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INTERNATIONAL COMMISSION ON IRRIGATION AND DRAINAGE (ICID)

WATER SECURITY – INDIAN PERSPECTIVE

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Indo-Global Irrigation Summit 2025
24-25 June 2025, New Delhi, India



Introduction

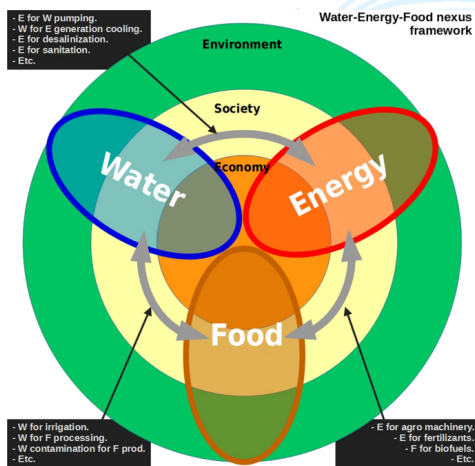
- ▣ Water, Energy and Food are essential for human Life.
- ▣ Global projections indicate that **demand** for freshwater, energy and food will increase significantly over the next decades under the pressure of
 - ✓ Human Population growth and mobility
 - ✓ Economic development
 - ✓ Urbanisation
 - ✓ Diversifying diets
 - ✓ climate change.



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The diagram illustrates the Water-Energy-Food (WEF) nexus framework. It features three overlapping circles: Water (blue), Energy (red), and Food (orange). These circles are nested within concentric layers representing the Environment (outermost, green), Society (middle, yellow), and Economy (innermost, grey). Arrows indicate the interconnectedness and flow between these resources. Text boxes provide specific examples of interactions: Energy is used for water pumping, generation cooling, desalination, and sanitation; Water is used for irrigation, processing, and sanitation, and can be contaminated during food production; Energy is used for agro-machinery, fertilizers, and biofuels, while Food is used for agro-machinery, fertilizers, and biofuels.

Harmonizing Water-Food-Energy Nexus

Harmonizing the water-food-energy nexus involves managing the **interconnectedness** of these three critical resources to achieve **sustainable development** and ensure **resource security**.

Water-Energy-Food nexus framework

- E for W pumping.
- W for E generation cooling.
- E for desalination.
- E for sanitation.
- Etc.

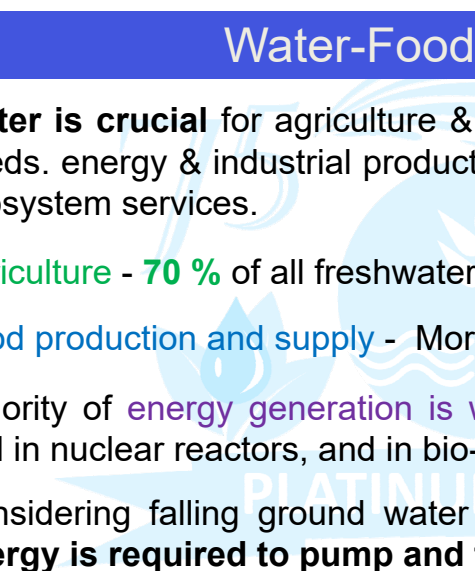
- W for irrigation.
- W for F processing.
- W contamination for F prod.
- Etc.

- E for agro machinery.
- E for fertilizants.
- F for biofuels.
- Etc.

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Water-Food-Energy Nexus

- **Water is crucial** for agriculture & food production, personal & household needs. energy & industrial production and water-dependent ecosystems & ecosystem services.
- **Agriculture - 70 %** of all freshwater worldwide (in India 80 to 85%).
- **Food production and supply** - More than $1/4^{\text{th}}$ of the **energy** used
- Majority of **energy generation is water intensive** (coal-fired power plants and in nuclear reactors, and in bio-fuel crop production).
- Considering falling ground water level & degraded water quality, **more energy is required to pump and treat water.**

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Drivers

- **Water** is the basic ingredient to Food and Energy security.
- **Water security** (adequate quantity and acceptable quality, sustaining livelihoods, human well-being, and socio-economic development, protection against waterborne pollution and water-related disasters, and for preserving ecosystems, peace and political stability).
- **Food security** (physical, social and economic access to sufficient, safe and nutritious food for an active, healthy life).
- **Energy security** (reliable, affordable, and sustainable supply of energy for economic growth, development, and overall stability.)



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Sustainable Development Goal (SDG) 6: Clean Water & Sanitation



No.	Goal
6.1	Safe and affordable drinking water
6.2	End open defecation and provide access to sanitation and hygiene
6.3	Improve water quality , wastewater treatment and safe reuse
6.4	Increase water use efficiency and ensure freshwater supplies
6.5	Implement integrated water resources management
6.6	Protect and restore water-related ecosystems
6.a	Expand water and sanitation support to developing countries
6.b	Support local engagement in water and sanitation management

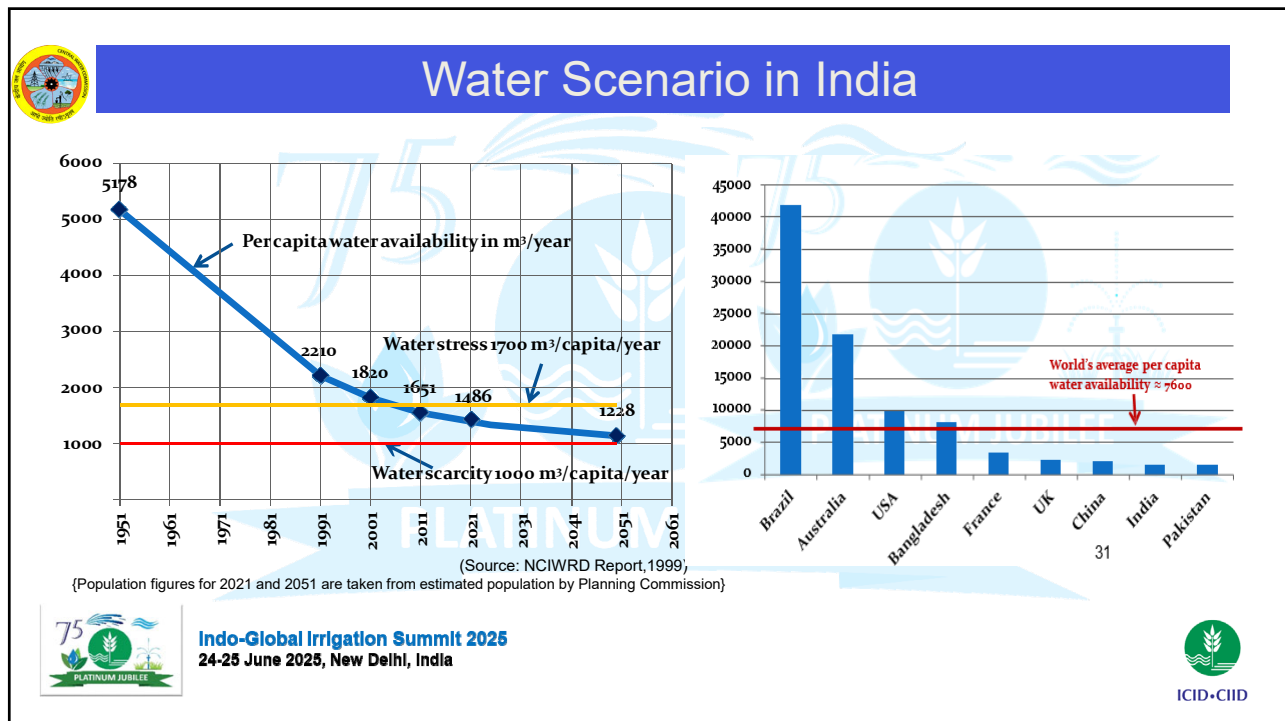
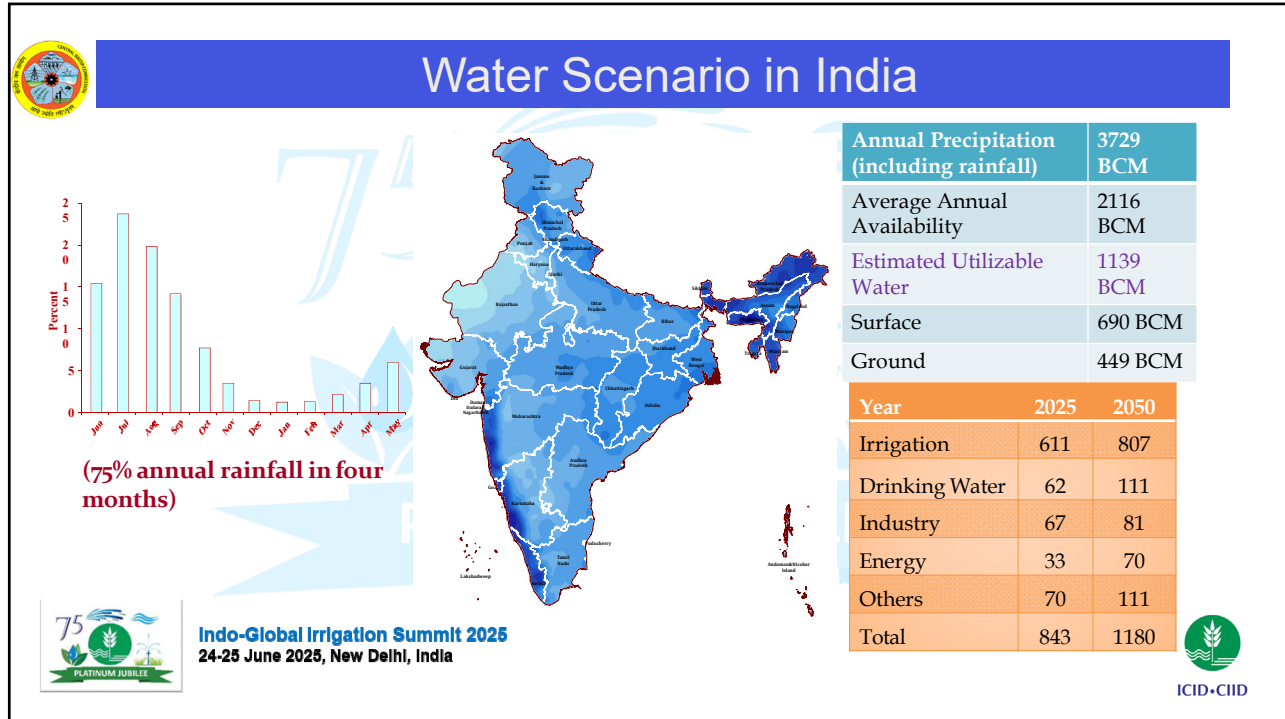
Water Governance Initiatives needs to be aligned with the SDG goals

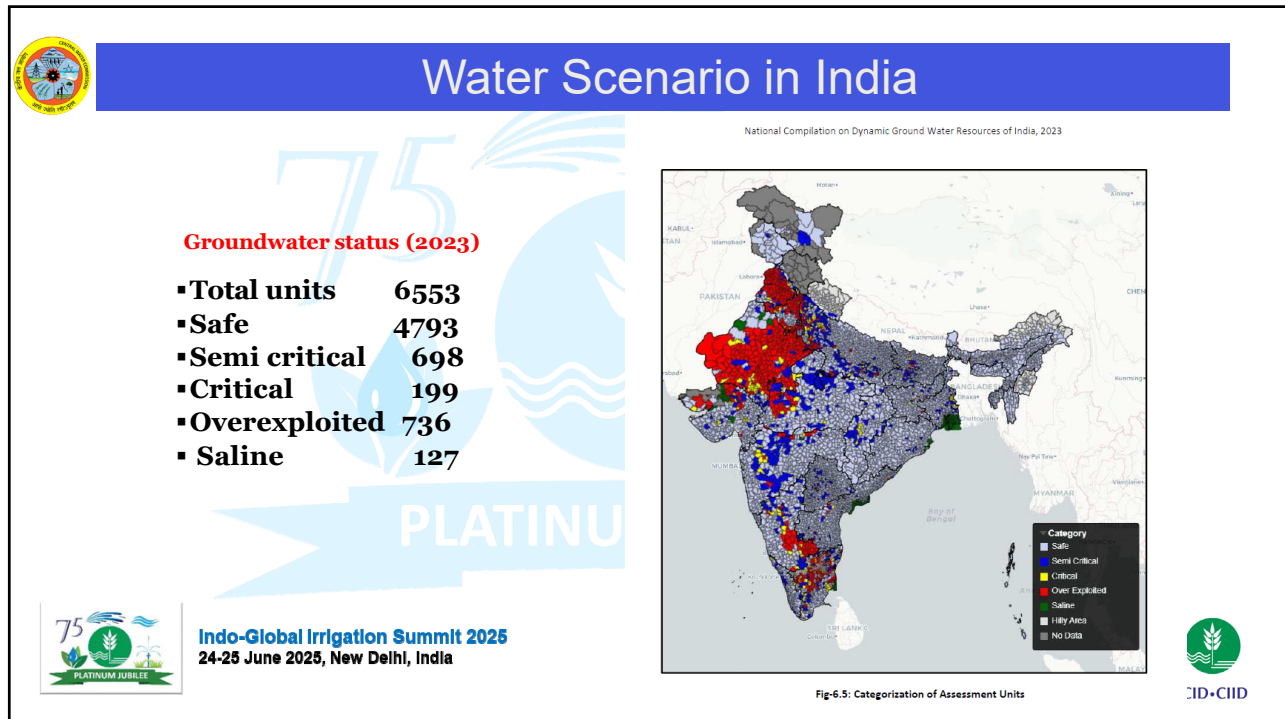
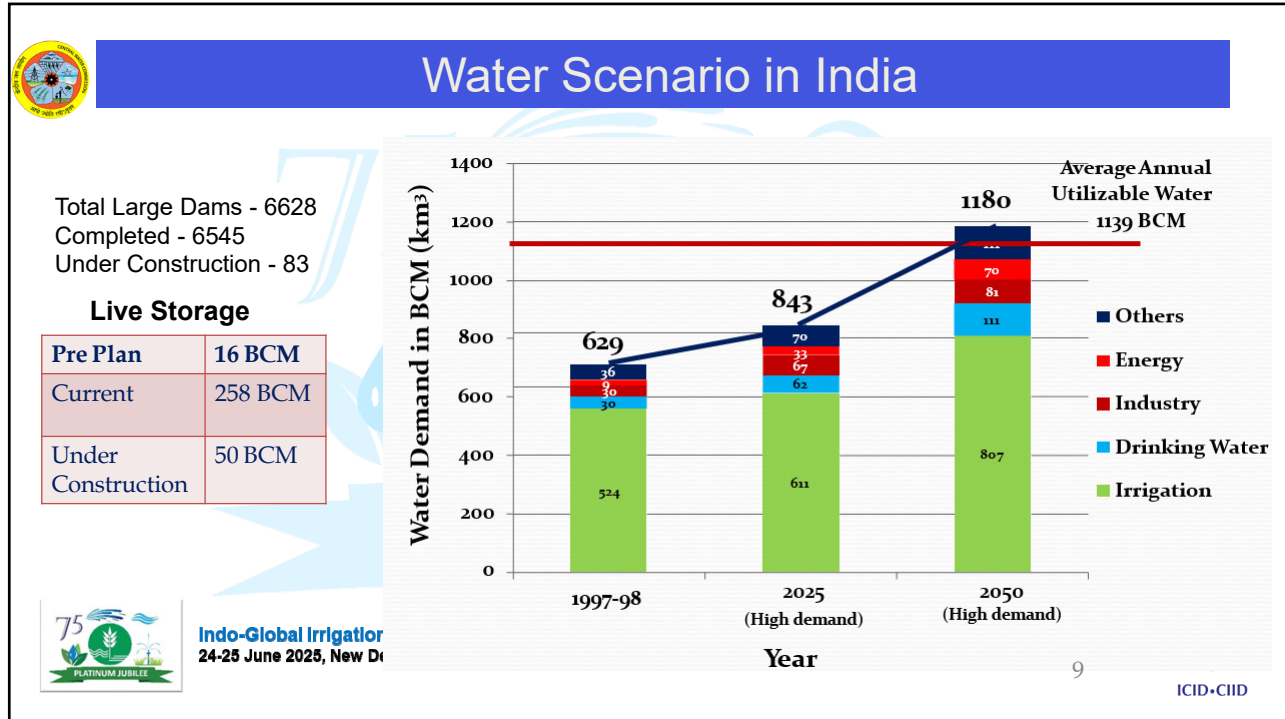


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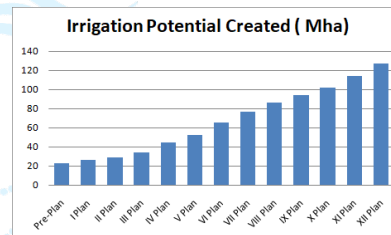






Agriculture & Irrigation Statistics in India

- Number of Major & Medium Irrigation Project – 1700 (approx.)
- Number Minor irrigation Structures: 20 million
- Net Sown Area – 142 M ha
- Net Irrigated area – 68.4 M ha
- Total Irrigation Potential – 140 M ha
- IPC has increased from 22.6 Mha (1951) to 126.73 Mha by the end of XII plan period (2012-17)
- Food Grain Production increased from 51 MMT (1950-51) to 332 MMT (6.0 times)



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11



Water Scenario in India (issues)

- ✓ Availability is more or less **constant** (Large scale spatial and temporal variation)
- ✓ Potential sites has already been **exhausted**.
- ✓ increased demand for Increase in population, Industrial development, energy needs.
- ✓ **Low** water use **efficiency** in all water use.
- ✓ **E-Flow** for sustainable ecosystem.
- ✓ Climate change (**uncertain** flood and drought with **higher magnitude**).



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Water Scenario in India (issues) contd...

- Serious issue of pollution in rivers and water bodies
- Reservoirs siltation
- Aging of dams
- Over exploitation of ground water use



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Water Scenario in India (challenges)

National Water Policy (2012) emphasizes integrated water resource management, efficiency, and sustainability. It also highlights the need for conservation, pollution control, and equitable distribution of water.

- ✓ Maintenance and operation of water infrastructures
- ✓ Efficient On-farm water (micro irrigation) use.
- ✓ Treated water use.
- ✓ Crop rotation (soil fertility), crop diversifications.
- ✓ Sustainable Ground water use (arrest ground water exploitation & contamination)
- ✓ Resolution of inter-State water disputes.
- ✓ Climate resilient innovative practices
- ✓ Trust building among stakeholders



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Water Management Initiatives-Agriculture

Accelerated Irrigation Benefit Programme (AIBP)-PMKSY - Extends financial assistance for early completion of MMI projects

Surface Minor Irrigation projects and RRR of water Bodies- with an eye to increase the irrigated area in the prioritized areas.

Micro irrigation – The PMKSY - Per Drop More Crop (PDMC) to improve water use efficiency at the farm level by promoting micro-irrigation methods

- Modernization of existing canal irrigation systems.
- **Economic pricing.**
- **On-farm water use**
- Use **green** energy like solar power.
- **Conjunctive use**
- Restricted **Ground water** use
- Irrigation scheduling



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Water Management Initiatives –Domestic & Industry

- Wastewater treatment and reuse in agriculture
- **Policy intervention.**
- Polluters Pay.
- Zero Liquid Discharge (ZLD).
- **Renewable energy sources**
- **safe drinking water**

Namami Gange Project - towards Nirmal and Aviral Flow in River Ganga

Jal Jeevan Mission (JJM): aims to provide potable water to every rural household through tap water connections by 2024.

Atal Mission for Rejuvenation & Urban Transformation (AMRUT): Focusing on providing universal coverage of water supply in urban areas.



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Water Management – Planning

Dam Rehabilitation and Improvement Programme (**DRIP**)

National Hydrology Project (**NHP**)

Mahatma Gandhi National Rural Employment Guarantee Act (**MGNREGA**)

New PMKSY under formulation - ERM of existing projects, SCADA, PDN, Micro Irrigation

National Water Mission: promotes water conservation and efficient use through various initiatives

Task force of NITI Aayog for IWRM

- Water accounting and auditing (WA&A)
- Water Harvesting
- **Demand Side management**
- **R&D**
- Structural health
- ISWD
- **Sustainability**
- **E-Flow**



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India Vision @ 2047

✓ GDP (9% growth for next 25 years)

✓ Per capita income (\$18,000-20,000)

✓ Industrial growth (green growth, reduced carbon emission)

✓ Infrastructure development (world class)

✓ Based on four Pillar (Empowering youth, farmers, Poor & Women)

• Aspires to be a developed (**Viksit**) Nation (**Bharat**)

• Inclusive sustainable growth with quality life and resilient economy.

• Achieving **30 trillion US dollar economy**

• Increased Human Development Index (**HDI**) – Economic condition, Income, Health, Education

• Minimum Government and maximum Governance with technology



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India Water Vision @ 2047

- 24 x 7 Drinking water supply to all
- Doubling of Food Grain Production
- Improve **water use efficiency**, Piped distribution network & promote **Micro irrigation** (potential 70 million ha)
- Optimized water **uses** & improved productivity and Reduce IPC-IPU gap.
- **Jan Bhagidari**.
- New Technology (**remote sensing, SCADA, AI/ML, modeling**) for better assessment and planning.



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India Water Vision @ 2047 contd...

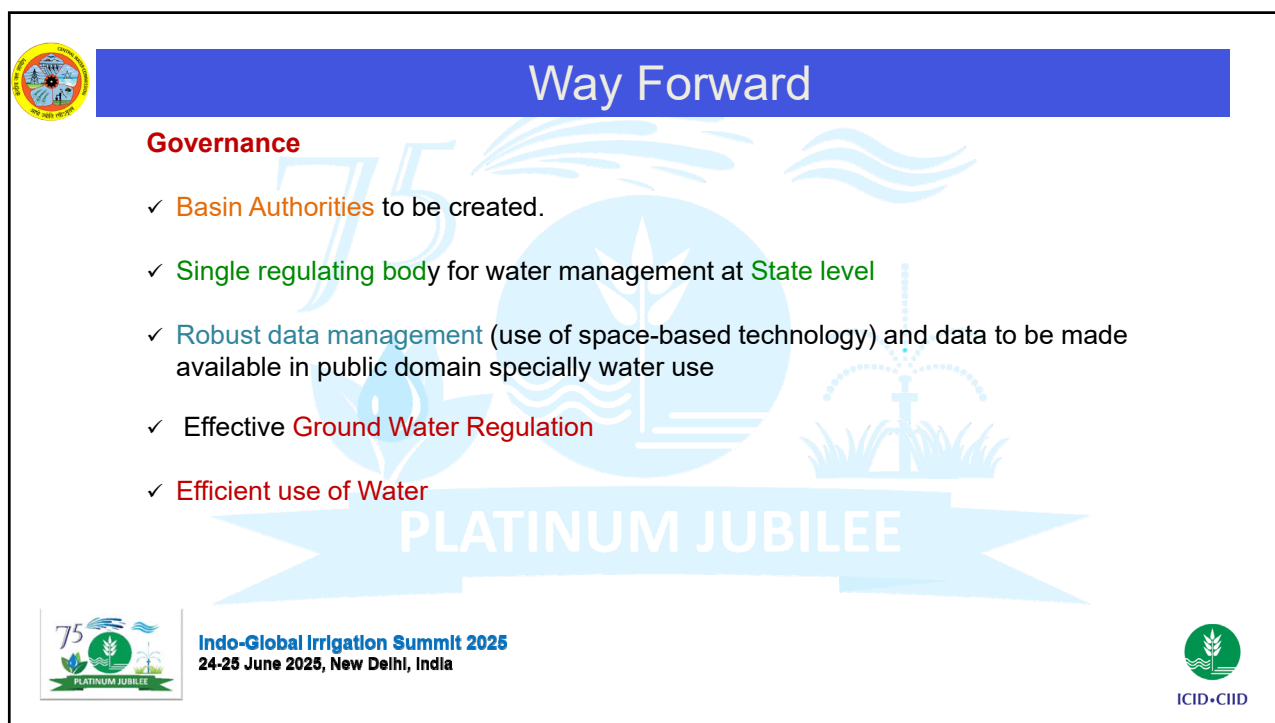
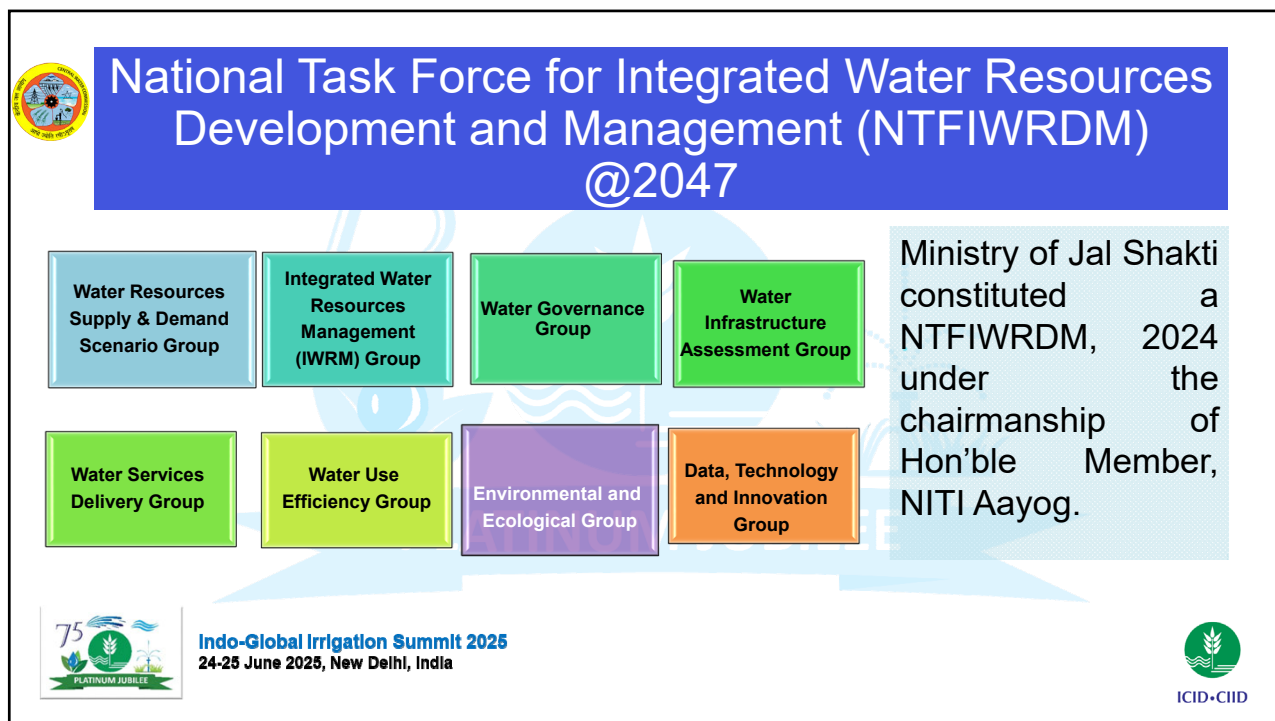
- Holistic **River health management** & Flood plain zoning
- Irrigation Performance Assessment including use of **ET based tools**
- Promoting **Command Area Development** for last mile connectivity and involvement of WUA
- Focus on **rainfed area** for drought proofing in infrastructure building.
- **Circular economy** targeting zero liquid discharge (**ZLD**).
- Improved **water quality, ground water management**



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Way Forward contd.....

River Management

- ✓ River Rejuvenation through waste water treatment, recycle & reuse, e-flow, flood plain zoning, river front development, community participation.
- ✓ **Rejuvenating springs** and other natural resources for augmenting river flows
- ✓ State of the art **Modelling Centre** with focus on Integrated Reservoir operation, Flood forecasting inundation modelling

✓ Interlinking of Rivers



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Way Forward contd.....

Agriculture

- ✓ **Crop diversification** based on ground conditions
- ✓ **Minimum support price** for crops needs to be relooked.
- ✓ Encourage **traditional crops cultivation**. Water saved may be used for other commercial use.



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Conclusion

Nexus Benefits (by 2050)

- ✓ Water, Food (450 MMT) & Energy Security
- ✓ Nirmal (clean) and Aviral (continuous) Dhara (flow) in Rivers
- ✓ Economic development (30 trillion \$)
- ✓ Sustainable Ecosystem
- ✓ Improved livelihood (21000 \$ per head)



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Thank You



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