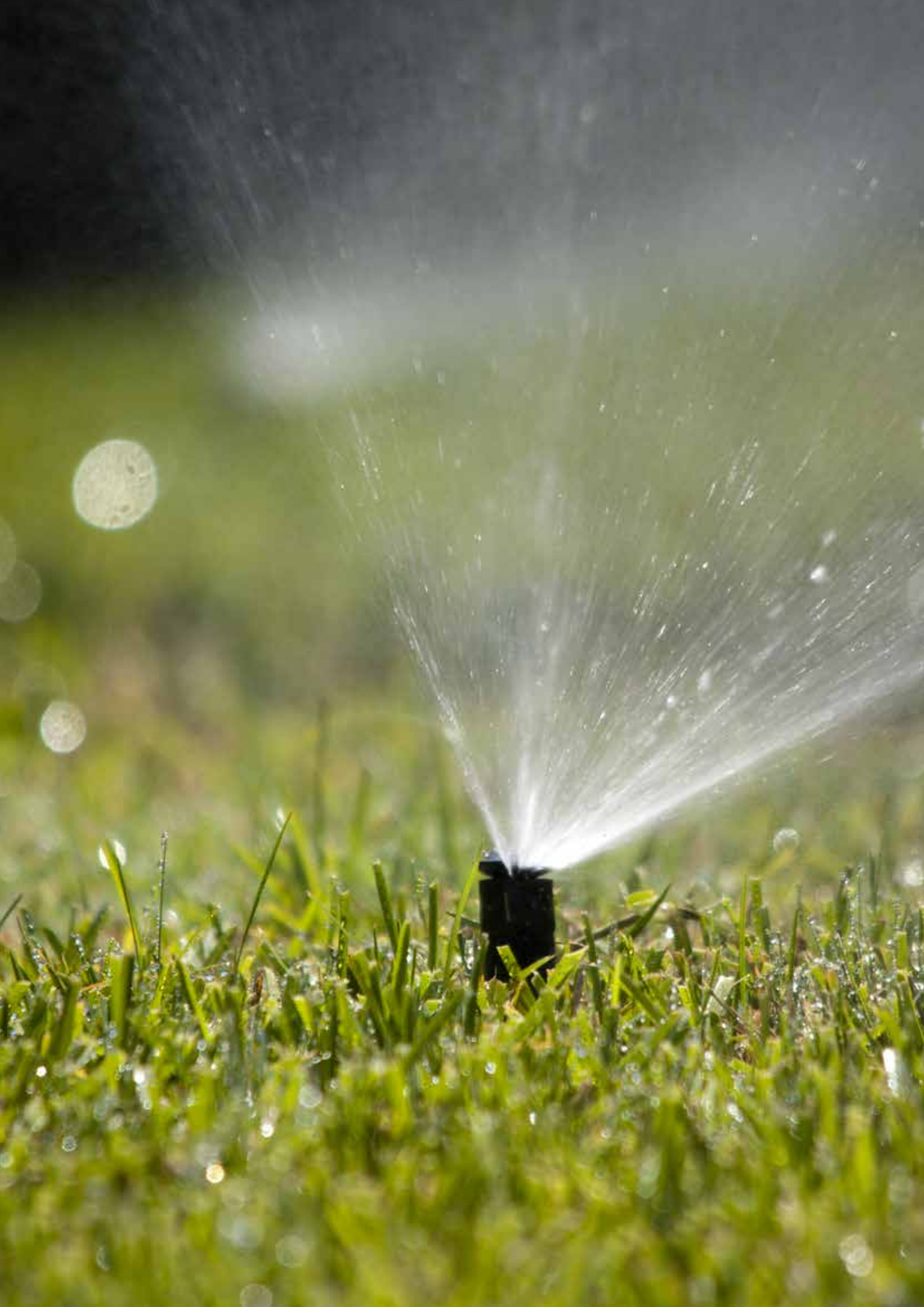
INDIA WATER FORUM 2013

International Water Convention
Water Use Efficiency

Conference Proceedings

28–30 October 2013

teri
The Energy and Resources Institute



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CONTENTS

FOREWORD

The one essential resource on which all forms of life depend on this planet is water. Yet human activities are producing a major impact on the quantity, availability, and quality of water across the globe. It is not only groundwater resources and surface water which human beings utilize directly for their biological and economic needs which are getting polluted, but even the oceans are being affected adversely. For instance, the Intergovernmental Panel on Climate Change (IPCC) in its Working Group II report, which is part of its Fifth Assessment Report, has found that climate change has major impacts on water across the globe. The earlier Working Group I report, which deals with the underlying physical science basis of climate change, has revealed that 30 per cent of the emissions of carbon dioxide which have taken place since the beginning of industrialization have been absorbed by the oceans, leading to acidification.

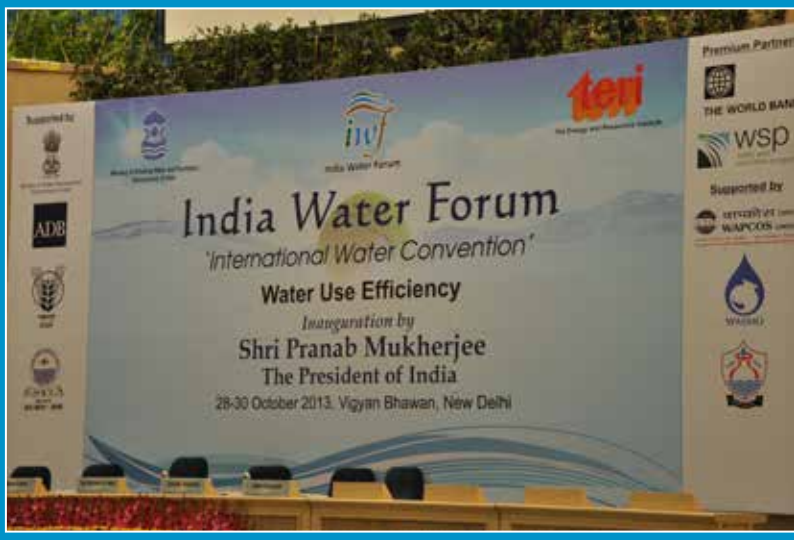
India faces major challenges in the water sector, not only because two-thirds of the population of the country depends on agriculture which in turn is crucially dependent on the availability of water, but also due to growing urbanization which is leading to growing demand for water in India's towns and cities

Climate change over the 21st century is projected to reduce renewable surface water and groundwater resources significantly in most dry subtropical regions, intensifying competition for water among sectors. It is also projected to reduce raw water quality and pose risks to drinking water quality even with conventional treatment, due to interacting factors like increased temperature; increased sediment, nutrient, and pollutant loadings from heavy rainfall; increased concentration of pollutants during droughts; and disruption of treatment facilities during floods. Adaptive water management techniques, including scenario planning, learning-based approaches, and flexible and low-regret solutions, can help create resilience to uncertain hydrological changes and impacts due to climate change.

In order to deal with the impacts of climate change on water, a number of adaptation measures will have to be adopted. These would include exposure reduction via structural and non-structural measures, effective land-use planning, and selective relocation. Construction of monitoring and early warning systems, measures to identify exposed areas, assist vulnerable areas and households and diversification of livelihoods would also be important factors. Increased risk of drought related water and food shortage causing malnutrition would again require early warning systems and local coping strategies. Adaptive/ integrated water resource management and creation of water infrastructure and reservoir development would be some important adaptation measures. Overall, in the management of water resources, diversification of water sources including water reuse, more efficient use of water through improved agricultural practices, irrigation management and resilient agriculture would be important in adapting to the impacts of climate change. The India Water Forum is an innovation on the Indian scene, which provides an opportunity to senior professionals working on various segments of the water sector to come together and devise solutions to the growing challenges. There is urgency in bringing about change which is highlighted in the pages of this informative volume.

– Dr R K Pachauri

INAUGURAL CEREMONY



The Energy and Resources Institute (TERI) in association with the Ministry of Drinking Water and Sanitation, Ministry of Urban Development and Water Sanitation Programme of The World Bank organized the three day international convention 'India Water Forum' (IWF) from October 28—30, 2013, on the theme, '**Water Use Efficiency**' at India Habitat Centre. The event was inaugurated by the Hon'ble President of India Shri Pranab Mukherjee in the presence of Hon'ble Minister of Water Resources Shri Harish Rawat and Hon'ble Minister of State for Human Resources, Shri Shashi Tharoor at Vigyan Bhawan, New Delhi. Dr R K Pachauri , Director General Of TERI welcomes the honourable guests, speakers and audiences and Mr Shri Prakash, Distinguished Fellow, TERI gave the 'Vote of Thanks' at the inaugural ceremony. The forum explored vast opportunities in developing technically viable and economically feasible solutions for governance and management of water resources. This international convention comprised of eight technical sessions, two special sessions (an NGO forum and a session with Secretaries, Government of India) and an international water expo during the course of three days.

Dr R K Pachauri, Director-General, TERI welcomed the Hon'ble President of India, Hon'ble Ministers and the distinguished speakers and participants present and said "Various projections of water availability in India indicate a sharp reduction per capita that people would face in the future. The Intergovernmental Panel on Climate Change (IPCC) projected that by the middle of the century, per capita availability of water in India would be around two-thirds of the current level. Hence, a large population of the country would be characterized by a situation of water stress. The main reasons may include population growth, increase in income and wealth leading to higher demand and the impacts of climate change. Institutional measures and policy changes need to be taken in hand, urgently to deal with the current situation which is far from satisfactory. The India Water Forum would deal with a range of issues that would assess the nature and extent of the challenges faced by India in the water sector, and discusses remedial steps that should be taken to safeguard the welfare of the increasing population". The threat of an impending water crisis affects all individuals around the world. In this context, water use efficiency has been identified as one of the most promising approaches for ensuring water security. Thus, the Forum assumes great significance. It envisaged a series of interactive sessions with policy makers, industrial experts, environmentalists, researchers, academicians, scientists, students, representatives from NGOs and civil society on a common platform. It also showcased advanced knowledge and successful technologies developed in different countries, with the aim of promoting an international knowledge network and partnerships for addressing challenges related to water security.

Speaking at the occasion, Shri Pranab Mukherjee, Hon'ble President of India, said "As we grapple with diminishing water resources and escalating water demand, water use efficiency holds great promise. In today's context, the saying "water saved is water generated" is truer than ever before. This conference, by focusing on water use

efficiency, will help to bring this important issue to the forefront of policy discourse. The National Water Policy 2012 recognizes the need to improve efficiency in the use of water resources. The improvement of water use efficiency requires innovative tools of promotion and incentives for efficient water utilization. At the same time, it calls for dealing with inefficient water consumption through disincentives and stricter regulation. In the past, focus was laid primarily on augmenting the quality of water available without giving due attention to the manner in which the water will be used or managed. A paradigm shift from 'water resources development' to 'integrated water resource management' is now necessary. For that, the existing institutions involved in service delivery have to be restructured and strengthened. I am aware of the good work carried out by TERI in the water sector, and happy to learn that it has chosen to take the lead in organizing the event. I am most certain that the India Water Forum will witness comprehensive and dispassionate deliberations on various aspects of water use efficiency".

Shri Harish Rawat, Hon'ble Union Minister of Water Resources, Government of India, stated "The Government of India is committed to finding solutions to water resource management. The National Water Policy 2012 and the National Water Mission reiterate the country's focus on water. It describes the government's policy to ensure water conservation and equitable use. The National Water Policy 2012 envisages suitable policies for adequate water supply and sanitation, water use efficiency in the agriculture and industrial sector, issues related with impacts of climate change etc."

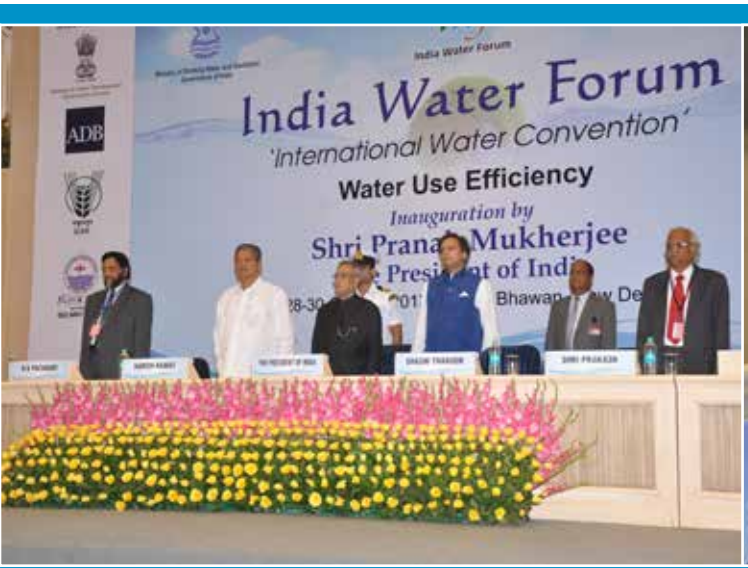
He further added, "Keeping in view, the need of greater water awareness, the Union Cabinet has declared year 2013 as the "Water Conservation Year" to sensitize public opinion on the importance of efficient use of conservation of each and every drop of water to meet the future challenges. The 'Water Use Efficiency', a focal theme of this forum is also a crucial challenge with regard to the utilization of our limited water resources available to us. Industries and municipalities must mandate to adopt water recycling practices. Industries and construction sectors need to adopt rain water harvesting practices religiously. We are also trying to address these challenges through the National Water Mission. One of the important goals of this mission is to enhance water use efficiency by 20 per cent".

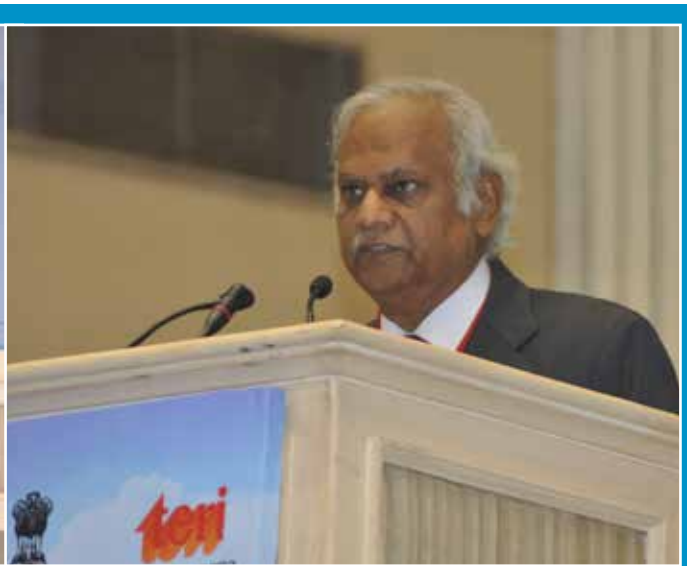
Dr Shashi Tharoor, Hon'ble Minister of State for Human Resource Development, Government of India, said "Effective water management should be seen as a goal of our society, and our educational system should start inculcating an awareness of water problems in our

children. Water, in its many dimensions, shapes the outlook of the society. Benjamin Franklin, once said "When the wells are dry, we know the worth of water". Before such a scenario happens, I hope we rise to the challenge from our classrooms to our panchayats, create better regulatory working systems when distributing water and bridge the gap between the water have and have not's. The India Water Forum is a step in the right direction".

On behalf of TERI and the India Water Forum organizing committee, Mr Shri Prakash, Distinguished Fellow, TERI, expressed his deep gratitude to the Hon'ble President of India for inaugurating the second India Water Forum (IWF), 2013. He said, "This international convention is extremely important since water is one of the most critical resources. The convention aims to take forward the issues related to water use efficiency, in the light of highly valuable and thought provoking views of the distinguished speakers on the subject. It will also strive to find answers to issues that are particularly relevant to our country". Mr Shri Prakash also acknowledged the encouragement expressed by the Hon'ble President for TERI and this convention. He thanked the keynote speaker Hon'ble Minister of Water Resources, Shri Harish Rawat for sharing the key programmes and policies of the government in achieving the goal of water security.

Mr Shri Prakash also thanked the Hon'ble Minister of State for Human Resources, Dr Shashi Tharoor for sharing his views on the importance of water use efficiency and the dire need to promote it in various sectors. He acknowledged his gratitude to all the distinguished speakers who agreed to share and exchange their valuable research and knowledge at the common platform of India Water Forum. He conveyed his sincere gratitude to Dr R K Pachauri, Director General TERI for





his constant encouragement, support and for leading the vision of TERI that is '*Creating Innovative Solutions for A Sustainable Future*'. The various sponsors and supporters of the forum were appreciated for their enormous cooperation in the organization of the event. He thanked the school students and all the participants of the forum including companies who exhibited their state-of-the-art products and knowledge in the India Water Expo.

SESSION - 1

WATER USE EFFICIENCY (WUE): AN APPROACH TO GLOBAL WATER SECURITY AND SUSTAINABILITY

CHAIR: MR RAVI NARAYANAN

CHAIR, ASIA-PACIFIC WATER FORUM GOVERNING COUNCIL



Mr Ravi Narayanan chaired the first session and began the proceedings of the session by introducing all the speakers. He mentioned about water security at the global level and emphasized on the issues and challenges faced in the Asia Pacific region. Mr Narayanan invited the panellists to enlighten the august gathering of water sector professionals, policy makers and researchers in the field.

Dr William Young, Lead Water Resource Management Specialist, The World Bank

Dr Young stated that by 2030, the global supply of water will surpass its demand by 40 per cent, resulting in increased water conflict and competition. Scarcity is an issue which inevitably comes with population growth. Hence, instead of focusing on the problem of water supply, he emphasized that we should concentrate on water security to maximize, manage, and equitably share the benefits derived from water resource management, rather than simply sharing the resource. Transboundary river basins occupy half the area in the world and support 40 per cent of the world's population. Bilateral treaties between countries on such rivers exist but there is a need for multilateral treaties to fully explore their potential. For achieving water security, Dr Young underscored the importance of a cooperative, basin-scale, cross-sector approach to integrate water resources management. He also stressed on the importance of data sharing. Dr Young concluded his presentation by proposing the South Asia Water Initiative, which is intended to increase regional cooperation in the management of the major Himalayan river systems in South Asia. It also aims to deliver sustainable, fair, and inclusive development and climate resilience.

Shri R D Singh, Director, National Institute of Hydrology, Roorkee

At the outset, Mr Singh talked about the global water scenario. He informed that globally, we rely on only 0.5 per cent of the total water reserves for our freshwater needs. He highlighted that India due to its geographical location has a high spatial variation of rainfall. The availability of water in India is 1869 BCM but only 1123 BCM is utilized due to topographical and hydrological constraints. Water scarcity in the country is being exacerbated due to wasted rainfall, depleted groundwater and increasing demand because of population explosion and high rate of industrial growth. The agriculture sector will be greatly affected due to the low irrigation efficiency. Augmentation of water supply, demand management of crops and water saving through various practices are some of the ways to improve irrigation efficiency. A significant increase in domestic water use efficiency can be achieved by using better water fixtures in bathrooms and sinks. Wastewater treatment, reuse and industrial water management are ways to improve water use efficiencies in industries. He concluded by stating the vital causes for low water use efficiency in India namely lack of knowledge at all levels from policy making to field implementation, inadequate data and information and the availability of a standard mechanism to exchange know-how.

Dr Robert Carr, Deputy CEO of eWater, Australia

Dr Carr outlined the severe water crises faced by Australia

in the Murray, Darling and Barwon river systems and the Information and Hydrologic Modelling systems used for efficient water management. He stated that Australia like India has a large spatial variation of rainfall and is too affected by climate change. Southeast Australia is getting drier and Northwest Australia is becoming wetter. Australia too is an agriculture-based economy like India and the sector accounts for 70 per cent of the total water consumption. In the light of these issues, the Australian government brought the 1994 water reforms where water entitlements and allocations were introduced. These put an upper limit on the use of water, effectively curtailing its excess use. eWater's policies provide ways to improve data sharing, forecasting and water modelling. The organization has also come out with a '*Best Practices Guidelines*', which encapsulates the various methods and practices for water modelling.

Dr Dinesh Goyal, Principal Secretary, Govt. of Rajasthan, Horticulture Department and Chairman International Horticulture Innovation and Training Centre (IHITC), Jaipur

Dr Goyal described the success story of the solar water pump-set programme implemented in Rajasthan. He showed that India and especially Rajasthan, possesses excellent solar insulation and is ideal for implementing solar pumps. The project envisages the substitution of electric water pumps by solar powered pumps and the use of the highly efficient drip irrigation in the farmlands. They made a survey of the existing subsidies provided by the Central and State governments and combined them to effectively offer the solar pumps at a subsidy of almost 86 per cent. Starting with just 14 pumps in 2008, the initiative has grown to 4500 pumps by 2013, saving millions of gallons of water and diesel. He

concluded by stating that a composite scheme made by combining stand-alone government initiatives can create unprecedented synergies and can effectively contribute towards addressing multiple challenges.

Dr Ganesh Pangare, IUCN, Bangkok, Thailand

Dr Pangare spoke about the environmental stake in water security and sustainability. He stated that a major challenge is the water demand which either exceeds or is threatening to exceed the sustainable levels of supply. Dr Pangare also highlighted the importance of sustaining the natural water service delivery system to ensure that the necessary infrastructure for water security is not destroyed. He explained that there existed a nexus between water security, food security and energy security. The well-being of one affected the well-being of the others. Effective water governance has a major role to play in improving water use efficiency. He remarked that good policy management, partnership building and innovative investment approaches will go a long way in securing our water future.

Mr Adrin Sym, Executive Director, Alliance for Water Stewardship

Mr Adrin Sym explained that water security and sustainability are inherently local but they are really essential global economic drivers. Sustainable improvements in water use efficiency and water security require the equal participation and approaches from stakeholders. These approaches should not be only site specific but also at the catchment level. With the help of water stewardship, it is easy to achieve sustainable water balance, good water quality, and Important Water Related Areas (IWRA).

Key Points

In the first session, the growing need for cooperative, basin-scale, and cross sector participatory approach for enhanced water use efficiency was highlighted by almost all the speakers. It also reflected that nature is part of the water service delivery chain and if you destroy nature, you destroy the water cycle, and consequently the water service delivery chain. Thus, a paradigm shift comprising of three phases—the motivation phase, the design phase and the implementation phase—is the need of the hour. Amongst the best practices in the world for water use efficiency, the concept of water market comprising of entitlements and allocations being practiced in Australia was presented by one of the speakers. The irrigation practice using non-conventional energy sources like the solar powered pump project in Rajasthan was a good example of addressing both water security and energy security. Conservation of water in agriculture was also stressed as the key necessity for water security in the country. As the future water scenarios are likely to worsen, it is extremely important to adopt new technologies like drip and sprinkler irrigation at a wider scale.

SESSION - 2

WATER USE EFFICIENCY IN THE AGRICULTURE SECTOR: MANAGING WATER SECURITY AND FOOD SECURITY

CHAIR: DR PETER McCORNICK

DEPUTY DIRECTOR GENERAL–RESEARCH,
INTERNATIONAL WATER MANAGEMENT INSTITUTE, COLUMBO, SRILANKA

Dr Peter McCornick chaired the session on Water Use Efficiency in the Agriculture sector. At the outset he introduced all the distinguished speakers and mentioned about the urgency of managing water for food security and for future. He emphasized that in India over eighty per cent of water was being used up in agriculture. Water use efficiency in agriculture is of utmost importance in India. He invited the panellists to enlighten the participants.

Dr Kamal Vatta, Associate Professor of Economics, Punjab Agricultural University, Ludhiana

Dr Vatta gave a presentation on: 'Achieving Sustainability in Indian Agriculture-ICT and Improved Water and Energy Efficiency'. He discussed about the success of the USAID WEALS Project in Gujarat, Jharkhand and Punjab. The objective of the project was to promote climate change adaptation and water sustainability while improving livelihood of farmers and food security. The strategy was straightforward with clear aims like improving water use efficiency in agriculture, capacity-building, incentive mechanisms, etc. Dr Vatta described in detail the key initiatives taken in each of the states. Other than usual engagement of farmers, they have been involved in using ICT resulting in an integrated management of resources like land, water and energy. The talk was concluded by touching upon the scale-up plans including replicating the successful programmes in new areas and also influencing policy reforms.

Professor Dr Hector M Malano, Department of Infrastructure Engineering, University of Melbourne, Australia

Dr Malano discussed the concept of water efficiency in the agriculture sector. Explaining the challenges faced globally on water supply demand, the concept and measure of efficiency were discussed. He emphasized that in order to derive maximum value of efficiency, it is necessary to harmonize the use of water. The water-food security indicates that though it is essential, water security is not sufficient to achieve food security. Concluding the talk, Dr Malano stressed on the fact that though a number of research is taking place, it is vital to focus our attention towards making these research studies actionable and it is time to actually make the change.

Mr Surinder Makhija, Jain Irrigation, New Delhi

Mr Makhija spoke on the topic, 'Optimize Water Use Efficiency in Agriculture Sector through Micro Irrigation'. Starting off with staggering statistics on water usage by the year 2050, and how water may be the new oil, the need for enhancing water use efficiency was emphasized. Drip irrigation was pointed out to be the most efficient irrigation practice as opposed to the conventional practices considering food, water, and energy security. With advantages like maintaining soil health, saving irrigation water, and crop yield enhancement amongst many others, drip irrigation gives 22.5 per cent higher yield than flood irrigation. A number of states have adopted the use of drip irrigation.

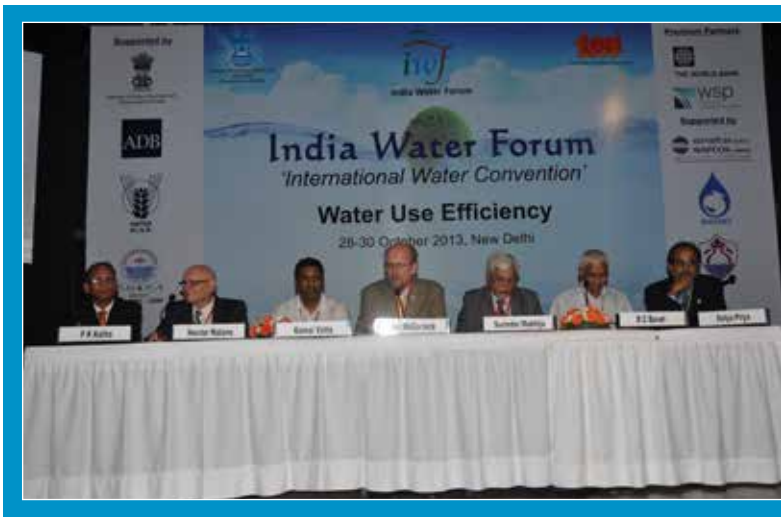
He concluded by retelling the famous saying that 'We do not inherit land from our ancestors, we borrow it from our children and we should leave this world better than we found it'.

Dr B C Barah, NABARD Chair Professor, Division of Agricultural Economics, ICAR, New Delhi

Dr Barah spoke about the 'Mainstream Benefits of System of Rice Intensification (SRI):Pro-poor Option for Household Food Security and Climate Change'. He mentioned that with the complacency in food security, impending water crisis, and rice being the staple food of 2.4 billion people worldwide, an alternative cultivation practice is required to enhance productivity and sustain production. SRI is one such innovative practice. He said that it enhances the productivity of land, labour, capital, and water. Further, Dr Barah explained how SRI is a set of simple practices with less input and more output. SRI is also a pro-poor rice improvement practice, which is environmentally benign. Conflicting views, questions, and objections were discussed; however, the impact of SRI can outweigh them. Discussing the existing and possible governance of SRI in India, he concluded with a few pictures of an SRI Experiment at the IARI Farm, New Delhi.

Professor Dr Prasanta K Kalita, Assistant Dean of Research, College of ACES, University of Illinois, Urbana-Champaign, USA

Dr Kalita mentioned that in the list of humanity's top ten challenges in the next 50 years, uneven distribution of water also figures. He stated that the per capita water availability in India is hitting an all-time low. There are several challenges of water resource sustainability today including water supplies, quality, conflicts, pricing and policies. There are however, a number of water sustainability opportunities in Indian agriculture. Efforts have been made through characterization and remediation of toxic metals in waste water and it has been found that economically viable treatment methods and materials for industrial waste water can be used for irrigation or used as supplemental irrigation in Indian conditions. Touching upon the role of water harvesting and water resource development, a number of other initiatives were discussed; Water and Livelihood Initiative (WLI) in the Middle Eastern countries, which was carried out by University of Illinois at Urbana-Champaign (UIUC)-



WLI-Jordan and UIUC-WLI-Lebanon. Vegetative filter strip and subsurface bioreactors are effective new technologies adopted here to control pathogens and remove nitrate from surface run off respectively. Dr Kalita elaborated on the India-UIUC initiative where the overall objective is to evaluate the performance of vegetative filter strips under Indian conditions for the treatment of agricultural and industrial runoff.

Mr Satya Priya, National Programme Coordinator (Land and Water), FAO, India

According to Mr Satya Priya, there is an increasing gap between the Irrigation Potential Created (IPC) and the Irrigation Potential Utilized (IPU) due to which the agriculture water-use efficiency is only about 38 per cent in India. However, the situation is changing through a paradigm shift in the management of water resources by bridging the gap between principles and practice. The irrigation WUE (Water Use Efficiency) is being improved by commands such as including all sources of water such as canal, groundwater, tanks, etc. It was also pointed out that integrated operation and management to increase WUE and productivity, and the priority areas require attention. Various policy innovations and initiatives were discussed and Mr Satya Priya concluded by discussing the lessons learnt including performance based planning and fostering partnerships.

Key Points

This session witnessed deliberations on inter-mingling of information technology and agriculture and indicated that this initiative will give flexibility to farmers to increase agricultural efficiency. As a way forward, it stressed on the fact that there is a need for market driven water policies for water conservation. Increase in food productivity, profitability and water efficiency can be achieved by replacing surface irrigation with micro-irrigation (e.g., drip irrigation).

SESSION - 3

WATER USE EFFICIENCY IN THE URBAN SECTOR

CHAIR: DR SUDHIR KRISHNA, IAS

SECRETARY, MINISTRY OF URBAN DEVELOPMENT,
GOVERNMENT OF INDIA



Dr Sudhir Krishna chaired this session and introduced all the distinguished speakers. He mentioned about his experience in the water sector in urban areas and emphasized on the issues and challenges faced in this sector and the urgency in enhancing water use efficiency before it is too late. He invited the panellists to enlighten the august gathering with their experience in this very important field.

Mr Ajay Anand, Senior Manager, Jain Irrigation, Jalgaon

Mr Anand spoke about increasing WUE in the urban Sector using the 'Concept of 24x7 Water Supply Distribution'. He explained that the 24x7 water supply system is the only solution to the present unsustainable water system in India. This has numerous advantages such as no leakages, no water contamination, assured water supply and effective use of water. The backbone of this system (continuous water supply with positive pressure) is the HDPE (High Density Poly Ethylene) Pipe. These pipes have a longer life, are corrosion free, light weight and thus easy to transport and also immune to soil acidity. Mr Anand expressed that the Jain Irrigation Systems Ltd., successfully established the 24x7 water supply system in four major cities of Karnataka in the last 4 years. Using the 24x7 water supply system, water consumption is reduced by 40–50 per cent and costs have reduced by 30–40 per cent. After highlighting the success of this water supply system, Mr Anand spoke about the sales and services, brand equity, and achievements of Jain Irrigation Systems Ltd.

Dr Suresh Rohilla, Programme Director, Waste Management, CSE

Dr Rohilla's talk described the roadmap for rating system for water efficient fixtures. He mentioned that one of the most important things on the reform agenda to increase water use efficiency is to reduce water demand. He aptly remarked that water efficiency is a "low hanging fruit" and is attainable by effective demand side management. The implementation of water efficient fixtures can save water up to 35 per cent. The reason for lack of such fixtures is not the suppliers (who follow international standards) but a lack of political will. The need of the hour hence, is to reduce water consumption to conserve water, to provide information on water efficient fixtures/appliances/technologies for informed decision-making and to promote water efficient fixtures/appliances/technologies. He also proposed that a new organisation named 'Bureau of Water Efficiency' be established or the existing Bureau of Energy Efficiency be expanded to include water efficiency.

Mr Ravikumar Joseph, Water and Sanitation Programme, The World Bank, South Asia

Mr Ravikumar talked on how 'Wastewater Recycle and Reuse' is a sustainable and economic option today. Many cities in India have exhausted their natural fresh water sources and are looking at more complicated processes such as desalination and pumping water from far off locations. Therefore, a system is proposed, where industrial and agricultural waste water can be treated which can be


used to meet the city's water demand. Coincidentally, while the cost of water is going up, there is a remarkable decrease in the cost of wastewater treatment. After examining cases of Hyderabad, Chennai's STPs (Sewage Treatment Plants) and the successful recycling of waste water in industries like Chennai Petroleum Corporation Limited and in countries like Israel, it can very rightly be concluded that reusing and recycling waste water from industries and agriculture is extremely beneficial. From the continuous and reliable source of water, the city's needs are met, viability of STPs is improved and industries are made more sustainable. A few Government of India initiatives like the National Urban Sanitation Policy and the Total Sanitation Programme reinforce the same concept. Mr Joseph also said that a number of treatment plants are operational or under implementation in the country and abroad to treat waste water for non-potable uses.

Dr Bill Kingdom, Lead Water and Sanitation Specialist, The World Bank

Dr Kingdom spoke on the 24x7 water supply system and building on the KUWASIP (Karnataka Urban Water Supply Improvement Project) Pilot. The pilot project was run in parts of Karnataka serving around 1,80,000 people. It has been running successfully for the past four years. After looking at the key benefits of this system, it was concluded that a continuous water system is technically more feasible, universal and widely accepted by satisfied customers. He further added that leakage loss has reduced from 54 per cent to 29 per cent after the employment of this system. It was hence concluded that a continuous water supply leads to an improved service quality by creating a virtuous cycle of improved service, and financial and environmental sustainability.

Dr Renu Khosla, Director, CURE, India

Dr Khosla spoke about improving water efficiency by incorporating the poor as partners into the system. She stated that the system of water distribution and delivery was very inequitable as some get a glass of water to drink while others get the ocean. Hence, the deprived classes of society are compelled to fix the water supply systems on their own. This results in water shortages and a loss of revenue for the government. The poor systems design, laid back approach of the authorities and clichés in the minds of people are some of the reasons. To counter this issue, CURE, came up with an innovative way to make the water supply reach the poor. Dr Khosla explained how they stretched and divided the pipeline which allowed water to reach a large number of houses in the slums. They further set up a water treatment plant in the slums which had the collateral benefit of being able to provide the dwellers with better housing and sanitation facilities. CURE is also running a similar plant near the Taj Mahal in Agra. Their effective establishment of a decentralized wastewater treatment plant led the State government to invite them to treat the waste coming from a much larger drain. They are also implementing state funded programmes to recharge the water tables in Agra. Concluding her talks, she emphasized that in order to drive change, it is imperative to un-think, connect the dots, simplify systems and nudge the change.

Key Points

The session brought a few key points which ensure 24x7 water supply in urban areas. This would ultimately reduce 40–50 per cent of consumption, operation and maintenance cost would be cut down by 30–40 per cent and thus the revenue of corporation would increase. Moreover, wastewater reuse and recycling can be a sustainable option for industries and viable for treatment plants, with respect to continuous water supply. But mainstreaming water efficiency needs paradigm shift at all four levels which are '***planning, project, programme and policy'.*** The need of the hour is to develop indicators and standards that can be measured to achieve the aim of increasing water efficiency by 20 per cent by 2020. And most importantly, involving the urban poor as partners in achieving sustainability of urban water efficiency is essential.

SESSION - 4

SUSTAINABLE RURAL DRINKING WATER AND SANITATION

CHAIR: MR GOURISHANKAR GHOSH

CHAIRMAN, WATERLIFE, NEW DELHI

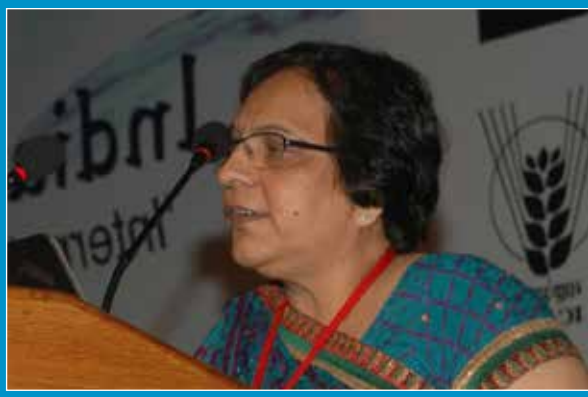
This session focused on equitable access and decentralized distribution system for water. It also showcased the key drivers of sustainable sanitation and some of the best practices in the rural sustainable sanitation and water supply. The session was chaired by Mr Gourishankar Ghosh. He started by emphasizing on decadal changes in rural drinking water and sanitation. During 1980s, the real focus was on technical sustainability and the emphasis was on community participation. During 1990s the focus shifted to more economical tools such as pricing, cost, and recovery tools but in long-term the economical tools proved to be unsustainable. Hence, Mr Ghosh aptly remarked that we have to learn from different areas and models and try to blend it depending on the local situation. He invited the distinguished panellists for making their presentations.

Dr Smita Misra, Lead Water and Sanitation Specialist, The World Bank, New Delhi

Dr Misra presented her views on The World Bank's support to the rural water supply and sanitation sector in India. The Central and state governments are investing more than 4 billion dollars per annum in this sector but it continues to face huge challenges. A huge fund is set aside for sanitation construction but it generally does not result in effective usage and village-wise sanitation still remains a big issue. However, the 2011 census has shown improvement in access to drinking water and toilets. The partnership between the World Bank and the Govt. of India is on service delivery and sustainable development in drinking water and sanitation. Major achievements include 1.4 billion US dollars financing, 24 million rural inhabitants and more than 15,000 villages who have benefited. The first generation projects focuses on bottom-up concept, i.e., community participation, second generation projects on the terms of demonstrating institutional models and service delivery through local governments and the third generation focuses on state-wise and sector-wise models with state governments. The key achievements under these projects were demonstrating the community based participatory approaches; integrating governance and accountability; securing total sanitation; and focusing not just on toilet creation but toilet usages through programmes which targets special communities and beneficiaries groups. Dr Misra concluded by saying that the involvement of the community right from planning and designing is very important.

Dr Manish Kumar, Senior Institutional Development Specialist, Water and Sanitation Programme, The World Bank

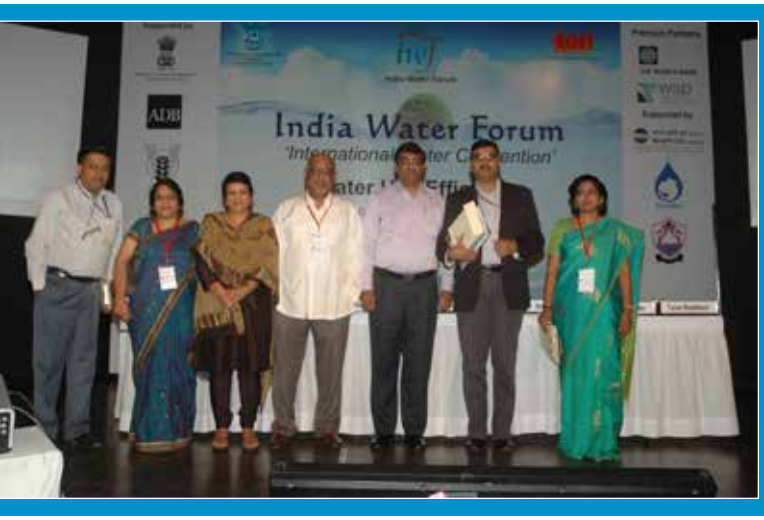




Dr Kumar discussed about a water security pilot project which is an initiative on community mobilization for managing drinking water scarcity at a pilot scale in the Karnataka. He discussed about the issues and challenges in the project and state that this pilot project has given valuable insights about water security in Karnataka and understanding about scaling it up further. This is something which the Government of India would eventually consider. Over a period of time, various interventions of the government has resulted in increased access to drinking water in rural India but at the same time the ground water has got extracted in large quantity for irrigation purposes due to improved technology. The idea of drinking water security pilot is to provide enough knowledge and training to Gram Panchayats to manage local water resources in a better way and also to resolve the scarcity of drinking water. Dr Kumar said that focus is essentially on source and system sustainability as it affects nearly 2.23 million people.

Ms Tulasi Maddineni, CEO, Zila Parishad, Dakshin Kannada District, Karnataka

Ms Maddineni shared her experiences on metered drinking water supply in rural villages of Dakshin Kannada, one of the most progressive districts of Karnataka. Metered drinking water supply initiative was prompted due to problem of distribution, maintenance and water scarcity in that region. At present, drinking water supply covers 203 Gram Panchayats encompassing around 1 million people. It was an initiative of a couple of active Gram Panchayats who figured out the source of water scarcity and strived for metered water supply. It became a reality when the Rajiv Gandhi National Drinking Water Mission came into effect and the village



water supply and sanitation communities were formed. She further added that metered water supply enforced by Gram Panchayats itself was successful. Technical support has been provided to the local people to improve the situation of metered water supply.

Ms Sumedha Kataria, Additional Director, Government of Haryana

Ms Kataria narrated her experience of scaling up sanitation and sustaining it in Kurukshetra, Haryana under the Total Sanitation Campaign (TSC) and *Nirmal Bharat Abhiyan (NBA)*. Strategies and processes which facilitated the sanitation programme are total sanitation campaign led by the community, people centred, and demand driven approach. Increased emphasis was on awareness creation and demand generation of sanitary facility, alternative delivery mechanisms, rural sanitary marts and production centre, and subsidy to sustainability through incentives. The involvement of PRIs, NGOs, self-help groups, and co-operatives has been very instrumental in the success of this sanitation journey. She also added that better access to sanitation facility and behavioural changes led to an improved quality of life. In 2002, Haryana had 28.6 per cent access to toilets and now it is 96.51 per cent. At present, 100 per cent of the schools have toilets and 300 out of 378 Gram Panchayats have already won the *Nirmal Gram Puruskaar* (NGPs). Ms Kataria concluded her deliberations by mentioning that the change in behaviour has only been possible because of the critical awareness generation.

Key Points

The speakers emphasized on creating simple infrastructure for service delivery and for addressing sustainability challenges. It was noted that the concept of one-size-fits-all is not applicable in a diverse country like India and it is essential to customize the technology, policy and governance issues to the specific needs of the State.

SESSION - 5

WATER USE EFFICIENCY IN INDUSTRY SECTOR

CHAIR: DR ARJEN HOEKSTRA

PROFESSOR, WATER MANAGEMENT, UNIVERSITY OF TWENTE,
THE NETHERLANDS


At the beginning of the session, the Chair **Dr Arjen Hoekstra** briefly introduced the speakers of the session. His latest book titled '*The Water Footprint of Modern Consumer Society*' describes the concept of water footprint and its associated components. Dr Hoekstra stated that water footprint accounting can change the global dimension of water scarcity. He mentioned that the water footprint of the average consumer in India includes 5 per cent of home water use, while 95 per cent is 'invisible', related to the products bought in the market. The water footprint of the Indian consumer covers 93 per cent agricultural products and 2 per cent industrial products while 2.5 per cent of the water footprint lies abroad. He also discussed the water footprint (water use per capita per year) of various countries of the world including USA, Germany and China. Dr Hoekstra also introduced the concept of green water footprint (volume of rainwater evaporated or incorporated into a product), blue water footprint (volume of surface or groundwater evaporated or incorporated into a product), and grey water footprint (volume of polluted water).

For business, the concept of water footprinting is shifting focus from own operations to supply-chain thinking; water withdrawals to considering consumptive water use; securing the 'right to abstract' to assessing actual impacts; and meeting 'emission permits' to assessing the company's contribution to pollution. Companies have traditionally focused on water use in their operations, but not in their supply chain. The water footprint does take an integrated approach. Dr Hoekstra added that most companies will discover that their supply chain water footprint is much larger than their operational water footprint. Companies have traditionally looked at reduction of water withdrawals. The water footprint shows water use in terms of consumption rather than in terms of withdrawal. Return flows can be reused, so it makes sense to specifically look at consumptive water use. Possessing a water use right or license is not sufficient for a company to manage water-related risks. It is useful to look into the spatio-temporal details of a company's water footprint, because information on where and when water is used can be used as input to a detailed water footprint sustainability assessment, to identify the environmental, social and economic impacts and to find out associated business risks.

In conclusion, he mentioned that assessing water footprint in business can lead to mitigating options for climate change as water footprint count would help to identify target areas for reducing climate change impacts (for example, Coca Cola's initiatives).

Mr Patrick Yadauga, Hindustan Coca Cola Beverages Pvt. Ltd, New Delhi

Mr Yadauga stated that water recovery is the next big step towards sustainability and new guidelines may be added in WHO and other standards. He explained the concept of 3Rs that should be applied within a plant. The 3 R's are: (1) Reduce- that includes promotion of water efficient technologies at design stage, regular water balance study, waste reduction and constant Water Use Reporting (WUR) focus, (2) Reuse- that includes operation of recovery systems to design capacity, implementation of reuse technologies at design stage, and rain maker-prioritization plans, and (3) Recycle and replenish-that include rainwater harvesting techniques, implementation



of Environment Protection and Management (EPM) tool for close monitoring of water use in the plants. He commented that outside the plants, the emphasis should be on sustainable agriculture to improve water efficiency at the watershed level (e.g., agriculture yield improvements) and water harvesting in critical/semi critical areas in the watershed ,etc. He also emphasized on using advanced water treatment technologies by the beverage companies.

Prof. Stuart White, Director, Institute for Sustainable Futures, Sydney

Prof. White stated that water use efficiency in business is possible by thinking globally and implementing locally. He introduced the concept of Integrated Resource Planning (IRP) as a process for supply-demand planning, demand forecasting, and supply estimation. He talked about water use efficiency which can be achieved through three mechanisms (1) regulatory instruments that include equipment and fixtures, new developments, water saving action plans, (2) economic instruments which include direct investment, retrofit programmes, loans, performance contracts; and (3) communicative instruments that include free or reduced cost audits, and advisory services.

Mr Mohit Dhamija, Manager, EHS, GlaxoSmithKline, Gurgaon

Mr Dhamija illustrated with example, GlaxoSmithKline (GSK) India's initiatives on sustainable environmental management in their business. He said that in the environmental sustainability front, GSK-India has made good progress. During 2010-12, carbon emissions from energy use had reduced by 24 per cent and water consumption had reduced by 13 per cent with zero liquid discharge. They are following the principle of 3 R's, i.e., reduce, reuse, and recycle. He informed that reduction in waste at source and reduction of the water pressure in different lines, reuse of treated water for low end applications, for example, drain cleaning, toilet, and recycle of seal cooling tower, etc., are the highlights of their efforts towards water use efficiency and environmental sustainability.

Dr Raphael Semiat, Dean, Wolfson Faculty of Chemical Engineering, Israel

Dr Semiat stated that for solving water problems in Israel, massive introduction of recycling of effluents and desalinization of sea water is required. To achieve these objectives, initiatives like continuous regulatory and monitoring efforts, field and laboratory interdisciplinary research are necessary for wastewater and sea water treatment systems. He also informed that initiatives like a policy of development along with maintenance of balanced water sources and aquifers were designed for water supply at the desired quality, quantity and availability according to the demands. As per the government decisions made during 2001-08, sea water desalination facilities are being built in Israel. In 2014, the desalination capacity will reach 600 million m^3/year, which is 80 per cent of the national urban consumption. He further added that 80 per cent of the treated wastewater is used for irrigation. There are still some impurities like phosphates, organic traces (like medicines) which need to be removed and salt content of tertiary water to be improved by using Reverse Osmosis (RO) membrane technologies.

Mr Anshuman, Associate Director, The Energy and Resources Institute, (TERI)

Mr Anshuman illustrated the water use efficiency initiatives taken by TERI to augment water resource availability. Water audit has been recognized as important criteria to manage water resources. He stated that the industrial sector in India, whether public or private is a key player in driving WUE in the country. He stated that the consciousness for efficient water management needs to take centre stage in business planning by the industries/corporates. To highlight the scope of water use efficiency in almost every field, he presented case studies of water audit related to Thermal Power Plants (TPP) and the Indian Railways. Recycling of about 64000 m^3/day of wastewater being discharged from the TPP can achieve zero discharge through a recycling and treatment plant. He concluded his presentation by mentioning about another case study on Indian Railways, where implementation of the recycling system leads to a saving of around 0.23 MLD of water at one cluster of washing line.

Key Points

The Chair, Dr Hoekstra emphasized on the need to assess water footprint for businesses to deal with global water scarcity. He also introduced the concept of blue water footprint, green water footprint and grey water footprint to the participants of the session. Assessing water footprint in business can lead to mitigating options for climate change as water footprint count would help to identify target areas for reducing climate change impacts (for example Coca Cola's initiative). Business initiatives like integrated demand-supply planning and accounting energy and greenhouse gas emissions in countries like India can bring sustainability in water resource availability. This can be achieved with a "shift in focus from own operations to supply-chain thinking and from meeting 'emission permits' to assessing the company's contribution to pollution".

SESSION - 6

CLIMATE CHANGE AND WATER VULNERABILITY

CHAIR: AMB. CS DASGUPTA

DISTINGUISHED FELLOW, TERI, NEW DELHI


The Chair, Ambassador C S Dasgupta began the session by emphasizing the need to understand the impacts of climate change on water resource availability and vulnerability. The speakers in this session shared their experiences which brought few key points to the forum like "hydrologic models do provide insights into the impacts of climate change on water availability but the data availability challenges results in high uncertainty in future climate projections". In addition to studying the hydrologic models, he stated the need to integrate hydrological considerations with socio-economic aspects for sustainability of water management interventions (e.g., initiatives taken by MGNREGA). Most importantly, to achieve sustainable society and reduce climate change impacts on water resource availability, there is an immediate need to understand the nexus between urbanization, climate change and water management.

Dr Arun Shrestha, Climate Change Specialist, International Centre for Integrated Mountain Development (ICIMOD), Nepal

Dr Shrestha stated that hydrologic models provide insight into stream flow composition for climate change impact studies. He illustrated with an example of a distributed hydrological model encompassing the upstream parts of the Indus, Ganges, Brahmaputra, Salween and Mekong Rivers with reference period from 1998-2007. The model was calibrated using observed runoff. There were few limitations due to data unavailability, high uncertainty in the precipitation forcing for high altitudes, and uncertainty in climate projections ,etc. Studies conducted by his team showed that the glacier melt contribution decreased but rainfall-runoff increased, depicting changes in outflow to downstream areas. But the considerable glacier melt decrease can be seen in only few upstream basin outlets.

Dr Eddy Moors, Unit Head, Climate Change and Adaptive Land & Water Management, Alterra, Wageningen, Netherlands

Dr Moors stressed on the impacts of climate change on water availability, starting with general discussion and then focussing on specific case studies. The study conducted by his team showed changes, in terms of extremes (dry, wet, hot weather) that are taking place and are expected to increase in the coming years. He informed that proper water demand management is essential, and under water-stress conditions only those fields will remain agriculturally productive for which sufficient water is available. He warned that more than 20 per cent of agricultural production will remain unsustainable without further improvements in water use efficiency. In the end, he suggested that long-term vision (20-50 years) is the need of the hour to develop robust short-term plans (1-5 years) for water resource availability and sustainability.

Dr Neena Rao, Director–Projects & Partnerships, SaciWATERs, Hyderabad

Dr Rao began her presentation by stating that partnering with NGOs, Public-Private Partnership (PPP) and local efforts can be potential tools for climate change adaptation and water vulnerability reduction. A good example is the initiatives taken by Mahatma Gandhi National Rural Employment Guarantee Act (MGNERGA).



She commented that there is a complete lack of social, economic, and hydrological considerations in planning and execution of water management activities. Estimation of available catchment areas at the local level is not conducted properly, resulting in the installation of 'over-designed' structures which are less effective in bringing about water resource sustainability.

Mr D Unnikrishnan, Senior Advisor, GIZ, New Delhi

Mr Unnikrishnan spoke about climate proofing of watershed development schemes. He started with the adaptation strategies for climate change, mentioned in the National Water Policy of India, 2002 and 2012. He then highlighted GIZ's climate-proofing strategies in their sustainability programmes. It incorporates issues of climate change to develop and enable implementation of more resilient watershed programmes. It also identifies co-benefits and opportunities to increase resilience of communities and ecosystems. Mr Unnikrishnan stated that GIZ's climate-proofing strategies involves four steps—screening of public schemes under the risk of climate change, detailed climate analysis, development and prioritization of needs of action, and integration in project design. He then described the climate-proofing process starting with collection of community-level data and scientific data on weather and regional climate projection, and then combining the data sets and analysing the climate risks in a workshop involving all stakeholders. The next step is identification and prioritization of adaptation measures for the watershed under consideration and integration of these measures into the watershed guidelines.

Mr Shashikant Chopde, Institute of Social and Environmental Transition, USA

Mr Chopde expressed that there was an urgent need to understand the nexus between urbanization, water management and climate change to assess the vulnerability and plan mitigation measures. He also stated that policies and tools are required for promoting water storage at all levels and effective water management policies, implementing equitable water rates, improving water quality, and reducing energy dependence. This can be successfully achieved by adopting proper pricing and metering tools. Mr Chopde concluded by stating the fact that water use efficiency can not only enhance water resource availability but also provide energy sustainability.

Key Points

The Chair Ambassador C S Dasgupta thanked all the distinguished speakers for sharing their knowledge. The speakers in this session shared their studies and experiences which brought certain key points to the forum. There is an urgent need to improve adaptation measures for agriculture productions to remain sustainable. Apart from studying hydrologic models, there was a need to integrate hydrologic considerations with socio-economic aspects for sustainability of water management interventions.

SESSION - 7

INTER-SECTORAL ISSUES AND CHALLENGES FOR WUE

CHAIR: MR ONNO RUHL

COUNTRY DIRECTOR, INDIA,
THE WORLD BANK



The Chair of the session **Mr Onno Ruhl** informed that the World Bank has five sector units on water. It is a real challenge to work across sectors to make right trade-off and choices as far as water is concerned. He invited the learned speakers to share their experiences and knowledge with the participants.

Mr Dipak Gyawali, Chair, Nepal Water Conservation Foundation, Kathmandu

Mr Gyawali mentioned that managing water is a complex issue, especially under the condition of scarcity and vulnerability. There is no sector which has no bearing on water. As an illustration, he motioned that those regions of the world are developed which use river and ocean transports efficiently. Nature is both efficient and inefficient. The planet has adapted to the hydro-ecology of our regions using plants that are highly efficient and also inefficient. He stated that the problem arises when we try to extend the nature's adaptation to efficiency; and inefficiency in the use of water due to scarcity or abundance. Rice and sugarcane are highly inefficient (grown in water abundant regions) while millets (grown in water scarce highlands) are efficient in the use of water. Physical nature over-compensates for uncertainty. When there is an uncertainty that is overcome, human system compensates for risk and vulnerability by measures. Equity issues are inherently inefficient. Mr Gyawali added that if equity is done away with, then things can be done efficiently. However, equity is essential. One should think of efficient use of water rather than withdrawing more water. Once withdrawn, maximizing the use of water is vital.

Dr Kh. Azharul Haq, Executive Member, Bangladesh Water Partnership, Dhaka

Dr Haq emphasized that increased water use efficiency is the key to sustainable water allocation for different sectors in Bangladesh. As the economy develops at a faster rate, competition for water between different sectors of the economy also increases. Unless different sectors use water efficiently a "water war" between them is inevitable. He presented a perspective on per capita water availability in South Asian countries and then focused on surface and groundwater availability and water withdrawal by different sectors in Bangladesh. Dr Haq also explained the possible ways to enhance water use efficiency in the irrigation, municipal, and industrial sectors. In conclusion, he maintained that inefficient users like agriculture and industry must increase efficiency to release water for use in other sectors. For the dry season, augmentation of water in the rivers, storage dams may be constructed in upper riparian countries especially Nepal, Bhutan and India. This will require effective cooperation amongst the riparian countries.

Dr Herbert Acquay, Sector Manager, The World Bank

Dr Acquay expressed that technological innovations are important to enhance water use efficiency in various sectors but one should look beyond the technological solutions. A paradigm shift from solely engineering and single sector approach to cross-sectoral approaches that take into account the economic and social dimensions are needed. He also stated that an Integrated Water Resources Management (IWRM) framework should be adopted to address cross-sectoral issues in water resources to ensure

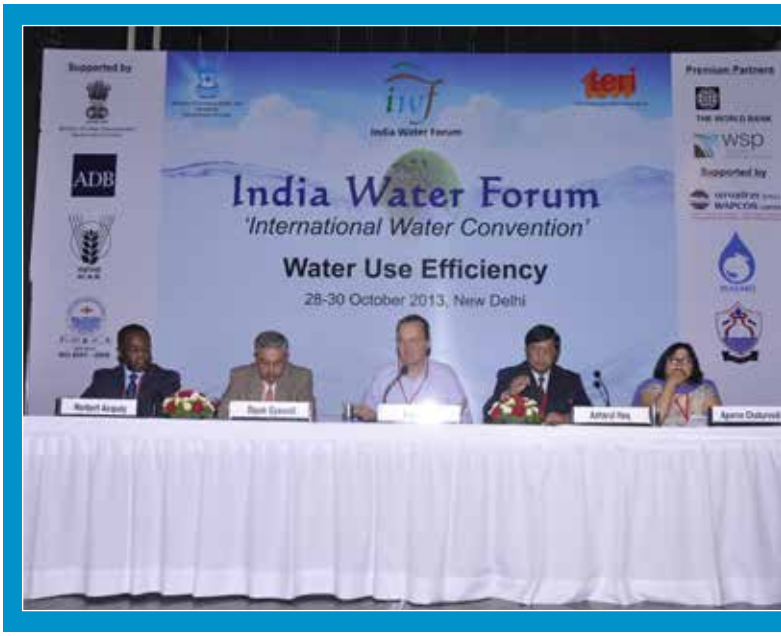
adequate and sustainable supply of freshwater from river basins. It is also important to promote water supply and demand practices that support conservation and efficient use of water resources. He expressed that enabling policy and institutional environment are essential for the success of IWRM programmes. Dr Acquay also maintained that there are opportunities for countries to learn from each other about economic, social, and technological options to effectively address the issue of water use efficiency.

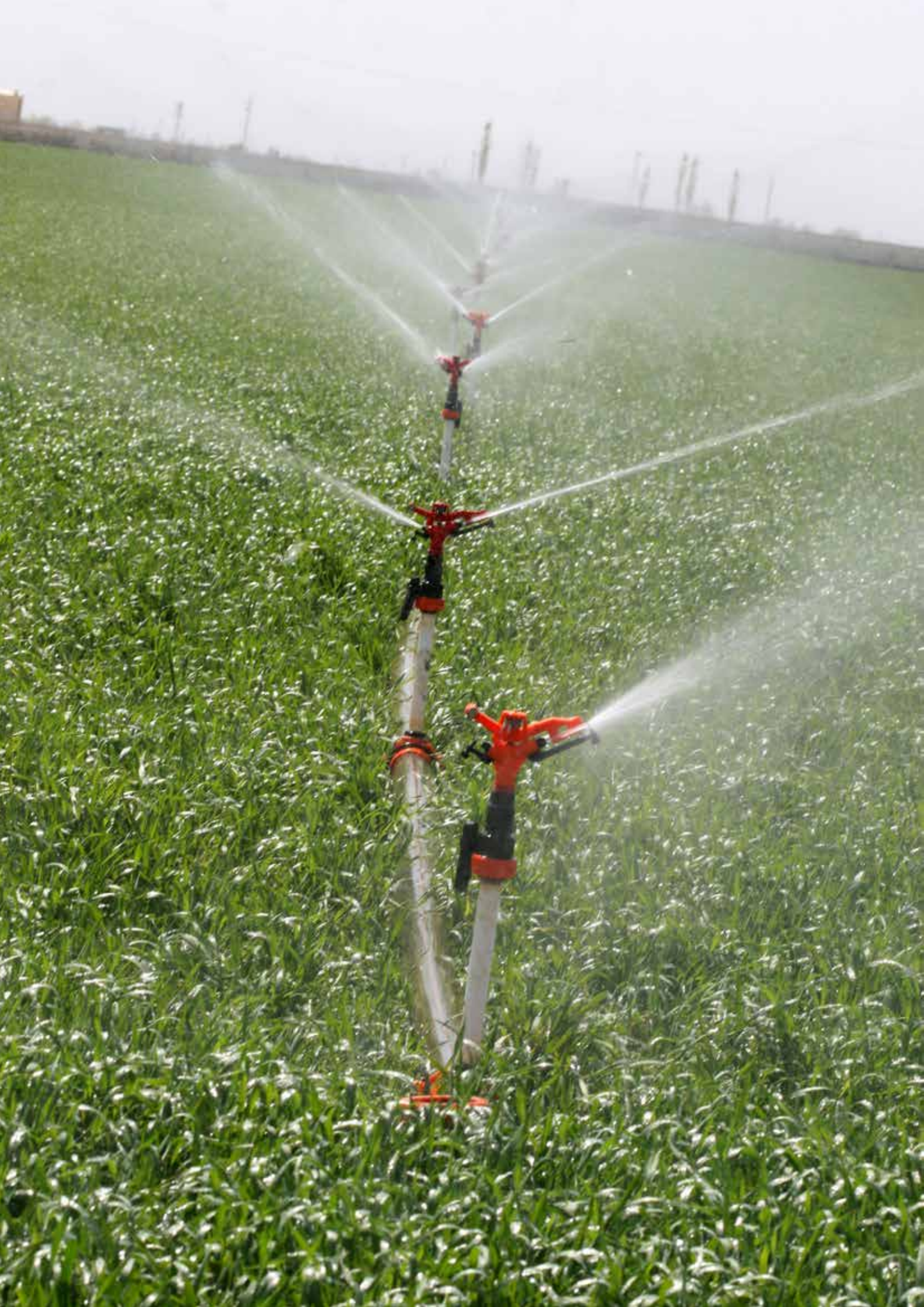
Ms Apurva Chaturvedi, Programme Specialist, Clean Energy & Environment, USAID

Ms Chaturvedi gave an account on USAID-India's inter-sectoral water and energy nexus project called WENEXA. She also highlighted the objectives of the project which is using an inter-sectoral approach encompassing different sectors like water, energy, agriculture, food security, finance, urban and rural development. The main objective of the initiative is to establish integrated approach to energy and water management for optimal utilization of these resources. She also stressed the key challenges in implementation of the project illustrating various case studies. Ms Chaturvedi also informed that WENEXA Project won the India Power Award 2009 under the Energy Efficiency and DSM Category.

Key Points

The session on inter-sectoral issues and challenge stressed more on decentralized local-level engagement for water use efficiency, vis-à-vis basin-scale management. Further, it laid emphasis on addressing the issues of equity prior to addressing the issue of efficiency. It also brought out the problem of lack of up-scaling of most pilot projects being implemented on WUE. The one-size-fits-all approach cannot be applied and new approaches based on local situations need to be evolved. For this, intensive research on various issues related to water use and management, taking into consideration climate change.





SESSION - 8

POLICY AND GOVERNANCE FRAMEWORK AND INSTITUTIONAL ARRANGEMENTS FOR WATER EFFICIENCY

CHAIR: SHRI RAMASWAMY R IYER, IAS (RETD.)

FORMER SECRETARY, MINISTRY OF WATER RESOURCES,
GOVERNMENT OF INDIA



The Chair Shri Ramaswamy R Iyer began with a statement that water use efficiency is not enough to solve the water crisis. There is considerable inequity in water distribution. Demand driven approach to enhancing water use efficiency is good but it may be misleading at times. Growth of demand can be curbed in some sectors like commercial agriculture and recreation, if necessary. To reduce the demand for water, he added that we should reduce the demand for some other commodity for which water is required. Demand for water is a derived demand and this should be taken into consideration while formulating any policy or plan related to water needs.

Mr Ali Tauqeer Sheikh, CEO and Director, LEAD Pakistan

Mr Sheikh put all the issues discussed in the forum under three categories namely access, equity, and hazards. He also raised a point on efficiency and sufficiency of water. Efficiency is one piece in the bigger puzzle which is driven by market and supported by technologies. Water security is larger than efficiency issues. He commented that efficiency is a function for market, pricing, technology, and culture. Water security is a framework for regulators, policy makers, and is essential for policies, budgeting and resource allocations. Then comes the issue of equity versus efficiency. This falls in the realm of policy. He also commented that in the context of Integrated Water Resources Management (IWRM), both the government and the policy should ensure a negotiated quantity and quality of water for health, livelihood, ecosystems and productions. Mr Sheikh also added that it should also give acceptable levels of water related threshold for risks emanating from disasters such as floods, drought, and climate change.

Mr Russell Rollason, First Secretary, AUSAid, Australian High Commission

Mr Rollason spoke about water governance and water efficiency. He said that India is facing a water crisis. At the heart of the challenge, there is no incentive for saving and there is no penalty for wasting water. He stated that proper management and efficient use of water is a shared responsibility. At the same time, we need effective policies, legislation, rules, standards, and institutions to enable fair and equitable access to water for all. In the context of Australia, he informed that Australia has a very high rainfall variation and it experiences extreme weather. But, due to its reform processes of 1994 and 2004, there has been significant improvement in the water use efficiency. He then carried forward his discussion towards formulating better waste management system which is possible by building up markets in the water sector, instilling certainty in water investments, involving the private sector, and by building water into the infrastructure debate. He concluded by talking about water saving measures through demand management, regulatory measures, and pricing.

Dr Michael Porter, Research Professor, Public Policy, Deakin University, Australia

Dr Porter began his presentation with an overview of the steps involved in water efficiency and economic sustainability in India. He commented that the challenge in the water sector in India is to turn the dead water



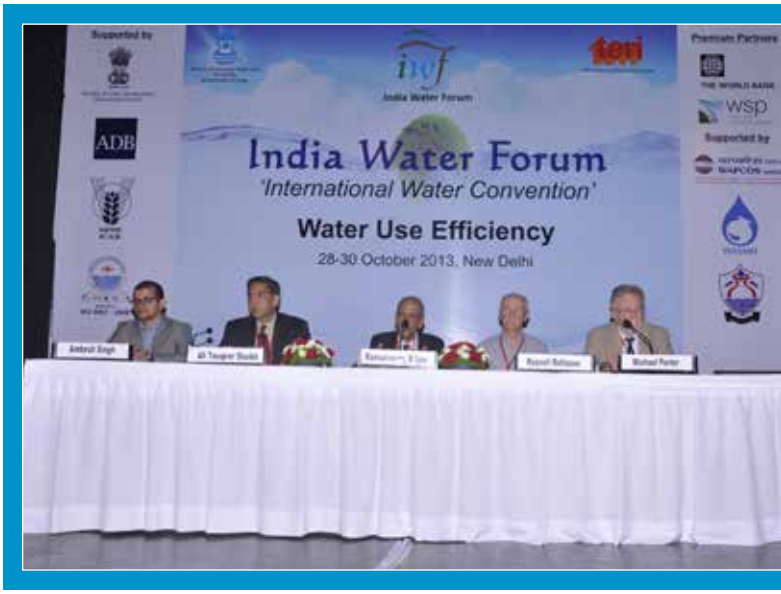
capital into live capital. In his presentation, he also mentioned that over 15 per cent of all aquifers in India are in critical condition, which will grow to 60 per cent in the next 25 years unless action is taken. India has high seasonal rainfall with 50 per cent of annual precipitation occurring in just 15 days and 90 per cent of the flow in the rivers occurring in just four months. There is no proper management of water. Dr Porter stated that the points to be considered for water efficiency and economic sustainability are: stimulating competition in and for the market for irrigation, water, and sanitation services; empowering users by vesting clear, enforceable water entitlements, genuine water rights; introducing incentive-based, participatory regulation of services and water resources, putting the water sector on a sound financial footing; and investing heavily in the development of new generation multi-disciplinary water resource professionals.

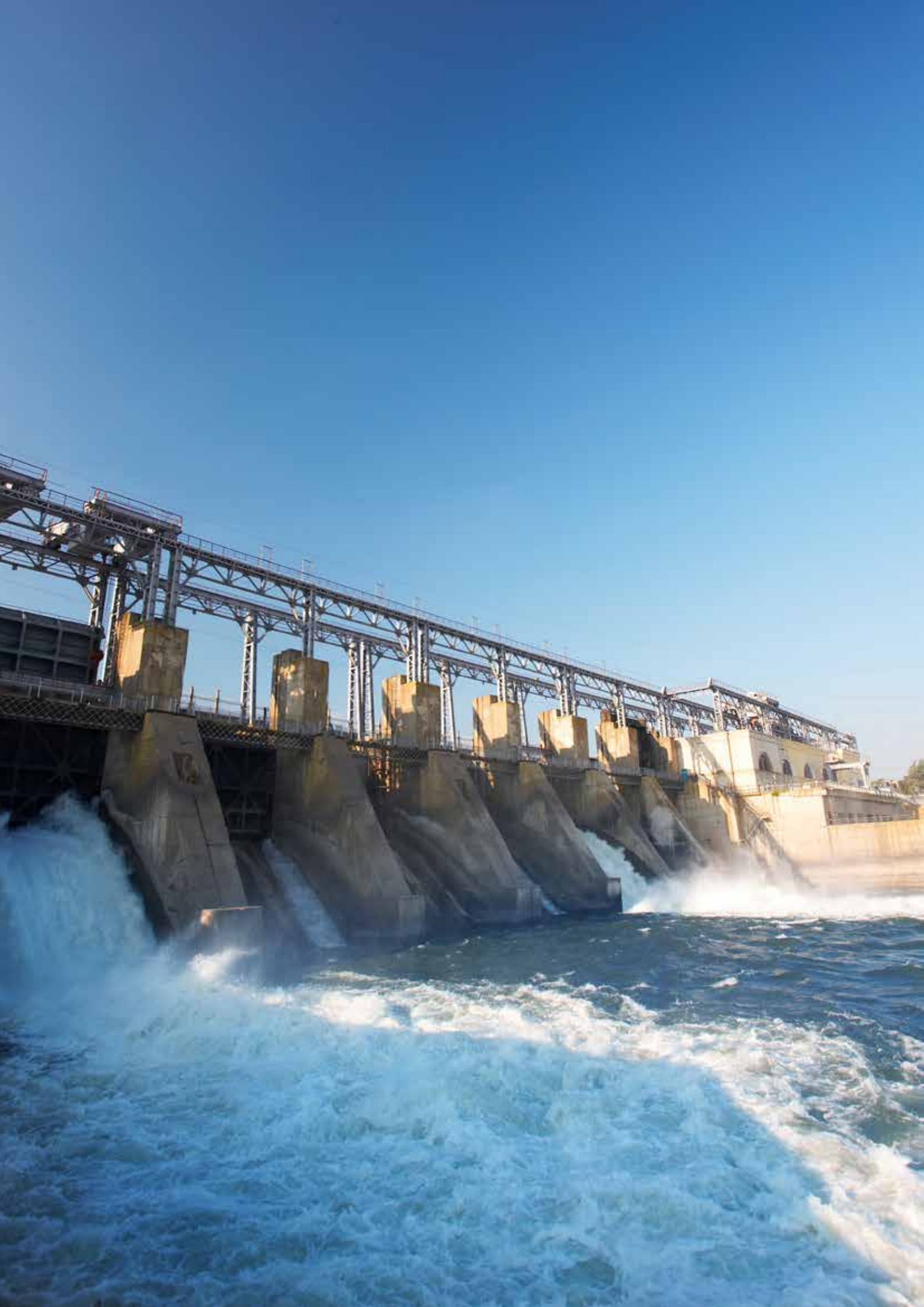
Mr Ambesh Singh, Carbon Disclosure Project (CDP)

Mr Singh started with an introduction to the activities of his organization called Carbon Disclosure Project (CDP). It is an NGO involved with various investors in the fields of water, forest and cities, operating across 12 countries. It also works with shareholders and corporations on greenhouse gas emissions. He mentioned that water crisis is poorly understood, and therefore, people do not take it seriously. CDP is planning a water programme for investors, companies, and the policy makers. This programme aims to enable the companies to understand their own water usage and risks; to assess issues that need to be addressed; to communicate with key stakeholders easily; and to learn from the experience of other companies. For policy makers, the programme will incentivize action amongst companies to reduce their impact on water resources, identify opportunities for collaboration, and collect meaningful, comparable and actionable water data. Mr Singh also said that CDP water programme in India will be launched in 2014.

Key Points

This session witnessed deliberations and debate on the issue of water pricing. It was further discussed whether it should be levied on all categories of application or "water for life" should be exempted from it; whether water should remain a state subject or should be privatized to optimise its usage? Various viewpoints and issues were categorically discussed in this session.



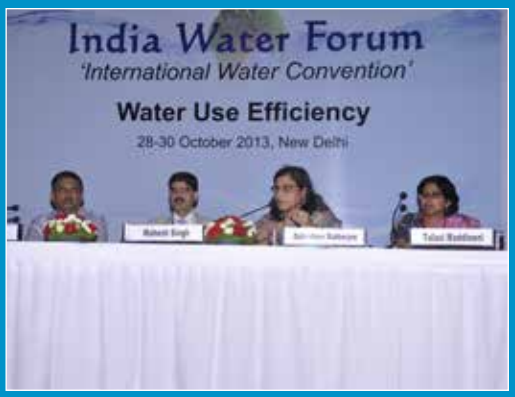


SPECIAL SESSION-1

SECRETARIAL CONCLAVE: STRENGTHENING CROSS-SECTORAL CONVERGENCE TO ENHANCE WATER USE EFFICIENCY

CHAIR: MS DEBASHREE MUKHERJEE

CEO, DELHI JAL BOARD, DELHI



The Chair of this session, Ms Mukherjee mentioned that we need to shift focus from 'water as a fundamental right' to 'water as an enabler of growth'. She feels that water availability can change India's growth story. There is enormous scope for Water Use Efficiency (WUE) in India. A focus on the drivers to promote WUE should be initiated. They mainly are deteriorating quality and increasing scarcity of groundwater, lack of water to sustain development in urban areas, increasing costs and so on. The solution involves fixing the gaps in institutional arrangements, incentivization of WUE, and inter-sectoral collaboration to increase WUE.

Mr Sujoy Mazumdar, Director, Ministry of Drinking Water and Sanitation

Mr Mazumdar discussed the various initiatives undertaken by the Ministry of Drinking Water and Sanitation, Government of India to promote WUE. The dependence on groundwater in rural areas has increased from 40 per cent to 57 per cent in the past two decades. In many areas the whole drinking water system is based on groundwater. This leads to heavy metal and other kinds of pollution in many areas. The alternative to groundwater sources is treated surface water but the surface water supply systems once implemented are not maintained properly due to lack of labour force. To solve this problem, he added, the government is actively working with Civil Society Organizations (CSOs) to take over the maintenance responsibility. He also shared that the World Bank has taken initiatives regarding WUE with public-private partnership but it requires local awareness and incentives.

Ms Tulasi Maddineni, CEO, Zila Parishad, Dakshin Kannada District, Karnataka

Ms Maddineni said that the initiative taken by her team shows that water resource augmentation at regional level strongly requires public-private partnership, involvement of women in water management activities, and encouragement for local initiatives. She said that the criticism of the agricultural water subsidy was unjust as it ensured food security to the nation. She also added that there is a need to incentivize the farmers on WUE until they can carry out these practices on their own. Modification in water demand and supply is required. For example, groundwater discharge must be linked with groundwater recharge, which she said was of prime importance. She also stated the need to learn from Israel's efficient ground water management techniques to ensure that the aquifers in India are not depleted.

Shri Mahesh Singh, Member Secretary, Gujarat Jal Seva Training Institute

Shri Singh stated that water is a growth engine and development follows water supply. He then stated the problems encountered by the existing water supply, highlighted the initiatives taken by Gujarat towards water use efficiency with joint effort of NGOs, locals, and the government at one platform. Gujarat adopted models of convergence for stakeholders' participation and successfully created the largest drinking water supply grid in the world. He concluded by showing a small film on this theme.

SPECIAL SESSION-2

NGO FORUM: ROLE OF WOMEN AND YOUTH IN EFFICIENT AND SUSTAINABLE WATER MANAGEMENT

CHAIR: DR SARA AHMED

SENIOR PROGRAMME SPECIALIST,
INTERNATIONAL DEVELOPMENT RESEARCH CENTRE, NEW DELHI

The Chair of the session, Dr Ahmed gave an overview on the importance of women and youth in efficient and sustainable water management. She stated that sustainable water management is not possible unless we address the key questions like equity, justice, and water as a human right. Dr Ahmed went on to say that for the poor and marginalized community, water is an economic good. It is not readily available and in some cases, they have to pay more for it. The time they spend in fetching water could have, otherwise, been used in generating income for the household. She added that women and youth, boys and girls, can work together for an efficient and sustainable water management.

Dr Renu Khosla, Director, CURE, India

Dr Khosla highlighted the fact that the economically weaker sections of people are always vulnerable. While talking about the current state of the slum area development in the cities, she cited three reasons why women should be involved in the development process of cities. These are water, toilet, and house. Poor people are informal, and women are more so, resulting in their inability to get access to formal services. They reside in illegal settlements in the cities. To solve these issues, the cities should be sensitized towards women; policies should be poor-friendly, and the system should be simplified. It is also necessary that capital be made available for funding infrastructures and women should be involved in the development process. She also added that access to water should not be measured by the length of the pipelines but by the number of households having access to water.

Mr Arumugam Kalimuthu, Country Director, Water for People, New Delhi

Mr Kalimuthu stressed on the engagement and involvement of youth and women in water sector at the grassroots level. He also highlighted a few examples of how women and youth led water management programmes have not only benefitted the people but are also sustainable. He cited few case studies depicting how the women and local youth contributed immensely to the successful implementation of some vital projects. In the process, the women were empowered and it gave a boost to the morale of the youth. These are some of the ways for employing the youth and instilling in them self-dependency.

Mr Ravindra Sewak, Country Director, SafeWater Network, New Delhi

Mr Sewak highlighted the importance of engaging youth and women in water management. He informed the audience about the various activities his organization has been associated with in water harvesting and water purification. Mr Sewak exemplified his organization's efforts on water conservation at the household level in Rajasthan by training and engaging both youth and women. This also resulted in zero human drudgery and improved health. He also deliberated on application of information technology in water supply sector and its relevance in the recent times.

Mr Joe Madiath, Executive Director, Gram Vikas, Odisha

Mr Madiath stated that there is a wrong presumption that the poor deserves poor solutions. He pointed that the poor must have two basic facilities–potable water

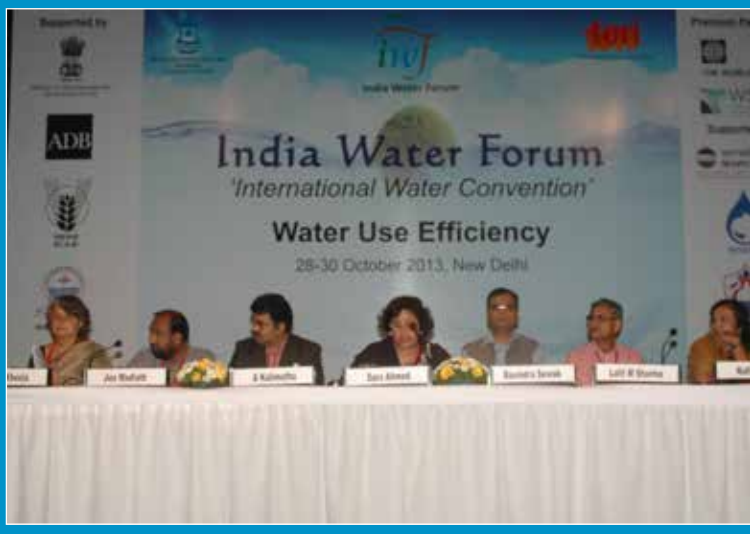
and sanitation. According to his experience, the poor are ready to pay for proper services. Mr Madiath also said that there is an immediate need to support men and women, including those who are discriminated against and marginalized, to engage in decision-making and thus ensure that their rights and needs are recognized. He discussed the various activities in the water and sanitation sector in which his organization had involved women and youth and ensured that the system was sustainable.

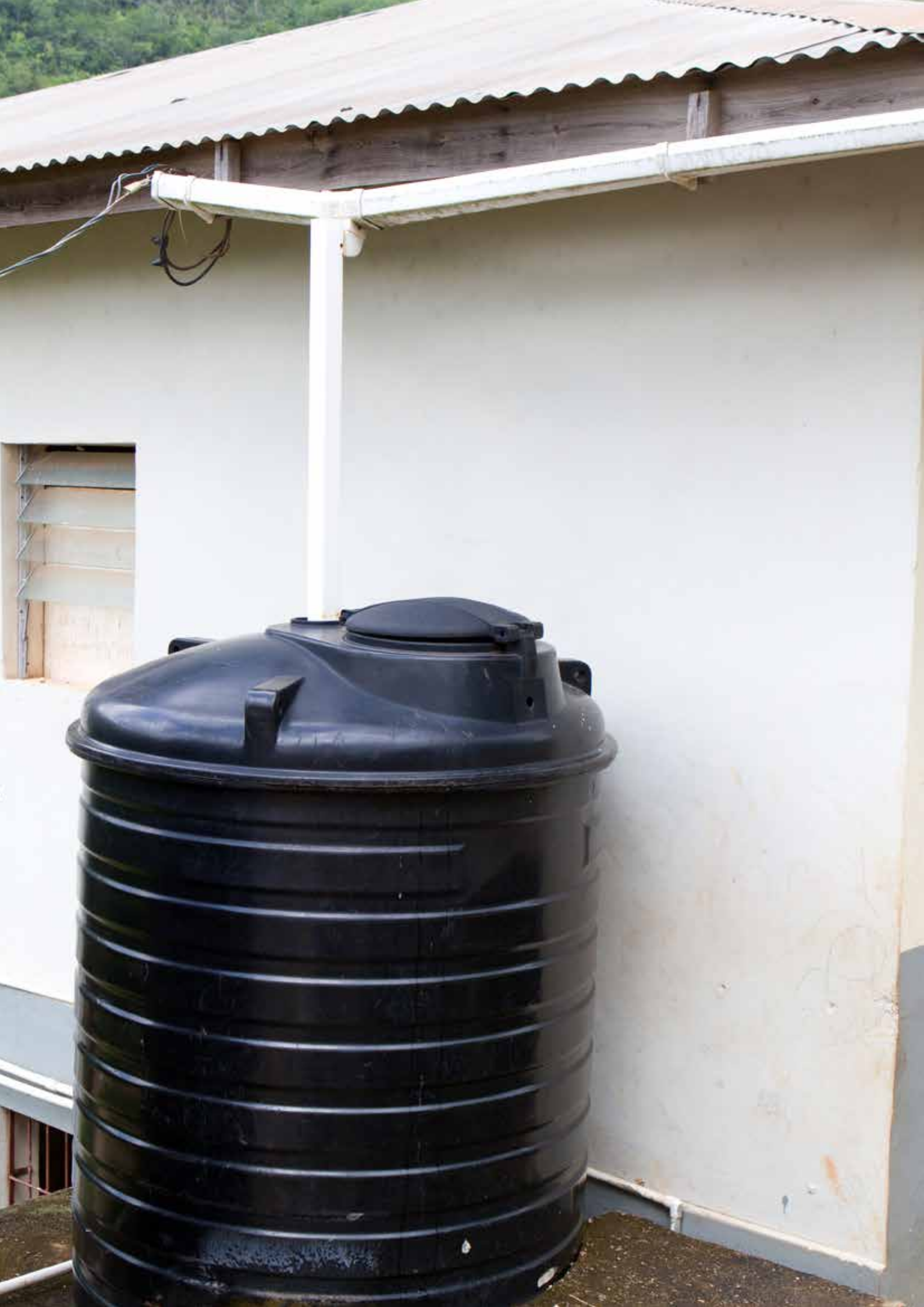
Mr Lalit Mohan Sharma, Group Leader, Natural Resource Management, Institute of Rural Research and Development (IRRAD), Gurgaon, Haryana

Mr Sharma expressed concern over the fact that even though generally women are responsible for providing water and are the major stakeholders in water, they usually do not have a say in managing water resources and neither could they participate in water discussions at the community level. He also said that there is no opportunity for women to lead community water management programmes or even participate in them. Women need to be transformed from sufferers to change makers by creating awareness about water entitlements, building leadership among women and building their skills to manage resources. Mr Sharma added that the government and community should be sensitized for empowering women.

Ms Nafisa Barot, Executive Director, UTTHAN, Gujarat

Ms Barot emphasized on women empowerment and also the need to improve the conditions of youth, women and the vulnerable communities. She stated that decentralized systems should be considered and inclusive decision-making is required for upgrading the standard of women at the rural level. She added that alternative gender sensitive vision and actions are the need of the hour to break the barriers of caste, class, gender, and religion. A change in the policies and government actions is a must, she said. She deliberated on the works UTTHAN has been involved in and the prime focus of all the activities is empowerment of women and youth.





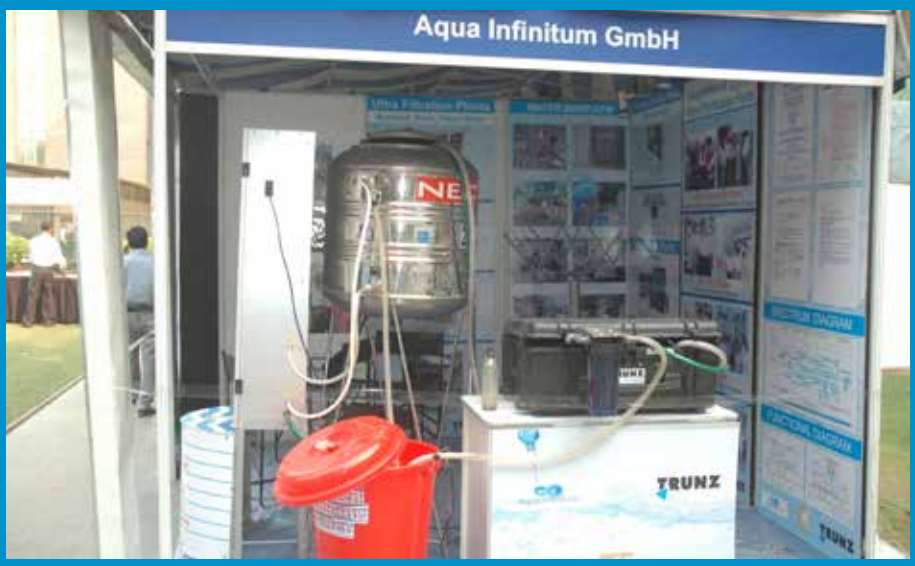
E X P O

The India Water Forum Exhibition (IWF EXPO) was inaugurated by Dr Robert J. Hauser, Dean, ACES, University of Illinois at Urbana-Champaign, USA in the Charminar lawns of the India Habitat Centre, New Delhi, India. A distinctive feature of the IWF was the Water Expo, which provided a platform for the water technology developers and industry leaders to display products and services related to the water industry. It also helped to enhance visibility of the respective industries and products. IWF Expo aimed to promote consultations and networking to bring about customized solutions to the challenges and opportunities in efficiently managing water resources.

The Expo helped many industries for collaborative partnerships and networking with new partners and new avenues to expand business. The inputs from policy makers, government officials, sector experts, academicians, researchers and social workers have added new dimensions to the exhibitors of water and wastewater industry. The visitors were able to view products and discuss services and solutions with the exhibitors. The following organizations had participated in the Expo:

- International Water Management Institute (IWMI)
- Coca-Cola, India
- Aqua Infinitum, London
- Reliance Foundation
- Everything About Water
- Jain Irrigation
- Delhi Jal Board (DJB)
- Institute of Rural Research and Development (IRRAD)
- Wapp Systems India Pvt Ltd (WAPPSYS)
- Water and Power Consultancy Services (WAPCOS)
- Lightning a Billion Lives (LaBL)—TERI
- Water Resources Division (WRD)—TERI
- Library—TERI


Water Resources Division (WRD) -TERI


Aqua Infinitum GmbH
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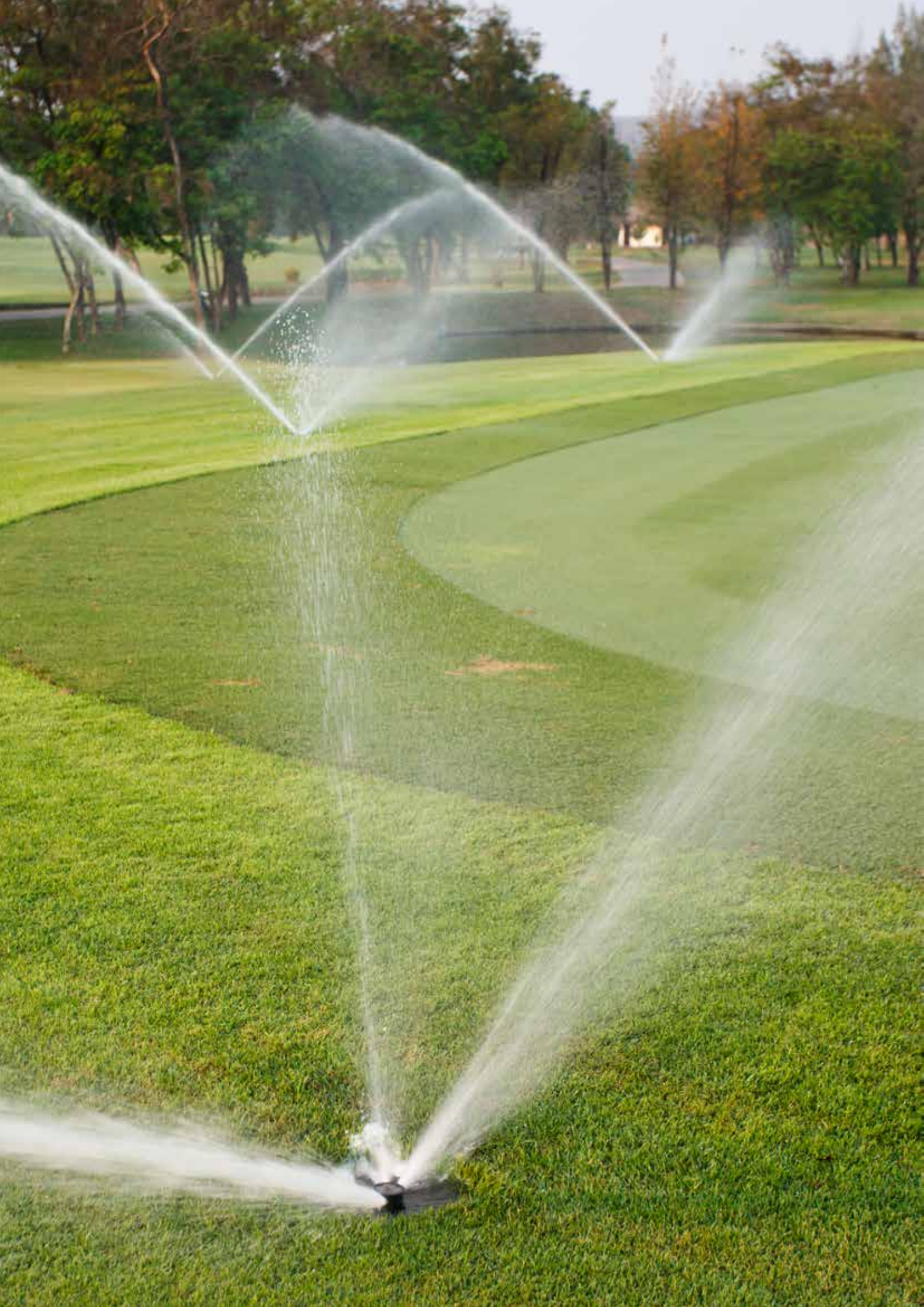
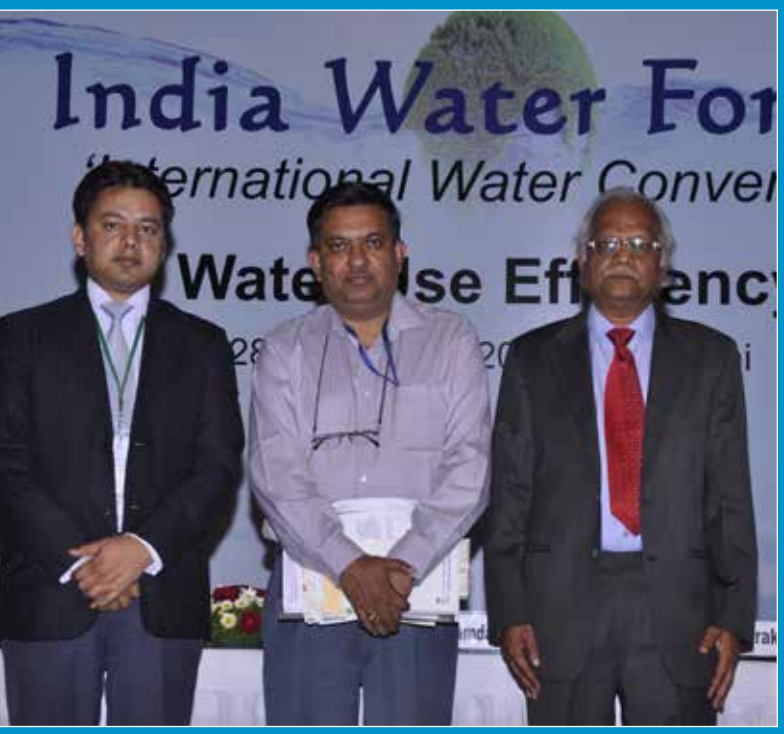
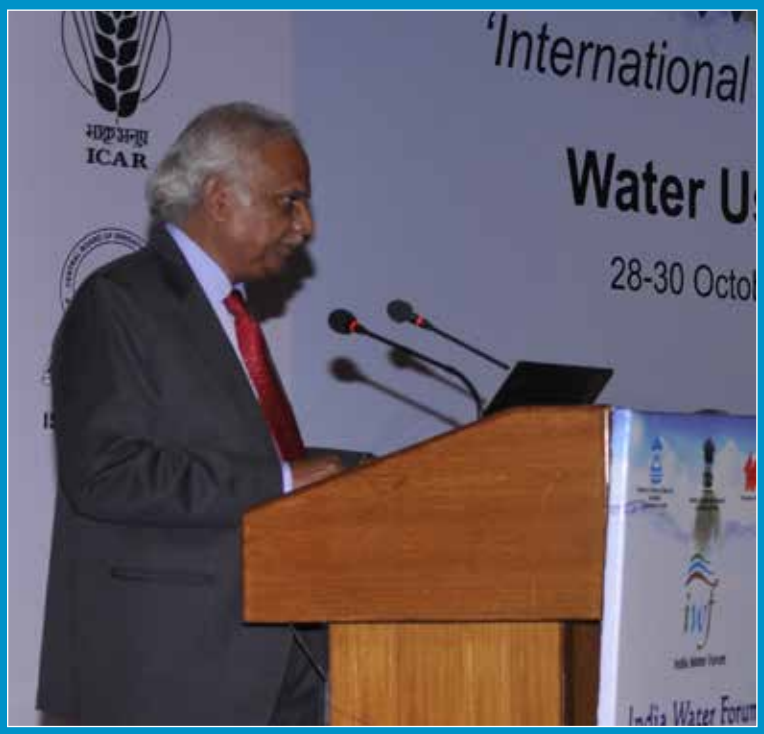


WAY FORWARD





Mr Shri Prakash, Distinguished Fellow, TERI gave the "Recommendations and Way Forward" of India Water Forum 2013. He shared a few key points that were raised during the India Water Forum:

- Need for cooperative, basin-scale, and cross-sectoral approach for integrated water resources management.
- In the urban areas, 24x7 water supply would reduce 40–50 per cent of consumption, it would cut down operation and maintenance cost by 30–40 per cent and, thus, the revenue of the corporation would increase.
- A paradigm shift comprising of three phases—the motivation phase, the design phase and the implementation phase—is vital.
- Mainstreaming water efficiency needs shift in approach at the **planning**, **project**, **programme**, and **policy levels**. The need of the hour is to develop indicators and standards that can be measured to achieve the aim of increasing water efficiency by 20 per cent by 2020.
- Business initiatives like integrated demand–supply planning and accounting energy and greenhouse gas emissions in countries like India can bring sustainability in water resource availability.
- Most of the pilot projects being implemented on water use efficiency are not scaled up. There should be effort in this regard.
- There is need to assess water footprint for businesses to deal with global water scarcity.
- There is an urgent need to improve adaptation measures for agriculture productions to remain sustainable.
- There is a need to lay emphasis on addressing the issues of equity prior to addressing the issue of efficiency.
- We have to learn from different areas and models for water management and try to blend it depending on the local situation.
- Best practices from the country and other nations could be adopted and modified according to the ground conditions.

Mr Shri Prakash stated that in the agricultural sector, there is requirement of market driven water policies for water conservation, and water saving options like drip irrigation. In the urban sector, the key issue raised was the need for appropriate water pricing and metering. Water recycling and reuse are promising solutions for efficient water management. The concept of one-size-fits-all is

not applicable in a diverse country like India. Therefore, there is a need for simple infrastructure that takes into account the local conditions. In the industrial sector, zero liquid discharge industries should be the ultimate aim in WUE. Water footprint and auditing would also help in water use efficiency.

The forum also recognized that there is an immediate need to support men and women, including those who are discriminated against and marginalized, to engage in decision-making and, thus, ensure that their rights and needs are recognized. It also highlighted that data unavailability and uncertainty is the major constraint in hydrological modelling and, thus, a shared platform is the need of the hour. Also, as the frequency of extreme events is increasing, there is a requirement to augment climate resilience as well.

Shri Sujoy Mazumdar, Director (Water), Ministry of Drinking Water and Sanitation, Government of India, in his valedictory address, appreciated TERI for organizing the India Water Forum 2013. He also expressed his gratitude to the NGOs, private sector and academicians for sharing their experiences. Shri Majumdar stressed that even though the Twelfth Five Year plan envisages increasing household tap connections and raising drinking water supply norms from 40 litres per capita per day (lpcd) to 55 lpcd, there is an immediate need to ensure that it is delivered to the end user. He spoke about choosing appropriate water management systems which are efficient and ensure sustainability of the water systems as well as the source.

The conference was concluded with the vote of thanks given by **Mr Anshuman**, Associate Director, Water Resources Division, TERI. He thanked all the distinguished speakers for sharing their knowledge and insights, and taking time out of their busy schedule for enriching the deliberations of the India Water Forum 2013. He expressed his gratitude to Dr R K Pachauri for constantly encouraging excellence in all spheres of activities. He also thanked all the members of the organizing committee for successfully organizing the international convention.

ANNEXURE-A

AGENDA

October 28, 2013, 1200 : 1245 hrs, Vigyan Bhawan, New Delhi		
Inaugural Event		
1206 : 1212 hrs	Welcome Address and Setting the Theme	**Dr R K Pachauri** Director General, The Energy and Resources Institute (TERI)
1215 : 1221 hrs	Special Address	**Dr Shashi Tharoor** Hon'ble Minister of State for Human Resource Development, Government of India
1221 : 1227 hrs	Key Note Address	**Shri Harish Rawat** Hon'ble Minister for Water Resources, Government of India
1227 : 1239 hrs	Inaugural Address by the Chief Guest	**Shri Pranab Mukherjee** Hon'ble President of India
1239 : 1242 hrs	Vote of Thanks	**Mr Shri Prakash** Distinguished Fellow, TERI
October 28, 2013 (Day 1), 1345 : 1400 hrs, Charminar, India Habitat Centre		
1345 : 1400 hrs	**Inauguration of India Water Forum EXPO by Dr Robert Hauser,** Dean, College of Agriculture, Consumer and Environmental Sciences, University of Illinois, Urbana-Champaign, USA	
October 28, 2013 (Day 1), 1400 : 1530 hrs, Stein Auditorium, India Habitat Centre		
Session 1 : Water Use Efficiency (WUE): An Approach to Global Water Security and Sustainability		
1400 : 1410 hrs	Chair	**Mr Ravi Narayanan** Chair, APWF Governing Council
1410 : 1415 hrs	Speaker	**Dr William Young**, Lead Water Resource Management Specialist, The World Bank
1415 : 1425 hrs	Speaker	**Shri R D Singh** Director, National Institute of Hydrology, Roorkee
1425 : 1435 hrs	Speaker	**Dr Robert Carr** Deputy CEO of eWater, Australia
1435 : 1445 hrs	Speaker	**Dr Dinesh Goyal** Principal Secretary to Govt. of Rajasthan, Horticulture Dept. and Chairman IHITC, Jaipur
1445 : 1455 hrs	Speaker	**Dr Ganesh Pangare** IUCN, Bangkok, Thailand
1455 : 1505 hrs	Speaker	**Mr Adrian Sym** Executive Director, Alliance for Water Stewardship, Germany
1505 : 1530 hrs	**Panel discussion**	
1530 : 1545 hrs	Tea	

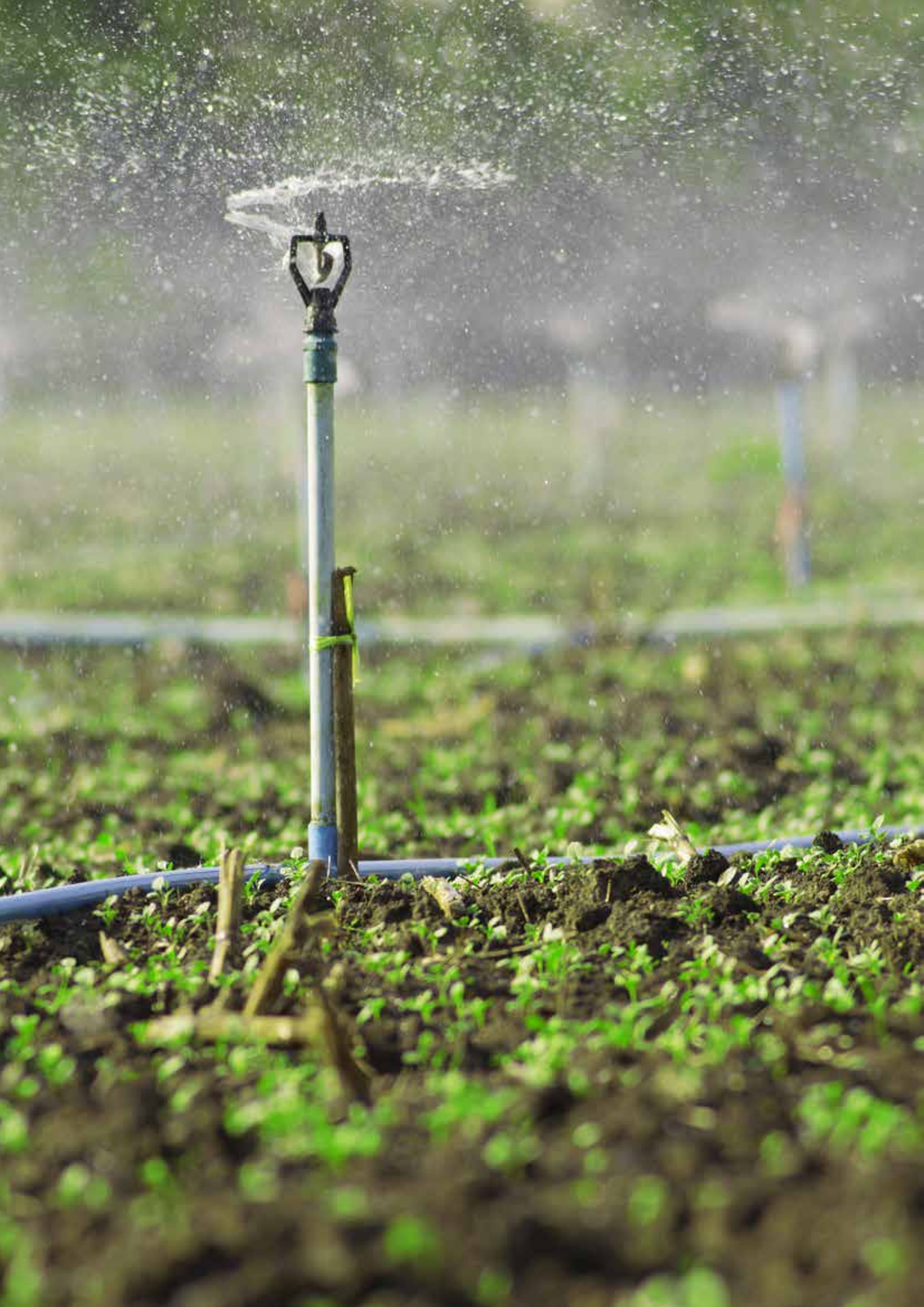
October 28, 2013 (Day 1): Signing of Memorandum of Understanding		
1545 : 1600 hrs	**Signing of MoU between TERI and WAPCOS**	
October 28, 2013 (Day 1), 1600: 1730 hrs, Stein Auditorium, India Habitat Centre		
Session 2: Water Use Efficiency in the Agriculture sector: Managing Water Security and Food Security		
1600 : 1610 hrs	Chair	**Dr Peter McCornick** Deputy Director General-Research, IWMI, Water Use Efficiency for Food and Water Security
1610 : 1620 hrs	Speaker	**Dr Kamal Vatta** Associate Professor, Punjab Agriculture University
1620 : 1630 hrs	Speaker	**Dr Hector Malano**, Professor, University of Melbourne
1630 : 1640 hrs	Speaker	**Mr Surinder Makhija** Jain Irrigation, New Delhi
1640 : 1650 hrs	Speaker	**Dr B C Barah** NABARD Chair Professor, Division of Agricultural Economics, ICAR, New Delhi
1650 : 1700 hrs	Speaker	**Dr P K Kalita** Assistant Dean of Research, College of ACES, University of Illinois at Urbana-Champaign, USA
1700 : 1710 hrs	Speaker	**Mr Satya Priya** National Programme Coordinator (Land and Water), FAO, India
1710 : 1730 hrs	**Panel Discussion/Question & Answer**	
October 29, 2013 (Day 2), 0930 : 1100 hrs, Stein Auditorium, India Habitat Centre		
Session 3: Water Use Efficiency in the Urban Sector		
0930 : 0940 hrs	Chair	**Dr Sudhir Krishna**, IAS, Secretary, Ministry of Urban Development
0940 : 0950 hrs	Speaker	**Mr Ajay Anand** Senior Manager, Jain Irrigation, Jalgaon
0950 : 1000 hrs	Speaker	**Dr Suresh Rohilla** Programme Director, Waste Management, CSE
1000 : 1010 hrs	Speaker	**Mr Ravikumar Joseph** Water and Sanitation Programme, The World Bank, South Asia
1010 : 1020 hrs	Speaker	**Mr William Kingdom** Lead Water and Sanitation Specialist, The World Bank
1020 : 1030 hrs	Speaker	**Dr Renu Khosla** Director, Cure India
1030 : 1100 hrs	**Panel Discussion/Q&A**	
1100 : 1115 hrs	**Tea**	

October 29, 2013 (Day 2), 1115 : 1245 hrs, Stein Auditorium, India Habitat Centre		
Session 4: Sustainable Rural Drinking Water and Sanitation		
1115 : 1125 hrs	Chair	**Mr Gourishankar Ghosh** Chairman, Waterlife
1125 : 1135 hrs	Speaker	**Dr Smita Misra** Lead Water and Sanitation Specialist, The World Bank, New Delhi
1135 : 1145 hrs	Speaker	**Mr Satyabrata Sahu** Joint Secretary, MDWS
1145 : 1155 hrs	Speaker	**Dr Manish Kumar** Sr. Institutional Development Specialist, Water and Sanitation Programme, The World Bank
1155 : 1205 hrs	Speaker	**Ms Tulasi Maddineni** CEO, Zila Parishad, Dakshin Kannada District, Karnataka
1205 : 1215 hrs	Speaker	**Ms Sumedha Kataria**, Additional Director, Government of Haryana
1215 : 1245 hrs	**Panel Discussion/Q&A**	
1245 : 1345 hrs	**Lunch**	
October 29, 2013 (Day 2), 1345 : 1515 hrs, Stein Auditorium, India Habitat Centre		
Session 5: Water Use Efficiency in the Industrial Sector		
1345 : 1400 hrs	Chair	**Prof. Arjen Y. Hoekstra** Professor , Water Management, University of Twente
1400 : 1410 hrs	Speaker	**Dr Raphael Semiat** Dean of the Wolfson Faculty of Chemical Engineering, Israel
1410 : 1420 hrs	Speaker	**Prof. Stuart White** Director, Institute for Sustainable Futures, Sydney
1420 : 1430 hrs	Speaker	**Mr Mohit Dhamija** Manager , EHS, GlaxoSmithKline, Gurgaon
1430 : 1440 hrs	Speaker	**Mr Patrick Yadauga** Hindustan Coca Cola Beverages Pvt. Ltd., New Delhi
1440 : 1450 hrs	Speaker	**Mr Anshuman** Associate Director, The Energy and Resources Institute, (TERI)
1450 : 1515 hrs	**Panel Discussion/Q&A**	
1515 : 1545 hrs	**Tea**	

October 29, 2013 (Day 2), 1545 : 1715 hrs, Stein Auditorium, India Habitat Centre		
NGO Forum **Theme: Role of Women and Youth in Efficient and Sustainable Water Management**		
1545 : 1555 hrs	Chair	**Dr Sara Ahmed** Senior Programme Specialist, International Development Research Centre, New Delhi
1555 : 1605hrs	Speaker	**Mr Arumugam Kalimuthu** Country Director, Water for People
1605 : 1615 hrs	Speaker	**Mr Ravindra Sewak** Country Director, SafeWater Network
1615 : 1625hrs	Speaker	**Mr Joe Madiath** Executive Director, Gram Vikas
1625 : 1635 hrs	Speaker	**Mr Lalit Mohan Sharma** Group Leader, Natural Resource Management, Institute of Rural Research and Development (IRRAD)
1635 : 1645 hrs	Speaker	**Ms Nafisa Barot** Executive Director, Utthan
1645 : 1655 hrs	Speaker	**Dr Renu Khosla** Director, Centre for Urban and Regional Excellence (CURE)
1655 : 1715 hrs	**Panel Discussion**	
October 30, 2013 (Day 3), 0930 : 1100 hrs, Stein Auditorium, India Habitat Centre		
Session 6: Climate Change and Water Vulnerability		
0930 : 0940 hrs	Chair	**Amb. C S Dasgupta** Distinguished Fellow, TERI
0940 : 0950 hrs	Speaker	**Mr D Unnikrishnan** Senior Advisor, GIZ, New Delhi
0950 : 1000 hrs	Speaker	**Dr Eddy Moors** Unit Head, Climate Change and Adaptive Land & Water Management, Alterra, Wageningen, The Netherlands
1000 : 1010 hrs	Speaker	**Dr Neena Rao** Director- Projects & Partnerships, SaciWATERs, Hyderabad
1010 : 1020 hrs	Speaker	**Dr Arun Shrestha** Climate Change Specialist, ICIMOD, Nepal
1020 : 1030 hrs	Speaker	**Mr Shashikant Chopde** Institute of Social and Environmental Transition, USA
1030 : 1045 hrs	**Panel Discussion/Q&A**	
1045 : 1115 hrs	**Tea**	

October 30, 2013 (Day 3), 1115 : 1245 hrs, Stein Auditorium, India Habitat Centre		
Session 7: Inter-sectoral Issues and Challenges for WUE		
1115 : 1125 hrs	Chair	**Mr Onno Ruhl** World Bank Country Director, India
1125 : 1135 hrs	Speaker	**Mr Dipak Gyawali** Chair, Nepal Water Conservation Foundation, Kathmandu
1135 : 1145 hrs	Speaker	**Kh. Azharul Haq** Executive Member, Bangladesh Water Partnership, Dhaka
1145 : 1155 hrs	Speaker	**Dr Herbert Acquay** Sector Manager, The World Bank
1155 : 1205 hrs	Speaker	**Ms Apurva Chaturvedi** Programme Specialist, Clean Energy & Environment, USAID
1215 : 1245 hrs	**Panel Discussion/Q&A**	
1245 : 1345 hrs	**Lunch**	
October 30, 2013 (Day 3), 1345 : 1515 hrs, Stein Auditorium, India Habitat Centre		
Session 8: Policy and Governance Framework and Institutional Arrangements for Water Efficiency		
1345 : 1355 hrs	Chair	**Shri Ramaswamy R Iyer** Former Secretary , Ministry of Water Resources
1355 : 1405 hrs	Speaker	**Mr Sujoy Mazumdar** Director, Ministry of Drinking Water and Sanitation
1405 : 1415 hrs	Speaker	**Mr Russell Rollason** First Secretary, AUSAid, Australian High Commission
1415 : 1425 hrs	Speaker	**Mr Ali Tauqeer Sheikh** CEO and Director, LEAD Pakistan
1425 : 1435 hrs	Speaker	**Dr Michael Porter** Research Professor of Public Policy, Deakin University, Australia
1435 : 1445 hrs	Speaker	**Mr Ambesh Singh** CDP, NGO
1445 : 1515 hrs	**Panel Discussion/Q&A**	
1515 : 1530 hrs	**Tea**	

October 30, 2013 (Day 3), 1530 : 1700 hrs, Stein Auditorium, India Habitat Centre		
Special Session: Secretaries, Government of India **Theme: Strengthening Cross-sectoral Convergence to Enhance Water Use Efficiency**		
1530 : 1545 hrs	Chair	**Ms Debashree Mukherjee** CEO, Delhi Jal Board
1545 : 1600 hrs	Speaker	**Mr Sujoy Mazumdar** Director, Ministry of Drinking Water and Sanitation
1600 : 1615 hrs	Speaker	**Shri Mahesh Singh** Member Secretary, Gujarat Jal Seva Training Institute
1615 : 1630 hrs	Speaker	**Ms Tulasi Maddineni** CEO, Zila Parishad, Dakshin Kannada District, Karnataka
1630 : 1700 hrs	**Panel Discussion/Q&A**	
October 30, 2013 (Day 3), 1700 : 1740 hrs, Stein Auditorium, India Habitat Centre		
Valedictory Function		
1700 : 1710 hrs	Recommendations and Way Forward	**Mr Shri Prakash** Distinguished Fellow, TERI
1710 : 1725 hrs	Valedictory Address	**Mr Sujoy Mazumdar** Director, Ministry of Drinking Water and Sanitation
1725 : 1730 hrs	Vote of Thanks	**Mr Anshuman** Associate Director, Water Resources, TERI



ANNEXURE-B

BACKGROUND NOTES

SESSION 1

WATER USE EFFICIENCY: AN APPROACH TO GLOBAL WATER SECURITY AND SUSTAINABILITY

Water is essential for all forms of life on the planet. So far as fresh water is concerned, it is a unique, crucial and very scarce resource. It cannot be substituted by any other substance in the world for its specific purpose. Though, two-thirds of the total surface area of the earth is covered by water in the forms of seas, oceans, glaciers, ice caps, etc., the availability of fresh water required for sustenance of terrestrial life is rather limited.

More than a billion people in the world lack access to clean water, and the situation is getting worse. Over the next two decades, the average supply of water per person will drop by a third, possibly condemning millions of people to an avoidable premature death.

India is amongst one of the top 12 water poor countries, with the per capita availability of 1,850 m^3/person/year as against the world average of 7,690 m^3/person/year. The total annual surface water availability in the country is estimated to be 1,869 billion cubic metres (bcm), but due to spatial–temporal variations only 690 bcm of it is utilizable along with 432 bcm of replenishable ground water. Therefore, the utilizable water in the country is only 1,122 bcm, which seems suffice for our present needs. An increase in population and economic growth will strain the demand–supply balance. Climate change impacts may also further put pressure on the country's water resources.

In India, water security will be under threat if current trends in its use continue. The Water Resources Group estimates that if the current pattern of demand continues, about half of the demand for water will be unmet by 2030.

As water becomes increasingly scarce, a necessity arises for new and sustainable solutions to water problems.

Water use efficiency is a comparison of the amount of water that is required for a particular purpose and the actual amount of water used or delivered. Efficient use of water will alleviate the impact of water scarcity. Efficient water usages will not only save water, it will also result in energy savings, reducing waste water loads, etc., resulting in sustainable water use. As per the Water Footprint Network, water-scarce countries can alleviate the pressure on their water resources through virtual water trade by importing cheap water-intensive products and exporting only water-extensive high-value commodities.

Water Use Efficiency (WUE) Approach

- Water audit: industrial, municipal, domestic
- Agricultural water management: more crop per drop
- Leakage detection
- Water efficient technologies
- Planning for resource protection: land use, waste management, source protection
- Behavioural changes for WUE
- Reuse and recycling.

Issues

- Unaccounted water losses
- Over-utilization of water for production (agricultural, industrial, commercial)
- Lack of water consumption data
- No benchmarking for agriculture water use
- Poor awareness among consumers
- Climate change impact on water resources.

Questions

1. What are the engineering practices to improve water use efficiency?
2. What are the behavioural practices to improve water use efficiency?
3. What are the planning and management practices to improve water use efficiency?
4. What are the drivers (economy, policy, awareness) of water use efficiency?
5. What are the replicable practices that may be adopted?

SESSION 2

WATER USE EFFICIENCY IN THE AGRICULTURE SECTOR: MANAGING WATER SECURITY AND FOOD SECURITY

Water is a key input for food production system. Agriculture requires large quantities of good quality water for irrigation. This quantity is dominant by all measures compared to all other sectors. As a result, imbalance between world's water and food security situation is being observed everywhere. Satisfying water demands for food, fibre, fuel, and other industrial inputs from agriculture in an increasingly productive way, is the main challenge. Major changes in policy and management, across the entire agricultural production chain, and agricultural input chain are required to overcome this challenge. Besides this, there are major uncertainties related to water quantity availability for agriculture sector due to cut-throat competition amongst different sectors. These uncertainties are again engraved by many factors like climate change, regional socio-economic factors, political pressure, etc. Efficiency and productivity gains alone cannot solve this problem completely. Other points like, unequal supply of natural and artificial resources, global consumption patterns and access are equally important.

In a situation where the competition for water is getting stiffer, these changes are making food production riskier and more uncertain. During recent years, prices on agricultural and energy inputs have risen and are becoming increasingly volatile, adding a new challenge to farmers and public. As adequate food production depends heavily on natural resources, mainly water and land, versatile long-term option exploration is the need of the hour. Some of these are as follows:

- Rainfed area food production
- Ecosystem conservation
- Towards a green economy—the water-food-energy nexus
- Trade and food security
- Securing water and food in urban areas
- Governance for water and food security
- Linking food production to human health and ecosystem services
- Paying more attention to the supply chain
- Trading food; and virtual water.

SESSION 3

WATER USE EFFICIENCY IN THE URBAN SECTOR

Increasing and competing water demand amongst various sectors including agriculture, industries, and households has put across concerning water challenges in many regions. The last six decades witnessed a significant growth in water demand in India while the per capita water availability declined from about 5,177 m^3 in 1951 to about 1,545 m^3 in 2011, clearly indicating a water stressed situation.

Growing urbanization, and changing social structure and lifestyles have posed constant challenges for urban areas in keeping the provision of basic services aligned with the growth. While the demographic growth and developmental activities have a definite role in the increasing water demand, a large share of growing water crisis is due to reasons such as inefficient service delivery, wasteful water use, overexploitation of groundwater, inadequate pricing of water, inadequate capacities of urban local bodies, and lack of public awareness, to name a few. It is estimated that the water lost in the urban water distribution is quite high in India and varies between 40–50 per cent [*Twelfth Five Year Plan (2012–2017): Faster, More Inclusive and Sustainable Growth. Volume I: The Planning Commission, Government of India]*.

A study titled, "2007 Benchmarking and Data Book of Water Utilities in India; Ministry of Urban Development, Government of India and Asian Development Bank" conducted in 20 major cities of India in 2007 shows an average water availability of 4.3 hours/day, an average unaccounted for water (UFW) of about 32 per cent and average metered connection of only 24.5 per cent. High UFWs or losses are indicative of inefficient water use mainly due to leakages and losses (including pilferage) in the water supply system. Inconsistent supply leads to a lot of wastage as the taps are kept open and water is stored in an amount larger than required and actually used.

The Government of India under the National Water Mission (NWM) envisages enhancing the water use efficiency by 20 per cent. This would require various agencies to relook the way water supply and distribution are being managed, and water valuation is done. To ensure long-term sustainability of water resources, the current focus of water management needs to shift from supply side management to demand side management. The approach calls for an integrated strategy, that aims to reduce the losses in the system (reducing UFW), exploring alternative options of recycle and reuse of treated sewage (for example, for supply to industries, recharge of water bodies, for gardening and other non-potable uses, etc.). Besides this, improving operational efficiency, promoting rationale use (incentivizing water conservation), appropriate valuation, and pricing of water and its equitable distribution needs to be focused.

There lies a considerable scope of water conservation. Reuse in urban water sector, and conducting regular water audits can help identify and optimize water use. Regular water audits need to be institutionalized to identify interventions, minimize consumption, establish benchmarks, and ultimately enhance water use efficiency.

The need for efficient water management has to take centre-stage in the planning for urban water sectors with the objectives of improving water use efficiency, minimizing wastage, promoting and incentivizing water conservation, appropriate pricing of water, use of efficient technologies, adequate policy planning, and effective implementation.

This session focussed on some of the above-mentioned challenges, and explored the challenges and opportunities in achieving water use efficiency in urban water sector.

Key Guiding Questions

- What are the successful models and how can they play a role in improving water use efficiency in urban water supply and distribution system?
- How can equitable access and reliable water supply be achieved in urban and peri-urban areas ensuring water for all, including the underprivileged?
- How can rational pricing/valuation of water be brought in and how can judicious use of water be promoted to reduce water losses and reuse urban wastewater?

SESSION 4

SUSTAINABLE DRINKING WATER AND SANITATION IN RURAL INDIA

India is facing many challenges in ensuring safe and sustainable drinking water supply to rural households. Reports indicate that over 90 per cent of rural households have access to drinking water. However, the quality of water and service sustainability is not yet assured. Water quality is impacted due to declining ground water table on account of excessive withdrawals. The levels of natural contaminants (fluoride, arsenic, etc.), anthropogenic chemical pollutants (pesticides, insecticides, etc.), and bacteriological contaminants (faecal coliforms) are excessively high in many areas. Systematic and concerted efforts are required to ensure safe drinking water and sanitized environments that promote healthy living.

The National Rural Drinking Water Programme (NRDWP), one of the six components of *Bharat Nirman,* emphasizes infrastructure that provides water from outside a given village through "grid supplying metered bulk water", as an alternate supply system at the sub-district, district and/or state level. Programmes like *Swajaldhara* demonstrated that demand-driven approach works well in terms of cost, community involvement, and water use efficiency. Participatory management processes encourage and recognize the social, economic, and cultural characteristics of the community.

The sanitation sector was neglected until the late 1990s. India's first nationwide programme for rural sanitation, the Central Rural Sanitation Programme (CRSP), was launched in 1986 by the Ministry of Rural Development with the objective of improving the quality of life of the rural population by providing privacy and dignity to women. The programme had a supply-driven approach and provided subsidy to construct sanitary toilets for Below Poverty Line (BPL) households. Regardless of the subsidy under this programme, only a marginal increase in rural sanitation coverage was observed, with average annual increase of only 1 per cent. The main reason was lack of community participation, and supply-driven, subsidy-oriented approach of the programme.

With the advent of the Total Sanitation Campaign (TSC) and now *Nirmal Bharat Abhiyan*, sanitation awareness spread across rural India. It is evident that lack of sanitation facilities has direct implication on human health, especially on the vulnerable sections of our society. Unhygienic conditions are responsible for a number of diseases, having economic, social, and environmental impacts.

In spite of all the efforts by the central and state governments in providing infrastructure, the usage of sanitation facilities remains a big challenge. The strategy adopted in Information, Education and Campaign (IEC) is yet to result in actionable outputs. The biological contamination of a large number of drinking water sources, primarily due to prevalent open defecation and insanitary conditions around the drinking water sources, is a serious problem. With the sanitation programme being implemented in the villages, the prevalence of waterborne diseases such as diarrhoea, cholera, etc., is seen to have decreased, but the incidence is still relatively high in some parts of the country.

This session envisaged deliberations on equitable access and decentralized distribution system for water. It also deliberated on the key drivers of sustainable sanitation and showcased some of the best practices in rural sustainable sanitation and water supply. The policy and institutional drivers to enable efficient service delivery were also highlighted. Some of the questions that the deliberations were focussed on are given below.

Key Questions

- What are the constraints restricting water availability, supply, and distribution in rural areas?
- How can the institutional mechanisms be strengthened for tackling geo-genic and anthropogenic contaminants to ensure water security and sustainability?
- What are the possible measures for improving water supply and distribution through water conservation and demand management approach?
- What are the key institutional drivers for scaling-up rural sanitation programmes?

SESSION 5

WATER USE EFFICIENCY IN INDUSTRIAL SECTOR

Industrial sector in India is the second largest consumer of water after agriculture sector. Its total share amounts to 9 per cent. Various industries require large quantities of water for different processes and also discharge huge quantity of waste water. Consequently, the industrial sector will be competing for access to water while pressures on the sector to protect water resources from pollution are mounting. The consequences of responsible or irresponsible use of water resources are increasingly becoming strategically important. Considering large inflow and outflow volume of water in this sector, water use efficiency is of utmost importance to this sector. The issue of water use efficiency is an important contributor to management strategies needed to address problems of water scarcity and costly new supplies.

Water use efficiency is not simply a matter of using less water through restrictions. It is about careful management of water supply sources, use of water saving technologies, reduction of excessive demand, and other actions. Industrial sector in this regard has to take extra efforts to sustain their business efficiently by taking measures for judicious use of water. The Draft Guideline for development of Water Use Efficiency in Rural, Urban, Industrial and Irrigation Sector, Government of India clearly states that for industries, water use efficiency measures essentially comprise of the following components:

- Accounting for water use
- Identifying water saving measures
- Preparing a plan to implement the identified measures.

Water efficiency management plans aim to help business better manage water use, save on water costs, improve efficiency, and reduce business water consumption.

There are various avenues where industry can use water more efficiently. Machinery, industrial processes and related support services require large quantities of water which can be reduced significantly by introducing water efficient technologies. Water saving measures, one of the essential components of water efficiency management plan is based on 3 basic R's: recycling, reuse, and reduction in water consumption.

Recycling

Water recycling is the multiple use of water, usually sourced from wastewater treated to a standard appropriate for its intended use. Recycled water can reduce the burden on fresh water resources by providing a fit-for-purpose water solution.

Reuse

In this system, the outflow from one process, whether treated or untreated, is used in another requiring a different quality of water.

Reduction in Water Consumption

It is possible to optimize processes, improve operations, or modify the equipment or the attitude of users. Here it is necessary to calculate the amount of water required by any given process, compare the result with the actual amount used, and evaluate options for reducing consumption. Industries having adjacent areas such as gardens, sanitary services, etc., have quite good potential of significant reductions.

Likewise, there are many more strategies that can be adopted to enhance water use efficiency in industries. Industrial facilities have a good potential for raising their water efficiency rates. Experience from around the world shows that adopting a systematic approach to water efficiency often results in reduced water consumption by 20–50%, and up to 90% when more advanced measures are implemented.

Questions

- What is the role of benchmarking in water use efficiency in industrial sector?
- What are the challenges in development of cost effective technologies?
- What is the energy implication of water saving technologies used by industries?

SESSION 7

INTER-SECTORAL ISSUES AND CHALLENGES FOR WATER USE EFFICIENCY

Human development is being challenged by the growing scarcity of water in many developing countries. Various anthropological factors such as industrial pollution, unsustainable agricultural practices, unplanned urbanization coupled with population growth, extreme weather events and climate variability, have further reduced the per capita availability of water. Usually, domestic and industrial usages are associated with urban demand and agriculture usage with rural demand. Increasing urban water demand is due to high concentration of residents in cities and also to support the industrial and economic activity. Although historically agriculture has been the biggest consumer of water, urban water demands (domestic and industrial) are increasing rapidly in the last two decades.[1] This increase in urban water demand is compelling the shift of regional water resources from rural to urban consumers to meet the cities' growing water needs, thus, creating an inter-sectoral competition over the allocation of water resources. The implications of urbanization on inter-sectoral issues of water are not only limited to technical or economic concerns, but they also lead to serious political and social problems. It is very important to look at the water needs of each sector in urban and rural areas including the timing, inter-sectoral linkages in water quality and quantity, values of water in different uses/sectors, etc.

In any developing nation, competition for water among various sectors such as agriculture, industries, domestic and environment will always be on the rise as the thrust is on economic growth, whereas the sources of water remain the same. The limited sources of water increase its value and the importance of efficient allocation of water among various sectors. Therefore, demand-side management by way of increasing water use efficiency is very critical.

Some of the strategies to manage water demands include identifying new water sources, reallocation from other sectors, and managing urban water demand. These strategies are more complex to implement as they need a combination of technical and institutional measures. Identifying new sources can include construction of new water structures, desalination, wastewater reuse and recycling, and harvesting rainwater.[1] Reallocation of water resource from other sectors is a more difficult issue on ground. From an economic perspective, allocation of water from low- to high-value uses appears to be more rational. But, in most of the cases the backward and forward linkages among various sectors, primary factors of production and institutions and other non-economic uses of water are not considered, which if accounted into the framework, addresses the issues of equity and sustainability. Therefore, the effort should be to allocate water resources, which further help to improve the standard of living.[2]

Urban water agencies are increasingly working to use the existing supplies more efficiently. Most of the Urban Local Bodies (ULBs) in developing nations have around 40–60 per cent of their water supplied as Unaccounted for Water (UFW) which comprises leakages, theft, and inefficient or old distribution system. Some of the ways to improve the urban water supply system are leak detection, stopping water thefts and illegal connections, creating awareness and pricing urban water. Pricing is one of the most sensitive issues as it is driven by political will. Water pricing can only be effective if it is accompanied by useful complementary regulations, education campaigns, leak detection, recycling, technical interventions, and improved service delivery.

This session made a sincere attempt to cover the most critical inter-sectoral issues and challenges in improving water use efficiency which are relevant globally. Overall, it aimed to address the topics given below.

- What are the present and prospective scenarios of water stress in the global and regional perspective?
- The existing coping mechanisms for the competing water demand amongst various sectors.
- The mechanisms for optimal use and allocation of water resources in river basin systems.

[1] Meinzen-Dick R, and Appasamy P. 2002. **Urbanization and inter-sectoral competition for water**. In *Finding the Source: The Linkage between Population and Water*, edited by G D Dabelko, pp. 27–51. Washington, DC: Woodrow Wilson Cent.

[2] Juana J S, Kirsten J F, and Strzepek K M. 2006. **Inter-sectoral water use in South Africa: efficiency versus equity**. [26th International Association of Agricultural Economist Conference, Gold Coast, Australia, 12–18 August 2006].

SESSION 8

POLICY AND GOVERNANCE FRAMEWORK AND INSTITUTIONAL ARRANGEMENTS FOR WATER EFFICIENCY

"A scarce natural resource, water is fundamental to life, livelihood, food security and sustainable development."

—As per the National Water Policy 2012

Water being a scarce (but a vital resource in the country) needs to be managed efficiently, which requires an effective governance framework along with holistic policies and the right institutional arrangement. India has policies for governing and managing its water resources, among which the National Water Policy (2012) and the National Water Mission under the National Action Plan on Climate Change (NAPCC) are the key ones. The realization of inefficient water use especially in the agriculture sector dawned early; the Vaidyanathan Committee report of 1992, the National Advisory Council in 2005 and the Parthasarthy Committee report of 2006 clearly establish this issue (Planning Commission, 1992; NAC, 2005 & MoRD, 2006).

The National Water Policy (2012) clearly recognizes the issue of wastage and over-exploitation of water resources across sectors, and more importantly the need for good governance and improving the "resource use efficiency" of these resources. Section 6 of the policy clearly delineates various methods and ways to improve water use efficiency and Section 7 of the policy advocates appropriate water pricing to ensure its efficient use and conservation. The National Water Mission has one of its goals as increasing water use efficiency by 20%, and it further proposes to set up the sub-committee on efficient use of water chaired by Additional Secretary, MoA. However, Mollinga and Tucker (2010) argue that the current policy responses to the changing context for water governance and management are not fully adequate. The ultimate challenge seems to be the realization of these policy provisions, and identifying and addressing the many unique challenges on the ground.

In addition to this, one other critical gap is that there is no exclusive water law in India; most of the water related legal provisions are dispersed across various acts (Saleth, 2005). Water pricing and valuation traditionally has led to inefficient use of water; the Jakhade Committee of 1987 has highlighted the water use efficiency function of an appropriate water pricing policy and though many states have revised water prices, the current tariffs need to further evolve rationally.

Saleth (2005) argues that the institutional arrangements assume a greater importance in India as the country is fast heading towards the ultimate limit of its utilizable water resource potential. He further argues that the water institutions of India developed in an era of water surplus (the colonial period) and their relevance to address the water scarcity challenges that India faces today is limited, in spite of the ongoing institutional transformations. He further states that the central government, in spite of the legal provisions and other administrative and financial leverages at its disposal, is unable to take lead in reforming the legal and institutional basis of the water sector as the final legislative powers rest with the state.

The organizations dealing directly and indirectly with water resources are many and their functional responsibilities with regard to water resources management are disjointed; the activities such as surface water and groundwater management, and irrigation and water supply provision are dispersed across departments or ministries.

Mollinga and Tucker (2010) claim that the combination of neoliberalization, increasing demands on water, proliferating water controversies, increasing prominence of the environmental aspect of water resources and the limited scope and flexibility of present institutional arrangements, may constitute a "tipping point" for water governance. They suggest that new paradigms have to evolve that will address issues both on the technical side and on the institutional side of water resources management.

SPECIAL SESSION

ROLE OF WOMEN AND YOUTH IN EFFICIENT AND SUSTAINABLE WATER MANAGEMENT

One of the targets of the Ninth Millennium Development Goals on environmental sustainability is to ensure that by the year 2015, all member states shall integrate the principles of sustainable development into country policies and programmes. Sustainability of water resource is expected to be achieved through developing water management strategies at local, regional, and national levels. Water management not only involves water as a system but the environment as well. This implies that there should be a total and holistic approach.

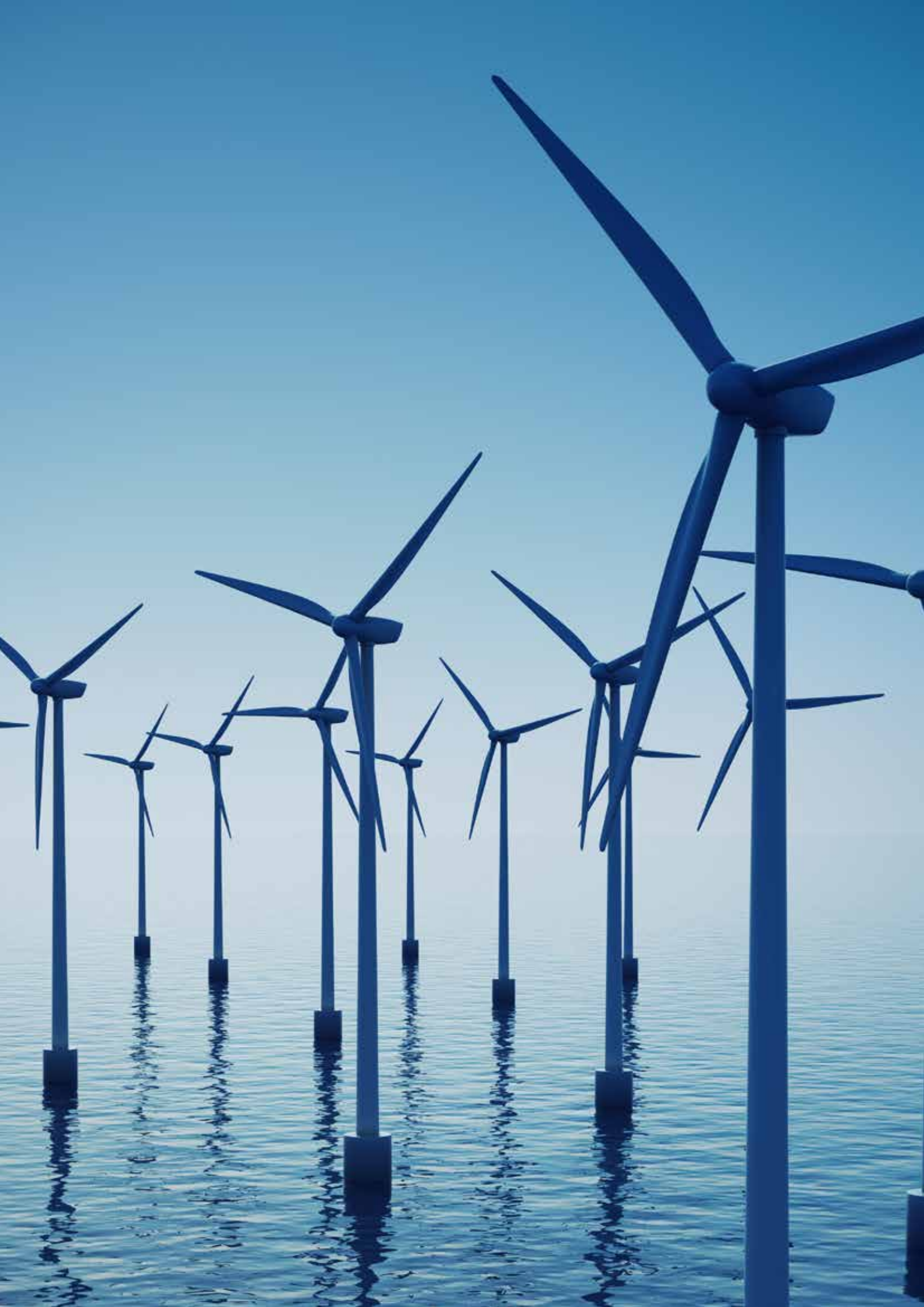
The state or quality of being young is associated with vigour, freshness, or immaturity which also means belonging to a particular identity that demonstrates dynamism, knowledge, skill, and aspiration. Young people themselves produce new values by their active participation in social life which changes and renews society. Youth participation results in the self-realization of personality, i.e., the opportunity for young people to actualize their own potentialities.

The role of women in planning, designing, and implementing and more importantly in decision-making has been ignored in the rural society. Efficiency, effectiveness, equity, and affordability are the major gains of adopting a gender approach. It requires detailed attention to social realities during the design, and throughout the execution, of water delivery systems. Where water is a scarce and vulnerable commodity, there is bound to be competition for supplies and those at the lowest end (i.e. the poor) of the power spectrum will go without it.

The present thinking in the water sector states that management systems must be user-oriented. Amongst users, one of the largest visible groups can be identified by gender. In most societies, the provision of water for fulfilment of fundamental human needs has always been a woman's responsibility. Women are responsible for preparing food, washing clothes, and cleaning.

How gender approach can be applied varies from case to case and circumstance to circumstance. What is essential, however, is a commitment to the process of gender mainstreaming in the entire water system. Some of the step-wise actions for applying gender-based approaches are as follows:

1. The emphasis on recognition of interests and needs of women as well as those of men in national/regional policies and programmes.
2. Legal frameworks and institutional reforms.
3. Building capacity to increase the understanding of gender implications for water management.
4. A proactive effort to gender sensitize water management approaches at senior policy making levels in national structures.
5. Gender training for men and women working in water-related organizations and programmes.
6. Policy changes to make gender an intrinsic part of policy.
7. Gender stratification in research and planning.
8. In-depth gender-sensitive consultation processes.



ANNEXURE-C

SPEAKER PROFILES

Mr Adrian Sym

Executive Director, AWS

As Executive Director, Mr Adrian Sym leads the pioneering work of the Alliance for Water Stewardship (AWS), in partnership with some of the world's leading players in sustainable water resource management. AWS is dedicated to improving the stewardship of our most precious natural resource through the International Water Stewardship Standard, independent verification processes, training and membership. Through its innovative and multi-stakeholder approach, AWS is at the leading edge of driving collective action and consensus-based responses to water risk. A development and sustainability professional, Mr Adrian joined AWS in 2011 from Fairtrade International. Prior to this, Mr Adrian spent seven years working on disability and development programmes in Bangladesh and Nepal. His diverse experience, together with his academic background (Masters in International Policy and Diplomacy), has helped to shape Mr Adrian's view on sustainable development, believing that true development can only be achieved through effective partnerships amongst and between stakeholder groups.

Mr Ajay Anand

Mr Ajay Anand is Senior Manager, Project Department, Jain Irrigation Systems Limited (JISL), Jalgaon. He has a B.E. Mechanical Engineering, Allahabad (UP) and had 28 years of experience in Poly Olefins Industries Ltd, NOCIL Ltd. For the past 6 years, he is working for JISL and has expertise on enhancing Water use efficiency in urban sector using concept of 24x7 Water Supply. JISL is the largest manufacturer in India for PE pipes and a total solution provider (concept to commissioning) in the field of water supply and distribution.

Mr Ali Tauqeer Sheikh

CEO & National Programme Director, LEAD Pakistan and Director Asia, Climate and Development Knowledge Network (CDKN)

Mr Ali Tauqeer Sheikh is the founding CEO and National Programme Director of Leadership for Environment and Development (LEAD) Pakistan. He also heads Climate Leaders Action Network (CLAN) which gives him access to over 2,000 experts in the field. Mr Sheikh is also the Asia Director for Climate and Development Knowledge Network (CDKN). Led by PricewaterhouseCoopers, CDKN is a global alliance of five organizations: ODI, Intrack, Futuro Latinamerico, South South North, and LEAD. In this capacity, he leads the efforts to assist developing country governments in the Asian region to mainstream climate compatible development in their policies and plans, strengthen their capacity to cope with climate induced disasters and extreme events, enhance their readiness to access international climate finance and to meaningfully engage in international climate negotiations for an equitable and ambitious global agreement.

Mr Sheikh has vast experience in training and facilitating multi-sectoral and multi-disciplinary expert groups on policy planning, leadership development and consensus building. He has served on several boards and is a member of national commissions and committees including the apex environmental body in the country, Pakistan Environment Protection Council (PEPC) chaired by the Prime Minister of Pakistan, the Taskforce on Climate Change set up by the Planning Commission of Pakistan, and the Core Group constituted by the Ministry of Climate Change charged to advise the Government of Pakistan on climate negotiations.

He studied at Quaid-e-Azam University Islamabad, Australian National University, Canberra, and University of Miami, Florida, obtaining a Master's degree in International Relations and Strategic Studies. Mr Sheikh has been a Fellow at the Institute of Soviet and East European Studies (ISEES) Miami, the International Institute of Strategic Studies (IISS) in London, and the Rockefeller Foundation in New York.

Mr Anshuman

Mr Anshuman, Associate Director, Water Resources Division of TERI (The Energy and Resources Institute) has been working in the field of water sector since last 15 years. His key qualifications include M. Tech. in Energy and Environmental Management from Indian Institute of Technology (IIT), New Delhi.

His expertise in the water sector lies in the areas related

to integrated water resource management, water use efficiency, water quality and quantity assessments where he has carried out several comprehensive research studies in context of the source (surface water, groundwater), issues (water scarcity, pollution, use efficiency etc.), sectors (irrigation, domestic and industrial) and stakeholders (central/state governments and local communities). His focus work areas include Integrated Water Resources Management (IWRM); Water Use Efficiency (WUE); urban water supply and demand management studies; water audits; water conservation; watershed management; climate change and water security; provision of drinking water, resource evaluation and pollution load assessment; adequacy and efficiency studies of sewage and effluent treatment plants; training and capacity-building in water and environmental management; regulatory legislations, Environmental Impact Assessment (EIA) studies etc.

He has been member of several advisory committees earlier and currently is member of Technical Advisory Committee (TAC) of National Institute of Hydrology (NIH) (Under Ministry of Water Resources, Government of India). He has executed several projects, presented several papers at national and international fora and has relevant national and international publications.

Ms Apurva Chaturvedi

Ms Apurva Chaturvedi is an environment and energy professional currently working as Programme Management Specialist for Clean Energy and Environment in USAID, New Delhi where she is responsible for design and management of clean energy and environment projects. She leads the building efficiency programme of USAID and also served as technical lead for Water-Energy Nexus (WENEXA) project amongst others. Her area of expertise is strategy formulation and programme design and development. Prior to USAID, she worked for British Council, British High Commission, as Project Manager-Climate Change for four years. She completed her Masters in Microbiology with specialization in Environment Microbiology and a Post Graduate Diploma in Intellectual Property Rights.

Prof. Arjen Y. Hoekstra

Prof. Arjen Y. Hoekstra is Professor in Water Management at the University of Twente, The Netherlands. He has led a variety of interdisciplinary research projects and advised governments, civil society organizations, companies and international institutions. With a broad international network, he has visited more than fifty countries throughout the world. Prof. Hoekstra created the Water Footprint concept in 2002 and established the interdisciplinary field of Water Footprint Assessment (WFA), which addresses the relations between water management, consumption and trade. He was initiator and co-founder of the Water Footprint Network and served as Scientific Director until 2012. Since 2013, he sits in the Supervisory Council of the Water Footprint Network. Prof. Hoekstra has been teaching water resources management, river basin management, hydrology and water quality, sustainable development, natural resources valuation, environmental systems analysis, and policy analysis. He has developed various educational tools, including the River Basin Game and the Globalization of Water Role Play. His scientific publications cover a wide range of topics related to water management and include a large number of peer-reviewed articles and book chapters. His books include 'Perspectives on Water' (International Books, 1998) and 'Globalization of Water' (Wiley-Blackwell, 2008), 'The Water Footprint Assessment Manual' (Earthscan, 2011) and 'The Water Footprint of Modern Consumer Society' (Routledge, 2013).

Mr Arumugam Kalimuthu

Country Director, Water for People

As Water For People's Country Director, India, Mr Arumugam Kalimuthu (AK) is responsible for the overall management of Water For People's India profile in the states of West Bengal, Bihar, Odisha, and Rajasthan.

Mr Arumugam Kalimuthu has 26 years of experience in the development sector with a strong focus on water supply, sanitation, and hygiene. Before joining Water For People, AK worked with WaterAid India,

WaterAid Nepal, and Plan International (India) where he masterminded a national level network on water and environmental sanitation (WES-Net India), and over 2,500 organizations across India are now part of this network. He was also instrumental in the establishment of a training and capacity building institution, "WASH Institute," that is now recognized by the Government of India's Department of Drinking Water and Sanitation as Key Resource Centre.

As a technical expert, AK is representing in four top level committees of Government of India namely, Department of Drinking Water Supply and Sanitation (DDWS), Department of Science and Technology, Sarva Shiksha Abhiyan, and National Disaster Management Authority (NDMA). AK has published several technical papers and guidebooks on water and sanitation.

AK holds a bachelor's degree in Civil Engineering from Coimbatore Institute of Technology, Bharathair University, India, and a Master of Science degree in Water and Environmental Engineering, University of Surry, UK, along with many other diplomas, awards, and publications. He is currently pursuing a Ph.D. from Gandhigram Rural University, India.

Dr Arun Bhakta Shrestha

Dr Arun Bhakta Shrestha is a Senior Climate Change Specialist at International Centre for Integrated Mountain Development (ICIMOD), Kathmandu. He is a Programme Manager for two regional programmes of ICIMOD, River Basin and Cryosphere and Atmosphere. Dr Shrestha holds a Ph.D. in Earth Sciences from University of New Hampshire, USA and a Master's Degree in Hydraulic Engineering from Minsk, former USSR. Before joining ICIMOD, he worked for the Department of Hydrology and Meteorology, Government of Nepal. His main areas of interest include climate change, glaciers and glacial hazards, glacial lake outburst mitigation, atmospheric environment, remote sensing and hydrological modelling. Dr Shrestha has several publications in peer reviewed international journals as well as national journals and magazines. He was involved in the Tsho Rolpa GLOF Risk Reduction Project and was in the scientific team for the preparation of the First National Communication of Nepal to United Nations Framework Convention on Climate Change (UNFCCC).

Dr B C Barah

NABARD Chair Professor, IARI

Dr Barah holds a NABARD Chair at IARI, New Delhi. He has a high class Ph.D. degree in Applied Econometrics and Agriculture. His major research areas of interest include sustainable agriculture, agricultural growth and outlook, resource conservation and income generation for the vulnerable small farmers and the poor, agricultural risk and uncertainty in unfavourable production environment (SAT and rainfed), traditional water harvesting and development and ecological implications, environmental sustainability, consumer demand analysis under changing taste and preference of food basket, rural institutional innovations and policy advocacy. His wide ranging exposures range from understanding of the grassroots micro-level reality of Indian rural scene to national and international scenario. Besides the research advisory, he is also involved in research networking and policy advocacy on agriculture and rural development. He served several national and international institutions including the International Crops Research Institute for Semi-arid and Topics (ICRISAT); Central University of Hyderabad; NABARD, Mumbai; Cornell University, New York; Duke University, Durham; NC, USA; National Institute of Public Finance and Policy (NIPFP); International Rice Research Institute (IRRI), Manila; and Asian Productivity Organization (APO), Tokyo, before taking up the position at NCAP and IARI, New Delhi. He is also involved in working group in 12th Five Year Plan, GOI and the National Consortium of SRI (NCS).

During the past decade, Dr Barah involves in mainstreaming pro-poor agro-ecological innovations such as SRI, SWI and SCI in PPP mode. Through policy advocacy, he accomplished some impact among the policy makers and research leaders. Dr Barah published a number of research papers in national, local and international journals, technical reports/bulletins and books.

Amb. C S Dasgupta

Distinguished Fellow, TERI

Chandrashekhar Dasgupta was an Indian Foreign Service officer from 1962 to his retirement in 2000. He served as Ambassador to the European Union and

Belgium (1996–2000), Ambassador to China (1993–1996), DPR & Ambassador at the United Nations (1986–1999), High Commissioner in Tanzania (1984–86), High Commissioner in Singapore (1981–83), etc.

He has led the Indian delegation in the preparatory negotiations for the Rio Summit on Environment and Development (1992) as well as the UN Framework Convention on Climate Change. He returned to the global negotiations on climate change during 2002–2010. He is currently a member of the Prime Minister's Council on Climate Change. He is also a member of the UN Committee on Economic, Social and Cultural Rights, Geneva, and Distinguished Fellow at The Energy and Resources Institute (TERI), New Delhi.

His interests include diplomatic history. He is the author of War and Diplomacy in Kashmir, 1947–48, and numerous essays and articles on international affairs and global environmental issues. Amb. Dasgupta has been awarded the Padma Bhushan by the President of India.

Ms Debashree Mukherjee

Chief Executive Officer (CEO) of Delhi Jal Board

Ms Debashree Mukherjee is the Chief Executive Officer (CEO) of Delhi Jal Board Water, which caters to the needs of 1.68 lac people of Delhi and National Capital Territory. She is also the Member Secretary, Delhi Pollution Control Committee and the Additional Director – Education.

She has been the Urban Advisor in the Department of International Development (India), Government of U K. She provided technical advice and managed all urban governance programmes in DFID's portfolio in India. She extended support to national urban renewal programs and the Senior Infrastructure Advisor on Infrastructure, particularly Water and Sanitation policy. She has held various important positions in the Government of Delhi, Goa, and Arunachal Pradesh. She was involved in the Acquisition of land for urban infrastructure projects like the Delhi Metro. She was also Joint Secretary Planning and Development in the Govt. of Arunachal Pradesh.

She holds a post graduate degree in Water and Environmental Management from UK and also a Master's degree in English from JNU, Delhi.

Dr Dinesh Kumar Goyal

Dr Goyal is an IAS Officer of 1981 batch and served Government of Rajasthan in various capacities. He has a Ph.D. from Birla Institute of Technology & Science, Pilani, and has done his M.Sc. from London School of Economics, on 'Social Policy Planning with specialization in Gender Development'. He has also been Eisenhower Fellow from India for Good Governance: Public Services, in the year 1997.

He is currently Additional Chief Secretary, Horticulture. He was the Principal Secretary, Horticulture Department, Chairman, International Horticulture Innovation & Training Centre (IHITC). He has held several important portfolios in Rajasthan.

He has held several important positions such as: Joint Secretary, BARC Officers Association, Chairman, Computer Society of India, Jaipur Chapter. Leadership positions for implementation of social programs relating to Women/ Child Welfare, Relief Operations, Rural/ Urban Development, Drinking Water, Medical/Health, Afforestation, Old-Age Pension, Poverty Alleviation, Population Control, Public Grievances, Computerization and Modernization, etc. He has several books, numerous policy papers, notes, articles for Government use to his credit.

Mr Dipak Gyawali

Mr Dipak Gyawali is currently 'Pragya' (Academician) of the Nepal Academy of Science and Technology and Chair of the non-profit Nepal Water Conservation Foundation. As a cultural theorist upholding the idea of institutional pluralism requiring all three styles of organizing, he conducts interdisciplinary research on the interface between technology and society.

A Moscow-trained hydroelectric power engineer and a Berkeley-trained political economist, he has initiated reforms in the electricity and irrigation sectors during his tenure as Nepal's Minister of Water Resources in 2002/2003. He has published extensively at national and international levels and serves/has served on many international advisory panels, including UNESCO's World Water Assessment Program, IDS Sussex's STEPs Centre, Mekong's MPower, Pacific Northwest National Lab, and Coca Cola.

Dr Eddy J Moors

Head, Research group 'Climate Change and Adaptive Land & Water Management (CALM)', Alterra Wageningen University and Research Centre, The Netherlands

Dr Eddy J Moors is Head of the research group 'Climate Change and Adaptive Land & Water Management (CALM)' of Alterra Wageningen University and Research Centre. Before coming to Alterra, he worked for the World Meteorological Organization in Africa and the Caribbean. Research topics of Alterra are Green Economic Growth, Green Adaptation, Green Cities and Sustainable Food Security. The expertise within the CALM group covers a broad range, from physical oriented to more socio-economic expertise. The group focuses on developing innovative solutions to improve the quality of life within sustainable boundaries. Mitigation of problems caused by climate change and socio-economic changes are key in the CALM research agenda. His background in hydrology and climate change research both on mitigation and on adaptation topics makes him a key player in this field. He has extensive experience in integrating different disciplines to tackle research questions that ask for an inter- and trans-disciplinary approach. Dr Moors is and has been coordinator of numerous national and international projects ranging from Europe, Africa, India, Bangladesh, East-Siberia to USA and Brazil. He is presently lecturing at Utrecht University (Hydrology, Climate Change and Fluvial Systems), Wageningen University (Terrestrial Water and Energy Balance) in The Netherlands and has given guest lectures in Japan and India.

Dr Ganesh Pangare

IUCN, Bangkok, Thailand

Dr Ganesh Pangare is currently the Coordinator, Regional Water and Wetlands Program, IUCN, Asia Regional Office, based in Bangkok, Thailand. His main area of work over the last two decades has been in people-centred water interventions, watershed management, participatory irrigation management, wetlands management, integrated water resources management etc. His present work is focussed on water sector reforms and water governance at national, regional and global levels, with a focus on natural infrastructure.

Dr Pangare was a member of the High Level Working Group on Watershed Development, Rainfed Farming and Natural Resource Management of the Planning Commission, Government of India, for the 10th Five Year Plan (2003–2007). He is a Fellow of the London-based Leadership for Environment and Development (LEAD) International Program. He is also a Fellow of the Ashoka Innovators for the Public Program based in Washington, and a Fellow of the East-West Centre, Hawaii. He is also an Advisor to the Water Portfolio of the Acumen Fund, USA. He has written more than 10 books on water related issues. He has also published several monographs and papers in reputed journals and magazines.

Mr Gourishankar Ghosh

Chairman, Waterlife

Mr Gourishankar Ghosh is currently the chairman and CEO of FXB India Suraksha, a non-profit company working for the vulnerable children specially affected by HIV/AIDS. Before his retirement from the United Nations in 2006 he was the Executive Director of Water Supply and Sanitation Collaborative Council (WSSCC), WHO, Geneva. It is then he launched the global WASH campaign in the year 2000 resulting ultimately in the recognition of the sanitation goals as one of the UN millennium goals in the World Summit for Sustainable Development (Earth Conference), Johannesburg in 2002 where he was one of the selected few plenary keynote speakers. With his concept and encouragement the African Sanitation Conference (AFRICASAN) and South Asian Sanitation Conference (SACOSAN) started in Africa and South Asia.

Mr Ghosh is a Geologist and Economist by academic training. A former member of the Indian Administrative Service of Gujarat Cadre he headed Gujarat Mineral development Corporation, Gujarat Dairy Development Corporation and was Director Geology and Mining. He was the Chairman of Gujarat Water Supply and Sewerage Board and Secretary Drinking water Supply when the severe drought of 1985 was handled so well in Gujarat that he was appointed as the founder Mission Director of the Rajiv Gandhi National Drinking Water Mission, India (1986–1991). He was recently appointed by the Govt. of India as the Chairman of Technology Expert Group

for rural drinking water supply. He has several articles, speeches and books on water, sanitation and development to his credit.

Prof. Hector M Malano

Prof. Malano has 35 years of experience in river basin management, water allocation and operation and management of irrigation systems. He has carried out extensive research in areas of water allocation in river basins under conditions of scarcity and with strong competition between water uses. He has conducted extensive research with strong focus on basins with extensive irrigation development including among others the Murray-Darling Basin, Australia and the Krishna River Basin, India. In recent years, his research has focused on the impact of climate change on water security and climate change adaptation processes. He has published authored and co-authored over 180 refereed papers. He is currently the Joint Editor of the Journal of Irrigation and Drainage, Wiley Publishing.

Prof. Malano has carried out consulting work for State agencies in Australia and a number of long- and short-term technical assignments for overseas bodies including the Australian Centre for International Agricultural Research (ACIAR), Australia, the Agency for International Development (USA), the World Bank (USA), the Food and Agric Organization of the UN (FAO). He has also served as Vice-President of the ICID and Chairman of the Committee for Technical Activities of the International Commission on Irrigation and Drainage.

Dr Herbert Acquay

Dr Herbert Acquay, a Ghanaian national, joined the World Bank in 1993 and has held various positions in the East Asia and Africa regions of the Bank. He was appointed the Sector Manager for the Environment, Water Resources and Climate Change Unit in the South Asia Region in November 2010 (since then changed to Environment and Water Resources Unit). Before joining the World Bank, Dr Acquay worked for the Government of Ghana, and local and international NGOs, including Friends of the Earth- Ghana, the largest environmental NGO in Ghana, which he founded in 1986. Dr Acquay holds a B.Sc. degree in Natural Resources Management from Kwame Nkrumah University of Science and Technology in Ghana, and M.Sc. and Ph.D. degrees in Natural Resource Policy and Management from Cornell University in the United States.

Mr Joe Madiath

Executive Director, Gram Vikas

Mr Joe Madiath has been the Executive Director of Gram Vikas, an NGO based in Odisha. Gram Vikas, today, is one of the largest NGOs in the State, reaching out to over 100,000 indigenous and poor families living in over 1,200 rural habitations with a population of over 400,000 people as on 31st March 2013.

Gram Vikas and Mr Joe Madiath have received several national and international awards in recognition of their work, including the Allan Shawn Feinstein World Hunger Award for 1995-96 from Brown University, USA; the Dr K S Rao Memorial National Award, 1998 for outstanding Lifetime contribution to the development of new and renewable sources of energy from the Solar Energy Society of India. Gram Vikas' 'total habitat development model' has been awarded the Most Innovative Development Project Award, 2001 (by the Global Development Network), the World Habitat Award, 2003 (by the Building and Social Housing Foundation, UK), Tech Museum Laureate in Economic Development (by the Tech Museum of Innovation, San Jose, California), Kyoto World Water Grand Prize, 2006 at the 4th World Water Forum (by the Kyoto Municipality and the Soroptimist International) and Skoll Award for Social Entrepreneurs 2006 by Skoll Foundation, California. In January 2010, Mr Joe Madiath was awarded LOK SAMMAN for the year 2009 for his 40 years of dedicated service in Socio-Economic Development of the Rural poor in Odisha by the Common man's Newspaper, Orissa.

Dr Kamal Vatta

Dr Kamal Vatta is Associate Professor of Economics in the Department of Economics and Sociology at Punjab Agricultural University (PAU), Ludhiana, India. He is a Ph.D. in Agricultural Economics with Gold Medal from PAU and was awarded DSE Fellowship to complete six-month Diploma in Agricultural Research for Development from the

International Centre for Development Oriented Research in Agriculture (ICRA), Wageningen, The Netherlands in 2002. He has been the visiting scientist to the Kazakh National Agrarian University, Kazakhstan and Research Institute of Economics and Business Management (RIEB), Kobe University, Kobe, Japan. He has also been invited by the Institute of Developing Economies (IDE), Chiba, Japan to deliver lectures on rural non-farm employment as well as on agriculture–industry linkages in improving rural livelihoods. He was also invited to Columbia Water Centre, Columbia University, USA to deliver talks on the issues of groundwater sustainability in Punjab, India.

Dr Kamal Vatta published more than 50 research papers in the peer-reviewed journals and completed 20 research projects funded by international and national organizations such as Columbia Water Center, APN, Ministry of Agriculture, Govt. of India and Indian Council of Agricultural Research. He is currently the Principal Investigator of the project "Innovations for Reversing Ground Water Depletion and Promoting Secure Agricultural Incomes in Punjab and other parts of India" funded by the Columbia Water Center, USA and "Capacity-building in National Planning for Food Security" funded by the UNEP. During the last three years, he has reached more than 7,600 farmers belonging to about 150 villages in Indian Punjab.

Mr Lalit Mohan Sharma

Mr Lalit Mohan Sharma is a Group Leader (Natural Resource Management Center) at Institute of Rural Research and Development (IRRAD), an initiative of Sehgal Foundation. He is a graduate civil engineer and holds a Masters of Technology (Management & Systems) from Indian Institute of Technology, Delhi. He is Member of "International Network on Household Water Treatment and Safe Storage".

Under his leadership, IRRAD's water management programme has been widely recognized. The organization has won UNESCO-Water Digest 'Best Water NGO' award for 'Revival of Rural Water Resources' in 2009 and 2010 and 'Best Water NGO' for 'Rain Water Harvesting' 2008; 'Ground Water Augmentation' Award by Government of India in 2011; FICCI Water Award 2013: first prize under NGO category for excellence in water management and conservation. He has presented several papers on issues related to integrated and sustainable development of water resources and sanitation.

Mr Mahesh Singh

Mr Mahesh Singh is an Indian Forest Service (IFS-1990 Batch) Officer of Gujarat Cadre. He has expertise in ecological issues (Wildlife & Forest Ecosystem Management), sustainable development, multidimensional environmental negotiations, and urban reforms.

In the beginning of his career, Mr Singh has managed the Gir Protected Area—famous for last basin of Asiatic Lion. During his tenure, he has implemented Global Environment Facility (GEF) funded Eco-development Project and the Gir Protected Area (PA) got the "Best Managed Protected Area Award" in the country. Played the pivotal role in reducing anthropogenic pressure and reviving the research activities in core and applied field of wildlife biology.

Mr Mahesh Singh has managed one of the finest forests of the country, the Dangs Forest of Gujarat State. He was able to bring in perceptible changes in forest management through multi stakeholder consultation, people's participation and bringing an element of transparency in management.

He has also embarked into the domain of urban development and served at both the levels—at policy framework and project implementation. He has guided and presided over the committee which has formulated one of the largest environmental projects—Solid Waste Disposal (including land fill sites) project for 159 Municipalities of Gujarat State. He has initiated the concept of reform based development in the urban areas of the State and closely worked for implementation of reforms like – Area based Property Tax, Double Entry, Accounting System, Slum Policy and Heritage Policy of the State. He has also formulated a programme for urban poverty elevation—Garib Samridhi Yojana in the State. During his assignment as Deputy Municipal Commissioner, he has worked for inclusive growth and implemented successfully the Slum Rehabilitation Project with livelihood support program—UMEED. He has also implemented one of the largest integrated housing projects for urban poor under BSUP – JNNRURM.

Dr Manish Kumar

Dr Manish Kumar is a Senior Institutional Development Specialist with the Water and Sanitation Programme of the World Bank in New Delhi. Dr Kumar started his career in 1991 as an Indian Administrative Service Officer and has held positions like District Magistrate and Collector, West Tripura District, Agartala; Secretary to the Chief Minister of Tripura; Additional Secretary, Department of Finance and Secretary, and Department of Power, Government of Tripura. He holds a Masters degree in Public Administration from Kennedy School of Government, Harvard University, USA and Ph.D. in Public Policy from The George Washington University, USA. Dr Kumar has also worked with UNICEF as a Senior Water and Environmental Specialist.

Prof. Michael Porter

Prof. Michael Porter holds a Ph.D. from Stanford University. Prof. Porter also taught at Yale (Irving Fisher Professor, 1978-9), Stanford, Monash and ANU. He was the founding Executive Director of the Centre of Policy Studies (CoPS) at Monash University in 1980. The Centre led pioneering work on energy, water, taxation and telecommunications reform. He was awarded a Commonwealth Research Centre of Excellence Award—$2.6 million over 6 years, to lead this work on economic reform. The reform agendas—such as the Reform of State Owned Enterprises in Victoria, Energy Pricing Issues in Victoria, National Priorities Project, the Markets and Environment Project, New Strategies for the Energy, Water and Transport Sectors, all formed a basis for Project Victoria—and were all influential and largely adopted by the government in the 1990s. He was a Division Director, Infrastructure, Macquarie Bank from 1998–2002. He formed the reform institute and consultancy Tasman Institute and Tasman Asia Pacific in 1990.

In 2010, Prof. Michael Porter formed The Australian Water Project, jointly between CEDA Research and Policy, Dr John Langford, Uniwater (Melbourne and Monash Universities) and Prof. John Briscoe, Harvard University. He has held numerous advisory and consultancy roles on water institutions and water policy, World Bank, Asian Development Bank and AusAID projects on water governance, restructure, privatization and investment in the Philippines, China, India, Indonesia, Bangkok, Thailand, Vietnam, Fiji, and Samoa.

His current major project is as Director, "Desalination and Economic Development in Australia – The Bigger Picture", 2012–2014, a project for the National Centre of Excellence in Desalination in Australia, through the Deakin University Centre for Regional and Rural Futures (CeRRF).

Mr Mohit Dhamija

Mr Mohit Dhamija has more than 11 years of experience in the field of EHS comprising of EHS Management Systems Implementations, regulatory law applications, sustainability including water and carbon footprinting, certified auditor having more than 200 man-days of audit experience.

He is presently working with the Glaxo SmithKline (GSK) Consumer Healthcare Limited as Manager-EHS (part of the Corporate EHS Function, EHS Lead for External Supply Sites in India, Environment and Sustainability Lead for primary sites in India and Sri Lanka). He has a B. Tech. in Civil Engineering and M. Tech. in Environmental Science and Technology.

Ms Nafisa Barot

Executive Director, Utthan

Ms Nafisa Barot is the Executive Director of the NGO Utthan, which is based in Ahmedabad, Gujarat, India. She is also a Member of the Executive Committee, CAPART - Government of India, Member National Alliance of Women's Organization (NAWO), Member Task force committee, National Bank for Agriculture & Rural Development (NABARD), Member Executive Committee Mahila Samakhya, Gujarat, Member JANPATH - a network of voluntary organization based in Gujarat.

She is on the Board of Directors of Development Support Center (DSC), MAHITI, Rural Development Center, Dholera, a Board Member of India WASH, Founder "PRAVAH" - a network of voluntary organizations, technical experts, academicians and planners working on drinking water issues and alternatives at state level. One of the initiators and promoters of this group; Board Member

of Water Energy and Sanitation Network (WES-Net); Member of Solution Exchange (Water and Sanitation); Member of Working Group on Women's Land Rights Organisation (WGWLO).

She has received special recognition in 1989 by Aga Khan Foundation AIF (America India Foundation) Summit on "Women Empowerment" October 2004. She was honoured through T.N. Khushoo Memorial Award (2005) by Ashoka Trust for Research in Ecology and the Environment for exemplary work in conservation and sustainable development for the year 2005. She has several articles and papers to her credit.

Dr Neena Rao

Director-Projects & Partnerships, SaciWATERs, Hyderabad

South Asia Regional CapNet UNDP Network (SCaN) Manager and Board Member

Director - Projects and Partnerships, SaciWATERs

Dr Neena Rao brings to SaciWATERs her varied and diverse national and international experience in academia, research, training and implementation in the development field. She has multidisciplinary training—spanning Economics, History, Natural Resource Management Policies, and Environmental Governance. Having worked with diverse groups ranging from American Indians (Indigenous people of Americas), African Americans, and Latin Americans in the US to the indigenous people of Nagaland, Andamans , interiors of AP and MP in India she is also very alive to diversity (geographical and cultural) concerns and sensitivities while designing and implementing developmental projects.

Her book, "Forest Ecology of India: Colonial Maharashtra" has been published by Foundation Books, Cambridge University Press, India. She has also published several papers in Journals and Books of national and international repute. Her recent publication has been a chapter: Muslims of Hyderabad: land locked in the walled city / in a book, Ed by Laurent Grayer & Christophe Jaffrelot, Muslims of Indian Cities: Trajectories of Marginalization, Ed: by Harper Collins, India & Hurst Publishers UK.

Mr Onno Rühl

World Bank Country Director, India

Mr Onno Rühl, a Dutch national, is currently the World Bank Country Director for India. Prior to this assignment, he was the Director for Operations Services and Quality in the South Asia Region of the World Bank, and was responsible for the Quality Assurance, Development Effectiveness as well as core fiduciary functions for the South Asia portfolio of the World Bank. Before that, he was the Country Director for Nigeria at the World Bank. In this capacity he was responsible for managing the World Bank's Nigeria portfolio valued at $3.4 billion, as well as for the dialogue with all layers of Government and civil society in Nigeria. Earlier, he was Manager for Results and Learning in the Africa Region of the World Bank. The unit has worked to help partner Governments improve their management for results focus, monitoring and evaluation, and statistical systems. The Unit has also put a strong focus on improving the results focus of projects financed by the World Bank in Africa.

Earlier, Mr Rühl was Country Manager for the Democratic Republic of the Congo, as well as Lead Private and Financial Sector Development Specialist in the Africa and Europe and Central Asia regions. His most important achievement during this time was overseeing the World Bank's support to the creation and financing of the African Trade Insurance Agency (ATI).

Before joining the World Bank's staff, he was Economic Secretary in the Royal Netherlands Embassy in Washington DC, Alternate Director on the Board of the Multilateral Investment Guarantee Agency and Desk Officer in the Multilateral Development Cooperation Department of the Netherlands Ministry of Foreign Affairs. He started his career teaching economics in Alkmaar, the Netherlands.

Dr Peter G McCornick

Dr Peter G McCornick is Deputy Director General at the International Water Management Institute, based in Colombo, Sri Lanka, and leads IWMI's research for development programme. Throughout his career, his focus has been on developing sustainable solutions for water resources management issues. He has led research and development programmes on water,

agricultural and the environment in Africa, Asia and the Middle East. Present areas of particular interest include water and food security, water-food-energy, water reuse, irrigation management, and water and climate adaptation. Dr McCornick is a licensed professional civil engineer in Colorado, USA, a member of the American Academy of Water Resources Engineers (AAWRE), a senior fellow at Duke University's Nicholas Institute for Environmental Policy Institute, and an affiliate faculty in the Warner College of Natural Resources, Colorado State University. He has publishing over 30 peer reviewed publications, and regularly presents at major international events.

Dr Prasanta K. Kalita

Professor and Leader- Soil & Water, Agricultural & Biological Engineering Department, University of Illinois at Urbana-Champaign (USA)

Dr Prasanta K. Kalita is Professor and Leader- Soil & Water, Agricultural & Biological Engineering Department, Director, ADM Institute for the Prevention of Postharvest Loss, and Assistant Dean of Research, College of ACES in the University of Illinois at Urbana-Champaign (USA). He is recognized as an international scholar, researcher, and expert in the area of water management and water quality issues. His basic research has focussed in characterizing pollutant transport pathways from source areas to the receiving water bodies, developing mathematical relationships to define transport mechanisms, and validating the relationship. His applied research includes designing and developing best management practices to control pollution and evaluating the effects of various applied field-based research to calibrate and validate computer simulation models. Dr Kalita has successfully formed and worked with multidisciplinary groups of researchers on campus, across the United States, and internationally, with collaborators in India, Lebanon, Jordan, and Sierra Leone. In 2012, Dr Kalita was the recipient of the NACTA Teaching Award of Excellence. He was honoured at the 2013 American Society of Agricultural and Biological Engineers (ASABE) International Meeting as an ASABE Fellow.

Mr Ramaswamy R Iyer

Honorary Research Professor, Centre for Policy Research, New Delhi

Mr Ramaswamy R Iyer was formerly Secretary, Water Resources in the Government of India, and in that capacity he was the initiator and principal draftsman of India's first National Water Policy in 1987. After his retirement from the Government, he was Research Professor at the Centre for Policy Research, New Delhi, where he worked on water-related issues, and in particular on cooperation on river waters by India, Nepal and Bangladesh (1990–99). He continues in CPR in an honorary capacity.

He was a member of two high-level committees set up by the Government of India to review the environmental and displacement/rehabilitation aspects of the Sardar Sarovar Narmada Project (1993–95) and the Tehri Hydro-Electric Project (1996–97), and was a member of the National Commission on Integrated Water Resources Development Plan (1997–99). He has also been a member of many other Government Committees and Commissions from time to time.

He is a member of the Programme Steering Committee for the Rajasthan State Partnership Programme with the European Commission (from 2006 onwards); and a member of the Government of India's National Council on the Artificial Re-Charge of Groundwater.

From time to time, he has done consultancy assignments for the World Bank; the World Commission on Dams (WCD); the International Water Management Institute, Colombo; UNDP, New Delhi; the European Commission; and others.

He is currently (from August 2007) a Member of the UNSGAB High Level Expert Panel on Water and Disaster, an adjunct to the UN Secretary-General's Advisory Board on Water and Sanitation.

He is presently working on putting together and editing a book titled, "Water and the Laws in India" under the auspices of CPR.

He is a contributor of papers/chapters to many books edited by others.

He has written numerous articles, papers, etc., on water resource policy, public administration, governance, and economic, political, social and cultural issues.

Dr Raphael Semiat

Professor of Chemical Engineering, Technion IIT, Dean of the Wolfson Department of Chemical Engineering, President of the Israel Desalination Society, Co-editor of Desalination Journal

Dr Semiat has done D.Sc., Technion from Israel Institute of Technology. He is currently a professor in the Chemical Engineering Department, Technion, Israel Institute of Technology, Haifa, Israel. He holds the Yitzhak Rabin Memorial Chair in Science, engineering and management. He served as the director of the Grand Water research Institute and is in charge of the Rabin Desalination Laboratory within the GWRI. He obtained his B.Sc. degree in Chemical Engineering from the Technion in 1973 and obtained his D.Sc. dissertation on MED Desalination in 1978 at the Technion. Expert in separation processes with industrial experience in IMI (TAMI), a subsidiary of Israel Chemicals Ltd, where he served as a senior research engineer and as the head of the Heat and Mass Transfer Engineering Research Department.

Dr Raphael Semiat's research interests are strongly related to the subjects of this proposal in all aspects, from basic knowledge and involvement, to the scientific aspects and up to the engineering ability to finalize the results in the process industry.

Mr Ravikumar Joseph

WSP, The World Bank

Mr Ravikumar Joseph works as a Senior Institutional Development Specialist at the Water and Sanitation Programme of the World Bank. He leads the urban water and sanitation team at WSP. He has collaborated with the Ministry of Urban Development on the National Urban Sanitation Policy, Rating of Cities and Septage Management Advisory. He has assisted several state governments in developing state sanitation strategies and preparation of the City Sanitation Plan (CSP) for Hoshangabad. Mr Joseph is currently assisting the Government of Madhya Pradesh to develop a programmatic approach for a state wide urban sanitation and the governments of Kerala and Tripura to prepare septage management strategies and pilot implementation plans. He has over 20 years of work experience and holds a doctoral degree in environmental engineering.

Mr Ravindra Sewak

Mr Ravindra Sewak is the Country Director of Safe Water Network in India. Currently, Safe Water Network has 36 safe water stations across India (AP & UP) and rain water harvesting at household level and community level in Rajasthan providing safe water access to nearly 200,000 people. He brings extensive, valuable technical and operating experience in the field of water and wastewater, bulk water processing, point of use purification system for vending machine and managing large franchise operations in the corporate sector. As Sustainability Director for PepsiCo India, he was instrumental in developing and implementing plans to attain positive water balance through annual savings of over 2.6 billion litres of water across 34 plants, a 50 per cent saving in three year leadership. In Safe Water Network, he introduced innovative concept of water containers with residual chlorine to improve water quality at homes and development of remote monitoring and sensing technology suited to rural environment. He is on the National Water Committee of CII and FICCI and a mentor in Legatum Center MIT and Santa Clara University. Mr Sewak is a B.E. in Mechanical Engineering and holds a PGDM from IIM, Ahmedabad.

Mr Ravi Narayanan

Chair, APWF Governing Council

Mr Ravi Narayanan is currently Chair of the Asia Pacific Water Forum whose secretariat is in Tokyo, Japan. He is International Mentor to the Japan Water Forum, and Chair of the Water Integrity Network, Berlin. He was a member of the World Panel on Financing Water Infrastructure (the Camdessus Panel) and the UN Millennium Task Force on Water and Sanitation. He is a life member of the Norwegian Water Academy.

At the national level he was a member of the Technical Expert Group set up by the Government of India to assess its national drinking water mission and a member of the 12th Five Year Plan Working Group on Water and Sanitation. He is an Associate of the National Institute of Advanced Studies in India.

In the not for profit sector Mr Narayanan was Asia Director at ActionAid and then Chief Executive of WaterAid. He has been a Board member (and Chairman during its early years) since the inception of Partners in Change, an organization dedicated to promoting partnerships between the corporate sector and civil society organizations, which he helped set up during his term with ActionAid. He is an advisor to the Arghyam Foundation which was set up in India to work on sustainable water and sanitation issues in India and a Trustee of Gram Vikas, both organizations working directly on water and sanitation issues with poor communities in urban and rural locations in India. He was awarded an honorary CBE by the UK Government in 2009 for water and sanitation services to poor communities in Africa and South Asia.

Dr Renu Khosla

Dr Renu Khosla is the Director of the Centre for Urban and Regional Excellence (CURE) in India. She works with slum communities in a number of Indian cities with the purpose of reimagining slum development; engineering a shift from city to people-led development. Through her work, she is strengthening capacity of local, state and national government agencies for engaging with the poor; visualizing community information using spatial (GIS) technologies; and localizing implementation strategies for building inclusive cities. She has in-depth understanding of slum communities and city development issues in India, and the relevant procedures and policies and their applications for integrated slums development. Her projects are innovative and have received several best practice awards/citations and are under replication in other cities.

Dr Robert Carr

Dr Robert Carr is a researcher, trainer and practitioner in the water science-to-technology, particularly in the field of simulation tools for integrated water management for Australia and also internationally. He has undertaken water management projects including real-time warning and operational models in the fields of data collection, hydraulic and hydrological analysis in IWRM, flood management, groundwater/surface water interaction and wet weather wastewater analysis. He has delivered more than 100 training courses and seminars in modelling for water resources management.

Mr Russell Rollason

Mr Russell Rollason is First Secretary, Development Cooperation at the Australian High Commission, New Delhi, with special responsibility for water, food and energy security. He joined AusAID in 2005. Mr Russell Rollason is an Honours Science graduate from Queensland University with a Master's degree in General Studies from the University of NSW. He is a former Executive Director of the Australian Council for Overseas Aid (1983–95) and worked as an international consultant (1995–98), principally with the Asian Development Bank. In 1998, he became a member of the Order of Australia for services to international development and humanitarian aid through ACFOA, and social justice in Australia.

Dr Sara Ahmed

Senior Program Specialist, International Development Research Centre, Canada

Dr Sara Ahmed has worked on the political economy of water in India for 20 years. She is an informed source on the connections between water, climate change, and gender issues.

Before joining IDRC, Ahmed worked with non-governmental organizations in parts of India vulnerable to drought, flood, and coastal storms. She tackled issues ranging from the impacts of climate change to the role of gender in water governance and conflicts over water. Dr Ahmed was Chair of the international Gender and Water Alliance and sat on the steering committee of the Forum for Policy Dialogue on Water Conflicts in India. She has also worked with the Institute for Social and Environmental Transition, taught for a decade at India's Institute of Rural Management, and published on many facets of water policy and gender issues.

Dr Ahmed holds a Ph.D. in environmental sociology and an M.Phil. in international relations from Cambridge University (England).

Mr Satyabrata Sahu

Jt. Secretary (Water), Ministry of Drinking Water and Sanitation, Govt. of India

Mr Satyabrata Sahu, IAS, started his administrative career in the year 1991. During his tenure, he has held various important positions of Govt. of Odisha with Sub-Collector, Collector of several districts of Odisha, Joint Secretary, Director, of various Government Departments and Municipal Commissioner in H & UD Department of Government of Odisha. He also worked as the Revenue Divisional Commissioner of the Dept. of Revenue & Disaster Management, Govt. of Odisha and as the Commissioner-cum Secretary of Dept. of Fisheries and Animal Resources Development, Govt. of Odisha. He is currently the Jt. Secretary (Water), Ministry of Drinking Water and Sanitation, Govt. of India.

Mr Surinder Makhija

As an alumnus of IIT, Kharagpur and International Rice Research Institute, Philippines, Mr Makhija is the longest-serving professional in the field of micro-irrigation in the country. He joined the field of water management in 1971 and has worked tirelessly to promote the concept of better water management and enhanced water use efficiency through micro irrigation for over 40 years with a missionary zeal. He was a member of the committee that made a presentation to Prime Minister's Office on benefits of micro irrigation in 2003 which resulted in formation of large Micro Irrigation Projects like APMIP in the country.

Member of various committees in BIS and NCPAH associated with micro irrigation, he has delivered lectures, made presentations at various forums and published a number of technical papers on drip and sprinkler irrigation systems, hydraulic rams and solar energy. He worked as a consultant to Government of Ethiopia at Addis Ababa in 2010 and is now associated with other micro irrigation projects in Africa and South-east Asia. He possesses record of accomplishment in delivering projects on time, following thorough initial conception to detailed planning, execution, final delivery and client satisfaction.

Mr Shashikant Chopde

Mr Shashikant Chopde has more than two decades of experience of working on issues of water management and more recently on linkages between water management and climate change. He has coordinated the India component of large-scale multi-country collaborative projects focussing on interface of climate resilience and water management. He works with Institute for Social and Environmental Transition (ISET)–a not-for-profit US-based organization, and has worked specifically on urban water management issues of Jaipur and Indore cities, in the context of climate change. In addition, he is currently involved in Asian Cities Climate Change Resilience Network (ACCCRN) programme. During his career, he has been associated with organizations such as VIKSAT and Winrock International India, and has worked on projects ranging from implementation of water management practices, research and policy advocacy. Mr Chopde is a Post Graduate in Civil Engineering with specialization in Water Resources Management.

Mr Shri Prakash

Distinguished Fellow, TERI

Mr Shri Prakash joined TERI in July 2011 as Distinguished Fellow, after a long and distinguished service in Indian Railways. His association with TERI goes back to 2003–2004 as a Visiting Senior Fellow.

His career with the Indian Railways spanned over 37 years where he held numerous key positions in different Zonal Railways and the Railway Board. Mr Shri Prakash retired as Member (Traffic), Indian Railway Board and Secretary to Government of India in December 2009. Upon retirement he was appointed as Chairman, Standing High Powered Committee on Infrastructure Planning, Business Development and Project Monitoring on Indian Railways. During his tenure, the Committee prepared a comprehensive report on future strategies for Indian Railways.

He was Chairman of various public sector undertakings such as Container Corporation of India (CONCOR), Indian Railway Catering & Tourism Corporation Limited (IRCTC), and Pipavav Railway Corporation Ltd (PRCL)

and was also Chairman of the Executive Committee, Centre for Railway Information Systems (CRIS).

He has been associated with number of research studies relating to transport, energy and environment in TERI.

Dr Smita Misra

Dr Smita Misra is the Lead Water and Sanitation Specialist, World Bank, India. She did her doctorate in Economics from the Delhi School of Economics, Delhi University, and has more than 15 years of experience in the Water Supply and Sanitation Sector. As part of the South Asia Sustainable Development Unit of the World Bank, she has been leading the preparation and implementation of a number of projects and analytical and advisory sector work in India. Currently, she is preparing a large Rural Water Supply and Sanitation Project, in collaboration with the Ministry of Drinking Water Supply and Sanitation, India. She has also worked in Bangladesh, Pakistan, and Kenya. Some of the recent analytical and advisory work includes improving urban water supply and sanitation services–'Lessons from Business Plans for Maharashtra, Rajasthan and Haryana and International Good Practices' (World Bank, 2012); 'Review of Twenty Years of World Bank Support to Rural WSS Sector in India' (World Bank, 2012); 'Review of Effectiveness of Rural Water Supply Schemes in India' (World Bank, 2008); 'India Water Supply and Sanitation–Bridging the Gap Between Infrastructure and Services' (World Bank, 2006).

Prof. Stuart White

Prof. Stuart White is Director, Institute for Sustainable Futures at the University of Technology, Sydney where he leads a team of 60 researchers who create change towards sustainable futures through independent, project-based research. With over 30 years of experience in sustainability research, Prof. White's work focuses on sustainable cities, infrastructure and improved decision-making. Prof. White has undertaken research in the area of urban water, water efficiency, least-cost planning in the water industry and distributed water systems since 1992, and was the editor and main author of the first WSAA Guide to Demand Management for Water Utilities. He has worked on projects associated with Sydney Water since 1995 (the Sydney Water Project: Water Efficiency) and led the development of the first end-use model and options analysis for meeting operating license consumption targets starting in 1997.

Prof. White has written and presented widely on sustainable futures and is a regular commentator on sustainability issues in the media. He is recognized internationally for his work in integrated resource planning for the urban water industry, and has worked in all mainland states and territories and internationally, particularly in Spain, the Middle East and North Africa. He has advised water utilities and all levels of government on water planning, including a NSW Cabinet Sub-committee for the Metropolitan Water Plan.

In 2012, he was awarded the Australian Museum Eureka Prize for Environmental Research. He is Deputy Chair of the IWA Specialist Group on Efficient Urban Water Management, and the Australian Alliance to Save Energy.

Dr Sudhir Krishna

IAS, Secretary, Ministry of Urban Development, Government of India

Dr Sudhir Krishna belongs to the Karnataka Cadre of IAS (1977 Batch) took over as Secretary, Ministry of Urban Development on 10th August, 2011. Before this, he was Additional/Special Secretary in the Ministry of Panchayati Raj. His earlier assignments include Joint Secretary, Ministry of Fertilizers and in the Central Finance Commission; Senior Deputy Director in the LBS National Academy of Administration, Mussoorie; Principal Secretary, Public Works, Ports & Inland Water Transport, Karnataka; Metropolitan Commissioner, Bangalore; Commissioner of Commercial Taxes, Karnataka; Divisional Commissioner, Gulbarga; Chief Secretary, Dharwar Zilla Parishad; Deputy Commissioner, Dakshin Kannada (Mangalore); Director of Sugar, Karnataka, etc. He holds a Master's Degree in Physics from Banaras Hindu University, another Master's Degree in Public Management from the Carnegie Mellon University, Pittsburg (USA) and Ph.D. in Public Finance from the Centre of Federal Studies, Jamia Hamdard, Delhi. He has published several articles and a few books on issues relating to various aspects of public administration and inter-government fiscal relations. His latest book relates

to Finance Commission Transfers in India, which was also the subject matter of his Ph.D. thesis.

Mr Sujoy Mazumdar

IFS, Director (Sanitation), Ministry of Drinking Water and Sanitation

Mr Sujoy Mazumdar is working as the Director, Sanitation in the Ministry of Drinking Water and Sanitation, Government of India. He is 1991 batch IFS officer of Madhya Pradesh cadre. Prior to this position, he was the Director, Drinking Water in the same Ministry. He has extensive experience in the Drinking Water and Sanitation sector and has held various important positions in the state of Madhya Pradesh. He has many articles and publications to his credit.

Ms Sumedha Kataria

Additional Director, Government of Haryana

Ms Kataria served as lecturer in English at F.C. College, Hisar for seven years. During her term as lecturer, she worked as Programme Officer N.S.S., successfully organized Literacy Campaign, Cleanliness & Sanitation and Health awareness campaign, Eye Donation Pledge Campaigns, Blood Donation Camps, Youth Leadership Training Camps.

She joined Haryana civil Services (HCS) in 1992 and has held various posts such as CEO- KDB, City Magistrate, SDM, MD Sugar Mills, Registrar, BPS Women University, etc. Presently she is posted as Additional Deputy Commissioner, Kurukshetra. She took up projects related to Rural Sanitation Health for all Family Planning, Women Education and Women Empowerment and spread of Literacy. Her work was highly appreciated by Senior Officers of the Govt. of Haryana, Govt. of India as well as by the social, Religious and Voluntary Organizations and Individuals. Impressed by her work as BDPO, She was appointed as CEO, Kurukshetra Development Board on deputation. There also she made a mark and relentlessly worked to bring Kurukshetra on tourist map of India and 'Gita Jayanti' -Kurukshetra Utsav -a national level festival.

As ADC, Kurukshetra, she was instrumental to bring about a sea change in the sanitation movement. 300 out of 378 Panchayas of the District have been awarded the "Nirmal Gram Puraskar" by the President of India. She has piloted solid waste management project in rural areas of district Kurukshetra : 'Kachre se kamaee' and successfully implemented in 32 villages during the tenure as ADC, Kurukshetra.

Dr Suresh Kumar Rohilla

Dr Suresh Kumar Rohilla is the Programme Director–Water Management at Centre for Science and Environment (CSE), New Delhi since April 2010.

He directs the Centre of Excellence in Sustainable Water Management Area, Ministry of Urban Development and the National Key Resource Centre, Ministry of Drinking Water Supply and Sanitation, Government of India activities at the CSE. The activities include policy advocacy, research and capacity-building aimed at mainstreaming sustainable and affordable water/ wastewater management practices including water efficiency/conservation and (re)use in India. He holds a doctoral degree from Queen's University Belfast, UK. He is a recipient of the Fulbright Nehru Environmental Leadership Fellow award (2012-13) and was affiliated at University of California Berkeley. Previously, he was also awarded the British Chevening Young Indian Environment Managers Award (2001) and was trained in the area of Environmental Management in UK.

Some of his previous assignments include–Director, Environment & Development, WWF India (2008–2010), Associate Professor in Environment Area–Administrative Staff College of India (ASCI), Hyderabad (2007–08), Lecturer in Sustainability and Environmental Management–University of Bradford, UK (2006–07), Assistant Director (Technical), National Capital Region Planning Board, Ministry of Urban Development (1997–2002) and Director, Natural Heritage Division at Indian National Trust for Art and Cultural Heritage (INTACH), New Delhi (1994–97). He is an active member of various national/international committees, professional bodies, think tanks and regularly writes in the national/ international peer reviewed journal and books.

Ms Tulasi Maddineni

Ms Tulasi Maddineni is a qualified Chartered Accountant and an IAS officer of 2005 batch, Karnataka Cadre. She has worked in the urban development and rural development departments in the field level and is presently Chief Executive Officer of Dakshina Kannada Zilla Panchyat.

Mr D Unnikrishnan

Senior Advisor, GIZ, New Delhi

Mr Unnikrishnan is the Senior Advisor of Climate Change (Mitigation & Adaptation). He has undertaken two state level pilots on Climate Proofing of Catchment Based Watershed Development Programme of Tamil Nadu and Rajasthan. He has also prepared the Project Design Document (PDD) & steered the process for the first registered Reforestation Clean Development Mechanism (CDM) project of NABARD at Koraput district of Orissa. As a Programme Manager - Social Forestry and Sustainable Practices, ITC Ltd, he has been the Manager for the multi-stakeholder Social Forestry Project in Andhra Pradesh & Karnataka. He has also played a major role in registering India's first and World's second large scale Reforestation Clean Development Mechanism (CDM) project.

He has been the Programme Officer WILDLIFE TRUST OF INDIA (WTI), and has worked with PRAGYA, Agriculture & Rural Development Through Rapid Action (ARDRA).

Mr William Kingdom

Lead Water and Sanitation Specialist, The World Bank

Mr William Kingdom started his career as an engineer working on water supply and irrigation projects in the Middle East and South East Asia before taking a Masters in Economics and moving to the Water Research Centre (WRc), the UK's central research organization for the water industry. At WRc he managed programs in the UK and North America on sector regulation, asset management, GIS, private sector participation, and performance benchmarking. He joined the Bank in 1999 where he established IBNET, the world's largest utility performance database, and lead research projects on public utility reform, sector consolidation, regulation and town water supplies. He moved to East Asia and Pacific region working on Vietnam, Indonesia, Philippines and China developing a range of output performance based initiatives, on city drainage and urban environmental improvement projects, and working with the local private sector to deliver water services in small towns. He now works in South Asia supporting the Bank's water and sanitation teams across the region. He is task manager for the project currently under preparation to upscale the successful 24X7 pilots in Karnataka.

Dr William Young

Lead Water Resources Management Specialist, World Bank, New Delhi

Dr Young recently joined the World Bank as a Lead Water Resources Management Specialist and Programme Leader for the South Asia Water Initiative (SAWI)–a partnership between the Bank and the government of the United Kingdom, Australia and Norway. SAWI aims to strengthen water management in the major river basins of the Himalayas in South Asia to deliver sustainable, fair and inclusive development and climate resilience. Prior to joining the Bank, Dr Young was the Director of the CSIRO Water Flagship–Australia's premier water research partnership spanning, urban water, environmental water, surface and groundwater assessments and modelling and IWRM research. He has extensive experience in delivering science to inform policy and has been deeply involved in the water reform journey in the Murray-Darling for more than a decade. He is internationally known for research in environmental flows and has advised governments in Australia and elsewhere on environmental flows for many years. He led the landmark Murray-Darling Basin Sustainable Yields study–a comprehensive assessment of water resource availability including assessments of climate change impacts, surface-groundwater connectivity and environmental impacts. As Director of River Basin Modelling at the Murray-Darling Basin Authority, he established the team and modelling framework to undertake the hydrologic and environmental analysis to guide the development of the first Murray-Darling Basin Plan. Dr Young remains a non-executive Director of the non-for-profit company waterAustralia.

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Mr Ashok Jaitly, Distinguished Fellow and Director,
Water Resources Division, TERI

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Dr Girija K Bharat, Fellow and Area Convenor, WRPM, TERI

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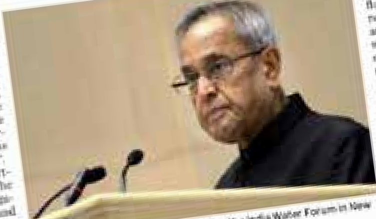
President calls for better utilisation of wa[ter]

Staff Reporter



President Pranab Mukherjee addressing the India Water Forum in New Delhi on Monday.

NEW DELHI: President Pranab Mukherjee on Monday called for devising a "broad over-arching" national legal framework that will pave way for essential legislation on water governance in the country. He described the current legal framework pertaining to water in India as "non-uniform and inadequate".

Mr. Mukherjee said a concerted effort is required to make the water sector policies and regulations "clear, coordinated and comprehensive" to be able to mitigate the impact of the looming water crisis.

...framework on wat[er]

New Delhi: Amid prediction of acute water shortage in the country by 2050 due to limited potential of 'utilizable' quantity of this resource, President Pranab Mukherjee on Monday called for a broad over-arching "national legal framework" to deal with the situation and appealed to people to work towards cutting down wastage.

Pranab Mukherjee

President for over-arching law on water use

Our Bureau

New Delhi, Oct. 28

President Pranab Mukherjee on Monday called for an over-arching legal framework on water use and management.

Inaugurating the three-day India Water Forum 2013 here, organised by The Energy and Resources Institute (TERI) with support from the Urban Development Ministry, the Drinking Water and Sanitation Ministry and World Bank's Water and Sanitation Program, Mukherjee said concerted effort was required to make policies and regulations clear, co-ordinated and comprehensive in the water [sector] with respect to water use, especially in agriculture.

"Our irrigation system has to encourage judicious use of water."

"Our irrigation system has to encourage judicious use of water and efforts at recycling water and reuse of waste water have to be doubled," he said, adding that rainwater harvesting had to be popularised by dovetailing it with rural development schemes.

Mukherjee called for a paradigm shift from "water resources development" to "integrated water resource management".

Minister of Water Resources Harish Rawat said the Government was committed ... solutions, adding ... declared 2013 as "Water Conservation Year" to sensitise public opinion about the importance of efficient use and conservation of water.

Industries and municipalities need to be mandated to adopt water recycling practices, he said. "We are trying to address these challenges through the National Water Mission ...to enhance water use efficiency by 20 per cent," he added.

R.K. Pachauri, Director-General, TERI, warned of "water stress" in India and called for urgent institutional measures and policy changes to deal with the situation.

editin@thehindu.co.in

[...]or nat'l framework [to red]uce water wastage

news शॉट्स

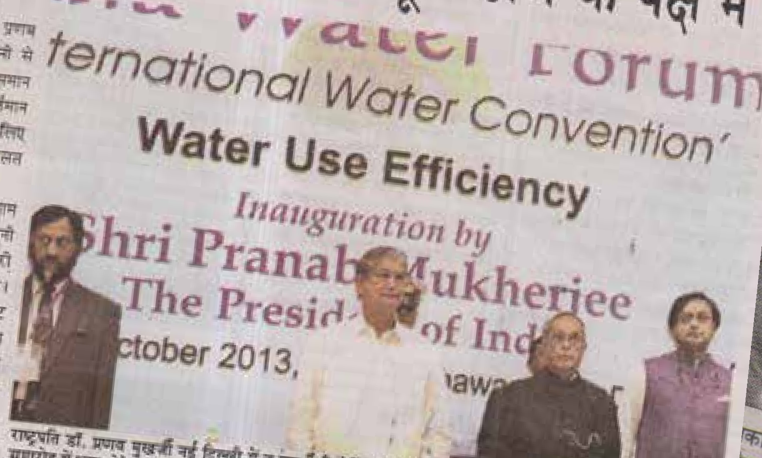
सम्मान

राष्ट्रपति पानी पर व्यापक कानूनी ढांचे के पक्ष में

विशेष प्रतिनिधि

नई दिल्ली, । राष्ट्रपति प्रणब मुखर्जी ने आज कहा कि पानी से जुड़ा वर्तमान कानूनी ढांचा असमान और अपर्याप्त है तथा उन्होंने वर्तमान जटिल स्थिति से निपटने के लिए व्यापक कानूनी ढांचे की वकालत की।

उन्होंने कहा, पानी के आम सिद्धांतों के व्यापक राष्ट्रीय कानूनी ढांचे से देश में जलशासन पर जरूरी कानून का मार्ग प्रशस्त हो सकता है। वह यहां द एनर्जी रिसोर्सेज इंस्टीट्यूट द्वारा आयोजित द्वितीय जल मंच का उद्घाटन करने के बाद अपना संबोधन दे रहे थे। द एनर्जी रिसोर्सेज इंस्टीट्यूट ने शहरी विकास मंत्रालय, पेयजल एवं स्वच्छता मंत्रालय के साथ मिलकर इस कार्यक्रम का आयोजन किया था।



राष्ट्रपति डॉ. प्रणब मुखर्जी नई दिल्ली में द एनर्जी रिसोर्सेज इंस्टीट्यूट द्वारा आयोजित द्वितीय जल मंच के उद्घाटन समारोह में भाग लेते हुए। साथ में हैं केंद्रीय जलसंसाधन मंत्री हरीश रावत और मानव संसाधन राज्य मंत्री शशि थरूर।

- पानी से जुड़ा वर्तमान कानूनी ढांचा असमान और अपर्याप्त है
- कानूनी ढांचे से जलशासन पर जरूरी कानून का मार्ग प्रशस्त हो सकता है
- उसके बाद ही जलसंकट के असर को कम करने की उम्मीद संभव

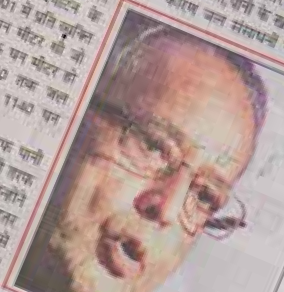
राष्ट्रपति ने कहा कि जलक्षेत्र की नीतियों एवं विनियमों को स्पष्ट, समेकित एवं समग्र बनाने के लिए ठोस प्रयास जरूरी है। मुखर्जी ने कहा, उसके बाद ही भारत जलसंकट के असर को कम करने की उम्मीद कर सकता है।

...धनों का उचित प्रबंध...

...नी पर कानूनी ढां...

नई दिल्ली। राष्ट्रपति ... से जुड़ा वर्तमान कानू... उन्होंने वर्तमान जटिल स्थि... ढांचे की वकालत की। उ... व्यापक राष्ट्रीय कानूनी ढा... कानून का मार्ग प्रशस्त हो स... इंस्टीट्यूट द्वारा आयोजित द्वि... बाद अपना संबोधन दे रहे ...

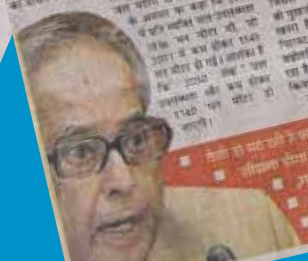
जल ... प्रबंधन जरूरी



राष्ट्रीय जल नीति 2012 में पानी के बेहतर इस्तेमाल की जरूरत को पहचाना गया है - राष्ट्रपति

जल संसाधनों का उचित प्रबंधन जरूरी

...पति ने जताई चिंता



India Water Forum

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