDA.

Speaking on the Interlinking of Rivers Programme, the panelists discussed the aspect of Spatial Rainfall and Temporal Variation in the country.

Shri R.K. Jain highlighted how the large variation in the rainfall pattern in the country leads to droughts, floods, scarcity etc. He discussed various Indian IBWT Project case studies which are still successful in India.

The session touched upon Peninsular and Himalayan Rivers Development projects which comprise of 16 and 14 links. The progress made by the National Water Development Agency and their prioritisation of the interlinking of rivers to solve water related issues was also discussed.

The need for interlinking of rivers and how it would be beneficial to the various sectors in the country like agriculture, industrial and also solve the issue of water scarcity by filling all the dams in the country, was the core learning of the session.

Improvement and Innovation in Reuse & Recycle Practices & Technologies

The speakers for this session were Shri Manoj Kumar Singh, Principal Secretary, Govt. of UP, Shri D.P. Mathuria, Executive Director (Technical), NMCG, Mr. Lahnsteiner Josef, Director Technology R&D, VA Tech WABAG Ltd., Ms. Martina Burkard, Programme Director, GIZ (Support for Ganga Rejuvenation) and Ms. Henriette Faergemann, Counsellor Environment, Energy and Climate Change - EU Delegation to India.

This panelists spoke about how water recycling, also referred to as water reuse or water reclamation, is an effective method of treating captured or conveyed wastewater

6th IWW 2019
INDIA WATER WEEK 2019
WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES
24th - 28th SEPTEMBER, 2019 VIGYAN BHAWAN NEW DELHI, INDIA

and redistributing it to benefit other water-dependent applications.

They suggested that India should learn from the proficiencies of the EU and Spain with regards to the treatment of wastewater. Discussions on the efforts taken by the National Mission for Clean Ganga in the state of Uttar Pradesh, also took place. Shri Manoj Kumar Singh talked about the various STPs in the State of Uttar Pradesh funded by NMCG. Various Case Studies were also presented. Ms. Nupur Bahadur, Fellow, Water Research, TERI presented a case study on Advanced Oxidation Nanotechnology.

The seminar provided an excellent forum for the exchange of ideas and discussion of appropriate approaches, including the technologies for addressing the issue of wastewater.

Water Quality and Public Health Issues

This session was chaired by Shri Shalab Kumar, Member (WS), DJB. The other speakers for this session were Shri Amit Bansiwal, Senior Scientist, NEERI and Dr. A.K. Susheela, Former Professor of AIIMS.

The opening remarks were delivered by Shri Kumar who brought to the forefront the efforts taken by the various departments of the government and stated that people should be made aware of it and that certain norms and guidelines should be formed for the same.

Shri Amit highlighted the two crucial aspects of water availability and water quality, with regards to the subject of water and how these are linked to human health.

The session addressed the issue of water quality from a systems perspective with a view of protecting and promoting health.

Research Needs in the Water Sector

This session revolved around the theme of "Research Needs in Water Sector".

The panellists for the session were Shri Y.K. Sharma, Former Member, CWC, Dr. V.V. Bhosekar, Director, CWPRS, Shri S. Masood Husain, Former Chairman, CWC, Shri S.L. Gupta, Director CSMRS and Mr. A. K. Ganju, Former Member, CWC.

The discussion saw presenters talk about sustained research and development being necessary and that the concept of search is also important. They listed conservation, distribution and utilisation as important aspects of the same.

The session laid out views about the increasing population and that there is a need for more water in stressed conditions. Importance of Rainwater and the need for desalination technologies being made cheaper in coastal states for increased usage was also discussed.

Innovations in Water Management

The chair Dr. T.B.S. Rajput, Senior Scientist, ICAR for the seminar stated, "Challenge can be taken up only through innovation." The session was co-chaired by Dr. Sahdev Singh, AGRI and Dr. Neelam Patel, Principal Scientist, IARI. This discussion specifically discussed new technologies being used in the sector of agriculture and water management. Several presentations by distinguished panelists mentioned the adaptable efforts made by farmers according to the changing situations and the introduction of scientific methods for irrigation by scientists and engineers. The use of drones as a tool for irrigation and agriculture was presented in the discussion along with technologies for land drainage. The seminar also mentioned the need for involving and training female farmers on irrigation practices and turning to agriculture practices which are cost effective and good for the environment.

6th IWW 2019
INDIA WATER WEEK 2019
WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES
24th - 28th SEPTEMBER, 2019 VIGYAN BHAWAN NEW DELHI, INDIA

Development of Waterways and Navigation

The session was chaired by Dr. Amita Prasad, IAS, Chairperson, IWAI. The other speakers for this session were Shri Pravir Pandey, IA & AS, Vice Chairman, IWAI, Shri M.U. Ghani, Former Member, GFCC, Consultant, IWAI, Patna, Prof. Nayan Sharma, Ph.D Adjunct Professor, CTRANS, IIT, Roorkee, Shri Saibal Ghosh, General Manager, Farakka Barrage Project Murshidabad (WB) and Prof. K Murali, Oceanography Dept., IIT, Madras.

The speakers discussed the benefits of having an Inland Water Transport System in the country, since it is one the cheapest means of transport and eases trade. Various problems with regards to nature and infrastructure faced by inland water transport systems were also discussed. The panel also stated how various recent technologies can act as game changers.

The session laid out the aspects and appropriate recommendations of eco-friendly modes of transport.

Flood Management- Future Challenges and Strategies

The session was chaired by Shri A.K. Sinha, Chairman CWC with Shri M.S. Dhillon, GFCC Patna and Shri Bibhas Kumar as

co-chairs. The Chair explained the concentration of flood prone areas in India. The concepts of flood protection, community participation and insurance for flood prone areas were highlighted during the seminar. The causes for floods such as extreme climate change, inadequate drainage and high variability in rainfall all around the country were discussed by the panellists.

The panel agreed that a shift in engineering based approaches for flood management to more inclusive approaches, which involve the beneficiaries, would be effective in the long run. Further, certain structural (reservoirs, embankment, channelisation of rivers, etc.), non-structural measures (flood forecasting methods) as well as government initiatives to control floods were discussed in detail, with the support of case studies.

Rainwater Harvesting for Sustainable Water Supply

The seminar was chaired by Shri Sriram Vedire, Advisor to Hon'ble Minister of Jal Shakti and co-chaired by Shri G.C. Pati, Member,CGWB. Hon'ble Chair, Shri Vedire, commenced the session by discussing the importance of rainwater, as it is the most abundant source of water for this country. He also showcased pictures of traditional rainwater harvesting methods.

The speakers noted how the Jal Shakti Abhiyan is working on several schemes and missions to improve water conservation/augmentation. The discussion emphasised encouraging proactive behaviours and attitudinal changes towards rainwater harvesting, e.g. how different techniques are employed in rainwater harvesting for different regions, depending on their terrains and traditions. The session highlighted different methods which could promote these practices further and integrate them into our cultures yet again.

6th IWW 2019
INDIA WATER WEEK 2019
WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES
24th - 28th SEPTEMBER, 2019 VIGYAN BHAWAN NEW DELHI, INDIA

Water and Heritage

The session was divided into two sessions, where Session 1 was chaired by Shri. A.B. Pandya, Secretary General, ICID and co-chaired by Dr. Vivek Saxena, Country Representative, IUCN with Mr. Pankaj Satija, Chief Regulatory Affairs, Tata Steel, Ms. Nupur Prothi Khanna, ICOMOS, Ms. Arushi Nishank, Sparsh Ganga and Ms. Meena Narula, Country Director, Water for people India as the panelists. The second session was chaired by Shri T.B.S. Rajput, ICAR and co-chaired by Ms. Archana Chatterjee, National Coordinator, IUCN along with Ms. Anupama Madhok, Director & Editor, Water Digest, Mr. Monish Siripurapu, ANT Studio, Mr. Divay Gupta, Architecture Heritage INTACH, Ms. Nidhi Madan, Secretary, ISOLA and Shri A Mridul, Birkha Bawari as the panellists.

The discussion saw presenters talk about several programs to preserve the old water bodies of India like Ganga, and using learnings from the past to create better opportunities for the future. Community participation emerged as a highlight during this discussion, along with revival of heritage sites. Some interesting insights were brought into the discussion such as the landscape approach to water and heritage, and reverting to old methods of air-cooling using water.

The panel recommended that professionals and organisations should contribute to a revision in policy protection measures, setup guidelines for CSR, considering both our natural and cultural heritage, and set up funding to tie up with engineering and technology for innovative solutions relevant to the Indian context. The session brought together professionals from diverse backgrounds, presenting their views, proving the relevance of water heritage to achieve the UN SDGs.

The cheerful presence of the torchbearers of the next generation, school children, made the session interactive and more meaningful.

Cultural Programme organised at Dr. B R Ambedkar Inetrnational Centre on 25th September 2019 in New Delhi

28th September 2019 | New Delhi

6th IWW 2019
INDIA WATER WEEK 2019
WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES
24th - 28th SEPTEMBER, 2019 | VIGYAN BHAWAN NEW DELHI, INDIA

सत्यमेव जयते
Ministry of Jal Shakti
Department of Water Resources,
River Development & Ganga Rejuvenation

Improved water conditions can lead to improvement in the economy

L to R Shri G Asok Kumar, Executive Director - Projects, NMCG, Mr. Dirk Stefees-Enn, Deputy Head of Economics Co-operation and Development, Germany Embassy, Shri Rajiv Ranjan Mishra, Director General, NMCG, Shri Rakesh Kumar, Director, CSIR-NEERI and Shri Rajneesh Chopra, Global Head, Business Development, VA Tech Wabag

Rejuvenation of the Ganga – From Planning to Action

The session was chaired by Shri Rajiv Ranjan Mishra, Director General, National Mission for Clean Ganga. The speakers for the session were Shri Rakesh Kumar, Director, CSIR – NEERI, Mr. Dirk Steffes-enn, Deputy Head of Economic Cooperation and Development, German Embassy.

The speakers stated rivers are not dirty it's the civilisation near the river basins and the people living in those civilisations that make rivers dirty. They stated that Ganga is an experimental lab and the methods of rejuvenation that work there would be applied to other rivers in the country.

The panel talked about the concept of "Aviral Dhara" and "Nirmal Dhara" under Namami Gange – the flagship program launched in 2015.

Technical presentation on the various aspects of Ganga Rejuvenation plan were delivered by Shri G. Asok Kumar, Executive Director – Projects, NMCG, Shri Rajiv Kishore, Executive Director (Admin), NMCG, Shri D.P. Mathuria, Executive Director – Technical, NMCG, Shri Rajneesh Chopra, Global Head – Business Development, VA Tech WABAG Ltd . and others.

Water Resources Development for Rural Economic Growth

This session was chaired by Shri Amarjeet Sinha, Secretary, MoRD. The other panelists for the session were Dr. Alok Sikka, Representative, IWMI, Shri K.C. Naik, Chairman, CGWB, Dr. Tushar Shah, Senior Fellow, IWMI, Shri Raghvendra Pratap, Director, MGNREGS, Shri K. Vohra, Commissioner (SPR), DoWR, Shri Rajeev Ahal, Director, NRM, Shri B. Rath, Technical Expert (WM), NRAA, MoAG, Shri Kamran Rizvi, Dr. A.R. Khan and Shri R.K. Agarwal, Superintending Engineer, WRD, Govt. of Chhattisgarh.

The panel highlighted the aspect of Water

6th IWW 2019
INDIA WATER WEEK 2019
WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES
24th - 28th SEPTEMBER, 2019 VIGYAN BHAWAN NEW DELHI, INDIA

Resources Development & Rural livelihood in the country. They stated that water-provision depends on self-provision. They also talked about the policy of MGNREGA and PMKSY and how they can play a major role in helping the irrigation sector of the country despite the constraints of energy availability and expensive diesel.

The session laid out discussions on ending poverty and bringing inclusive growth and emphasised that activities related to agriculture need to be closely integrated with the SDG targets, as agriculture is highly dependent on water.

Participatory Irrigation Management (India-NPIM)

The special session was chaired by Shri Sanjay Belsare, Vice President, India NPIM

and co-chaired by Shri Puneet Kumar Mittal, Sr. Joint Commissioner, SJC, CAD, Ministry of JalShakti. The panelists also included Shri Y.D. Sharma, Secretary, India NIPM and Shri Mohan Sharma, India NIPM.The importance of participation of the farmers was a highlight of the session since they identify most with the issues discussed. The discussions started with emphasis on 99 prioritised projects under PMKSY (Pradhan Mantri Krishi Sinchayee Yojna). The focus was then shiftedto water user associations where the progress in many states is not up-to-date and the drawbacks for the associations were brought to the forefront. Policy reformations along with establishment of support services were suggested as the remedial options for reoccurring issues. For full participation from management and farmers, counseling was proposed as a viable solution. The management of irrigation would be better only when the farmers are independent, self-motivated& confident, and the State and Central Governments are transparent about the information being transmitted.

Focused Role of Federal Government in Ensuring Sustainable Water Resources Development

The brainstorming session was chaired by Shri A.B. Pandya, Secretary General, ICID, and co-chaired by Shri Navin Kumar, Member (WR), CWMA & Chairman, CWRC.The speakers highlighted several actions and initiatives taken up by the Union Government, State Government as well as the local administration. They also stated that a unified strategy is required to be adopted to achieve the desired results in the future, for sustainable development of water resources. The main focus of the session was a stimulating discussion between the experts and professionals about the areas that require immediate attention, such as scientific implementation of the initiatives taken by the governments, addressing climate change as an important factor affecting policies, diversifying centrally sponsored programs, disincentivising

unsustainable practices and co-ordination between the government and community.

Moving Towards Integrated Planning and Management of Waters and Institutional Arrangements

The seminar was chaired by Shri S.K. Haldar, Member (WP & P), CWC along with Dr. Jonathan Quebbeman, RTI International USA, Ms. T. Rajeshwari, Additional Secretary, WR, RD & GR and Ms. Brigit Vogel, India-EU Partnership, GIZ India was a

presenter at the seminar. The panel highlighted the importance of looking at water from an integrated perspective, i.e. the coordinated development and management of not just water, but land and resources as well, in order to maximise economic and social welfare. It was noted that India faces uneven rainfall throughout the country hence river basin management, flood control, adequate investment by the government, active participation by all relevant stakeholders, etc. were highlighted by the speakers as certain key elements for successful integrated planning and managementof water. They also emphasised how river basins are considered as the most scientific, suitable and hydrological unit for water management. Ms. Brigit Vogel spoke in detail about the joint planning and managing of river basin issues which can vary from state to state. Multiple methods of flood control emerged as another important theme which could be extremely beneficial for

6th IWW 2019
INDIA WATER WEEK 2019
WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES
24th - 28th SEPTEMBER, 2019 VIGYAN BHAWAN NEW DELHI, INDIA

the management of water. Along with the key elements for successful management of resources,planning and implementations of the programswere also emphasised by the panel.

Learning from Best Practices in the Water Sector

The session was chaired by Shri K.P. Bakshi, Chairman, Maharashtra Water Resources Regulatory Authority. The other speakers for the session were Dr. Yella Reddy, Dean, Faculty of Agriculture, Engineering and Technology, ANGR, Shri G.R. Kulkarni and Shri Pradeep Kumar, Former Member, CWC.

The panel opined that with an increase in the demand for water various purposes including that for irrigation, the aspect of water use efficiency is the need of the hour. They highlighted the need of a Regulatory Authority Board in a state to monitor water resources. They further talked about how Maharashtra is the pioneer in the subject of water regulation.

The session laid emphasis on the aspect of collecting, sharing and managing data, water use efficiency, participatory approach and the importance of tariffs.

Various research papers were also presented by experts in the subject of Water Management practices.

E-Governance in the Water Sector

The session was chaired by Shri N.K. Mathur, Former Member CWC. The other

speakers for this session were Dr. Ranjna Nagpal, DDG, NIC, Shri D.S. Chaskar, Shri B. Khapre, Hydrology Expert, Mechatronics systems Pvt. Ltd., Shri Ashok Kharya, CWC, Dr. S.N. Sankhua, Chief Engineer, NWDA, Shri Parag Agarwal, CMD, Janajal and Shri C.M.S. Adhikari, Group Lead, ESRI India Technologies Ltd.

The panel highlighted that e-governance in the water sector can provide efficient gathering, managing and reporting of water resources data to promote effective public participation.

The speakers talked about the various aspects in e-governance. They stated that there is a need to redefine the rules for data collection, processing storage, dissemination of information, decision making etc.

The aspect of mobile governance and the way it complements e-governance was also highlighted by the panel. The speakers also discussed the SMART model of e-governance.

The session laid out various suggestions on what the best course to implement e-governance could be.

Ever Increasing Complexities in Adjudication of Water Disputes

The brainstorming session was chaired by Shri Suresh Chandra, Former Chairman, CWC and co-chaired by Dr. Srinivas Chokkakula, Centre for Policy Research, New Delhi. The panelists for the sessions included Shri A.B. Pandya, Secretary General, ICID, Shri R.S. Prasad, Former Chairman, CWC & Assessor, KWDT II, Shri R.K. Jain, GRMB, Dr. Avdhesh Pratap Singh, CCU University, Meerut among others. The panel noted how water demands and availability in India are variable for every State and how rivers have been a State subject even though most rivers are inter-state in India. They observed that climate change has a negative impact on future water availability and future water demand resulting from different agro-climatic scenarios. They also highlighted that problems related to water dispute are rarely

presented in front of the Tribunal by the States, listing some infamous water disputes (Ravi-Beas, Godavari, etc.) and the stagnation within the Tribunal.

The issues that the session brought to the forefront were those of a single standing Tribunal, no presence of technical officers in the panel and inefficiency of the State in reporting disputes. The Inter-State Water Dispute Amendment 2019 was an important part of the session where regulated discussions went on about the advantages and disadvantages of the Amendment as well as the improvements that can be made.

6th IWW 2019

INDIA WATER WEEK 2019

WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES

24th - 28th SEPTEMBER, 2019 VIGYAN BHAWAN NEW DELHI, INDIA

GLIMPSES OF THE EXHIBITION IWW 2019

The 6th India Water Week 2019 quotidian newsletter has been designed and curated by Advance Water Digest Pvt. Ltd. • www.thewaterdigest.com

29th September 2019 | New Delhi

6th IWW 2019
INDIA WATER WEEK 2019
WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES
24th - 28th SEPTEMBER, 2019 | VIGYAN BHAWAN NEW DELHI, INDIA

सत्यमेव जयते
Ministry of Jal Shakti
Department of Water Resources,
River Development & Ganga Rejuvenation

Water Saving Technologies have the potential to bridge the gap from Lab to Land

Special session for school children

A special session was organised where many school children participated. The session was an interesting highlight of the India Water Week as the school children performed skits on various water related issues in India which saw children from several schools in Delhi who attended the session. The skit was followed by an interactive question and answer session.. The session aimed at increasing awareness among children of different age groups as well as learning from the point of views presented by them.

Bridging the Gap-Lab to Field

Considerable research has been conducted in the area of water resources management and development across the world, particularly in developed countries. Such research is primarily directed towards better planning and improved efficiency. The research and academics industries in India have also made considerable progress; however, the application of findings of such research outcomes is relatively very slow.

The session "Bridging the Gap-Lab to Field" focused on the urgent need of adopting these findings for these findings in planning & operation of the water resources projects to ensure optimum and efficient utilisation for the benefit of the Society.

The session was chaired by Dr. Man Singh, Project Director, WTC and co-chaired by Shri M K Sinha, Executive Member, NCA. The other speakers for this session were Dr. K Sreenivas Reddy, Principal Scientist, ICAR-CRIDA, Shri D K Singh, Principal Scientist, WTC, ICAR-IARI, Dr. TBS Rajput, Emeritus Scientist, WTC, IARI and Shri Anuj Kanwal, Director (WS&RS), CWC.

The panel discussed the aspect of transfer of water saving technologies to farmer's field for bridging the gap from lab to land. They highlighted the topic of Enhancing Irrigation

6th IWW 2019
INDIA WATER WEEK 2019
WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES
24th - 28th SEPTEMBER, 2019 VIGYAN BHAWAN NEW DELHI, INDIA

Efficiency via various technologies like laser leveling, bio-gas technology, raised bed technology & micro-irrigation linked with solar energy.

The aspect of bridging the gap between created and utilised irrigation potential was also emphasised upon. Various reasons for the gaps were highlighted.

The panel briefed the delegates about the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) and how this policy is contributing in bringing a necessary change in the irrigation sector.

Water Quality Concerns, Preventive Measures and Treatment Options

India has made considerable improvements over the past decades in both the availability and quality of municipal drinking water systems; however, its large population and increased demand has put severe stress on water resources both in urban and rural areas. In addition to drinking water, many other water resources are also found to be contaminated with both bio and chemical pollutants. It has been estimated that over 21% of the country's diseases are water related.

The session "Water Quality Concerns, Preventive Measures and Treatment Options" focused on the water sustainability solutions to the growing scarcity of fresh water in India.

The panel for this session included Dr. Pawan Labhasetwar, CSIR-NEERI, Dr. Noor Afshan Kahn, CSIR-NEERI, Dr. G. K. Khasde, CSIR-NEERI, Dr. Dipankar Saha, Member, CGWB and Dr. Raman Sharma, CSIR-NEERI.

The speakers highlighted the aspects of drinking water, need of required water quality and further management of wastewater. They talked about the deteriorating quality of water in India and several reasons for the same.

The session laid out water quality Issues, treatment options and experiments to provide a platform to scientists, researchers and professionals for sharing their experiences, discussing issues and identifying measures for addressing the same in an appropriate manner.

River Basin Management- Modelling Tools

The seminar for River Basin Management – Modelling Tools was chaired by Dr. R. K. Jain, Chairman, GRMB and co-chaired by Sharad Kumar Jain, Director, NIH. The lead paper presenter was Dr. R. N. Sankhua, CE, NWDA.

River basins have been identified as most appropriate planning, development and management of water resources in a sustainable manner and for ensuring optimal benefit to the society. The planning of the basins have it's own complexities as several restraints are taken into considerations. The important aspects of river basin planning and management were highlighted during the sessions such as understanding the hydrological processes, identification and projection of diverse needs, analysis of different economic, social and political context, selection of most appropriate alternative.

The chair addressed the delegates by mentioning that river basin management encompasses all aspects of society, politics and economical. The field of river basin management faces more problems due to political disputes than technological sessions. For river basin management presence of appropriate data and tools are important. Most of the manpower in the management is usually exhausted while organising data. Since data attainment is a problem, in order to overcome the scarcity of data, modelling for river basin is essential but the modelling in India is still functioning at sub-optimal power. Different methods and software's ranging from advanced to beginner, for river basin modelling were discussed in-depth such as the Geo-RAS, HSPF, ANUGA, SOBEK, etc. Various technical papers were shared on suitable models for river basin management and modelling for different regions of India. Another important highlight of the session was the discussion about the appropriation and economic benefits being received by the stakeholders which has been problematic in this sector. The seminar was concluded with various technological interventions provided by the speaker and the chair.

6th IWW 2019
INDIA WATER WEEK 2019
WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES
24th - 28th SEPTEMBER, 2019 VIGYAN BHAWAN NEW DELHI, INDIA

Valedictory Session marking the dignified conclusion of India Water Week 2019

L to R- Shri M K Srinivas, Director General, NWDA, Shri A K Sinha, Chairman, CWC, Shri Rattanlal Kataria, Hon'ble State Minister, Ministry of Jal Shakti, Shri Gajendra Singh Shekhawat, Hon'ble Union Minister, Ministry of Jal Shakti, Shri U P Singh, Hon'ble Secretary, DoWR, RD & GR, Ministry of Jal Shakti and Shri S. M. Husain, Former Chairman, CWC

The flagship event of the Ministry of Jal Shakti - 6th India Water Week 2019, came to a dignified end with the valedictory session. This session saw the augustus presence of Shri Gajendra Singh Shekhawat, Hon'ble Union Minister, Ministry of Jal Shakti, Shri Rattanlal Kataria, Hon'ble State Minister, Ministry of Jal Shakti, Shri U P Singh, Hon'ble Secretary, DoWR, RD & GR, Ministry of Jal Shakti, Shri M K Srinivas, Director General, NWDA and Shri S. M. Husain, Former Chairman, CWC and Shri A K Sinha, Chairman, CWC.

The conference was a grand success with some national and international luminaries discussing ways to sustainably manage water resources and plans to create a better future and sustainable solutions to various problems of the water sector all around the globe.

Delivering the welcome address, Shri A K Sinha mentioned that 6th India Water Week has established itself as a key platform for having discussions on various subjects related to water.

He further mentioned the theme for the 6th India Water Week 2019 "Water Cooperation – Coping with the 21st Century Challenges". He briefed that this year's India Water Week comprised of a plenary session, 15 seminars, 12 panel discussions, 4 brain storming sessions and 6 special sessions (including sessions by EU, Japan and a session for school children) and an Exhibition.

Shri Gajendra Singh Shekhawat eloquently addressed the challenge of the water crisis facing the world and how it should be of paramount importance for the Ministries as

6th IWW 2019
INDIA WATER WEEK 2019
WATER COOPERATION – COPING WITH 21st CENTURY CHALLENGES
24th - 28th SEPTEMBER, 2019 VIGYAN BHAWAN NEW DELHI, INDIA

well as the people. He pointed out that the 6th India Water Week contributes crucially towards the planning and implementations made by researches and policy planners.

Drinking water is a pressing problem in not only India but all around the globe resulting in deaths in several places. He extended his

gratitude and congratulated the entire team of Department of Water Resources & RD & GR for organising the 6th India Water Week and completing it successfully.

An extremely important issue addressed by Shri Shekhawat was the gap between technology and dissemination of information to the fields and labs. The technology for maximising the outputs have been discovered but the information and technology needs to be transferred to the people who are responsible for their practical applications. He brought to the forefront the traditional ways of conserving water which was time and again mentioned through the discussions in India Water Week. Furthermore, he asked each person to take responsibility and requested cooperation and coordination in the global endeavour of saving water. According to Shri Shekhawat people's participation is crucial and children from a young age should be taught to imbibe the habit of conserving water.

Shri Rattanlal Kataria in his address highlighted the importance of water and that it is required in every field of life be it domestic, agricultural, animal husbandry, industries etc. He touched upon the subject of treatment, recycle and reuse of wastewater so that people draw water within a limit and do not overuse the precious resources. He briefed the audience that under the vision of the Prime Minister Shri Narendra Modi, the union government is making continuous efforts with regards to the subject of water and trying their best to resolves the issues. He ended his address by urging the audience to switch to efficient ways of water management in life.

Shri U P Singh addressed the gathering by going over the important discussions and deliberations performed over the one week of 6th India Water Week. He highlighted the sessions which also included participations from famers and school children. He rightly pointed out that the water governance in India needs modifications and the integrated water resources planning has to be improved. He suggested that the outcomes of the water week will help further in improving the policy making and create consensus building between various states.

According to Shri U P Singh the focus of the crisis should be shifted from conflict to cooperation. He placed emphasis on putting in place certain policies such as the formation of functional water regulatory authority in various states while citing the example of Maharashtra. He also mentioned the need for authorities for reuse and recycling of water as well as improving water use efficiency and further shed light on the aspect of water sharing and cooperation

He pointed out the presence of updated technology in India which should be used in the process of data management. He concluded his address by reiterating the Prime Minister's remarks for making the Jal Andolan into a Jan Andolan.

The recommendations made during the various sessions of the 6th India Water Week were presented by Shri S. M. Husain.

At the end, Shri M K Srinivas delivered a note of thanks to all the organisations and individuals who played a part in making the 6th India Water Week a huge success.

WATER DIGEST | WD NEWS
The 6th India Water Week 2019 quotidian newsletter has been designed and curated by Advance Water Digest Pvt. Ltd. • www.thewaterdigest.com

EXHIBITION

Main Entrance of Exhibition

Shri Gajendra Singh Shekhawat, Hon'ble Minister of Jal Shakti inaugurating Exhibition in presence of Shri Rattan Lal Kataria Hon'ble Minister of State, Jal Shakti, Shri U P Singh, Secretary, Smt. Rajeswari, Addl. Secretary, DoWR, RD&GR and Shri M K Srinivas, Director General, NWDA

Shri Gajendra Singh Shekhawat, Hon'ble Minister of Jal Shakti, Shri Rattan Lal Kataria Hon'ble Minister of State, Jal Shakti along with dignitaries visiting NWDA Stall

Shri Gajendra Singh Shekhawat, Hon'ble Minister of Jal Shakti, Shri Rattan Lal Kataria Hon'ble Minister of State, Jal Shakti along with dignitaries visiting NMCG & WAPCOS Stalls

Shri Rattan Lal Kataria Hon'ble Minister of State, Jal Shakti inaugurating stall in the august presence of Shri Gajendra Singh Shekhawat, Hon'ble Minister of Jal Shakti

Shri Gajendra Singh Shekhawat, Hon'ble Minister of Jal Shakti, Shri Rattan Lal Kataria Hon'ble Minister of State, Jal Shakti along with dignitaries visiting DoS & T Stalls

Shri Gajendra Singh Shekhawat, Hon'ble Minister of Jal Shakti, Shri Rattan Lal Kataria Hon'ble Minister of State, Jal Shakti along with dignitaries visiting European Union Stall

His Excellency Mr. Kenji Hiramatsu, Ambassador of Japan visiting Exhibition

Dignitaries visiting Exhibition

Students visiting Exhibition

Shri Gajendra Singh Shekhawat, Hon'ble Minister of Jal Shakti, Shri Rattan Lal Kataria Hon'ble Minister of State, Jal Shakti along with dignitaries visiting Exhibition

Shri Gajendra Singh Shekhawat, Hon'ble Minister of Jal Shakti, along with dignitaries visiting Exhibition


52 JANAJAL - SUPREMUS DEVELOPERS PVT. LTD.
6th IWW 2019
JANAJAL
CHANGE BEGINS WITH SAFE WATER
Empowering millions by making clean drinking water affordable, accessible and available through water ATMs.


NATIONAL WATER DEVELOPMENT AGENCY
NWDA


Equity
Efficiency
Sustainability
WRD
WATER RESOURCES DEPARTMENT
GOVERNMENT OF GUJARAT


Government of Maharashtra
Water Resources Department
WRD
Government of Maharashtra
Water Resources Department
WRD


Rivulis
Rivulis
Rivulis
manna
manna


Water Resources Department of
Rajasthan


राष्ट्रीय स्वच्छ गंगा मिशन
BIODIVERSITY
WABAG


WRD, MP
6th IWW 2019


ITC: KISSANO KE LIYE JAL, GAON GAON MEIN SUNEHRA KAL
ITC: A GLOBAL EXEMPLAR IN SUSTAINABILITY
ITC'S WATER STEWARDSHIP MISSION
IWAI
Enduring Value


WRD, GOVT. OF ODISHA
6th IWW 2019
38
SANSKAR PUBLIC SCHOOL,
6th IWW 2019
37
D&D ECOTEC
WATER WEEK 20
Water Cooperation-Coping with 21st Century Challenges

LIST OF SPONSORS FOR IWW-2019

S. NO.	NAME OF ORGANIZATION	TYPES OF SPONSORSHIP
1.	MINISTRY OF AGRICULTURE AND FARMERS WELFARE	SPONSOR
2.	GOVERNMENT OF RAJASTHAN	PLATINUM
3.	CSIR-NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INSTITUTE	PLATINUM
4.	GOVERNMENT OF KERALA	PLATINUM
5.	GOVERNMENT OF MAHARASHTRA	PLATINUM
6.	VA TECH WABAG LTD., CHENNAI	PLATINUM
7.	GOVERNMENT OF ANDHRA PRADESH	PLATINUM
8.	GOVERNMENT OF GUJARAT	GOLD
9.	KARNATAKA NEERAVARI NIGAM LTD	GOLD
10.	XYLEM WATER SOLUTIONS, NOIDA	GOLD
11.	VISVESVARAYA JALA NIGAM LTD, BANGALURU	GOLD
12.	DEPARTMENT OF SCIENCE & TECHNOLOGY	GOLD
13.	GOVERNMENT OF MADHYA PRADESH	SILVER
14.	GOVERNMENT OF CHHATTISGARH	SILVER
15.	GOVERNMENT OF GOA	SILVER
16.	GOVERNMENT OF BIHAR	SILVER
17.	SARDAR SAROVAR NARMADA NIGAM LTD.	SUPPORTER
18.	M/S WATER FOR PEOPLE INDIA, NEW DELHI	SUPPORTER
19.	GIZ, EUROPEAN UNION	FOREIGN PARTNER

LIST OF EXHIBITORS FOR IWW-2019

S. No.	NAME OF ORGANIZATION
1.	AGC INC, JAPAN.
2.	ARAB G-WADI NETWORK, OMAN
3.	ASAHI KASEI PVT. LTD.
4.	BHAKRA BEAS MANAGEMENT BOARD
5.	BHARAHMPUTRA BOARD
6.	BHARATI WATER – SGL INC.
7.	CENTRAL GROUND WATER BOARD
8.	CENTRAL SOIL AND MATERIAL RESEARCH STATION
9.	CENTRAL WATER AND POWER RESEARCH STATION
10.	CENTRAL WATER COMMISSION
11.	CSIR-NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INSTITUTE
12.	D&D ECOTECH SERVICES
13.	DAIKI AXIS, JAPAN
14.	DEERFOS MEMBRANES CO. INDIA PVT.LTD.
15.	DEPARTMENT OF SCIENCE & TECHNOLOGY
16.	EA WATER (WEXTRA LTD.)
17.	EHSAS FOUNDATION, USA
18.	ENERGY & ENVIRONMENT FOUNDATION
19.	EUROPEAN UNION
20.	INLAND WATERWAYS DEVELOPMENT AUTHORITY
21.	ION EXCHANGE, MUMBAI
22.	ITC LIMITED
23.	JANAJAL - SUPREMUS DEVELOPERS PVT. LTD.
24.	KARNATAKA NEERAVARI NIGAM LIMITED
25.	KAUSHIKS INTERNATIONAL
26.	KERALA WATER AUTHORITY, GOVT. OF KERALA
27.	KURARAY INDIA PVT. LTD
28.	LIVINGUARD TECHNOLOGIES PVT. LTD
29.	MAITHRI AQUATECH
30.	MINISTRY OF CONSUMER AFFAIRS
31.	NARMADA CONTROL AUTHORITY

32.	NATIONAL BANK FOR AGRICULTURE AND RURAL DEVELOPMENT DEVELOPMENT
33.	NATIONAL HYDROLOGY PROJECT
34.	NATIONAL INSTITUTE OF HYDROLOGY
35.	NATIONAL MISSION FOR CLEAN GANGA
36.	NATIONAL REMOTE SENSING CENTRE
37.	NATIONAL WATER DEVELOPMENT AGENCY
38.	NETAFIM IRRIGATION PVT. LTD.
39.	NMS RESOURCES GLOBEL LIMITED (FORMERLY IFM IMPEX GLOBEL LIMITED)
40.	OBEL SYSTEM PVT. LTD.
41.	OXFAM INDIA
42.	RIVULIS IRRIGATION INDIA PVT. LTD.
43.	SANSKAR VALLEY PUBLIC SCHOOL , HYRYANA
44.	SEKISUI DLJM MOLDING PVT. LTD.
45.	SUNCITY SCHOOL, GURGAON
46.	SWAN ENVIRONMENTAL PVT. LTD.
47.	TEHRI HYDRO DEVELOPMENT CORPORATION INDIA LIMITED
48.	TOSHIBA WATER SOLUTION PVT. LTD.
49.	TOTESTU MFG. PVT. LTD.JAPAN
50.	TRACTEBEL ENGINEERING PVT.LTD.
51.	VISWESWARIAH JAL NIGAM LIMITED
52.	WADE FOUNDATION
53.	WATER AND POWER CONSULTENCY SERVICES
54.	WATER MATICS
55.	WATER RESOURCES DEPARTMENT, GOVERNMENT OF CHHATTISGARH
56.	WATER RESOURCES DEPARTMENT, GOVERNMENT OF GUJARAT
57.	WATER RESOURCES DEPARTMENT, GOVERNMENT OF MADHYA PRADESH
58.	WATER RESOURCES DEPARTMENT, GOVERNMENT OF MAHARASHTRA
59.	WATER RESOURCES DEPARTMENT, GOVERNMENT OF RAJSTHAN
60.	WATER RESOURCES DEPARTMENT, GOVERNMENT OF TENALGANA
61.	WATER RESOURCES DEPARTMENT, GOVERNMENT OF ODISHA
62.	XYLEM INC. WATER SOLUTION INDIA PRIVET LIMITED

COMMITTEES OF IWW-2019

COMPOSITION OF THE ORGANISING COMMITTEE OF IWW-2019

1.	Secretary, Department of Water Resources, RD & GR Ministry of Jal Shakti	**Chairman**
2.	Additional Secretary, Department of Water Resources, RD & GR Ministry of Jal Shakti	Member
3.	Chairman, Central Water Commission	Member
4.	Member (WP&P), Central Water Commission	Member
5.	Director General, National Mission for Clean Ganga. DoWR,RD&GR Ministry of Jal Shakti	Member
6.	Joint Secretary (Admin), Department of Water Resources, RD & GR Ministry of Jal Shakti	Member
7.	Joint Secretary (IC & GW), Department of Water Resources, RD & GR Ministry of Jal Shakti	Member
8.	Joint Secretary & Financial Advisor, Department of Water Resources, RD & GR Ministry of Jal Shakti	Member
9.	Joint Secretary, Department of Drinking Water & Sanitation Ministry of Jal Shakti	Member
10.	Chairman-cum-Managing Director WAPCOS Ltd.	Member
11.	Chairman, Central Ground Water Board	Member
12.	Chief Engineer (HPP&I), Central Electricity Authority, Ministry of Power	Member
13.	Mission Director, National Water Mission (NWM), DoWR,RD&GR, Ministry of Jal Shakti	Member
14.	Director General, National Water Development Agency, New Delhi.	Member-Secretary
	Special Invitee	
15	Director (IEC), Department of Water Resources, RD&GR Ministry of Jal Shakti	Invitee

List of Members of Technical Committee 6th IWW-2019

1.	Chairman, Central Water Commission Sewa Bhawan, R. K. Puram, New Delhi-110066	**Chairman**
2.	Chairman, Ganga Flood Control Commission, Ministry of Jal Shakti	Member
3.	Member (D&R), CWC, Sewa Bhawan, R. K. Puram, New Delhi-110066	Member
4.	Member (WP&P), CWC, Sewa Bhawan, R K Puram, New Delhi-110066	Member
5.	Member (RM), CWC, Sewa Bhawan, R K Puram, New Delhi-110066	Member
6.	Director General, NMCG, Ministry of Jal Shakti New Delhi	Member
7.	Director General, National Water Development Agency, New Delhi-110017	Member
8.	Shri A.B. Pandya, Secretary General, ICID, Nyay Marg, Chanakyapuri, New Delhi.	Member
9.	Director, Central Soil and Materials Research Station New Delhi	Member
10.	Member, Central Ground Water Board, Faridabad	Member
11.	Member (Hydro), Central Electricity Authority , Sewa Bhawan, R K Puram, New Delhi	Member
12.	Advisor (Water Resources & Land Resources), NITI Aayog, New Delhi	Member
13.	Joint Secretary (Urban Development) In-charge of Smart Cities project, Ministry of Urban Development, New Delhi	Member
14.	Joint Secretary, Department of Drinking Water &Sanitation, Ministry of Jal Shakti Paryavaran Bhawan, New Delhi	Member
15.	Director , National Institute of Hydrology, Roorkee	Member

16.	Chairman-cum-Managing Director WAPCOS Ltd. New Delhi	Member
17.	Shri M.E. Haque, Assessor, Vamsadhara Water Dispute Tribunal, New Delhi	Member
18.	Chief Engineer, Delhi Jal Board, New Delhi	Member
19.	Chief Engineer (YBO), Central Water Commission, New Delhi	Member
20.	Chief Engineer (IMO), CWC Sewa Bhawan, R. K. Puram, New Delhi-110066	Member
21.	Chief Engineer (HRM), CWC Sewa Bhawan, R. K. Puram, New Delhi-110066	Member
22.	Director (TC), CWC, Sewa Bhawan, R K Puram, New Delhi	Member
23.	Scientist 'E', India Meteorological Department, Lodhi Road, New Delhi	Member
24.	Principal Scientist (WM), KAB-II, ICAR, Krishi Anusandhan Bhawan, New Delhi	Member
25.	Project Director, WTC-IARI, Pusa Institute, New Delhi	Member
26.	Executive Secretary, India Water Partnership (IWP), New Delhi	Member
27.	Additional Commissioner, Rainfed Farming Systems Division, Krishi Bhawan, New Delhi	Member
28.	Head, Technology Missions Division, Dept. of Science and Technology, New Delhi	Member
29.	Director, Impact Assessment Division, MOEF, New Delhi	Member
30.	Chairman-cum-Managing Director, NHPC Limited	Member

31.	Chief Engineer (South), National Water Development Agency, Hyderabad	Member
32.	Chief Engineer (H.Q.), NWDA, Saket, New Delhi.	Member Secretary

Special Invitees

1.	Shri S. Masood Husain, Former Chairman, CWC, New Delhi
2.	Dr. Alok Sikka, Head Indian Operation, IWMI, New Delhi
3.	Dr. Ravinder Kaur, Principal Scientist, WTC, ICAR, New Delhi
4.	Dr. Srinivas, Center for Policy Research, New Delhi
5.	Shri S. K.Gangwar, Member (Technical), IWAI, Noida
6.	Shri Bhupinder Singh, Director (NP), CWC , New Delhi

Officer in-charge of Sub themes (CWC)

S. No.	Name
1.	Shri. S. K. Das, Director (HCD-E&NE), CWC, Sewa Bhawan, R. K. Puram, New Delhi-110066
2.	Dr. Jakir Husain, Research Officer, RDC-2 Directorate, CWC, Sewa Bhawan, R. K. Puram, New Delhi-110066
3.	Shri. Vivek Tripathi, Director CMD(E&NE), CWC, Sewa Bhawan, R. K. Puram, New Delhi-110066
4.	Shri. Goverdhan Prasad, Director (HYD-N), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
5.	Shri. Piyush Ranjan, Director (PA-N), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
6.	Shri. Sarad Chandra, Director (FFM) CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
7.	Shri. Pankaj Sharma, Director (RDC-2), CWC,Sewa Bhawan R. K.Puram, New Delhi-110066
8.	Shri. D M Raipure, Director (BP), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
9.	Shri. Ajay Kumar Sinha, Director (M&CC), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
10.	Shri. Prashant Kumar Gupta, Director (BP-3) CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
11.	Shri. Sanjay Kumar Singh, Director (CM), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
12.	Shri. Sunil Kumar, Director (BP-1) CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
13.	Shri S. K. Rajan, Director (TC), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
14.	Shri Rajiv Singhal, Director (DSM), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
15.	Shri. R. D. Deshpande, Director (Mon-C), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
16.	Shri. S. Biswas, Director (Mon), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
17.	Shri Anant Gupta, Director (EA), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
18.	Shri. Piyush Kumar, Director (FMP), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
19.	Shri. Ritesh Khattar, Director (FCA-1), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
20.	Shri. Rajiv Kumar, Director (PA-C), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
21.	Shri. Kamal Kumar Jangid, Director (IPO), CWC Sewa Bhawan R. K. Puram, New Delhi-110066
22.	Shri. S. K. Sinha Director (Training), CWC Sewa Bhawan R. K. Puram, New Delhi-110066

23.	Shri. Praveen Kumar Director (PCP), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
24.	Shri. Rajesh Kumar, Director (RDC-1), CWC Sewa Bhawan R. K. Puram, New Delhi-110066
25.	Shri. Samir Kumar Jha, Director (Mon-E&W), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
26.	Shri. H. S. Sengar, Director (RMC), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
27.	Shri. N. Mukherjee, Director (PA-S), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
28.	Shri. S. L. Meena, Director, CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
29.	Shri. K. V. Prasad, Director (FM-II), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
30.	Shri. Vimal Kumar, Director (ISM-1), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
31.	Shri. D. K. Jha, Director (RB), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
32.	Shri. Anuj Kanwal, Director (WS&RS), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066
33.	Shri. B. B. Saikia, Director (EMO), CWC, Sewa Bhawan R. K. Puram, New Delhi-110066

Officer in-charge of Sub themes (From other organisations)

S. No.	Name
1.	Dr. Prabhakar Nanda Principal Scientist, ICAR-IIWM
2.	Dr. Atmaram Mishra Principal Scientist, ICAR-IIWM
3.	Shri. Ajay Kumar Director (Water Quality), DoDWS, Ministry of Jal Shakti
4.	Shri.Jaideep Singh Bawa, Chief Engineer (HPP&I), CEA,Sewa Bhawan, R. K. Puram, New Delhi-110066
5.	Dr. S D Attri, Scientist - F Agromet Advisory Division, IMD
6.	Dr. Rakesh Kumar Scientist G & Head, Surface Hydrology Division, National Institute of Hydrology.
7.	Shri. Ajit Kumar, Director (MP-I), GFCC, Sinchai Bhawan, Patna, Bihar - 800 015
8.	Dr. Poonam Sharma, Sr. Hydrologist, CGWB, Bhujal Bhawan, NH-IV Faridabad- 121001
9.	Dr. S. K. Ambast Director , ICAR-IIWM
10.	Dr. R. K. Panda, Principal Scientist & Program Leader, ICAR-IIWM, Bhubaneswar
11.	Shri. D. K. Singh Principal Scientist, WTC, ICAR-IARI
12.	Dr. S. Suresh, Sr. Hydro-geologist, CGWB-CHQ
13.	Shri Anshuman, Associate Director Water Resources Division The Energy and Resources Institute (TERI)
14.	Shri. Sanjay Kumar Gangwar Member (Technical), IWA, Noida
15.	Shri Sidhartha Mitra Director, National Water Academy
16.	Shri. D. K. Singh Principal Scientist, WTC, ICAR-IARI
17.	Dr. Pawan Kumar Labhasetwar Scientist and Head, WTMD, CSIR-NEERI Nagpur
18.	Dr. Sanjay Kumar Scientist, Department of Science and Technology, New Delhi

Abbreviations

ADB	Asian Development Bank
AIBP	Accelerated Irrigation Benefit Programme
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
ANFIS	Adoption Neuro Fuzzy Inference System
ANGRAU	Acharya N G Ranga Agricultural University
BARC	Bhabha Atomic Research Centre
BBM	Building Block Methodology
BBMB	Bhakra Beas Management Board
BCM	Billion Cubic Meter
BCR	Benefit Cost Ratio
BIS	Bureau of India Standards
BS	Brainstorming Session
BWSSB	Bangalore Water Supply and Sewerage Board
CAD	Command Area Development
CAD&WM	Command Area Development and Water Management
CCS	Cash Compensatory Support
CEA	Central Electricity Authority
CEEW	Council on Energy, Environment and Water
CGWB	Central Ground Water Board
CID	Composite Drought Index
Cll	Confederation of Indian Industry
CIMFR	Central Institute of Mining and Fuel Research
CMP	Catchment Management Plan
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health and Environmental Engineering Organisation
CRC	Cooperative Research Centre
CS	Civil Society
CSS	Continuous Stream Storages
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSMRS	Central Soil and Material Research Station
CSR	Corporate Social Responsibility
CRCWSC	Cooperative Research Centre for Water Sensitive Cities
CTC	Cauvery Technical Cell
CWC	Central Water Commission
CWPRS	Central Water and Power Research Station
DFAT	Department of Foreign affairs and Trade
DG	Director General
DJB	Delhi Jal Board
DM&EWS	Drought Monitoring and Early Warning System
DO	Dissolved Oxygen
DoWR,RD&GR	Department of Water Resources, River Development and Ganga Rejuvenation
DoDW&S	Department of Drinking Water and Sanitation
DoST	Department of Science and Technology
DPR	Detailed Project Report
DRIFT	Downstream Response to Imposed Flow Transformation
DRIP	Dam Rehabilitation and improvement programme
DRR	Disaster Risk Reduction

DSS	Decision Support System
DWRIS	Development of Water Resources Information System
EAP	Emergency Action Plan
EFR	Environmental Flow Release
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EKW	East Kolkata Wetlands
ERP	Emergency Response Plan
ERP	Enterprise Resource Planning
EVW	Embodied Value of Water
EU	European Union
FICCI	Federation of Indian Chambers of Trade and Commerce
GDP	Gross domestic product
GFCC	Ganga Flood Control Commission
GHG	Greenhouse gases
GIS	Geographic Information System
GLOF	Glacial Lake Outburst Floods
GPS	Global Positioning Systems
GRMP	Godawari River Management Board
GSI	Geological Survey of India
GWP	Global Water Partnership
HP	Hydro Power
HYV	High-Yielding Variety
IARI	Indian Agricultural Research Institute
ICAR	Indian Council for Agricultural Research
ICEWaRM	International Centre of Excellence in Water Resources Management
ICIMOD	International Centre for Integrated Mountain Development
ICID	International Commission on Irrigation and Drainage
ICIS	Integrated Computerized Information System
ICOLD	International Commission On Large Dams
ICT	Information and Communication Technologies
IEC	Information Education and Communication
IFC	International Finance Corporation
IIS	Integrated Irrigation Solution
IIT	Indian Institutes of Technology
IIM	Indian Institutes of Management
ILR	Inter Linking of Rivers
IMD	India Meteorological Department
IMTI	Industrial Management and Training Institute
ISRO	Indian Space Research Organisation
INRM	Integrated Natural Resource Management
IPC	Irrigation potential created
IPU	Irrigation potential utilized
IRAP	Institute for Research Analysis and Policy
IRBM	Integrated River Basin Management
IRD	Irrigation Research Division
IRAD	Integrated Research and Action for Development
ISBIG	Incentivisation scheme for bridging Irrigation Gap
ISWD	Inter-State Water Disputes

ISWW	Inter State Waters Wing
ITC	Indian Tobacco Company
IUCN	International Union for Conservation of Nature
IUWM	Integrated Urban Water Management
IWAI	Inland Waterways Authority of India
IWMI	International Water Management Institute
IWP	India Water Partnership
IWRM	Integrated Water Resource Management
JKSPDC	Jammu and Kashmir State Power Development Corporation
KRMB	Krishna River Management Board
kWh	kilowatt hour
LE	Logic Element
L&T	Larsen & Toubro
LFA	Logical Framework Analysis
LIDAR	Light Detection and Ranging
LSH	Large Scale Hydropower
LTTD	Low Temperature Thermal Desalination
M&E	Monitoring and Evaluation
MDBA	Murray-Darling Basin Authority
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MHPA	Mangdechhu Hydroelectric Project Authority
MIS	Management Information System
MNRE	Ministry of New and Renewable Energy
MoJS	Ministry of Jal Shakti
MoEF&CC	Ministry of Environment, Forests and Climate Change
MoP	Ministry of Power
MoRD	Ministry of Rural Development
MoU	Memorandum of Understanding
MoUD	Ministry of Urban Development
MP	Madhya Pradesh
MRC	Mekong River Commission
MW	Mega Watt
MWRD	Maharashtra Water Resources Department
MWRRA	Maharashtra Water Resources Regulatory Authority
NABARD	National Bank of Agriculture and Rural Development
NCGG	National Centre for Good Governance
NCMRWF	National Centre for Medium Range Weather Forecasting
NCT	National Capital Territory
NE	North East
NEERI	National Environmental Engineering Research Institute
NATCOM	National Communication
NAQUIM	National Aquifer Management Progarmme
NGO	Non-Governmental Organization
NHPC	National Hydroelectric Power Corporation
NIH	National Institute of Hydrology
NIT	National Institute of Technology
NITI	The National Institution for Transforming India
NIUA	National Institute of Urban Affairs
NMCG	National Mission for Clean Ganga

NRAA	National Rainfed Area Authority
NRDWP	National Rural Drinking Water Programme
NRM	National Resource Management
NRSC	National Remote Sensing Centre
NRW	Non-Revenue Water
NRWQL	National River Water Quality Laboratory
NSS	National Service Scheme
NTPC Ltd	National Thermal Power Corporation Limited
NUDM	National Urban Development Mission
NWA	National Water Academy
NWDA	National Water Development Agency
NWIC	Niagara Wireless Internet Connection
NWM	National Water Mission
O&M	Operation and Maintenance
ODF	Open Defecation Free
PA	Project Appraisal
PAO	Project Appraisal Organization
PD	Panel Discussion
PIM	Participatory Irrigation Management
PIN	Piped Irrigation Network
PMKSY	Pradhan Mantri Krishi Sinchan Yojana
PPCP	Public-Private-Community Partnerships
PPA	Power Purchase Agreement
PPP	Public Private Partnership
PRI	Panchayati Raj Institution
PSPs	Pumped Storage Plants
PSS	Pump Storages Scheme
PUB	Public Utilities Board
PWD	Public Works Department
R&D	Research And Development
R&M	Renovation and Modernization
RBO	River Basin Organisation
RBMPs	River Basin Management Plans
RDMS	Relational Database Management System
RESD	Renewable Energy Sources Development
RLA	Remaining Life Assessment
RMU	Ring Main Unit
RO	Reverse Osmosis
RRR	Required Rate Of Return
RRR	Repair, Renovation and Restoration
SAARC	South Asian Association for Regional Co-operation
S&T	Science and technology
SDMC	SAARC Disaster Management Centre
SNU	Shiv Nadar University
SPR	State Project Wing
SPV	Special Purpose Vehicle
SS	Special Session
SSI	Sustainable Sugarcane Initiative
SVNIT	Sardar Vallabhbhai Patel National Institute of Technology

TAC	Technical Advisory Committee
TERI	The Energy and Resources Institute
THDC Ltd.	Tehri Hydro Development Corporation Limited
TNUDP	Third Tamil Nadu Urban Development Project
TNUIFSL	Tamil Nadu Urban Infrastructure Financial Services Limited
ULB	Urban Local Bodies
UNESCO	United Nations Educational Scientific and Cultural Organisation
UNESCAP UN	Economic and Social Commission for Asia and the Paci c
UNIDO	United Nations Industrial Development Organization.
UT	Union Territory
UYRB	Upper Yamuna River Board
VAW	Value Added Water
WACREP	Water and Climate Resilience Program
WALMI	Water and Land Management Institute
WAPCOS	Water and Power Consultancy Services
WASH	Water, Sanitation and Hygiene
WBCSD	World Business Council for Sustainable Development
WIMS	Web Based Irrigation Management System
WLMTRI	Water and Land Management Training and Research Institute
WP&P	Water Planning and Projects
WQI	Water Quality Index
WQMS	Water Quality Monitoring and Surveillance
WRD	Water Resources Department
WRDM	Water Resources Development and Management
WREMI	Water Resources Engineering and Management Institute
WRG	Water Resources Group
WRIS	Water Resources Information System
WSIP	Water Service Improvement Programme
WSP	Water Safety Plan
WTC	Water Technology Centre
WUA	Water Users Association
WUAs	Water Users' Associations
WWF	World Wide Forum
ZLD	Zero liquid discharge

6th IWW 2019

#IWW2019

NATIONAL WATER DEVELOPMENT AGENCY
18 – 20, COMMUNITY CENTRE, SAKET
NEW DELHI - 110 017

R.K. JAIN: +91.9868140785, +91.9868847750
K.P. GUPTA +91.9810815824

CONNECT@INDIAWATERWEEK.IN
WWW.INDIAWATERWEEK.IN

facebook.com/indiawaterweek.in
twitter.com/indiawaterweek
instagram/indiawaterweek