

## **S-1 Seminar : Water for Food security**

### **Recommendations**

1. Initiatives towards both, the supply-side and demand-side management are necessary for significant impact on water use and agricultural productivity.
2. Public participation in water management besides Government interventions is the key for achieving the goals of food security. Participatory Irrigation Management (PIM) to be implemented using PPP model on case to case basis.
3. To enhance irrigation efficiency, watering based on crop requirement needs to be ensured. Proper mechanism for optimal water use needs to be devised in consultation with the farmers.
4. Restructuring of the Water Users Association (WUA) for water management below distributory is essential. Training and awareness among various stakeholder are key in long term sustainability of the economy, food security and stability of prices. This will help in sensitising the consumers in various water use.
5. Ensuring recovery of appropriate water service charges is an important factor for efficient water management. Necessary actions are required to be taken on priority.

## **S2: Seminar : Water Quality and Public Health Issues**

### **Recommendations :**

1. Massive health education programme should be introduced into health services at all levels aimed at creating awareness at the grassroots on water quality and health.
2. Immediate steps to be taken in standardization & accreditation of water quality monitoring laboratories in the country. Central and State Surface/Ground Water Departments and other Agencies may be asked to strengthen their respective monitoring networks and integrate among themselves through sharing data for comprehensive monitoring of Surface/ Ground Water Quality. There seems to be overlapping efforts in terms of various government agencies in water quality monitoring which warrants avoiding duplication in water quality monitoring.
3. Water Quality Index (WQI) is a very useful and efficient method for assessing the suitability of water quality. It is also a very useful tool to summarize complex scientific information on water quality into a simpler form for assessment, communicating the information on overall quality of water to the concerned citizens and policy makers. State and Central Government department involved in the water quality monitoring must use this tool for presenting the data in the water quality yearbook.

4. Awareness generation and sensitization on water quality issues should be given the utmost priority by each and every agency to invoke people's active thinking on the issue related to water quality and their participation. Active community participation by forming scientific team at village level and priority to household tap connectivity in the states should be promoted.
5. There is an urgent need of water quality monitoring of reservoirs or national projects by Central Water Commission immediately.
6. Number of water monitoring stations in river should be increased and strengthened. CWC monitoring stations should be established on the river and tributaries confluence points upstream and downstream of the major cities.
7. Ministry of Jal Shakti should monitor the pesticide level in the all river basin of India and ground water aquifers. Also, fractionation of metals in the river sediment analysis should be started in all river basins. Monitoring of metals/metalloids namely Selenium, Uranium etc. should also be included in routine surveys.
8. Speciation of the toxic metals like arsenic and chromium etc. should be monitored by Central and State govt departments in surface and groundwater.
9. Apart from heavy metal pollution, studies on microbial contamination, their disinfection or eradication and prevention by implementing hygiene practices at water sources need to be encouraged for public health concerns.
10. Due to improper or lack of treatment at centralized level, decentralized and advanced household point-of-use water purification/ treatment system application in households should also be considered to reduce health risk at use.
11. The village / habitation-wise fluoride database, with safe and unsafe sources need to be developed and updated once in 3 years.
12. As total prevention and control of Fluorosis is possible through practice of two interventions viz. (i) consumption of safe water, (ii) improving the diet through essential nutrients viz. calcium, iron, vitamin C, E and other antioxidants through vegetables, fruits and dairy products. Every effort need to be made to popularize the above through IEC strategies and group counseling the families / communities.
13. Importance of safe water for consumption and awareness on adverse effects of fluoride should begin at schools and school children should have safe water for consumption.
14. As a part of problem identification, people suffering from arsenicosis should be diagnosed and training of medical and para-medical professionals is also required in this regard.
15. Real time water quality monitoring during the Kumbh mela or mass bathing in India should be monitored by CWC.

16. Initiatives should be undertaken to monitor emerging contaminants including PPCPs, POPs, PCBs, etc.
17. Comprehensive program on monitoring of micro/nano plastics should be undertaken immediately.
18. Development of indigenous robust and reliable real time water quality monitoring systems including wireless sensors networks. Cloud based platforms should be undertaken.
19. All concerns Ministries/ Departments, particularly the Ministry of Education and Ministry of Health & Family Welfare should be sensitized for use of safe water not only for drinking but also for preparation of food etc especially in schools for children.
20. Careful monitoring of use of recycled/waste water in agriculture should be made as a public health concern.

### **S3- Seminar : Shrinking Space for Hydropower Development in Energy Security**

#### **Recommendations:**

1. With significant increase in installed capacity of the system, especially in thermal & renewable and also due to increasing capital cost as well as tariff of hydro projects, the role of Hydropower Development in Energy Security appears to be Shrinking. However, Hydro Power Sector is on path of revival and has brighter future prospects on account of certain policy interventions by Government of India in March 2019 to promote hydropower development and the “below 2 degree Celsius” commitment of the Paris Agreement.
2. In comparison to other means of renewable energy such as wind and solar, hydropower lends it advantages as a flexible resource in terms of providing peaking capability, ramping capability, frequency response, part-load operation for maintaining reserves, load following – correlation with demand, energy storage capability (Pump Storage Projects), multiple start stop operation, dynamic VAR support – inductive / condenser and black start capability etc.
3. In recent times, there has been an increased focus on environmental issues, especially climate change and therefore, India being an active participant globally has also started taking initiatives towards sustainable development and cleaner environment as the Government of India has set a target of installing 175 GW of Renewable Energy capacity by the year 2022. Also, now as the Large Hydro (>25MW) also classified under RE, hydro plants shall also account for clean energy or green energy funding support.
4. As wind and solar power are variable and intermittent, it was felt that the role of Pumped storage hydro power Plants becomes vital as these plants are capable of balancing the grid for demand driven as well as generation driven fluctuations

at a high ramp up/ down rate. These plants are also likely to be in high demand in the ancillary services market in near future.

5. There is need to create greater awareness about the tangible as well as intangible benefits from hydro projects. The success stories about these benefits as well as third party evaluation would go a long way in building confidence among the people for greater supports.
6. In light of sluggish growth of the sector, greater emphasis has to be there for pressing the existing capacity in to good working condition through renovating programmes.

## **S-4 : Seminar : Sustaining Climate Change Impacts – Challenges and Opportunities**

### **Recommendations**

1. Most of the studies/research have been carried out in the regions outside of India, so there is urgent need for conducting more studies both micro and macro levels locally in the Indian conditions.
2. Climate change discussions/research need to pass to potentially affected parties/people/nations and involve people's participation and localized solutions for mitigating impacts of disasters associated with climate change by proactive response.
3. The developmental plans should be prepared in such a way that causative factors of climate change are factored in and side by side humanity need to be well prepared to face consequences of adverse impacts of climate change hazards of increased frequency and/or increased magnitude by timely proactive response so as to minimize loss of life / property.
4. There is a need to focus on various challenges and to identify suitable strategies to cope up with impact owing to rapidly changing climate. It is also suggested that to tackle climate change impacts, a serious policy framework needs to be put in place to encourage partnership among government bodies, private and public partnership with grass root participation of people.
5. Concerted efforts are to be made from local levels by sharing knowledge, technology and past experiences among all stakeholders so as to have climate resilient development by accounting for climate variability as well proactive disaster preparedness.
6. All stakeholders including those at grass root level should be sensitized regarding the potential impacts of climate changes and adaptation to them as some changes were happening in the past and will also happen in future but rate of adverse changes due to developmental activities can be minimized by adopting environmental friendly lifestyle as well as technologies.

## **S-5 Seminar: Drought Management: Future Challenges and Strategies**

### **Recommendations :**

1. There is need to develop comprehensive mitigation and adaptation strategies along with implementable contingency plan.
2. A guideline on drought action plan needs to be formulated.
3. Regular, dedicated Drought Monitoring and Early Warning System (DM&EWS) at State, District and Sub-district level needs to be put in place.
4. Composite Drought Index (CDI) approach is more efficient for drought monitoring as it provides spatial information as well as severity of drought which enables policy makers to allocate proportionate relief/contingency to the effective regions.
5. District-wise or basin-wise vulnerability and risk assessment based on physiographic hydro-meteorological and social factors needs to be carried out to demarcate areas with different degree of vulnerability/risk to drought. This is essential for prioritization of mitigation actions.
6. Proactive drought mitigation measures should be planned based the disaster risk reduction approach to minimize the potential losses or to reduce degree of threat to people and regional economic activities.
7. The drought recurs in various climatic regions with different dimensions of frequency, severity and persistence in successive years. Therefore, region specific mitigation planning is necessary as the same set of mitigation strategies may not be effective in all climatic regions.

## **S-6 Seminar: Flood Management- Future Challenges and Strategies**

### **Recommendation**

1. For effective Flood Management, Integrated approach may be adopted in combination of structural and non-structural measures such as Embankments, channel improvement, flood plain zoning, diversion of flood, attenuation of flood through reservoirs, flood forecasting and flood evacuation plan.
2. Reservoirs can be utilized for flood moderation if their flood cushion is used effectively. Rule curve for all the reservoirs wherever necessary should be prepared and updated timely and followed with decision at operational level. Rule curves of major reservoirs, where flood cushion is not in-built, need to be reviewed to have some dynamic flood cushion. While planning a new water resource projects, storage may be decided considering the provisions for flood

moderation. Wherever feasible, a dynamic flood cushion for major part of the season may be provided in the reservoir.

3. Inflow forecasting for the reservoirs may be utilized as an important tool for real time reservoir operations from flood mitigation point of view. This will be particularly useful for cascading reservoirs in a basin where real time operation can be guided through modelling and taking into consideration of instant level and inflow to the reservoir, readiness of project authority to take decisions with regard to variations in the conservational benefits and downstream conditions.
4. It is essential that Emergency Action Plan (EAP) be prepared in the event of dam break/extreme flood situations. Dam break flood inundation, Flood waves analysis and time analysis (time to reach flood peaks) are essential tools to plan emergency action plan and evacuation plan.

## **S-7 Seminar: Groundwater Management Challenges & Future ahead**

### **Recommendations**

1. Groundwater is the major contributor in irrigation as well as drinking and domestic water supply sectors in rural India. Sustainability of the resource at shallow depth is the biggest challenge in groundwater section as majority of small & marginal farmers are solely dependent on it.
2. There is bigger dependency of the stakeholders on the groundwater resource and majority of abstraction structures are privately-owned in the country. Extensive withdrawal and over-exploitation of the resource is a matter of concern. There is need to regulate the withdrawal of groundwater and norms shall be setup for groundwater use in irrigation sector based on area-specific available groundwater resources and hydro-geological disposition of the aquifers.
3. Adoption of cropping pattern shall be based on the available groundwater resource in areas being irrigated with groundwater sources. An advisory may be issued by the States at district-level indicating the crop types which can be irrigated through groundwater based on estimates of replenishable groundwater resource of India.
4. Capacity building and institutional strengthening of State Groundwater Agencies needs focused attention. Further, collection, validation and sharing of data/information on the resource can strengthen the States in planning policies/schemes on groundwater development and recharge to meet the future water demands.
5. Aquifers have high vulnerability to the pollution and once contaminated, their remediation is, either irreversible or long- term process. Presently, groundwater is contaminated through anthropogenic pollution in urban and industrial areas. Landfill, unlined drains and direct pumping of waste water in groundwater systems are to be mapped, monitored, regulated and penalized.

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

## **S-8 Seminar: Inter Basin Water Transfer From Planning to Implementation**

### **Recommendations :**

1. The river interlinking projects are essential for sustenance of rural economy for equity in water use, for drought mitigation and for achieving sustainable use of groundwater in India. These water transfer projects would be very critical for water security, food security, energy security and socio-economic development.
2. Environmental, wild life and forest land diversion clearances are crucial aspects in ILR projects and need to be carefully considered and planned for obtaining clearance.
3. There is a need to make the whole process of Interlinking of Rivers (ILR) workable and make the targets of ILR time-bound. Co-operation among various stakeholders for ultimate utilization of water for benefit of the country is essential.
4. Links, physically located in single state, either inter-basin or intra-basin, have an important role but the hidden inter-state aspects as also the environmental and economic aspects require careful consideration.
5. Out of box thinking in regard to national water planning is good. However, such proposals, even at a conceptual stage need to be technically feasible and should be quantified in terms of estimation of resource requirement in an approximate way.

## **S-9 Seminar: River And Reservoir Sediment Management And Its Implications For River Restoration**

### **Recommendations:**

1. There is a need to approach the sediment-induced problems in an integrated way.
2. Sediment management measures for restoration of reservoirs and rivers capacities may be adopted; which may inter-alia include

- a. Catchment area treatment;
  - b. Construction of check dams;
  - c. Controlled construction activities of roads and houses in hilly areas.
  - d. Occurrence of landslides / landslips especially in hilly areas with heavy rainfall need to be controlled by proper slope stability measures
  
  - e. River training works such as bank protection, spurs etc. should also be made for the vulnerable reaches to check the river bank erosion.
  
  - f. Submerged Vanes & Bundling for localized aggradations
  - g. Boulder / Gravel / Sand Mining should be done as per “Sustainable Sand Mining Management Guidelines – 2016” of MoEF&CC.
  
  - h. Routing of sediments towards downstream of Reservoir: This includes sediment bypass channel and tunnel, sluicing and density current venting.
  
  - i. Sediment removal from the Reservoir by flushing, sediment redistribution inside the reservoir, sediment replenishment, dredging and syphoning.
  
  - j. Increase of storage capacity of Reservoir as per site conditions
3. The sediments should be beneficially used after proper investigation about quality etc: for various purpose which may inter-alia include: (a) Land Reclamation, Improvement and Filling (b) Capping of contaminated sites, filling on barren lands (c) Construction and Protection Materials- Brick Making, Aggregates in concrete, Flood protection works like embankments, geobags etc. (d) Top Soil Enhancement and Agricultural use (e) Habitat Creation and Restoration (f) Beach Nourishment and Shore Protection (g) River Training Measures with dredged sand.

## **S-10 : Seminar : River Basin Management – Modelling tools**

### **Recommendations**

- 1) Easy availability of quality data is a big constraint in taking up hydrological modeling. HP-I, HP-II, India WRIS, efforts by various State Govts. etc have made a difference. NHP is likely to improve the situation with the help of NWIC further but still a lot needs to be done.
  
- 2) There is a need to develop indigenous modeling tools to address the real - life problems.
  
- 3) Governments and administrators should involve all stake-holders at an early stage of water resource development. Dialogue is necessary between project planners and projects managers and this dialogue will be most useful if focused on problems arising in practice.

- 4) Low flow conditions in rivers and streams are of fundamental importance for good ecological status of the watercourses and predetermined minimum flows should be ensured while planning and managing water control structures.
- 5) Apart from hydrological modeling, the river basin management needs to be guided by modeling of other important aspects also such as agronomy, demography, socio-economic, environmental aspects, climate change scenarios, multi-purpose benefits etc.
- 6) Scenario based modeling approach could be used by policy makers and decision makers to better understand the consequence of decisions.
- 7) Integrated and optimal operation of reservoirs both for flood moderation and conservation benefits is crucial as temporal distribution of water and inadequate storage often leads to sub-optimal benefits from these reservoirs and may adversely affect other stakeholders in the basin.

## **S-11 Seminar : Improvement and Innovation in Reuse and Recycle Practices and Technologies**

### **Recommendations**

1. Due to low demand and lack of supporting policy environment, a significant quantum of treated waste water is mixed with the untreated one and discharged into water bodies. Experiences and approaches of other countries which are at an advanced stage with promoting reuse of treated waste water, can help in strengthening the existing policies, as better planning and more effective implementation.
2. Comparative assessment with EU can be helpful in providing necessary directions and guidelines for developing a comprehensive National TWWR policy for India
3. Water recycling and reuse solutions have to be economically, technologically and socially sustainable. These three factors are interlinked and should be the decisive criteria for water management.
4. Economic sustainability should not only mean short pay-back periods of 3 to 5 years, Industries must accept longer return on invest periods (at least 10 years) in order to promote water reuse and overall sustainability that includes industrial, agricultural, urban and potable water supply reliability, which is also of great social relevance.
5. Social acceptability is important especially in developing countries and emerging markets, and incorporates the creation of jobs and subsequently improvements in the health situation and the overall standard of living.

6. Adequate pretreatment (normally by conventional technologies) is decisive for the successful operation of advanced technologies such as membrane filtration and thermal processes.
7. Financing is a further decisive factor in realizing water recycling projects and innovative, tailor-made financing models will increasingly be employed.
8. Treated domestic and municipal used water can be utilized safely and economically for potable reuse. Potable reuse constitutes a great opportunity for a safe and reliable drinking water supply - a sustainable solution for a better life.
9. Nanotechnology has emerged as one of the leading new innovative technologies with a great potential for treating waste water in a more effective and efficient manner than methods that have been previously used.
10. Advanced Oxidation Nanotechnology has been developed for achieving zero liquid discharge (ZLD), enhancing water reuse efficiency and decentralized treatment option in Water Wise Cities
11. Microbial bioremediation of urban sewage is a suitable option when conventional sewage treatments are energy intensive and costly. The isolated bacteria *Pseudomonas aeruginosa* can be used for development of microbial filter for bioremediation of urban sewage.
12. Separation of domestic sewage and storm water disposal system is need of the hour to preserve quality of storm water and avoid excessive treatment cost.

## **S 12 – Seminar :Moving Towards Integrated Planning and Management of Water Resources and Institutional Arrangements**

### **Recommendations :**

1. Availability of relevant data, proper capacity building, communication between stakeholders, correct tools, models and forecasts are pre-requisite for IWRM.
2. Appropriate institutional arrangements considering river basin as management unit should be set up in accordance with appropriate legal framework consisting of desired acts, laws, policies, guidelines etc. for implementation of IWRM.
3. International cooperation and learning of lesson from successful case studies such as Danube, Mekong River Basins etc should be considered.
4. Under India-EU Water Partnership, River Basin Plan of Tapi river is being developed involving CWC and all party states (Maharashtra, Gujarat and Madhya Pradesh). Lessons from the efforts should be analysed for modifying and extending such exercise for other basins.

5. The emerging concept of Integrated Urban Water Management (IUWM) is subset of IWRM focusing on specific needs of urban areas and this should be duly considered while preparing plan for IWRM.
6. Water, Energy and Food Nexus is one of the effective measures for analysis of requirements for Sustainable and Integrated Water Resources Development and Management in India.
7. Sustainability of vital ecosystem is essential for development and management of water resources at river basin level.
8. Facilitation exercise for generating informal dialogues amongst various stakeholder groups of the basin should be encouraged to generate better outcomes.

### **S-13 Seminar : Micro Irrigation for improved agricultural economy**

#### **Recommendations**

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

## **S-14 Seminar : Innovations in Water Management**

### **Recommendations:**

1. The farm pond, by suitably designing, can be used for storage of rain water during the rainy season. Once that water is used, during the remaining period, the same pond can be used for cultivation purpose.
2. Using drone technology, crop area could be assessed, the growth of crop can be monitored and unauthorized use of water can be deducted. This is found to be a very cost effective methodology.
3. Sub-surface drainage for managing the water logging and salinity issues in the agricultural field, may be judiciously applied considering local geo hydrology and topography to manage the cost of drainage systems.
4. Remote Sensing, GIS and Google Earth Engine techniques can be suitably applied for conservation of lakes, in particular urban area, and reservoirs including near real-time assessment of storages and estimation of crop water requirement at a particular instance. Asset management of distribution net works can be made more responsive using these techniques.
5. The water demand & supply for drinking, irrigation and other purposes could be efficiently managed by developing suitable APP.
6. By application of SCADA, reservoir operation for flood forecasting & flood warning and for regulation of irrigation water through canals & pipelines could be efficiently managed.

## **S-15 Seminar: Rainwater Harvesting for Sustainable Water Supply**

### **Recommendations**

1. Usage of GIS, Satellite and IT technology - Geo-Tagging, Drone and Satellite survey, GIS data & tools, Mobile App, Web portal should be promoted.
2. Need of hour is that the government should act as facilitator and stakeholder's participation should be ensured.
3. Water harvesting through conservation by constructing Contour Trench/ Bund, Check Dams, Structures, Percolation Tanks, Cement Plug, Farm ponds plays important role and hence such conservation practice should be promoted.
4. A nodal agency needs to be identified by State Government, who will maintain a scientific database for Water augmentation/conservation structures.
5. While evaluating the cost effectiveness, it has been observed that desilting of tank, recharge wells provided with the structures and recharge wells with

percolation pond is more economic in comparison to check dam with recharge well.

6. Affected members of the community should be involved in the development of conservation planning goals and throughout the implementation process. Involving the community in goal development and implementation serves an important public education function and can greatly enhance the success of conservation programs.
7. Extensive awareness programmes should be done at all stages, viz. planning, execution, monitoring, etc.

## **PD-1 Panel Discussion: Water Scarcity- Challenges Ahead**

### **Recommendations**

1. Water demands are to be met from the available resources by both demand and supply sides management. Improving water use efficiency in irrigation and agricultural practices, use of water efficient crops, application of technologies and administrative reforms through the participation of water user associations are few amongst the major aspect which need to be considered for demand side management.
2. There is need to create maximum possible storages and infrastructure for inter-basin water transfers in view of high temporal and spatial variations in water availability which is likely to further increase under climate change scenario. Various technical, financial and socio-environmental challenges need to be dealt for achieving the same. In view of massive protests against large storage, bond building process with the affected people needs to be initiated at early stage of the projects to understand and address their issues appropriately to minimize the protests and discourage the anti-dam activists.
3. There is need to create country-wide network of Irrigation and drainage infrastructure with massive investments to enhance incomes of farmers and make them independent of monsoon and climate change conditions.
4. Water scarcity in agriculture is a global challenge. In order to address this challenge, a global framework on water scarcity in agriculture in changing climate (WASAG) has been established by more than 80 ministers of agriculture at 9<sup>th</sup> Berlin Conference in January, 2017 with the aim to bring together key stakeholders across the globe and across sectors to tackle the collective challenge of using water better in agriculture to ensure food security to all. WASAG at present is having 67 partners from 22 countries. India, as a country and its institutions should also become partner of WASAG and support and benefit from its activities to achieve water related targets of Agenda 2030 of sustainable development and jointly address the pressure of global change impacts on water scarcity in agriculture.

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

## **PD-2 Panel Discussion: Integrating value chain for Agricultural water Management**

### **Recommendations**

1. The concept of integrating value chain offers a framework to adopt both supply side measures (water augmentation measure) and demand side measures (water pricing, energy pricing, water market, crop choice etc.) together for improving management of agricultural water. The objectives of water planning should be clearly specified and should be integrated with other agricultural practices. There is need to have a tradeoff between water security and economic security.
2. Regional mapping of value chain of agricultural water management is the need of the hour.
3. District Irrigation Plans developed under Pradhan Mantri Krishi Sinchai yojana (PMKSY) could be upgraded to integrate value chain.
4. Decision making across value chain shall be data driven. Efforts shall be extended to improve data collection infrastructure in the country.
5. Adoption of efficient water management system to reduce the water foot print of blue water in crop production is essential for agricultural value chain.
6. Cropping pattern may be finalized for different canal commands based on facility of existing value chain and taking care of blue & green water.
7. Value chain should be strengthened and defined to increase the primary and secondary processing. First step of value chain (production system), consumes more than 90% of water in comparison to other steps of value chain. Hence, production should be optimised in terms of water foot print.
8. There is need to change from “Supply” based system to “Demand” based system. However, demands have to be based on a pre- defined efficiency level as per local agro climatic conditions.
9. The water distribution system in canal command area should be modernised including the use of underground piped network and integrating last mile connectivity with pressurized irrigation systems such as sprinkler and drip

irrigation systems based on crop to be grown. All Accelerated Irrigation Benefits Programme (AIBP) assisted projects should be future ready for micro irrigation and all outlets under “Har Khet ko Pani” should be pressurized outlets.

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

### **PD-3 Panel Discussion: Water Resources Sustainability for industrial Growth**

#### **Recommendations**

1. In India mostly rivers are an inter-State river and in a state of flow, no State can claim exclusive ownership of its waters or assert a prescriptive right so as to deprive other States of their equitable share. Water Quantity and Quality are to be managed by :
  - i. Creating Regulatory Authority for Water,
  - ii. Drainage system/pattern of water
  - iii. Cooperative Management of Water resources.
  - iv. Integrated River Basin Development
  - v. Public Policy Structure.
  - vi. Metering and Pricing the water.
2. Agriculture is consuming water to the extent of 85 %. So, water is to be effectively managed by increasing water productivity, water efficiency and effectiveness. Tendency should be *More crop per drop*, which is a program by the Government to achieve it.
3. Bureau of Water use Efficiency may be contemplated. Agriculture consumption of water can be reduced by changing irrigation methods, changing cropping pattern, efficiently using water etc. Water requirement or consumption by industries can be reduced by
  - Increasing Water Use Efficiency
  - Third Party Audit,
  - Using water saving efficient technologies.
  - Innovative technologies should be explored and promoted which could significantly reduce water and chemical uses. Use of multi Stakeholder platform to facilitate access to innovative and low cost technologies.
  - Re-engineering the process of industries,
  - Assessment and reducing the consumption of water through water foot print.
  - Recharge, reduce, recycle, reuse should be ultimate goal. Recycle/ reuse of wastewater with an ultimate goal to achieve zero liquid discharge (ZLD)
  - Water related data disclosure; Awareness Programme need to be conducted.

- Government can promote industries by incentivising those industries who work in the area of conservation of water.
  - Establish and improve the benchmarks for Industrial water use, pollution abatement, waste water reuse.
4. The concept of industrial symbiosis is required to manage available water resources. Setting up of institute which will provide information on industries specific good practices in water use in the form of Bureau of water use efficiency can be considered.
  5. Subsidies should be given towards technological development for eco-friendly solution for water conservation.
  6. Alongside rainwater harvesting, mine water can also supplement to the artificial recharge of aquifers.
  7. Abandoned quarries and pits could turn into mine pit lakes which often act as lifeline to the local population and also serve as surface water bodies for recharging of water table in the surrounding areas

## **PD- 4 Panel Discussion : Challenges in Achieving Sustainable Development Goals for Urban Water Supply and Drainage**

### **Recommendations**

1. A distinction was made between water as a natural resource which has to be conserved and protected, and water as a commodity delivered at the doorstep which requires investments in infrastructure requiring appropriate service charges for ensuring sustainability of the same.
2. Reduce, Recycle and Reuse water has to be enforced at the stage of planning for development.
3. Revival /restoration/protection of water bodies / lakes / ponds is need of the hour. Safeguard against encroachment of surface water and also against contamination by not discharging untreated waste water in the water bodies need to be enforced.
4. Excessive use of groundwater has to be curbed through appropriate policies. Groundwater recharge is very important.
5. Groundwater contamination is a very serious issue in urban areas. Leachate coming from garbage hills of mixed waste leads to GW contamination. Solid waste management should be brought back into Atal Mission for Rejuvenation and Urban Transformation (AMRUT) for an integrated approach.

6. Segregation of water in different categories (i.e. Grey / Black / Fresh) should be done at household / Village level so that recycling and reuse can be cost effective.
7. Strengthening institutions of service delivery and improving governance is crucial for water delivery. Infrastructure is necessary but not sufficient.

## **PD-5 Panel Discussion: Development of Waterways and Navigation**

### **Recommendations:**

1. Waterways and navigation has historical connection with mankind in the same manner as ancient civilisations flourishing on the banks of rivers. With the pressures on other modes of transportation increasing day by day, waterways & navigation offers a promising alternative in terms of cost-effectiveness, environment-friendliness and viability. It is especially suited for bulk transportation of non-perishable goods.
2. Due to its high freight carrying capacity, it has the potential to ease off the traffic on roads and railway. The contribution of navigational mode of freight transportation may be targeted to be 15-20% from the present around 1.5-2% of the total freight transportation through all modes.
3. Provision of adequate draft/navigable depth and river reaches being free from encroachments, sedimentation and floods are the essential requirements for successful operation of waterways. As such, latest technological interventions and innovations are required to be adopted for maintaining the waterways with greater viability and sustainability.
4. Impetus to the development of National Waterways-1 on Ganga through World Bank assisted Jal Marg Vikas Project and O&M of Multi-Modal Terminals through PPP mode has been adopted for better viability of the sector.
5. R&D and involvement of technological institutes has ushered in cost effectiveness in controlling and removing obstructive sedimentation through innovative techniques like bottom panelling, submerged vanes etc. utilising the Stream Energy Harnessing Techniques.
6. Concept of complimentary dredging may be given utmost priority over traditional dredging to make the navigation facilities more cost effective and efficient.
7. Technological innovation has also offered quick and hassle-free operation & maintenance of navigation locks and navigation across temporary pontoon bridges etc.
8. There is lot of scope in further developing the navigational relationship with our neighbouring countries like Nepal, Bhutan, Bangladesh and Myanmar for their

fast-commercial development. Waterways are invaluable in establishing strategic connections also as has been proved in case of Kaladan Project involving neighbouring Myanmar to serve NE territories.

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

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

## **PD-6 Panel Discussions : Water Resources Development For Rural Economic Growth**

### **Recommendations**

1. Special emphasis should be given on building the capacities of communities, especially *Panchayats* to become better 'demand centres' and take advantage of the provisions of MGNREGS. More emphasis should be given on 'non-wage' benefits of MGNREGS as it would help: [a] avoid alienating the well-off and influential farmers; [b] durable asset creation; and [c] eventual crowding-out demand for minimum-wage work. MGNREGS interactions with local labour markets should also be kept in mind.
2. The PMKSY vis a vis Har Khet ko Pani should focus on un-irrigated half of India's agrarian landscape, prioritizing Irrigation Deprived Districts and Adivasi farm holdings. Implementation of PMKSY may be supported through independent, third-party reviews; credible civil society organizations, philanthropic trusts, NGOs and CSRs can play a crucial role in this.
3. Sustainable water resources development and its efficient use in irrigation sector with higher productivity is the backbone of rural economic growth. Promotion of knowledge and skill based agriculture and post-harvest on-farm value addition may positively affect related non-farm rural economic growth.
4. Planning from Basin to sub-basin up-to micro-watershed level with institutional mechanism at local, district and state level; rainwater harvesting should be implemented in scientific and sustainable manner for food security of the Nation. During such planning, influences of such rainwater harvesting structures on downstream storage structures should also be taken into account.
5. Conservation/ rainwater harvesting and re-use of Water may be mainstreamed in all schemes/ programmes of Govt. with emphasis on community education and engagement-through a mass movement. Cultivation of low water consuming crops should be incentivized.
6. Water requires far more integrated approach to tackle India's water challenges. Water budgeting at local level should be encouraged.

## **PD-7 Panel Discussion : Re-orientating the Water Education to Address the Water Related Challenges**

### **Recommendations :**

1. There should be a right mix of knowledge and skills required to learn in the students' curriculum rather than focusing excessively on acquiring knowledge.
2. There is a need for closer interaction between Academia and Professional. The interaction should be two-way and on genuine issues affecting the water sector, aimed at addressing the present disconnect between the two.
3. The faculty on water related departments should preferably have faculty from amongst other professionals also.
4. Important components of water governance should be appropriately taught to students.
5. There is a need to incorporate social engineering aspects also in the curriculum for water education to appreciate the socio-economic aspects of water planning and management.
6. Water education is necessary to be imparted at various levels, right from the farmers level to the policy planners including media and general public, by designing suitable and appropriate content for every level.
7. Disambiguation of basic principles of water planning and management in public discourse is an urgent need to steer the healthy public dialogues on better scientific and rational terms.

## **PD-8 Panel Discussion : Bridging the gap from lab to field**

### **Recommendations :**

1. There is need for enhancing the technical capabilities of field and practising professionals of different areas of water development and management to address the even increasing challenges.
2. Training and capacity building program for farmer /stakeholders in the latest technology for optimal use of water with a view to enhance water and agriculture productivity should be undertaken.
3. To promote faster adoption of new technologies, incentives such as crop insurance and water charges based on water metering should be adopted.
4. Modern electronic and mass media avenues should be used and further promoted for knowledge dissemination through success stories about water management technologies and their benefits.

5. The scientists in research organization and academia should be encourage to take up research on field problems through enhanced grants for research.
6. Transfer of laboratory/controlled environment based outcome to field require additional efforts on the part of developing as well as safety nets for the field implementing groups. Financial, logistical and manpower resources should be factored while taking up such exercises.
7. There must be emphasis on pro active coordination amongst R&D institutions, line department and stakeholders
8. More investment on development of on-farm irrigation infrastructure and it's O&M should be promoted.

**PD-9 Panel Discussion : Water Quality Issues –Treatment Options & Experiences (With Special Reference to Geogenic contaminants in drinking water and treatment options)**

**Recommendations :**

1. In order to ensure drinking water safety the drinking water sources are to be tested for water quality parameters with geogenic origin and also microbiological parameters
2. Drinking water exceeding permissible standards for water quality parameters needs suitable treatment or selection of alternate safe water sources for drinking water supply
3. Contaminated drinking water sources are to be discriminated with suitable marking
4. Treatment units installed for removal of different contaminants are to be evaluated by reputed independent agency
5. Proper operation and maintenance of water treatment units are to be ensured by water supply authority in the state
6. It should be ensured that the water treatment units are used by the people and the units should not stand idle.
7. Public awareness campaigns are to be organized in this regards
8. Considering degradation in source water quality, protection of water sources and upgradation/retrofitting of conventional water treatment plants are needed
9. Water distribution system needs identification of the weakest links and unauthorized connection to avoid degradation in water quality prior to reaching households

10. One should ensure drinking water safety from catchment to consumers based on water safety principle
11. Safe household water handling practices should be inculcated among water users at household level
12. Water should be tested for emerging contaminants like pharmaceutical and personal care products
13. Decentralized sewage treatment plants should be preferred options which can also promote enhanced safe reuse of treated sewage
14. Natural sewage treatment technologies are better suited over conventional treatment systems in decentralized option to minimize operation and maintenance failure.

## **PD-10 Panel Discussion : Technological Innovation and Big Data for Water Security Emerging Direction and Prospects**

### **Recommendation**

1. Big data is associated with high volume and variety of data which requires new technologies and techniques to capture, store and analyse it and is used to enhance decision making and analysis.
2. Big data has vast potential to revolutionize not only research and development but also technology. Big data using artificial intelligence has considerable potentials for (i) planning water resources systems optimally (ii) analysing climate change impact, (iii) detecting changes in ecosystem through remote sensing, (iv) predicting natural and manmade calamities, (v) scheduling irrigation plans, and (vi) mitigating environmental pollution etc.
3. Big data is creating a new generation of decision support data management.
4. Automatic sensor and monitoring system being installed at large no. of sites are providing large amount of real time data. These sensors with computational technology in terms of big data can be used to track river, which may be utilised for real time flood forecasting, crop assessment and yield forecast, monitoring of e-flow, pollution of river water, dust storm forecasting etc.
5. As water-related data sets have a variety of formats with different observation methods generated from different organizations, either a general standardized format for data exchange or an open sourced data management tool that glues all relevant scripts for read and write of different data formats can benefit the water resources engineers and research community on handling data sets.

6. A National Water Data Policy is needed for standardization/integration/storage of data with synergy with National Water Policy, 2012 and this should be enforced.
7. Big data analysts, high end computing facilities and domain experts of water resources sector have to come together for solving the problem of sector.

## **PD-11 Panel Discussion : “Learning from Best Practices in Water Management**

### **Recommendations**

1. Efforts should be made to involve farmers in various aspects of management of irrigation systems like collection of user charges and O&M etc. for long-term sustainability of such schemes. PIM act should be publicized and Water User Association should be empowered and trained for proper distribution and management of water. WUA should also be trained for marketing and processing of farm produce. Water charges collected by WUA should be retained at WUA level for maintenance as is being done in Maharashtra.
2. PIM act should be publicized and Water User Associations should be empowered and trained for proper distribution and management of water.
3. PIM is not limited to handing over irrigation facilities to the WUAs, it is beyond that. The ultimate test of PIM is whether the farmer is benefitting from agriculture or not. Hence PIM should encompass the marketing aspects as well to ensure proper return to the farmers from agricultural operations.
4. Independent water regulator is needed in all states for fair water pricing, equitable distribution, water use efficiency and dispute resolution in irrigation as well as other water sectors.
5. Widespread implementation of GIS based Canal Automation Technology for smart digital irrigation management will contribute immensely to judicious and equitable use of water among farmers and increased water use efficiency.
6. Extensive use of Remote Sensing for performance evaluation of irrigation and other water resource projects should be encouraged to assess the health and performance of infrastructure and to identify the action to be taken for improvement.
7. Data creation, updation and sharing should be given priority. Proper data sharing policy should be implemented by each state (Central Govt. already has a data sharing policy).
8. Water conservation is a key element of any strategy that aims to alleviate the water scarcity crisis in India. There is urgent need to evaluate the status of our existing ancient water conservation structures and make efficient planning to revive these structures.

9. Gap between potential created and utilized is quite substantial. Steps should be taken to reduce the same by simultaneous development of command area so that water reaches tail end farmer. Command area development section of the WRD should be strengthened.
10. Emphasis should be given to micro irrigation and less water intensive crops to increase water use efficiency.
11. Emphasis should be given to improve the surface water quality available for irrigation.
12. Solar pumping scheme can be undertaken to provide safe drinking water through community driven approach in rural communities where the traditional gravity schemes are not feasible.

## **PD12 Panel Discussion: Indo UK collaborations for Water Quality Research**

### **Recommendations**

1. The mechanism of transport and treatment of geogenic and anthro gogenic including emerging antaminants need to be fully understood and the community must be equipped to deal with situation.
2. The awareness programme for the community and capacity building for the same is of paramount important and necessary programme must be taken up on priority at appropriate scale. The awareness programme and capacity building programme should inter-alia, include aspects of handling emergency situations during disasters.
3. Water quality standards for drinking water as well as for irrigation need to be developed along with low cost detention kits for detecting the water quality should be developed and put in use to ensure safe water supply for drinking and other proposes.

## **BS-1 Brainstorming Session: Ever Increasing Complexities in Adjudication of Water Dispute”**

### **Recommendations**

1. Resource distribution/sharing requires collective and conscious convergence. India direly needs to develop collective and conscious convergence and then only can we ensure a cogent proposition in the field of resource management.
2. In resources sharing, demand supply patterns are subject to change with time and thereafter review of adjudicated issues become necessary. In absence of it,

recurrence of dispute take place. As of now, once issue adjudicated is delivered to be settled and the balance is left on execution which is the main reason for making issue more complex. Method and philosophy of adjudication and principle of jurisprudence need to be regalanised in this context.

3. Water utilization in all form, particularly that through of minor irrigation schemes of basin States (which is quite substantial but generally not accounted for) must be correctly assessed.
4. Before matter is referred to and considered by the Tribunal, the following aspects needs attention:-
  - a) Critical evaluation of the technical aspects of the claims of the party States.
  - b) Identification of various alternative plans to address the issues.
  - c) Evaluation of the identified plans from technical, social, economic and legal considerations.
  - d) Seeking the views of all concerned parties on the identified plans (through an interactive and continuous process)
  - e) Identification of the most appropriate configuration of the plan which ensures sustainable development and management of water resources and also enables optimum benefits to the society.
5. An appropriate mechanism must be put in place to ensure implementation of Tribunal awards.
6. A comprehensive water law is required to be introduced.
7. To address the legal complexities and other ambiguities, academic and training iinstitutions may introduce in its curriculum some hybrid courses clubbing water engineering with legal aspects in the similar line of courses like bio-medical and agricultural engineering etc.

## **BS-2 Brainstorming Session : Focused Role of Federal Government in Ensuring Sustainable Water Resources Development**

### **Recommendations**

1. The future challenges in water resources development and management would be more complex and for addressing these challenges, serious and sustained efforts are required with cooperation of all stakeholders.
2. In view of the fact that: (a) several of the future challenges would be impacted and / or influenced by the external forces, particularly the climate change, the global economy, technological innovations and demography etc.; and (b) growing inter-State and international issues would have to be addressed expeditiously, the Union Government has to play a very important role in: (i) comprehensive planning for addressing the challenges; (ii) coordinating the needed actions; (iii) guiding the various stakeholders; (iv) ensuring capacity building of the professionals involved at all level of governance; and (v) making

available avenues for exchange of concerns and ideas at regional and national level.

3. The constitutional provisions and the functions of the Department of Water Resources, River Development and Ganga Rejuvenation of the Union Ministry of Jal Shakti (as defined in the allocation of Business Rules) and considered adequate for addressing the future challenges. However in addition to initiative already made from time to time, there is need for focused attention on some specific area which *inter alia* include (a) Improving the quality of hydrological observation and water consumption data and adoption of prescribed standard procedure by all agencies namely the Union Government, the State Government and Project Authorities; and (b) Promotion of research and studies on a much larger scale with emphasis on: (i) research in the area of water related policies and their impact on the society; (ii) research in the field of water planning including the dynamic nature of planning, particularly in view of likely impact of the climate change on water resources; and (iii) research on the impact of external factors such as demography, climate change, the global economy, changing societal values and norms, technological innovation, laws and customs and financial markets etc. on water resources management.
4. With the objective of ensuring overall improvement in the management practices, the Union Government must assert and play pro-active role particularly in respect of ; (a) Generation of Future Scenario of Water Availability and Demand on a non-partisan basis ; (b) Preparation of basin wise comprehensive plans on the principles of Integrated Water Management without any further delay by appropriately strengthening and streamlining the concerned units ; (c) Adopting the practice of water accounting for the current status and trend analysis; and water auditing with the objective of improving the management practices ; (d) Undertaking appropriate studies using all available information including that in respect of river flow forecast and planning advisories for equitable utilization at various levels ; (e) Strengthening and streamlining of the monitoring mechanism for in-depth evaluation of schemes at different stages of implementation and initiating course-correction measures, wherever necessary; and (f) Promoting avenues for exchange of concerns and ideas.

### **BS-3 Brainstorming Session: Research Needs in Water Sector**

#### **Recommendations**

1. Emerging challenges in respect of water resource development and management call for serious effort for sustainability enhancing the research activity in respect of water related issues.
2. The research areas should address all aspects of planning and management of water resource, particularly that for addressing the policy and governance issues.

3. Water management being intra-disciplinary in nature, the involvement and cooperation of all stakeholder is considered essential and hence joint research projects should be promoted.
4. Research should be carried out in structured and methodical manner to ensure that the outcome of the same are appropriately implemented for the benefit of society.
5. Since the access to adequate and quality data is basic requirement for undertaking the research, due emphasis must be laid on proper policy and programme for obtaining data and ensuring the availability of same for research activity.

## **B-S4 Brainstorming Session : E-Governance in Water Sector**

### **Recommendations**

1. The need of governance in water sector through electronic mode was duly emphasized, particularly in view of the fact that most of the data being generated is in silos and they do not talk to each other and hence the governance of data in the water sector itself is the most crucial factor for leveraging e-governance.
2. Data integrity is the key to successful implementation of e-governance for achieving the objectives of translating benefits to the end users i.e. public at large.
3. There is urgent need of uniform data protocol in the water sector. However, the e-governance solutions should be smart enough to synthesize the data in accordance to standardized protocol irrespective of data collection, which is often in localized units.
4. The data sourcing agency should be solely responsible for its repository and providing access to all the other stakeholders in water resources for decision support system.
5. Attention needs to be drawn towards taking multiple stakeholders on board for collaboration and integration of data through analytic tools. Use of GIS is must in water sector for better realization of water sector data.
6. Although certain progress has been made in promoting e-governance from government to citizens (G2C), a lot of work is yet to be done for e-governance from citizen to government (C2G approach).
7. Many facets of e-governance are required to be taken at a common platform so as to reduce reaction time of government, encourage public participation, reduce digital divide etc.

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

## **SS-1 Special Session : Rejuvenation of the River Ganga – from Planning to Action**

### **Recommendations**

1. E-Flows should be season wise (such as monsoon, non-monsoon etc.) and also reach wise where there are various water diversion/storage structures located along the length of river.
2. E-flows as decided should be maintained in every reach of the river Ganga.
3. Monitoring of 11 projects in the river Ganga upto Unnao for E-flow releases has been commenced from 1st January, 2019. It is found that some of the projects on the river Ganga upto Unnao are not meeting the e-flow norms particularly during lean period mainly because of commercial interest and scarcity as these projects were not planned and accounted for the recent e-flow norms. It is considered necessary that the project authorities must take necessary policy decisions for adhering to e-flow norms and initiate immediate requisite measures like revising Power Purchase Agreement (PPA) and improving water use efficiency.
4. The project authorities should take immediate necessary action for installation of automatic data acquisition and transmission system for data transfer.
5. Continuous Stream Storages (CSS) is effective and implementable method for river rejuvenation.
6. Increasing irrigation efficiency by 10% (from 30% to 40%) can achieve river rejuvenation for all streams by CSS, maintaining the present deficit level in Mula-Mutha Basin. For future water demands, irrigation efficiency can be further increased to 50% maintaining the river rejuvenation requirement.
7. The planting of indigenous or exotic deciduous tree species that produce high value tree products such as fruits or timber, while practicing agriculture, can capture a much larger amount of rainfall to help in recharge of ground water. The native tree species would be the most suited for planting along rivers. Such trees in agro forests and social forests provide long term eco system services like revival of springs and small local streams resulting in river rejuvenation. Besides, this will also help in watershed protection as well as ground water recharge and biodiversity conservation.

## **SS-2 Special Session – Water Culture and Social Harmony**

### **Recommendations**

1. It has been emphasized that there is definite role of religion in creating the values and emotional bonding with water. Atharva Veda also emphasised out that the “the pathway to prosperity lies in the intelligent use of the water within the limits of endowments of the particular region”. Emphasis to use water judiciously as our part of age old culture since Veda era needs to be embedded into our priority, awareness and policy making. Awareness generation at all level is the key as water resources will remain scarce commodity in Indian condition.
2. The increasing incidence of the extreme events in the context of the Climate Change with a special reference to Kerala Floods and recurring droughts in some of the parts show that these developments pose a serious challenge for the policy framing.
3. Water has in-built local challenges which are to be managed locally and these aspects are to be duly recognised while formulating policies in respect of water.
4. Community Participation is a must. Adopting indigenous practices at local level by involving local expertise and available resources can do wonder as depicted by Churu District of Rajasthan, North Eastern and others parts of India.
5. Our Policy making has become Growth driven at the cost of environment and water. Policy emphasis has become more technology oriented and less science driven. Science has taken a back seat in today’s policy making which is very unfortunate. We need to take a break from the Business as usual approach. If illiterate women of Bundelkhand can solve the local water harvesting issues, one has to adopt these local measures in policy making as well.
6. In India, there is huge divergence between policy and its practice. That gap needs to be bridged immediately. Examples include urban flooding in Mumbai, Chennai, Kerala.
7. Initiatives like Nal(Tap) se Jal (water) is commendable. However, it needs to be ensured that the supply side is well managed.
8. India is largest extractor of Ground Water in the whole world and there is need for a balanced approach in adopting measures which can enhance balanced and conjunctive use of surface and ground water.

## **SS-3 Special Session : Bilateral Cooperation for Mutual benefits**

### **Recommendations :**

1. India has always believed in bilateral arrangements for sharing common water resources between its hydrologically connected neighbours. Historically, the bilateral arrangements with Nepal, Bhutan, China and Bangladesh have worked well and many successful milestones in the form of treaties, agreements, MoUs and Joint Mechanisms with these countries bear sound testimony to it. This may be continued in future with an appropriate pace, diligence, water-diplomacy and foresightedness.
2. Confidence-building measures at Government level on both the sides are crucial as well as congenial so as to thwart away any trust-deficit and public hindrances which may have adverse bearing on the bilateral co-operation.
3. Sincere political wills and consequent actions on both the sides for proper, smooth and conducive bilateral co-operation is essential and beneficial to both the countries and their people.
4. Appropriate IEC measures in a true and transparent manner regarding the sensitive issues concerning both the countries may be resorted to in order to prevent any misconceptions among the people on either side which may turn into hindrances and law & order problems.
5. Bilateral arrangements need operational mechanisms and each case will need specialised mechanisms operated by professionals for sustainable operation of the treaty and agreement provisions.

## **SS4 Special Session : Water and Heritage**

### **Recommendations**

1. Professional organizations such as ICID, IUCN, ICOMOS, ISOLA and INTACH can contribute and should be associated in the process of revision in policy and protection measures considering both Natural and Cultural Heritage.
2. Guidelines should be prepared under Corporate Social Responsibility (Schedule 7, (vi) Ensuring Environmental Sustainability) to link Corporate Intent, Financial resources with on-ground revival of water heritage with professional conservation professionals as facilitators to ensure timely and quality work.
3. The historic practices of nature and culture conservation should be promoted and appropriate fund should be allocated for experimentation tie up these traditional practices with engineering and technology for innovative solutions relevant to the Indian context.
4. Heritage structures and practices are living examples of sustainability principles and contain lessons for new projects/systems to be put in action. It is necessary to maintain and publicize the experience and features for future generation to come.