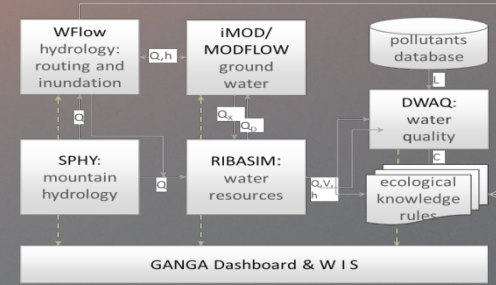


Strategic Basin Planning for the Ganga River Basin in India



Project Description 2017

A Typical River Basin...

Where will investment in STP have biggest effect ?

Which other interventions will enhance the impacts ?

Can cultural/religious sites be prioritized and how ?

Can flood waters be stored and used in dry season ?

How does storage in dams compare with groundwater storage ?

Are there other unforeseen impacts ?

How will tube wells for agriculture impact on low flows in rivers ?

How will that affect water quality concentration levels ?

What is impact on Eco-system services ?

...there is a need to integrate the activities of multiple actors...

Agriculture Department

Livestock Department

Forest Department

Rural Water Supply Department

Urban Water Supply Department

Irrigation Department

Power Department

Industry Department

Fisheries Department

Environment Department

Transport Department

Tourism Department

Wetlands / Environment

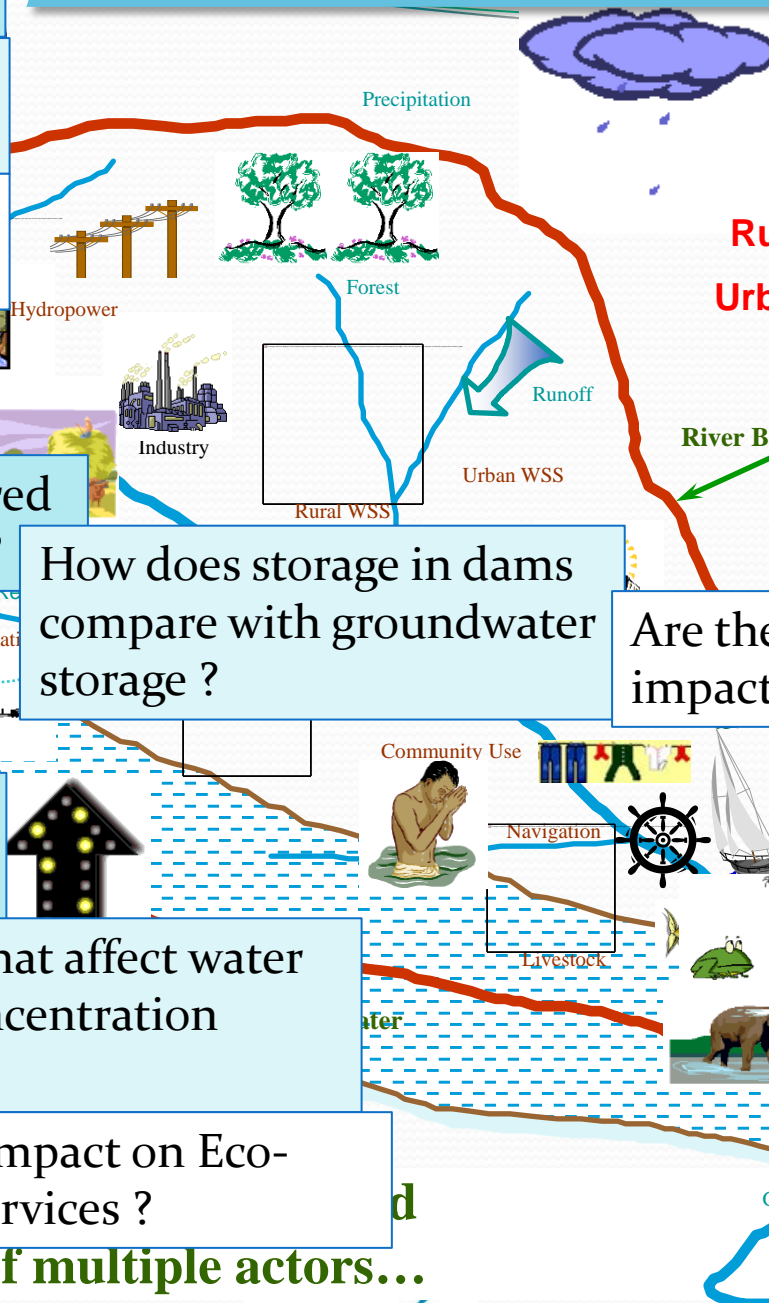
Ocean

Groundwater Dept

Surface Water Dept

Ocean Development

Trans-boundary



Support to strategic basin planning

- **MoWR, RD & GR committed to adopt a scientific strategy for rejuvenating the river Ganga**
- A robust water resources planning model for the entire Ganga basin in India for Holistic planning is needed
- MOWR, RD & GR in collaboration with World Bank initiated a Consultancy on Strategic Basin Planning for Ganga river in India
- Consultants : Deltares in consortium with AECOM and Future Water
- Duration of consultancy : 28 months from date of commencement
- Committee headed by Secretary MOWR, RD & GR constituted in Dec 2015 for monitoring the progress

The main project products are:

robust water resources planning model (Quantity and Quality)

multi-scale environmental flow assessment

scenarios that explore alternative options

surface-groundwater interactions across the basin

multi-stakeholder consultation process (Manthan)

wide access to the models and analyses and quality documentation

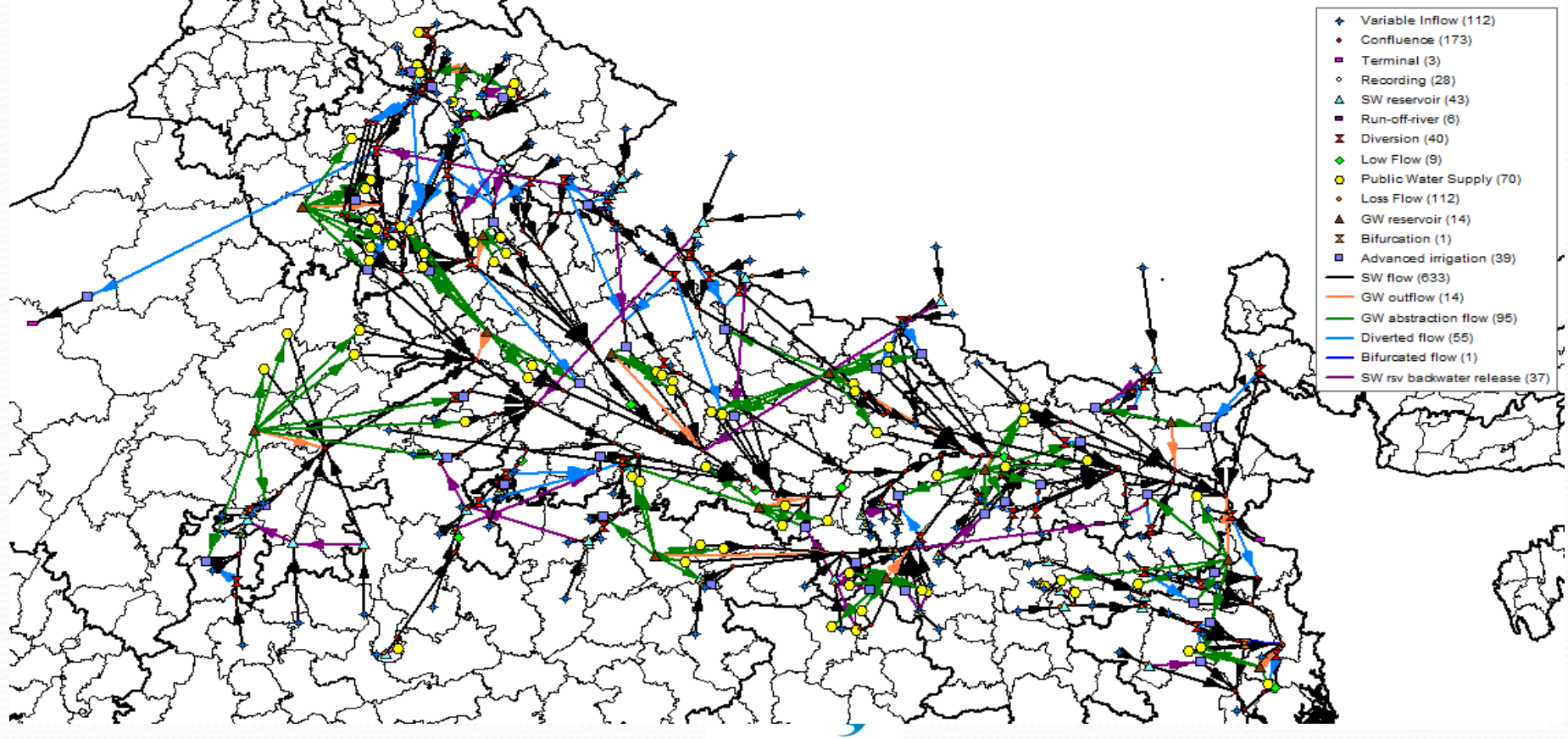
Activities carried out in first year

- Engaging stakeholders and Central and State level
- Identify main issues
- Assess data availability and collect relevant data
- Develop prototype models
- Elaborate issues and cause and effects in collaborative modeling workshops and identify indicators for planning
- Develop strategic planning models and connect them to dashboard
- Prepare e-flow zonation

Connected Models have been developed

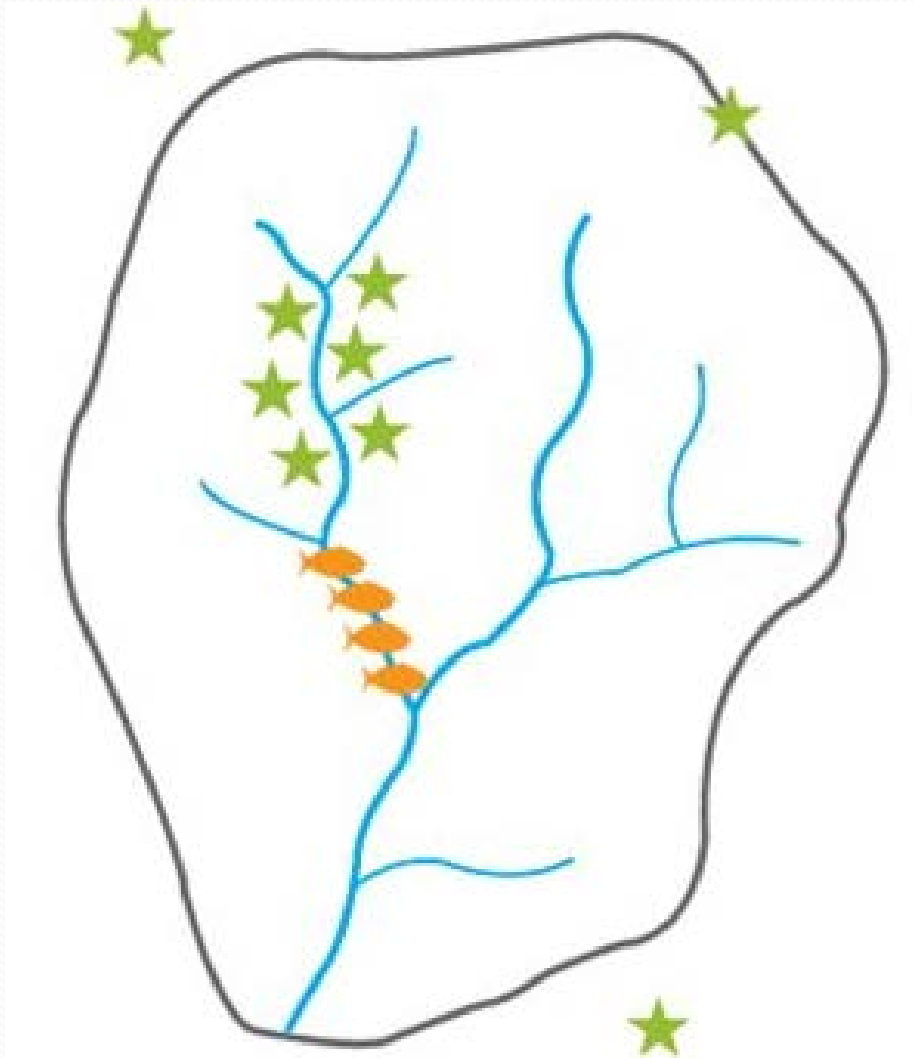
• Simulating the following processes:

- Rainfall transition to Runoff and Groundwater
- Groundwater interacting with surface water
- Water uses, abstractions, infrastructure etc
- Water Quality and ecology



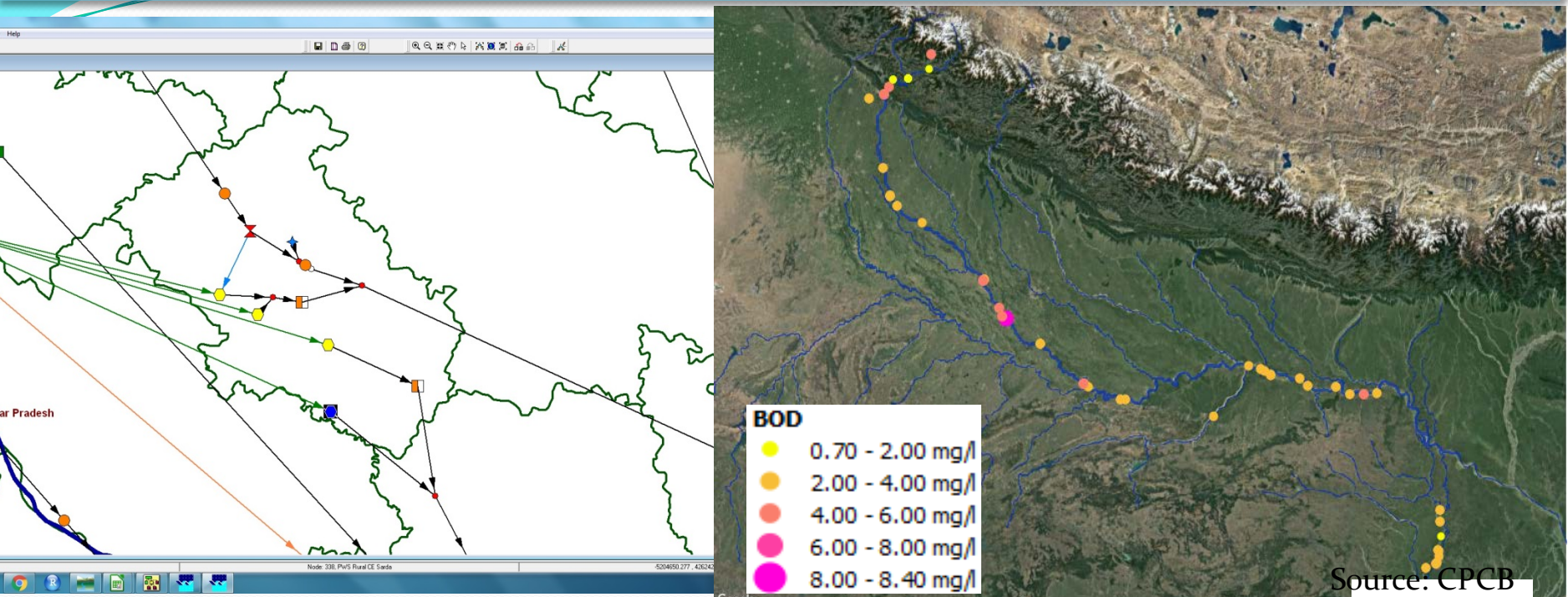
Water quality

- **Assessing best investment strategy**



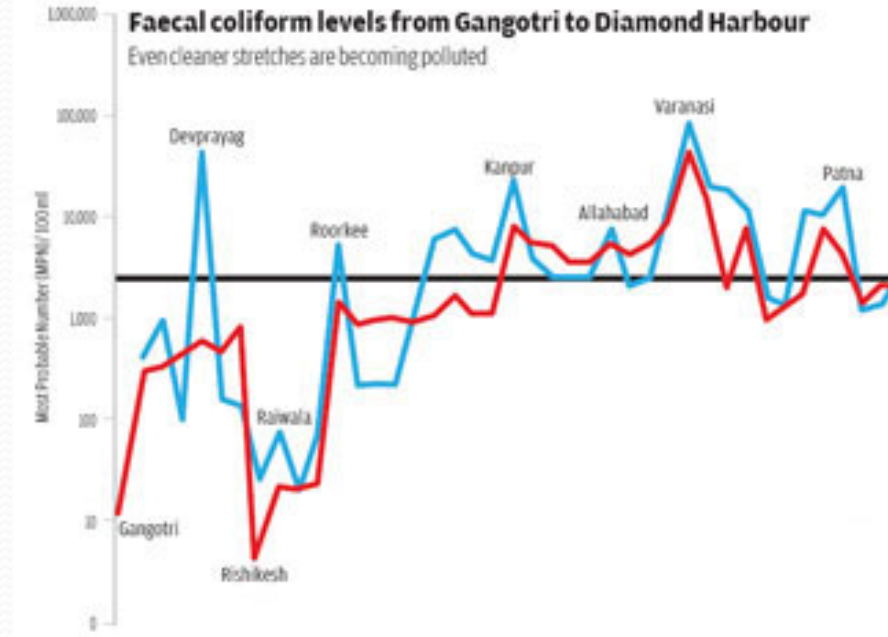
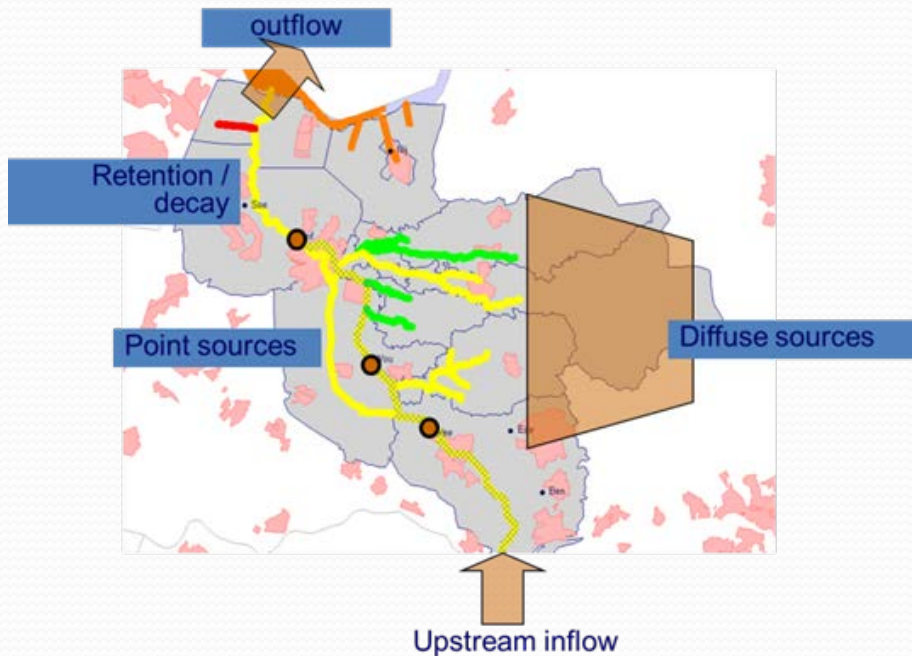
- **Distributed investments do not always give desired results**
- **Models can help find the best investment strategy for optimal impact**

Water Quality (2)



- To support Namami Ganga program the model allows the user to switch on/off STP in any urban area to assess its impact on the river water quality.
- Also effects of flushing/dilution can be evaluated.

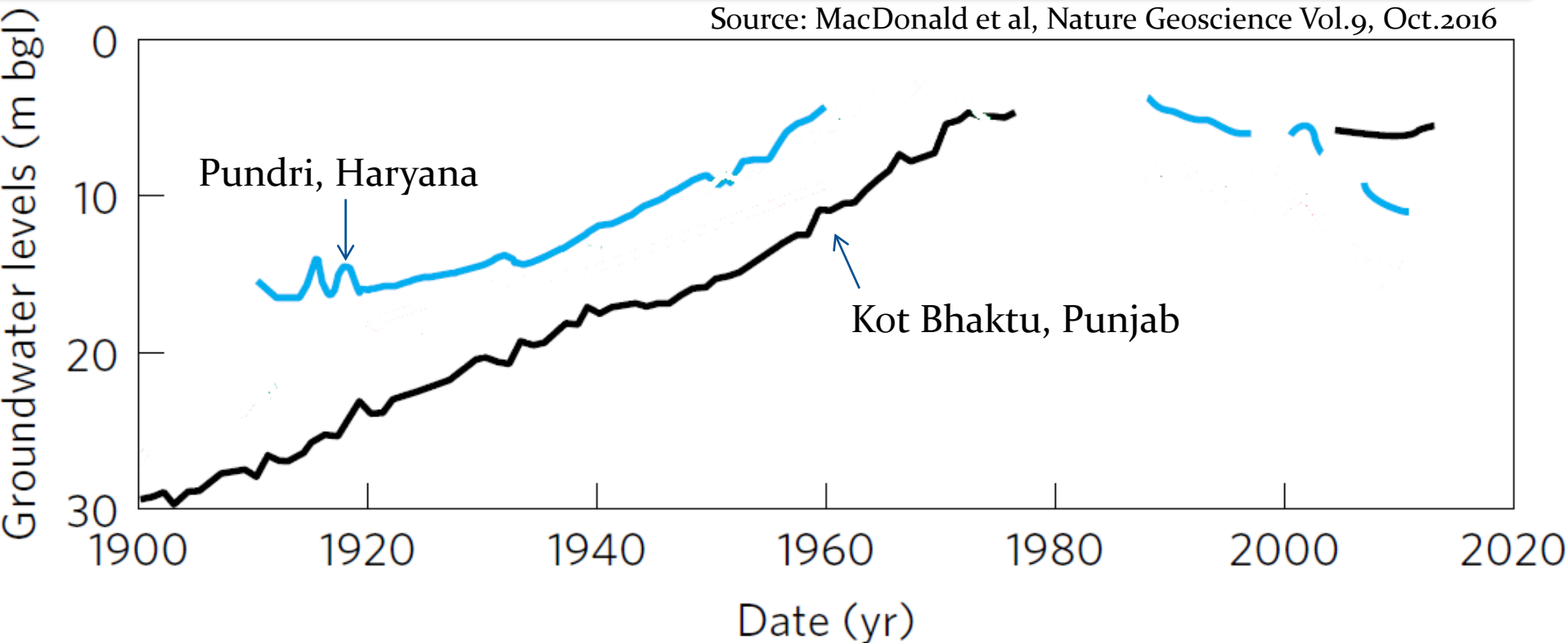
Water Quality (3)



Source: CPCB

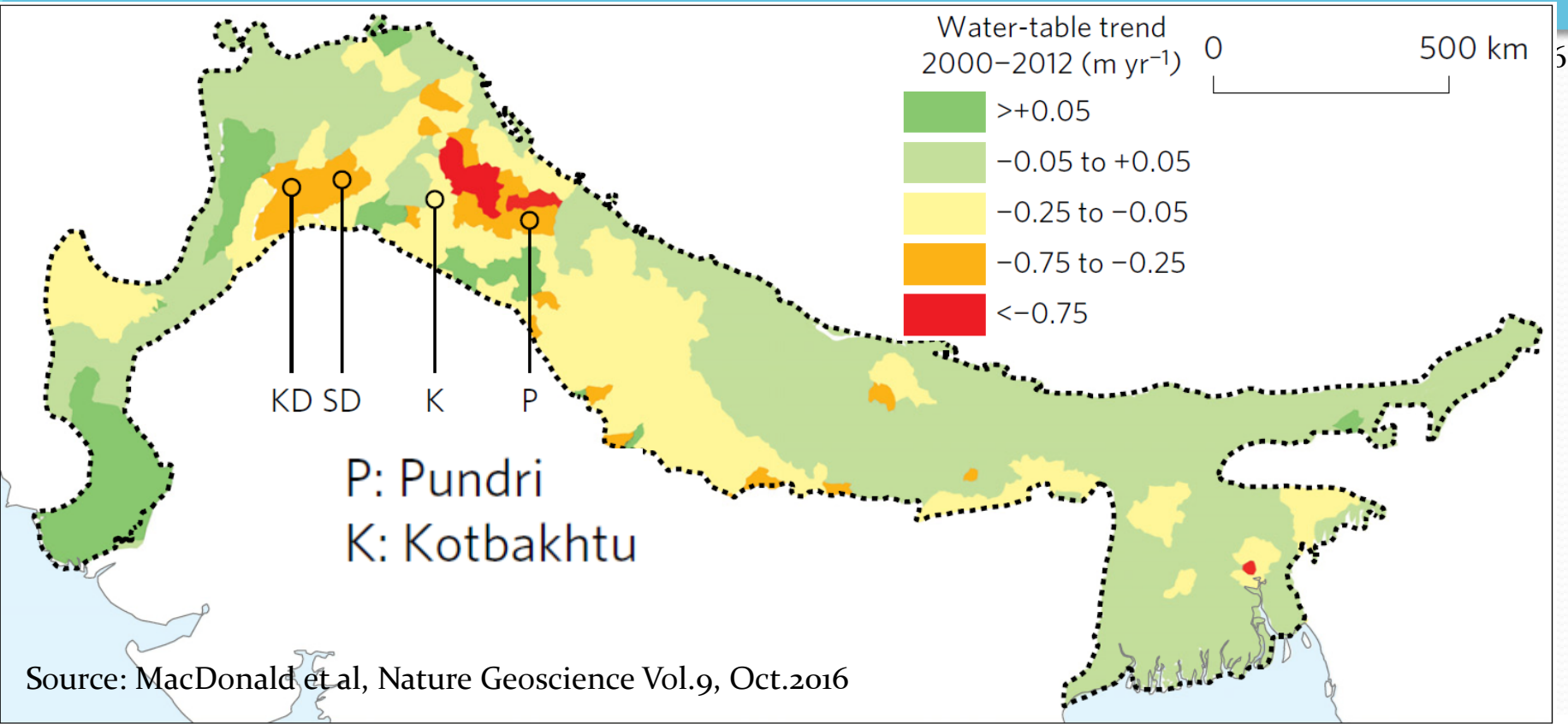
- We also simulate water quality processes in the river “**natural cleaning capacity**” and its effect on the river water quality.
- Combined effect can be assessed for key sites (health risk, cultural values, ecology)

Surface water-Ground water interaction



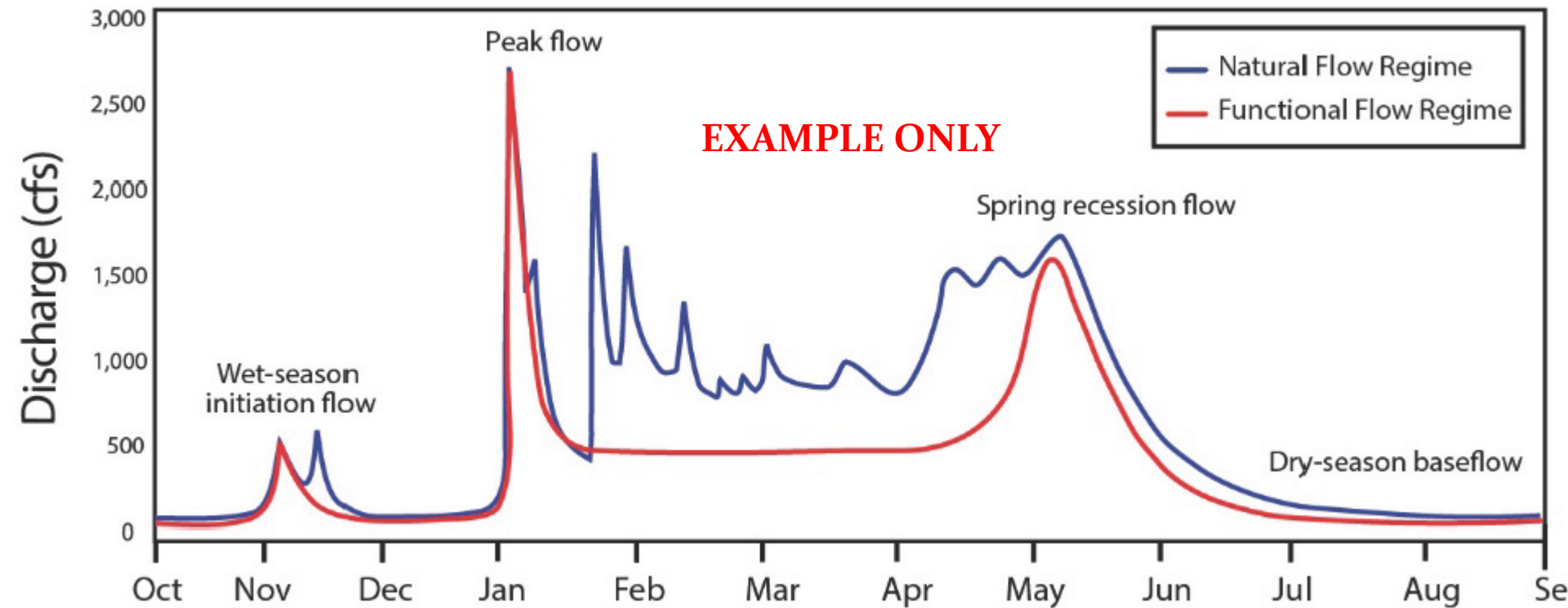
- Decades of irrigation has increased water levels in many places and present declines are localized in areas of high demand.
- With models we can simulate the interaction and seek to better understand and guide management of SW-GW interactions as linked resources. These connections are critical to managing river flows in the lean season

Surface water-Ground water interaction



- A huge Ground water reservoir is available.
- With models we can simulate how carefully managed conjunctive use can improve benefits without creating problems

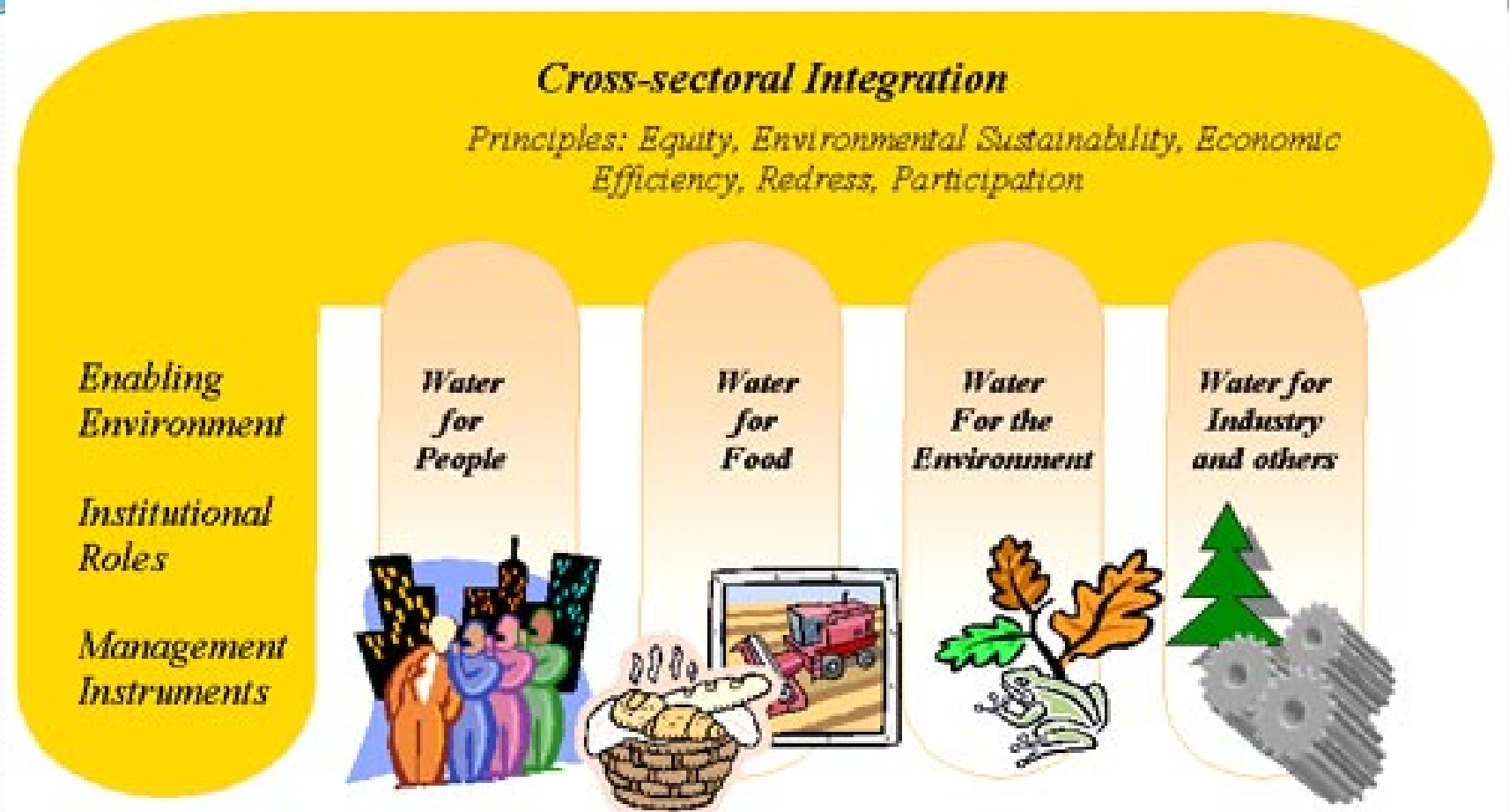
Environmental flow



- E-Flow is about variability and connectivity, not only minimum flow.
- With models we can simulate what is acceptable management options combining human and ecosystem needs (which also benefit humans)

- **Building dams is always a balancing of pros and cons.**
- **With models we can simulate the impacts and add compensating measures before deciding**
- **Models can simulate with/without dam:**
 - **Downstream flow changes and impact on ecosystem**
 - **Power generated**
 - **Water stored**
 - **Different release strategies**

Strategic Planning will assist Governments to stimulate the best mix of interventions and policies



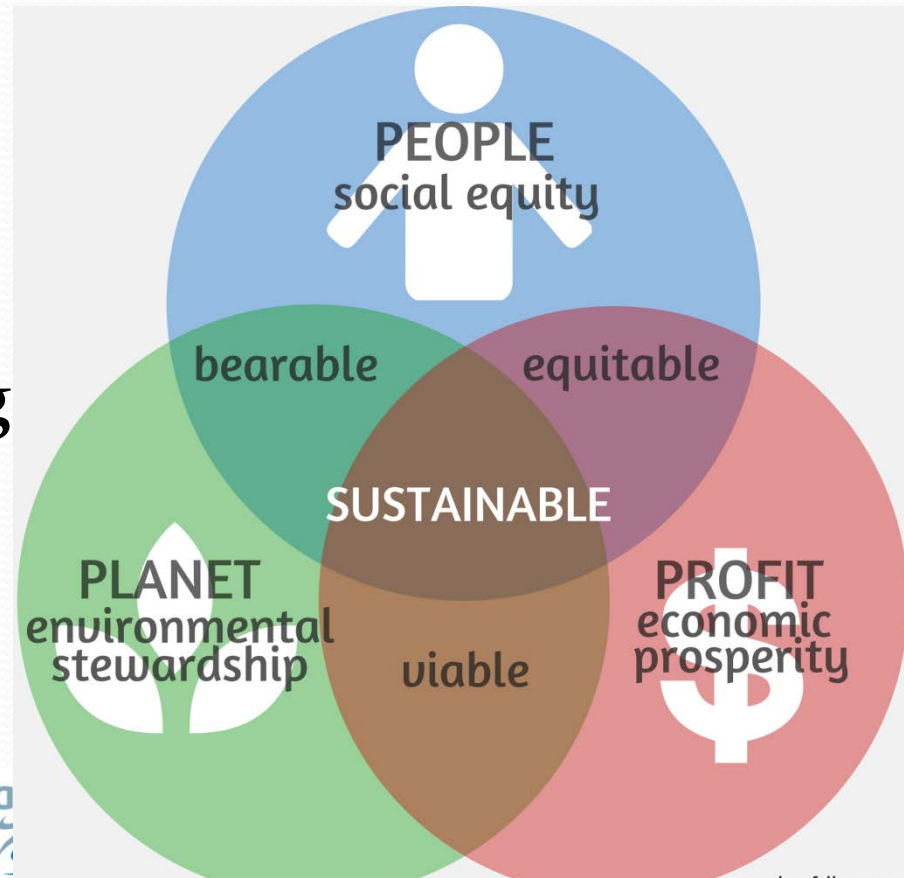
Ganga Rejuvenation requires joint consideration of Quality and Quantity (SW, GW, eflows). We can also explore scenarios of enhanced inland navigation, irrigation efficiency, etc.; with or without climate change.

Triple Bottom Line

Almost all the world's societies acknowledge that they aim for a combination of

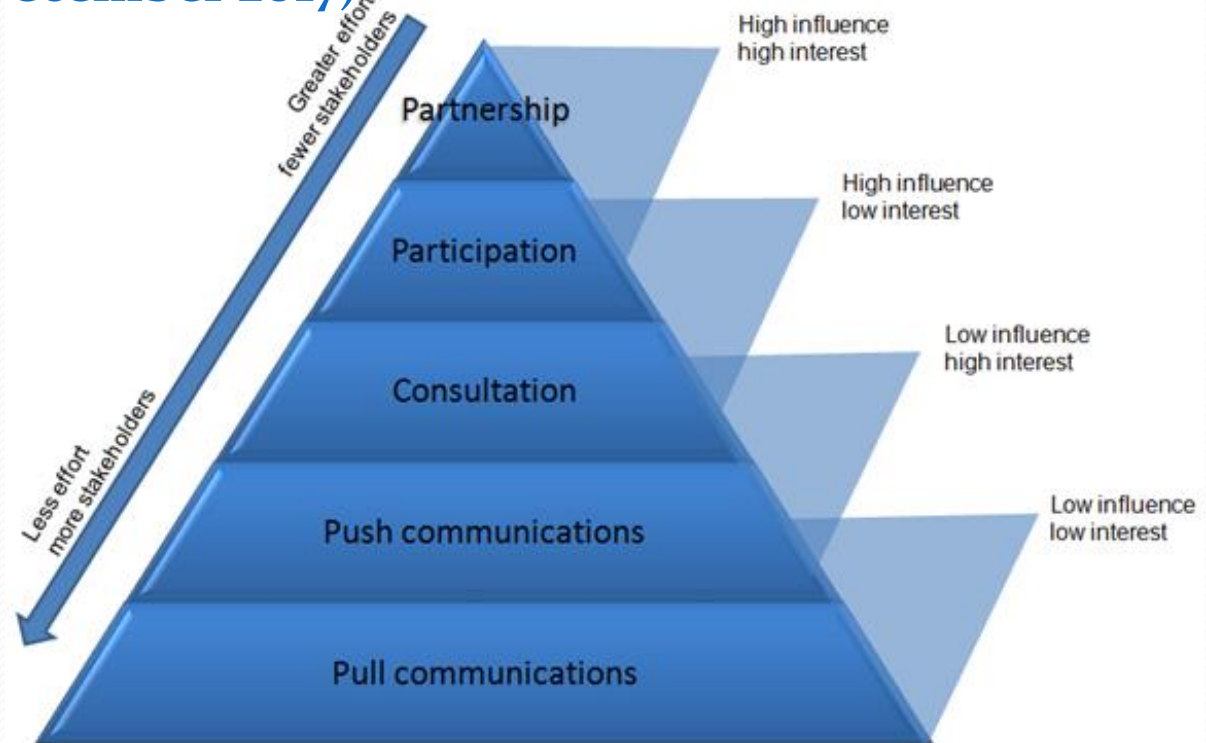
- **Economic development,**
- **Environmental sustainability, and**
- **Social inclusion,**

So it is not only about **solving problems** but also **creating opportunities**



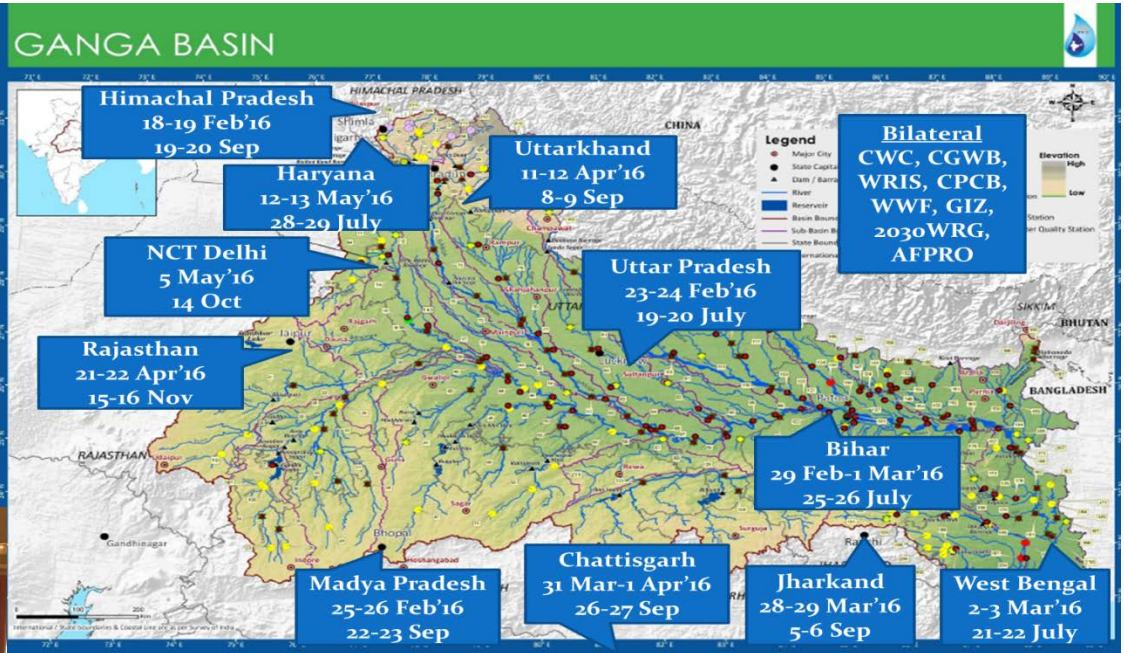
Stakeholders are essential for success

- **Basin Wide workshop**
 - **Engagement meetings in all States** Chief Secretary/secretary level
- **Basin Wide workshop**
 - **State Collaborative modelling workshops** with Technical staff
- **Basin Wide workshop (planned February 2017)**
 - **State Strategy and Scenario workshops (April-June 2017)** Technical staff, closing with secretaries
- **Basin Wide workshop (December 2017)**



Stakeholder Engagement & Collaborative Modeling

All 11 states in the basin have been consulted with engaging and collaborative modeling workshops



BASIN-WIDE ISSUES in the Ganga Basin

Water quality

- Waste water contamination in urban areas/pollution from communities , leading to contamination of water with pathogens/ Public health concerns
- High concentration of toxic/industrial chemicals in surface water
- Agricultural pollution (pesticides etc.)
- River pollution (colliery)/ effects of mining
- Groundwater contamination both manmade and natural with arsenic, fluoride
- High salinity of Groundwater

Ecology

- Loss of biodiversity (e.g. dolphin)
- Environmental flows
- Environmental pollution
- Ecological protection

Miscellaneous

- Navigation
- Low agricultural productivity and efficiency
- Unplanned development in the whole basin
- Data acquisition and sharing of (digital) data

Water quantity

- Limited Availability and rising demand of water
- Water distribution
- Natural calamities/Floods (in urban areas)
- Flood affected soils Water logging
- Drought
- Reduction of river discharge
- Groundwater depletion/lowering of groundwater table
- Groundwater underutilization in other areas
- Interaction surface water - groundwater
- Changing monsoon/rainfall (less)

Sedimentation/siltation

- Siltation of dams/anicuts
- Soil and bank erosion
- Sand mining

Expected outcomes of the project

- Increased awareness and capacity in the states to do Basin water management
- Basin wide models available to all states and central organizations enhancing inter-state discussions and mutual understanding
- Cross sectoral impacts are better understood which will lead to more integrated plans with less negative side effects
- Inter departmental and inter ministerial cooperation will be enhanced based on better insights in the interconnection of systems
- Project is an important pilot for the river basin planning work envisaged under NHP. We will share “lessons learned” as input to NHP later in the project



Thank you