Groundwater institutions and governance in China and India in comparative perspective: Experiences and lessons learnt

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Background

- ‘Global boom’ in GW irrigation in last four decades
  - more reliable source of water-supplies for agricultural irrigation
- More than half of global GW abstraction
  - India, US and China
- India and China major players in Asia
  - annual rate of GW abstraction between 1% and 2%
    - supporting smallholders’ livelihoods
      - potently reduced rural poverty
- However, GW not properly managed, also confronts a brand new challenge of negative impacts of climate change

Objectives

- To overview GW economy of China and India
- To review experiences of GW governance in China and India focusing on institutional aspects
- To draw lessons for concrete policy measures

Methods / Materials

- Extensive review of available literature on GW institutions and governance in China and India in comparative perspective
- Utilised potentially rich sources of secondary data available through publications of international institutions, Governments of China and India and research conducted by individual researchers

Groundwater Development Scenario in China

- China population: over 1.3 billion
- GW provides 60%-70% of water supply in 400 large Chinese cities
  - 90% of GW polluted in these cities, seriously polluted in 60%
- Average total amount of water resources in China
  - 2812 billion m^3 per annum, per capita water resource about 2200 m^3
- Highly skewed temporal and spatial distribution of water resources
- Abundant GW in Southern China: 71% of total national GW resources
- Northern China: 29% only
- Agriculture, main water using sector in China
  - generates 70% of total grain production
- Current GW abstraction: 20% of total water use in China

Groundwater Development Scenario in China

- China attempted to regulate GW use in agriculture
  - water use rights system designed to reduce surface water quotas for farmers to transfer agricultural water to other sectors
- However, farmers compensate ‘loss’ of surface water by using more GW to maintain production practices and yields
- Regulation of GW very difficult
  - more emphasis on water ‘efficient’ agriculture and irrigation technology innovations as part of water-saving programmes, ultimately decreased water use intensity, reduced inefficiencies and water losses
- Highly energy intensive technologies used

Groundwater Development Scenario in India

- India largest GW user (230 km^3 per year)
  - construction of millions of private wells
    - new pump technologies and credit facilities
    - flexibility and timeliness of GW compared to SW and subsidies
- GW irrigates two-thirds of agriculture (91% of total GW withdrawals)
  - 85% of rural drinking water
- Small and marginal farmers (operating <2 ha): 78%
  - operate 32% of land, own and operate 45% electric water-extraction devices
  - constitute 40% of GW - irrigated area
- GW irrigation 35% more than SW irrigation
- To minimize decline of GW levels, Managed Aquifer Recharge (MAR) interventions

Groundwater Development Scenario in India

- India withdrawing more than estimated safe yield
  - 29% of GW blocks semi-critical, critical, or overexploited
- GW pollution serious issue
  - contamination of aquifers
- Significant impact of climate change on GW recharge and its availability
- Aquifer systems greater buffering capacity against droughts and climate fluctuations
  - hard rock aquifers highly vulnerable to climate change
    - due to low GW storage and yields

Comparison of Groundwater Development in China and India

- India and China facing emergent water crisis with differential extent and magnitude
- North China experiencing severe water crisis
- India already “water stressed” with per capita water availability below 1,700 m^3
- Increasingly rising water demands in both China and India
  - industrial and domestic sectors along with agricultural sector
- India and China use over 300 km^3 of GW per annum
  - half of world’s total annual GW use
- GW extraction mechanisms increased from less than 1 million in 1960 to 26-28 million in 2002 in India
- In China 3.5 million agricultural tube wells, withdraws 75 km^3 of GW
- GW dependence in agriculture declined more rapidly in India than China

Groundwater Governance and Institutions

- In India and China, numerous policy instruments implemented
  - GW laws, licensing & permit systems, tradable property rights & pricing GW
    - however, GW governance structures proven to be very ineffective
- Main policies affecting GW governance in India
  - without any statutory status and lack legal enforcement
- China enacted groundwater laws starting with 1988 National Water Law
  - Whether these laws indeed implemented with due diligence or not?
- Compared to India, China way ahead in legislative and regulatory measures
  - new water law in China requires all pumpers to get a permit
    - but yet to be enforced

Groundwater Governance and Institutions

- India not able to make a GW law to regulate more than 20 million pumpers
  - despite having a draft model GW bill for more than three decades due to high transaction costs of enforcing GW regulation
- In China, adoption of water-saving technologies low in agriculture due to lack of economic incentives to save water and inadequate water rights
- However, huge potential to realize co-benefits in water and energy savings through improved irrigation technology in China
- Governments unable to eliminate energy subsidies due to stiff opposition from farmer lobby
  - political feasibility of switching to volumetric electricity pricing weak compared to using flat tariff
- Energy pricing to users offer powerful tools for agricultural GW management

Conclusion

- China attempted to regulate GW use in agriculture
  - water use rights system to reduce SW quotas to transfer agricultural water to other sectors
- However, farmers compensate losses of SW by using more GW
- Regulation of GW use very difficult in China
- India's GW recharge through user participation offers a window of opportunity for better GW governance, whereas such initiatives lacking in China
- Therefore, users' acceptance and understanding of water requirements prerequisite for ensuring support for measures aimed at protecting GW resources
- A 'one-size-fits-all' approach to GW governance inadequate
- Need to tailor a package of measures to local hydro-geologic and socio-economic setting
- Improvements in 'irrigation water-use efficiency' and reducing energy use

Thank you!