

Welcome !

The Taj Mahal Hotel, New Delhi
December 2-4, 2015

Scientific Workshop

Future Ganga: *Science Needs For Water Security*



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Science and Water Management Challenges in the Ganga Basin



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First Ganga River Basin Management Plan 2015

Consortium of 7 "Indian Institute of Technology"s (IITs)



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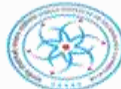


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Future Ganga: Science Needs For Water Security
Wednesday, December 2, 2015

IMPRINT India: Water Resources and River Systems



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First Ganga Rive Basin Management Plan 2015

- National River Ganga Basin (NRGB)
- Current Status
- Philosophy, Vision and How to Begin the Journey of Restoring Wholesomeness of National River Ganga

Most Important Starting Point

Vibrant Campaign on Ganga River Conservation and What it takes to Restore Her Health

National River Ganga



Ganga River Basin and the River Ganga

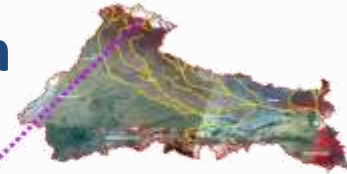
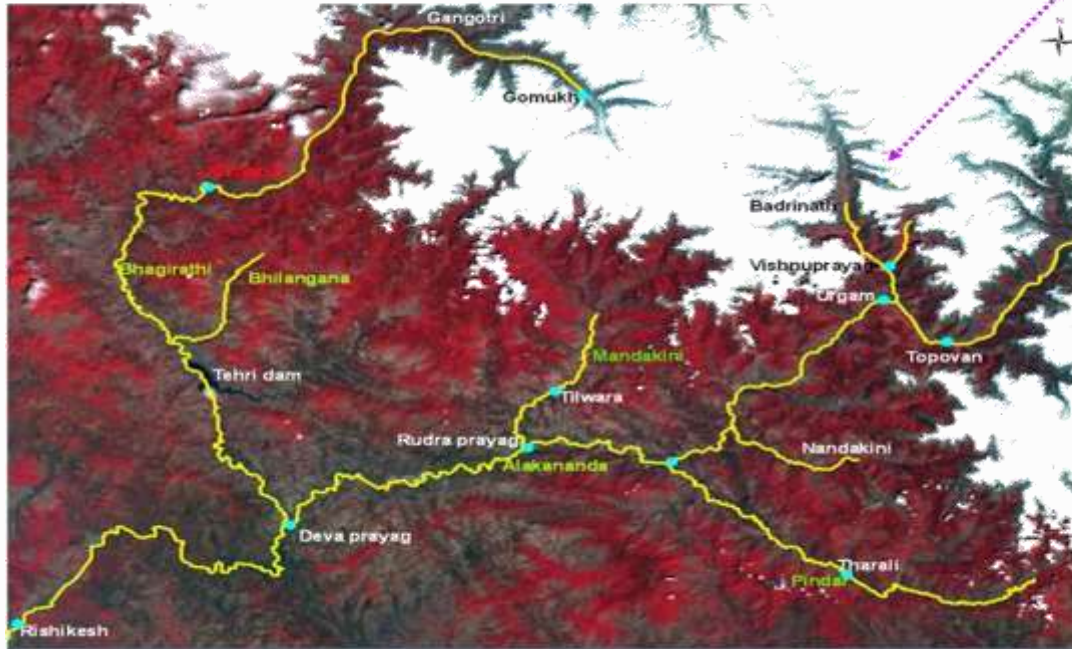
- River Ganga ≈ 2500 km
- Main Streams: Bhagirathi, Alaknanda, Mandakini, Dhauliganga, Nandakini and Pindar
- Important Confluences: Vishnu Prayag, Nand Prayag, Karn Prayag, Rudra Prayag, Dev Prayag and Prayag Raj



Ganga River Basin: 907,000 sq km; Covering 11 States in India

Upper Ganga Segment (UGS)

294 km up to Bhimgauda Barrage, Haridwar in
Hilly Terrain



Upper Ganga Segment (UGS)

- Flows on steep and narrow bed, mostly rocks and boulders.
- Carries cold water, is subjected to much less anthropogenic pollution.
- Has highly sensitive and fragile ecosystem and biodiversity, and
- Most importantly considered to have potential for harnessing hydropower.

Middle and Lower Ganga Segment

Middle Ganga \approx 1071 km Bhimgauda Barrage to Varanasi

Lower Ganga \approx 1145 km Varanasi to Ganga Sagar



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Centre for
Ecology & Hydrology

NATURAL ENVIRONMENT RESEARCH COUNCIL



Dr Vinod Tare
IIT Kanpur

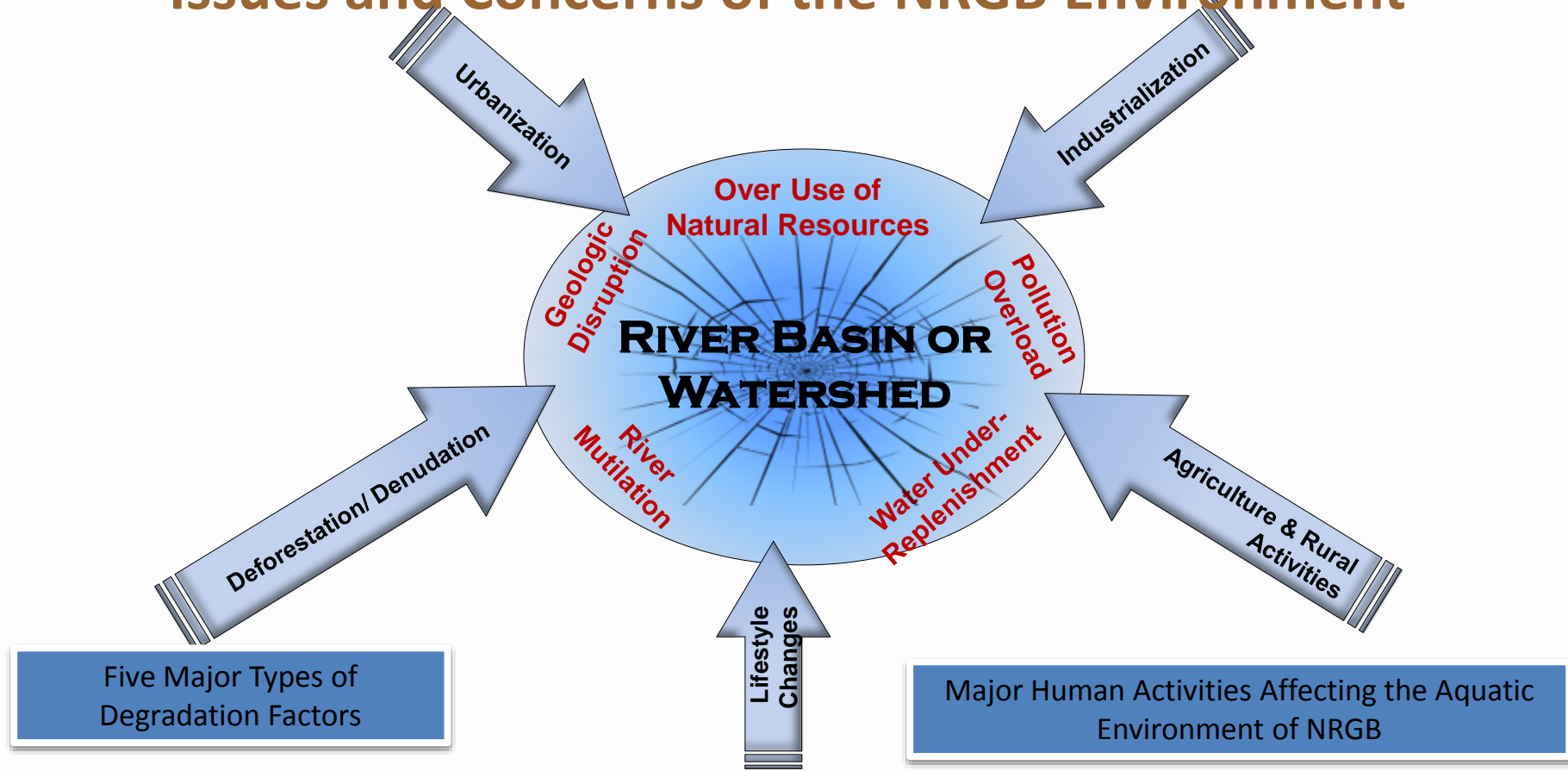
Middle Ganga Segment (MGS)

- Enters and flows in plains, meandering mostly on bed of fine sand.
- Has wide river bed and flood plain, and
- Most importantly modified through human interventions in terms of huge quantities of water diversion/abstraction and subjected to high degree of pollutant loads from domestic, industrial and agricultural activities.

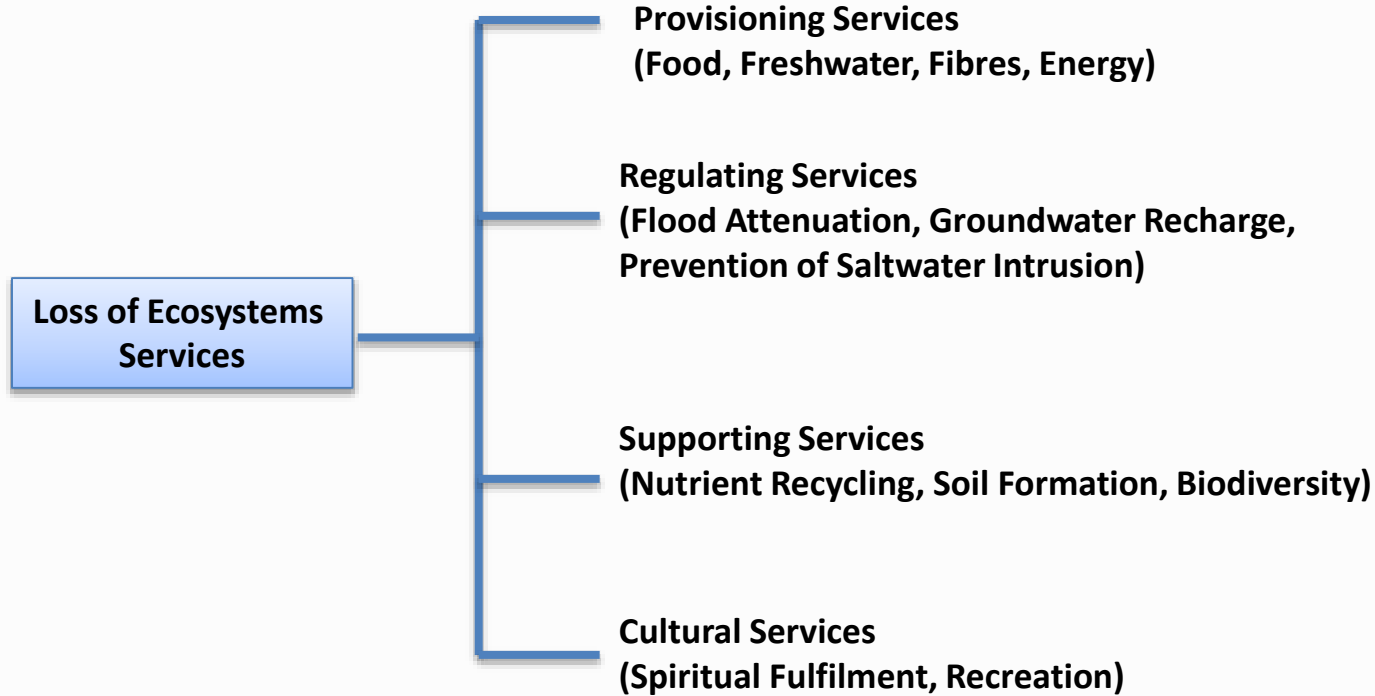
Lower Ganga Segment (LGS)

- River has experienced considerable changes in the sediment transport and deposition.
- Causes wide spread flooding.
- Undergoes frequent changes in her channel path, and
- Most importantly is subjected to international disputes on flows and interventions made and/or are being carried out/planned.

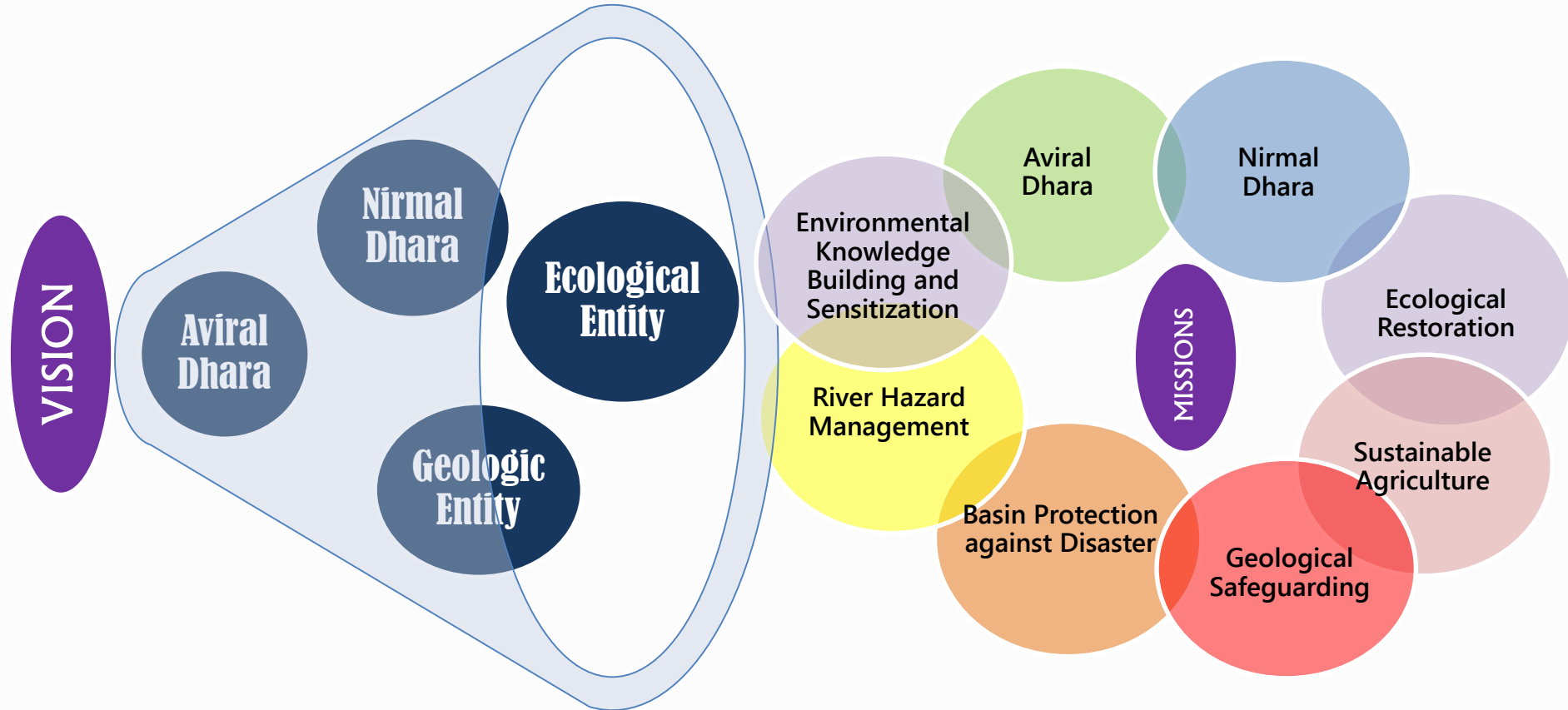
Issues and Concerns of the NRGB Environment



Impact on Humans



Vision and Implementation



Concept of Aviral Dhara (Un-interrupted Flow)

- Longitudinal Connectivity
- E-Flows
- Health of the River

Environmental Flows or E-Flows

"A regime of flow in a river or stream that describes the temporal and spatial variation in quantity and quality of water required for freshwater as well as estuarine systems to perform their natural ecological functions (including sediment transport) and support the spiritual, cultural and livelihood activities that depend on these ecosystems".

Assessment of E-Flows

- Location
- Ecological Settings
- Geomorphological Mapping
- Hydraulic Modelling
- Hydrology
- Socio-Cultural Aspirations

Concept of Mission Nirmal Dhara (Un-Polluted Flow)

अस्या जलस्य गुणाः शीतत्वम्, स्वादुत्वम्, स्वच्छत्वम्, अत्यन्तरुच्यत्वम्, पथतत्वम्, पावनत्वम्,
पापहारित्वम्, तृष्णामोहध्वंसत्वम्, दीपनत्वम्, प्रज्ञाधारित्वंच, इति राजनिर्घण्टः

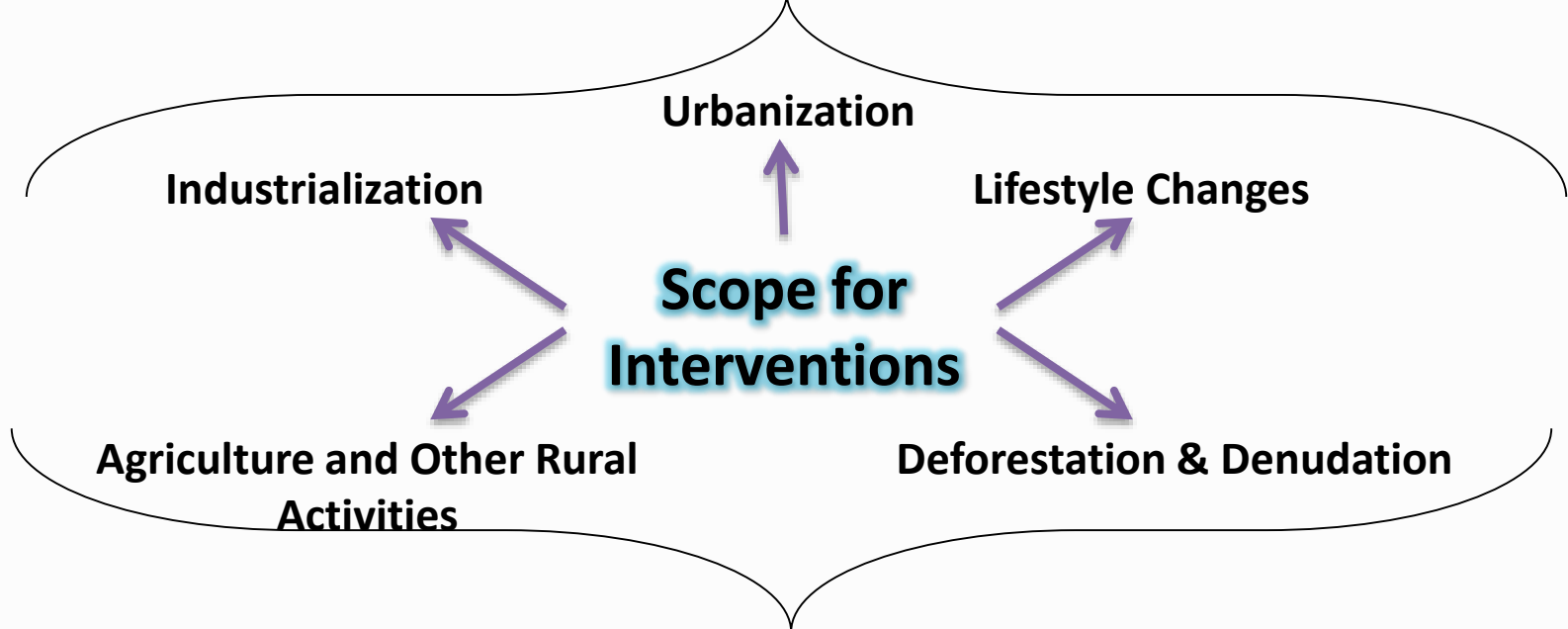
“The qualities of Ganga water are: Coolness, sweetness, transparency, high tonic property, wholesomeness, potability, ability to remove evils, ability to resuscitate from swoon caused by dehydration, digestive property and ability to retain wisdom”:

गंगां पुण्यजलां प्राप्य त्रयोदश विवर्जयेत् । शौचमाचमनं सेकं निर्माल्यं मलघर्षणम् ।
गात्रसंवाहनं क्रीडां प्रतिश्रद्धमथोरतिम् । अन्यतीर्थरतिचैवः अन्यतीर्थं प्रशंसनम् ।
वस्त्रत्यागमथाघातं सन्तारंच विशेषतः ॥

Prohibited thirteen types of human actions: (1) defecation, (2) gargling, (3) throwing of used floral offerings, (4) rubbing of filth, (5) flowing bodies (human or animal), (6) frolicking; (7) acceptance of donations; (8) obscenity; (9) considering other shrines to be superior, (10) praising other shrines, (11) discarding garments; (12) bathing, and (13) making noise.

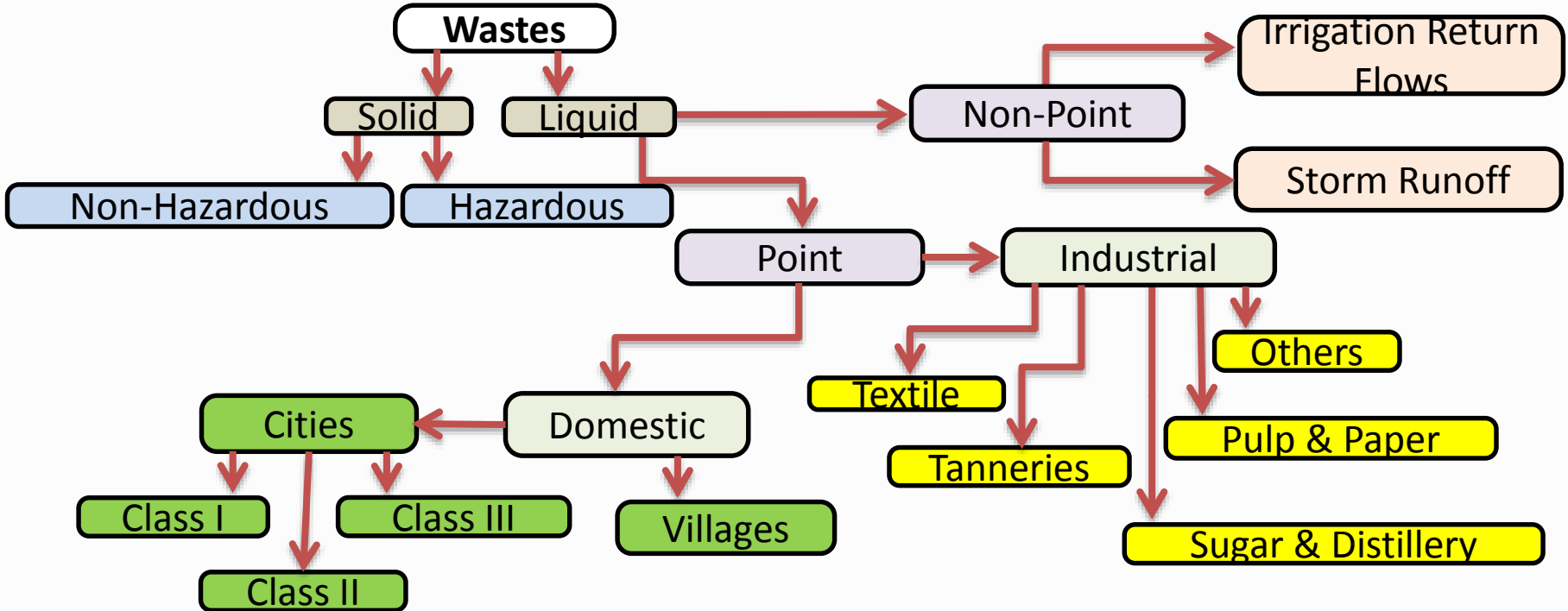
Scope for Interventions

Profit Making Activities & Activities of Relatively Effluent Section of the Society



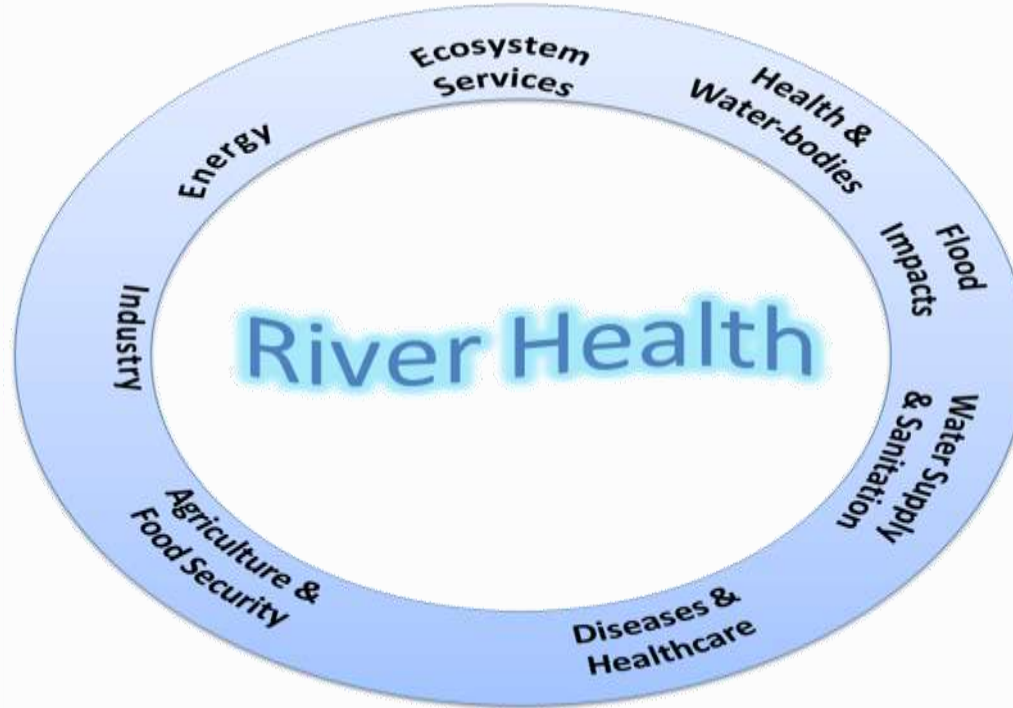
Basic Needs and Livelihood
of Relatively Poor or Marginal Sections of Society

Mission Nirmal Dhara or Un-polluted Flow: Various Types of Waste Generated



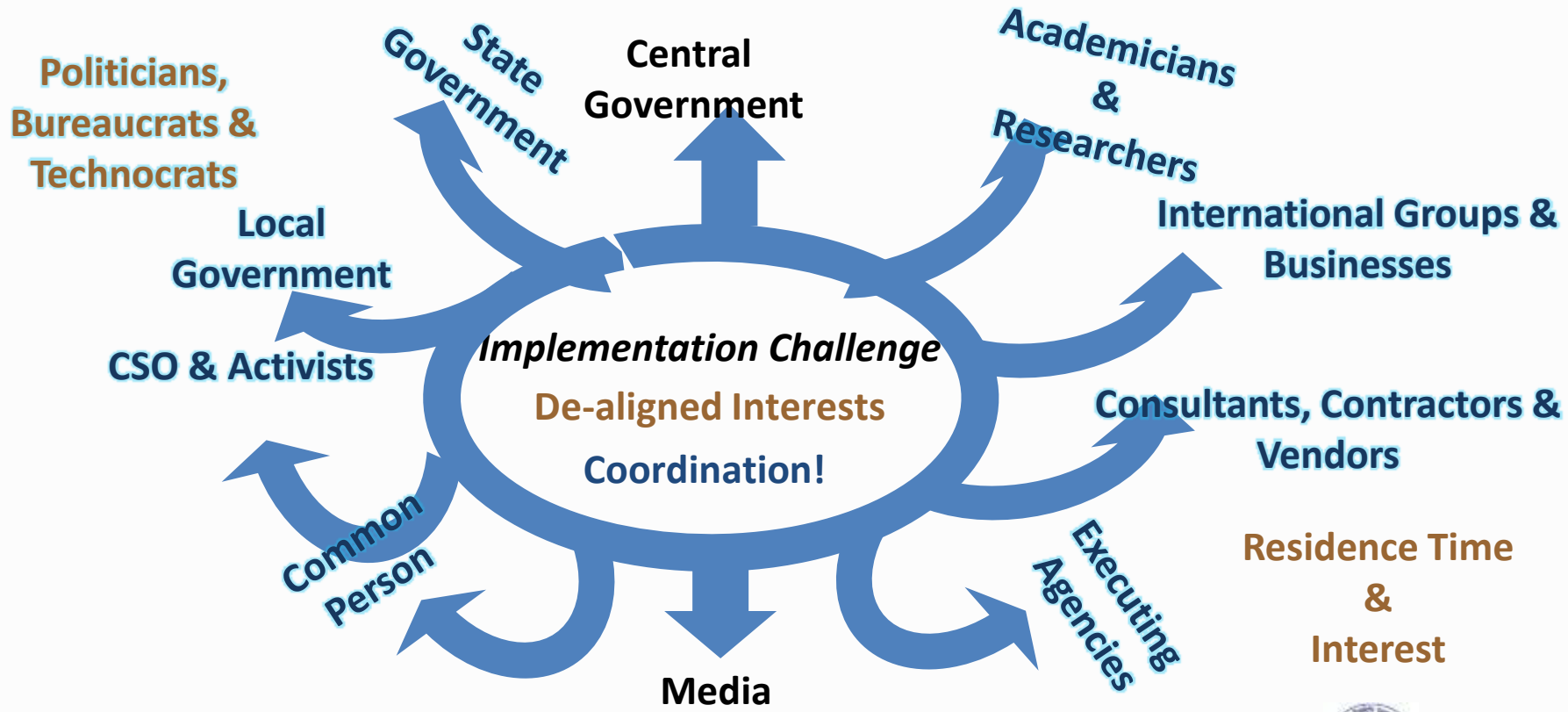
Implementation of GRBMP: Challenges

Most Sensitive Sectors



Implementation of GRBMP: Challenges

Actors and their Interests



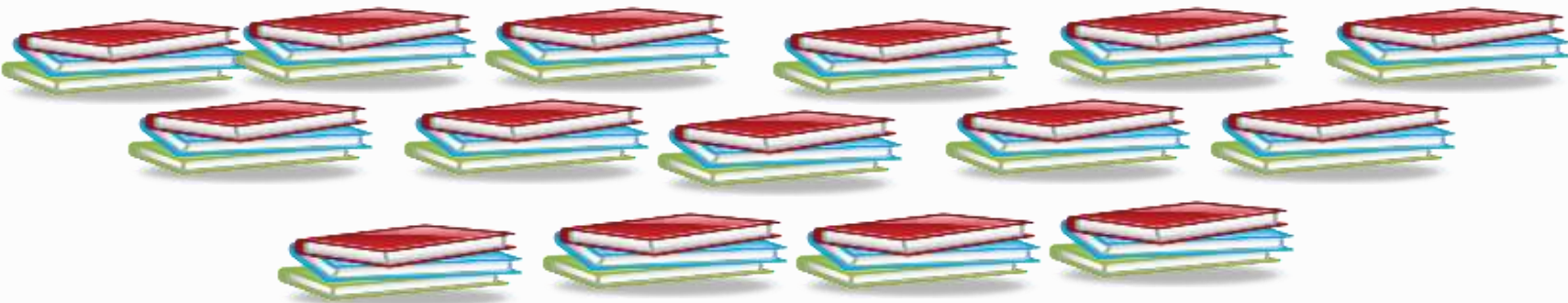
GRBMP Documentation Plan



Mission Reports

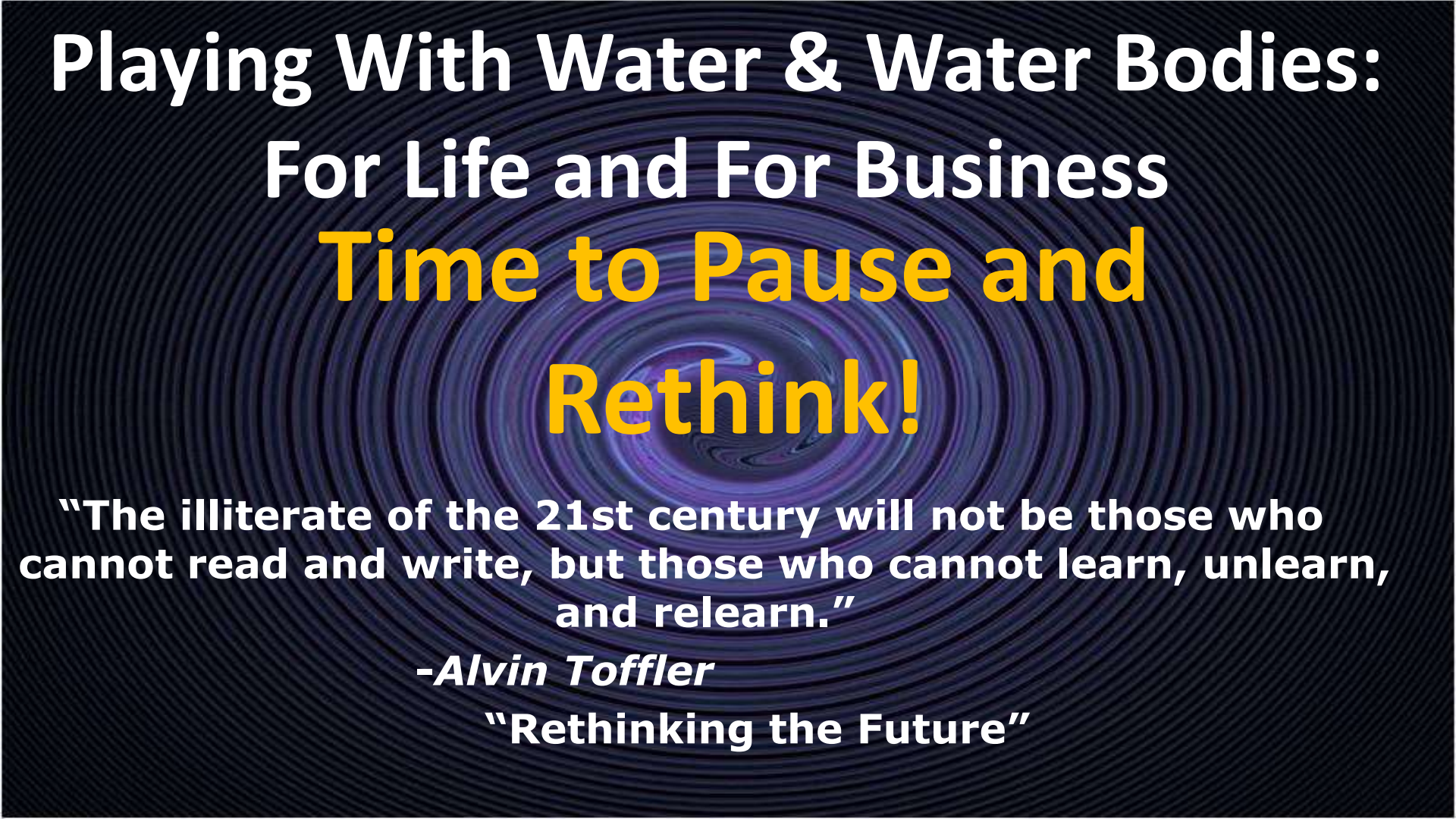


Thematic Reports



GRBMP

- Long journey → 25 to 30 Years
- Will require reforms and investments of the order of INR 6,00,000 Crores (US \$ 100 b)
- Dynamic, will evolve as we learn to gather more systematic information
- Show how to begin this journey



Playing With Water & Water Bodies: For Life and For Business Time to Pause and Rethink!

“The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.”

-Alvin Toffler

“Rethinking the Future”

WATER RESOURCES AND RIVER SYSTEMS

- An impending water crisis stares the country in her face today.
- Many of our rivers and water bodies are heavily polluted, posing severe health problems
- Many cities and towns face acute water shortage every year
- Much of the population has no access to safe drinking water
- Over-exploited groundwater resources are affecting agricultural output in large tracts of the country

WATER RESOURCES AND RIVER SYSTEMS

- Rapidly vanishing water bodies have gravely damaged aquatic ecosystems and their resilience.
- The low efficiencies of irrigation water use and poor water management practices and policies at all levels have contributed to the overall aquatic crisis.

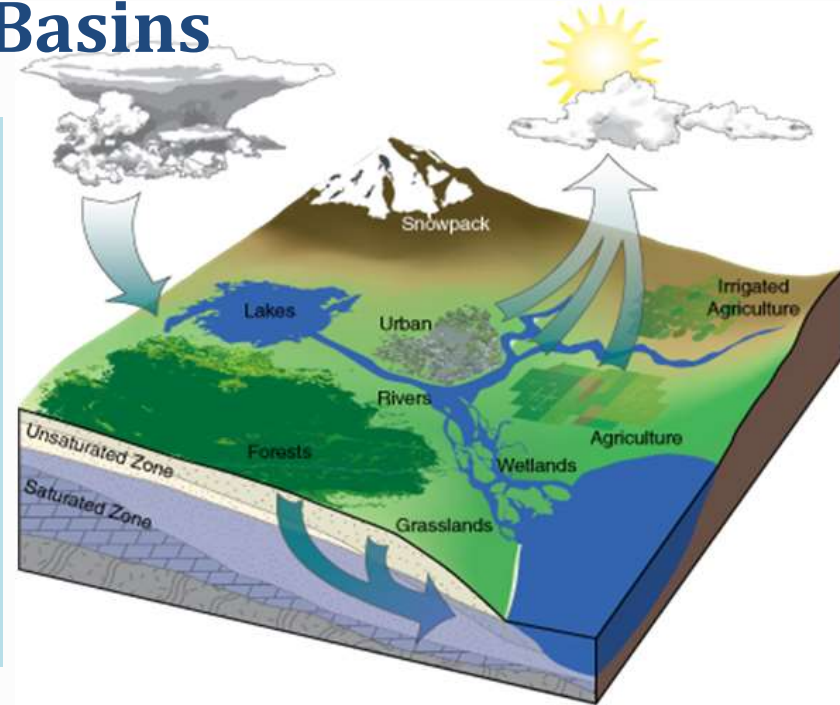
The focus of the IMPRINT initiative is to evolve appropriate educational and research policies that can overcome the critical challenges of water resources and river systems.

Themes – 1. River Basins

Scientifically Manage River Basins

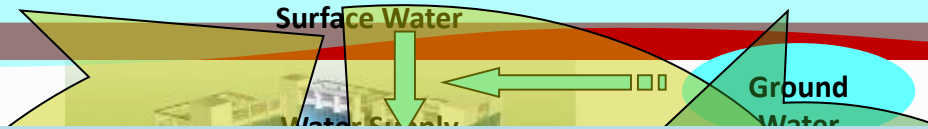
Grand Challenges

- Convert rapid flows to sluggish flows to increase water availability for human and ecosystems
- Define, maintain and improve the health of water bodies



Themes – 2. Water in Urban Systems

3. Water in Rural Eco-Systems



Grand Challenges

- Close water and nutrient loop at local scale
- Increase water-use efficiency through cost effective technology interventions, measurements, pricing mechanisms, informed opinions and public policies
- Sanitation Practices – Short-cited Vision of Pathogen Control to avoid chemical contamination of groundwater resources

Themes – 4. Water & Agriculture

5. Water & Industry

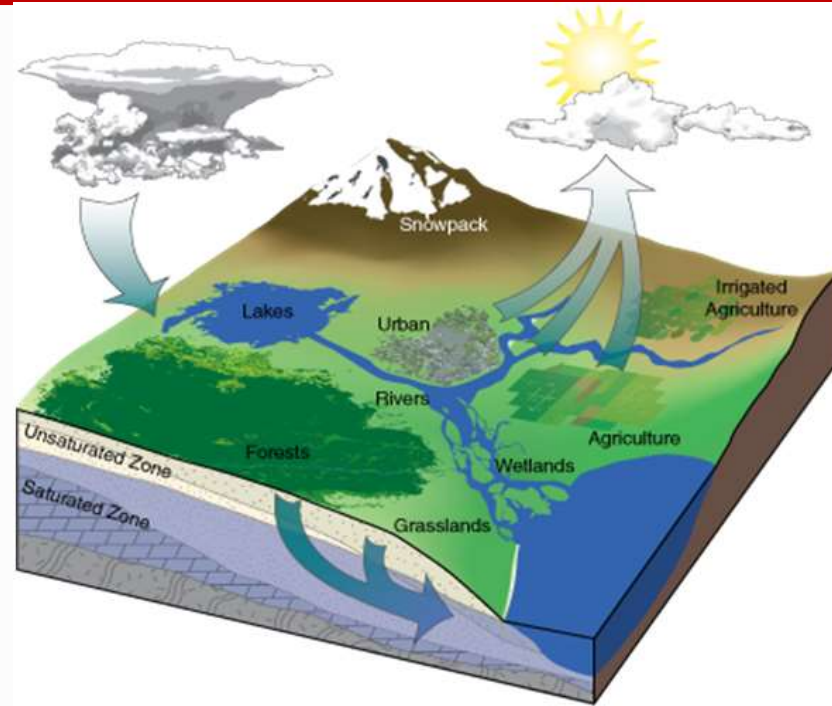
Grand Challenges

- Increase water-use efficiency through cost effective technology interventions, measurements, pricing mechanisms, informed opinions and public policies
- Recognize and disseminate traditional knowledge and practices regarding management of water and water bodies

Agriculture & Industry

Use Efficiency

Themes – 6. Spatial Data Infrastructure for Real Time Data Acquisition and Dissemination



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Major Science Questions

- What are the key gaps in data availability, monitoring and dissemination at various spatial and temporal scales that affect water resources and river systems?
- To what extent water availability and water demands changed historically and how these are likely to change in future ?
 - Business as Usual and Smarter Ways
- How sensitive are the river basins towards changes in land-use/ land- cover and climate?

Valuing Water

- Water is not only a commodity, but its true value also includes social, cultural, environmental and economic values.
- The value of water embedded, directly or indirectly, in various products and services also needs recognition.
- World over this concept of virtual water now influences production and trade policies, especially in water-stressed areas, enabling the most economic and efficient use of scarce water supplies.

Governance

- Encroachment, Abstraction and Waste Disposal
- Licenses, Permits and Policing to Recognizing, Responding, and Responsibility
- Empower through knowledge

Knowledge & Capacity Development

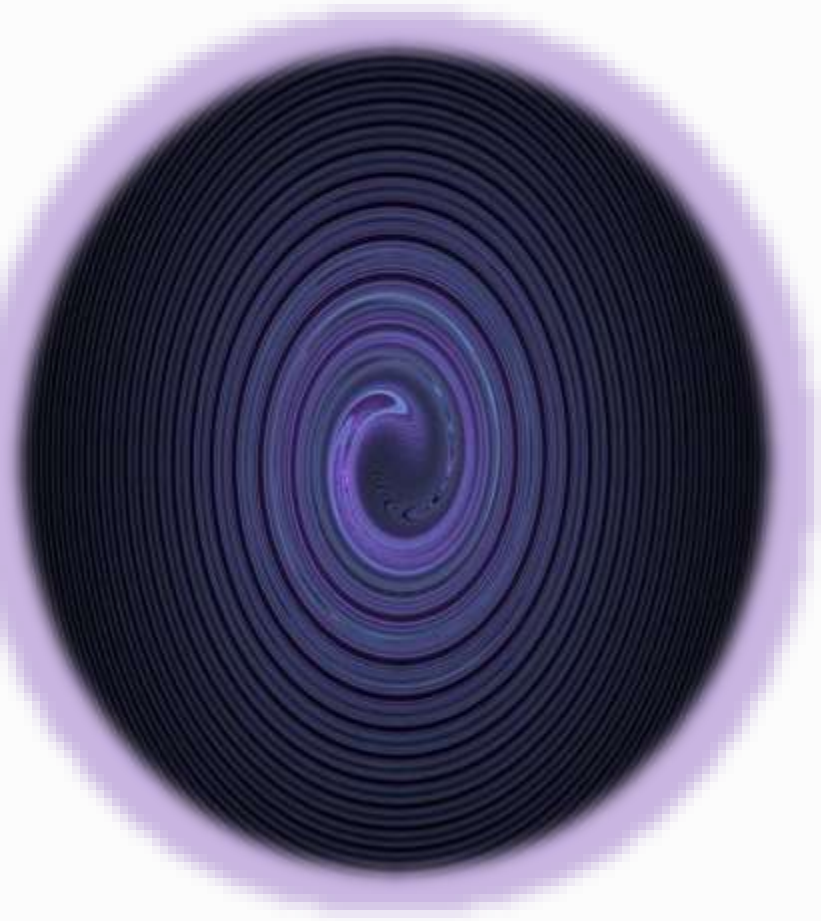
- The lack of data and sound knowledge-based systems, combined with inequitable access to and sharing of scientific, local and indigenous knowledge, comprises the major stumbling block to sound water management. Yet, we have the knowledge and capacity to solve many – and probably most – of our pressing water-related problems if water issues are properly governed.

Knowledge & Capacity Development

- Globally the strategy to improve the overall quality of water resources is based on local level actions. Lessons learned — successes and failures — are invaluable sources of information and, if properly shared, will help us to solve some of our most pressing freshwater-related problems.

Preparation of Policy Document on Education & Research

- Assessment of present status and setting benchmarks for engineering, innovation and education
- Identification of - R&D gaps, policy gaps and implementation issues
- Articulate shift in human resource development policy at various levels - school to higher education, vocational, etc.
- Re-adjust focus, identify needs (infrastructure, financial and human resources) and set timelines for R&D
- Suggest measures for addressing implementation issues



Thank You !

Vinod Tare

