GROUNDWATER IN URBAN INDIA

CSE: Anil Agarwal Dialogues, March 2013
The larger picture

- Global estimate: more than 1.5 billion urban dwellers rely on groundwater, currently

- India: Groundwater share in urban water supply is 48%  \( (CSE, 2012) \)

- Dependence on groundwater, especially in “developing cities”:
  - Population growth
  - Rapid urbanisation – city sprawl
  - Increased per-capita use
  - Higher ambient temperatures
  - Reduced reliability of intakes, especially from rivers
  - Demand & supply factors
  - Modest cost of water-wells (especially in India!)

- Conundrum of depleting groundwater and deteriorating quality (sanitation, solid and liquid wastes)
Freshwater availability and demand

Urban water is related to all these factors.
Will the picture change in India…?

**WATER TRANSITION THAT WILL NOT HAPPEN**

Urban-industrial growth needs water but in India, even as this sector will grow, people will continue to live in rural areas and depend on agriculture.

- **82%** of the population in India live in rural areas.
- **8%** live in rural areas due to urban-industrial growth.
- **10%** will live in cities.
- **70%** Indians will live in rural areas. Even in 2050, less than 50% will live in cities.
- **30%** live in cities in rich countries. Water use has moved with people.

**RICH INDUSTRIALISED COUNTRIES**

- **35%** of the population in rich countries live in cities.
- **14%** live in urban areas.
- **51%** live in rural areas.


*Excreta Matters, CSE (2012)*
Urban – rural continuum

ARGOSS, 2001: BGS, UK

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Slice of the pie: Pune city

Shallow aquifers in western fringes

Shallow aquifers in and around core city

Shallow aquifers in eastern fringes

Deeper aquifers used from all over the city and environs
Annual water supply in BL
Sewage pumped annually in BL
Water supply in lpcd
Population in million

PMC, various years, Deolankar, 1977, Kulkarni et al, 1991
Groundwater: source, sink with a unique set of dynamics…
Urban groundwater: common issues

Foster et al, 2010: GW-MATE

• Modification of groundwater cycle on account of urbanisation

• Many problems around groundwater are predictable, few are predicted

• Conceptual hydrogeological model not constant – needs continuous modification

• Two major consequences:
  • Paradox of urban recharge – tradeoff between reduction in infiltration-facilitative surfaces and leaking mains and sewers
  • Contaminant loading of sub-surface systems – improper sanitation, poor sewerage and haphazard waste-disposal
Alluvium
Transition
TIME TO REACH AQUIFER-SCALE LIMITS OF OVEREXPLOITATION in years

- Present (10^0)
- Relative Community (10^1)
- District (10^2)
- State (10^3)
- National / International (10^5)

- Hard rock
- Carbonates
- Consolidated sediments
- Unconsolidated sediments

Moench, Kulkarni & Burke, 2013

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| Smaller towns | In-situ / close to the town, part of watersheds | Usually in-situ, mostly multiple aquifers now, may have begun water supply from a single aquifer |
| Larger cities and metros | Distant, larger river basins involved | In-situ and ex-situ, complex aquifer dynamics involved with large-scale inter-aquifer transfers |
Components of a consolidated approach...

- Comprehensive understanding of groundwater resources (aquifers) required: KNOWLEDGE-ACTION agenda including strategic urban recharge through an aquifer based approach

- Information on sources, usage, impacts (especially recharge and quality): CROWD SOURCING, CAPACITY BUILDING leading to an urban groundwater database

- Logic of including groundwater in the formal civic water supply system – POLICY and PARTICIPATION
  - Link regulation and licensing to assured water supply and equitability
  - Major improvements in sanitation, sewerage, recycling and treatment
  - Improved groundwater literacy...