Nature and Organization of India’s Water Economy: Insights from 10 years of IWMI-Tata Water Policy Program

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Defining features of India’s water economy

• Unusually high reliance on groundwater

• Large and growing informal component with over reliance on self-provision of water services

• Heavy emphasis on water resources mobilization to the neglect of governance of infrastructure and service provision
South Asia and North China are the world’s biggest irrigated areas.

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India is the world’s largest user of groundwater in agriculture in the world.

India has over 20 million irrigation wells. Until 2000, it added 0.8 million/year.

Every fourth cultivator owns an irrigation well; non-owners depend on groundwater markets.

Increasing irrigation in canal and tank commands is with Pumped water.
Over half of India’s irrigation pumps were installed after 1990.

India’s Groundwater Juggernaut is still accelerating!!!
Pervasive groundwater
Irrigation-A South Asian Phenomenon

There is a similarly explosive growth in urban and industrial groundwater use. The groundwater boom is a response to the inability of public systems to meet growing water demand.

Irrigation as well as urban water planning ignores groundwater.
After US $ 35 billion invested in canal irrigation since 1991, India has 3 m ha less under canal irrigation.

**Trends of public expenditure in major and medium irrigation and net irrigated area under different sources in India**

- **Groundwater**
- **Canal command**
- **Tanks**

<table>
<thead>
<tr>
<th>Year</th>
<th>Expenditure (billion US$, in 2000 prices)</th>
<th>Net irrigated area (million ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>1970</td>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>1980</td>
<td>30</td>
<td>12</td>
</tr>
<tr>
<td>1990</td>
<td>40</td>
<td>18</td>
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<tr>
<td>2000</td>
<td>50</td>
<td>24</td>
</tr>
</tbody>
</table>
Future of urban water demand..

High GW dependence

Higher SW access
Large and growing informal component with over reliance on self-provision of water services
How effectively these instruments can be used to influence the Behaviour of millions of final users depends upon the degree of Formalization of the water economy.

**Industrialized country’s Water Economy**

- **Formal Water Sector**
  - Incidence of Laws, prices, taxes/subsidies, public policies falls on service providers

- **Informal Sector**

**India’s Water Economy**

- **Formal Sector**

- **Informal Water Economy**
  - Self-provision dominates; laws, prices, policies fail to stick
70-80% of rural households have self-supply domestic water needs; 70-75% of irrigators self-supply their irrigation requirements using pumps. The only way IE can work with these is offering resource support. But regulation, management, and markets are possible only in towns and cities.
Indians today pay just around Rs 10,000 crore for their domestic water supplies; but India needs to invest Rs 500-600 thousand crore to assure protected water supply to all. The issue is not capital or technology; but how to pave the way for an organized water industry.

For a long time to come, India’s prime water sector challenge will be the creation and sustainable management of water infrastructure and services.
Community-driven water harvesting and groundwater recharge movement in Saurashtra has revitalized dying agriculture.

Large-scale people’s and community water initiatives unknown in highly formalized water economies of Industrialized societies. These contain challenges as well as opportunities.
The booming informal economy of peri-urban waste water irrigation

- Urban India releases 15 BCM of waste water/year.
- Some of this is untreated nutrient rich water.
- According to one estimate, around 1 million ha of gross area is irrigated with urban waste water.
- Opportunity out of an adversity?
- Can this recycling be done by design to minimize health risks and develop cost-effective, sustainable urban wastewater treatment regime?
Over-emphasis of public policy on water resources development, overlooking the relationship between the water economy and the larger national economy.
Obsession with resource development to the neglect of infrastructure and service provision.

Abundant water resources = Improved Water access? No

• Physical and economic water scarcity;

• Improved water access= $f(\text{Improved governance of the water economy } G_w)$;

• $G_w = g(\text{economic development; } x, y, z)$

• Water poverty index = $f(\text{access to water; water resources; capacity; water use efficiency; water environment})$
Figure 2 Water Access Poverty and Water Scarcity: How Little they Have to Do with Each Other

\[ y = 0.0104x + 12.411 \]

\[ R^2 = 0.0072 \]
Figure 3 Correlates of Water Poverty: Water Scarcity or Underdevelopment?

- **Water Poverty Index**
- **Water Resources Index**
- **Human Development Index**

Linear (Water Poverty Index):
\[ y = 0.1905x + 42.643 \]
\[ R^2 = 0.6431 \]

Linear (Water Resources Index):
\[ y = 0.002x + 8.9023 \]
\[ R^2 = 0.0004 \]
The structure of a dynamic national economy adjusts, even if imperfectly, to water endowments.
Figure 5 Water Environment Index and PPP adjusted GNP

\[ y = 0.0005x^2 - 0.0518x + 11.346 \]

\[ R^2 = 0.2935 \]

Environment Kuznet’s Curve:
E. degradation is not inevitable to growth; but growing demand for environment amenity and changing structure of output help.
## Transformation of Informal Water Economies with Overall Economic Growth

<table>
<thead>
<tr>
<th>Stage</th>
<th>Completely Informal</th>
<th>Largely Informal</th>
<th>Formalizing</th>
<th>Highly Formal Water Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of users in the formal sector</td>
<td>&lt;5%</td>
<td>5-35%</td>
<td>35-75%</td>
<td>75-95%</td>
</tr>
<tr>
<td>Examples</td>
<td>Sub-Saharan Africa</td>
<td>India, Pakistan, Bangladesh</td>
<td>Mexico, Thailand, Turkey, Eastern China</td>
<td>USA, Canada, Western Europe, Australia</td>
</tr>
<tr>
<td>Dominant mode of water service provision</td>
<td>Self-supply and informal mutual-help community institution</td>
<td>Partial Public Provisioning but self-supply dominates</td>
<td>Private-public provisioning; attempts to improve service and manage the resource</td>
<td>Rise of modern water industry; High Intermediation; self-supply disappears</td>
</tr>
<tr>
<td>Human, technical, financial resources used/km³ of water diversion</td>
<td></td>
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<td>% of total water use self-supplied</td>
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<td>Rural population as % of total</td>
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<td>Cost of domestic water as % of per capita income</td>
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<tr>
<td>Cost of water service provision</td>
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<tr>
<td>Concerns of the Governments</td>
<td>Infrastructure creation in Welfare Mode</td>
<td>Infrastructure and Water services, especially in Urban areas in a welfare mode</td>
<td>Infrastructure and service in towns and villages; Cost recovery; Resource protection</td>
<td>Integrated mgt. of water infrastructure, service and resource; Resource protection</td>
</tr>
<tr>
<td>Institutional Arrangements</td>
<td>Self-help; mutual help and feudal institutions dominate</td>
<td>Informal Markets; Mutual help and community management institutions</td>
<td>Organized service providers; self-supply declines; informal institutions decline in significance</td>
<td>Self-supply disappears; all users get served by modern water industry.</td>
</tr>
</tbody>
</table>
• During the past six decades, India’s water withdrawals have increased faster than population growth.

• India has emerged as amongst the most densely irrigated regions in the world.

• India used less than 20 BCM of groundwater for all uses around 1960. Today, India is the groundwater champion of the world.

• India’s water economy is highly informal, with over 75 percent of water volume and water users outside the ambit of direct regulation or intermediation.

• As a result, India’s water economy is driven more by near-term incentives and jugad technology rather than a well-organized water industry.

• The dynamic linkages between the water economy and the larger national economy determine the ease of sustainable water governance.
Thank you for the opportunity.
2. Does water scarcity cause water poverty?
The Water Poverty Index for 147 countries

<table>
<thead>
<tr>
<th>WPI Component and its weight</th>
<th>Sub-components</th>
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</table>
| Water Resource Availability (20%) | • Internal freshwater flows  
• External inflows  
• Population |
| Access to Water (20%) | • % of population with access to clean water  
• % of population with access to sanitation  
• access to industrial water compared to need  
• access to irrigation compared to need for irrigation |
| Capacity (20%) | • ppp adjusted per capita income  
• under-five mortality rates  
• education enrolment rates  
• Gini co-efficient for income distribution |
| Water Use efficiency (20%) | • Domestic water use in litres/day  
• Share of water use by industry adjusted by sectoral share in GDP  
• Share of water use by agriculture adjusted by its share in GDP |
| Environment (20%) | Indices of  
• Water quality  
• Water stress (pollution)  
• Environment regulation and management  
• Informational capacity  
• Biodiversity based on threatened species |