Carrot and Stick for drinking water protection and recharge for Gurgaon & Faridabad

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Context of Drinking water in Gurgaon

1. Critical dependence on groundwater - 70%?
   1. Many old sectors 100%?
   2. All new sectors - 100%?
   3. Villages and slums?

• Gurgaon block over-draws GW - 300% (CGWB)
• GW is finite and declining - Run out by 2017?
So...

• We need to take Demand side and supply side measures
• tackle unprecedented water scarcity likely?
• Supply side measures will make demand side measures more acceptable to communities.
• Innovative financial and technological measures
1. Design a **water conservation program for Gurgaon** (and Faridabad) that includes:

   • **Metering**
     – Bulk and end-user **smart meters**
     – Apartment blocks using GW often have neither

   • **Efficiency standards**
     – for water using devices and activities

   • guidance on implementation
   • Implement with new buildings,
   • Retrofitting on old buildings.
2. **Hydrogeological assessment** of aquifers of Gurgaon to assess natural recharge zones

3. Monitor one to 5 observation wells in each sector

4. Estimate sustainable yield of groundwater for each sector, based on natural recharge rates.
5. Develop a **large scale water recharge program** that combines:

(a) **zoning and protection of natural recharge areas** (Aravallis, water bodies etc) with a
(b) complementary **artificial rainwater recharge program for city areas**.

Can include a voluntary RWH audit system
Securing Aravalli for Delhi NCR drinking water
High value of infiltration

- At a moderate infiltration level of 33.6% of annual rainfall
- and 10 paise per litre as the value of infiltration,
- the infiltration value is Rs 2.0 lakhs /ha per year, and the NPV value (5%, 20 yrs) is Rs 27 lakhs /ha
- Mining Dept
- Identifying potential mining areas
## Status of Aravalli lakes in Faridabad /Gurgaon

<table>
<thead>
<tr>
<th></th>
<th>Historical Water Status</th>
<th>Water status 209-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Surajkund</td>
<td>perennial</td>
</tr>
<tr>
<td>2</td>
<td>Peacock Lake</td>
<td>perennial</td>
</tr>
<tr>
<td></td>
<td>(adjacent to Suraj Kund )</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Badhhkhal Lake</td>
<td>perennial</td>
</tr>
<tr>
<td>4</td>
<td>Dhauj jheel</td>
<td>perennial</td>
</tr>
<tr>
<td>5</td>
<td>Embankment and lake at Lal Kherli (village Mandawar)</td>
<td>seasonal</td>
</tr>
<tr>
<td>6</td>
<td>Damdama lake</td>
<td>perennial</td>
</tr>
</tbody>
</table>
Water Bodies

• 100s of water bodies in Gurgaon need protection
  – Put in revenue & other records irrespective of ownership
  – This will prevent change of land use
  – TOI Jul 9, 2010 Natural lake lost, Gurgaon now digs for artificial one
6. Setup an online **registrar of tubewells**
   – location, depth, logging records of all borewells,
   – possibly withdrawal,
   – de-commissioning - safety steps.

7. A **GPS based tracking** system for borewell drilling machines and water and sewage tankers.

8. In urban areas making all existing borewells **public assets**
   – based on principle of intergenerational equity,

10. A ‘concrete tax’ based on area paved within a plot or area in the city (as this will reduce recharge on the one hand and increase storm water runoff and flooding risk on the other),

11. This can be balanced by a ‘recharge credit’, for credible / measurable rainwater recharge at site or off-site.
12. A groundwater abstraction and use permit system that CAPs extraction and use at sustainable yield of ground-water for each sector. It would allocate across existing and proposed users and specify:

1. the water allocation for a property
2. abstraction technology (power of pumps, diameter of pipe etc),
3. the metering technology (smart meters - kinds of meters etc),
4. the maximum quantity of water that can be abstracted on a daily, monthly and annual basis
5. the public comment and public meetings required prior to approval
6. the renewal process
7. transparent web-based sharing of such information
14. Develop mandatory guidelines for preparation of master plans that incorporate the protection of areas providing ecosystem services

- such as groundwater recharge zones, stream buffers, flood plains, water bodies
- forest and natural vegetation areas, ponds, lakes, wetlands,, charismatic trees,
- areas of socio-cultural significance -sacred groves
15. Bureau of water-use efficiency (BWUE), on the lines of the Bureau of Energy Efficiency,
   – rate appliances for water efficiency,
   – also rates buildings, colonies, projects for their water-use intensity, based on water budgeting.

16. Water Impact Assessment (WIA),
   – like Environmental Impact Assessment,
   – Look at impact on other users.
   – Simple checklist system
17. Create basis for groundwater conservation in local HUDA, MCG, PHED etc rules, so there is legal regulatory basis for groundwater conservation

   – treats urban, peri-urban and rural areas separately
Drinking water source sustainability

• Running Pure – study of 105 cities - 33 of the largest cities (or 1/3) obtain a significant % of drinking water from protected areas

• “For many cities, time is running out”.

• Protecting forests around water catchment areas is no longer a luxury but a necessity. When they are gone, the costs of providing clean and safe drinking water to urban areas will increase dramatically.”(Dudley et al, 2003)
High Recharge in Aravalli

• *High secondary porosity*
  – because of joints and fractures.
  – storage capacity and yield may be low
  – Likely high transmission capacities because of fractures.
  – The ridges are therefore likely to be important recharge zones for the surrounding alluvial plains

• Need to protect through zoning as critical groundwater recharge zones.
Berlin zones

- three protection zones – 230 km²:
  - well head protection area (Zone I).
  - closer (Zone II),
  - wider (Zone III),
- 40% - green, lake, river
Austin City region, Texas

Landuse plan identified:

- Drinking water protection zone  1/3 area
- Desired Development Zone  2/3 area

- Purchased land and easements
- Large scale funding by city through long term bonds.

The Barton Creek Watershed protects the water quality of Edwards Aquifer, which is the sole source of drinking water for 1.5 million Texans.
Actions in NYC catchment

- **Land Acquisition**
  - purchase environmentally sensitive lands
  - brought 128,000 acres.

- **Land Management**
  - passive use - hiking

- **Forestry**
  - to protect water quality

- **Wastewater Treatment Plant Upgrades**

- **Watershed Agricultural Program**
  - implement pollution prevention practices on watershed farms.
  - Pay farmers to reestablish vegetative buffers
### Financing Rainwater Harvesting and Biodiversity Conservation

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<tr>
<th>Options</th>
<th>Benefit</th>
<th>Feasibility</th>
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<tbody>
<tr>
<td><strong>Earmarking a portion External Development Charges</strong> levied for urban landuse change (huge funds collected much of which are unspent)**</td>
<td>Increased recharge</td>
<td>High as existing pot of funds with large inflows with a local spending mandate and unspent balances.</td>
</tr>
<tr>
<td><strong>RWH cess on new buildings to contribute towards city and peri-urban, in lieu of building their own injection borewell.</strong></td>
<td>No net financial cost – instead of self-construction, contribute to community recharge</td>
<td>High as no net financial cost, in fact could lead to savings for some.</td>
</tr>
<tr>
<td><strong>Graded Charges on monthly water bills and use for sustainability investments.</strong></td>
<td>High users pay more. Regular flow of funds.</td>
<td>Moderate – as a new payment. However, basic level of water supply can be exempted to increase political acceptability. May promote efficiency investments as well. A key challenge will be metering borewells in private sector.</td>
</tr>
<tr>
<td><strong>Seasonal monsoon Credit for roof rainwater harvesting</strong></td>
<td>Can be used to offset the cess on water use and incentivize RWH on a regular basis</td>
<td>High – as incentivizes good behavior.</td>
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<td>------------------------------------------------------------------------</td>
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<tr>
<td>Earmarking a portion <strong>External Development Charges</strong> levied for urban landuse change (huge funds collected much of which are unspent)</td>
<td>Reducing risk of landuse change on privately owned hills and linking to fund collected expressly for external development</td>
<td><strong>High</strong> as existing pot of funds with large inflows with a local spending mandate and unspent balances.</td>
</tr>
<tr>
<td>Transferable Development Rights – acquire privately owned hills and pay thru marketable TDRs that can be applied in urban MC areas.</td>
<td>No financial cost.</td>
<td><strong>High</strong> as no financial cost, Utilized extensively in other Indian metros for road widening and other purposes. Regulatory provisions in gurgaon as well. Needs careful structuring to prevent perverse outcomes – targeting low value land of preferred owners.</td>
</tr>
<tr>
<td>One time <strong>cess on private borewell registration</strong> – new and old borewells</td>
<td>Linking capital investments in groundwater infrastructure to capital investments in land for groundwater recharge</td>
<td>Moderate – as a new payment that will have to be levied which is likely to be resisted widely, especially as those obtaining canal water have no such requirement</td>
</tr>
<tr>
<td>Cess on property registration and land use conversion charges</td>
<td>Regularly levied</td>
<td>Low, as the state views it as their revenue and will resist earmarking fiercely</td>
</tr>
<tr>
<td>Contributions from the State Compensatory Afforestation and Management of Forest Dividends</td>
<td>Can be earmarked for biodiversity protection and management</td>
<td>Limited funds in the state as low forest cover to start with</td>
</tr>
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Ways forward

- Sector wise sustainable yield CAP on groundwater extraction
- Contamination risk map
- High Recharge Zones Map
- Zoning to protect high recharge zones in the Aravalli
- Registrar of tubewells
- Water quality
  - Task certified path labs for water testing along with blood, urine, stool.
• GW levels fine scale monitoring in urban areas
  – Dark sectors / dark colonies not just blocks
• New area can do a fresh start
  – Water efficiency standards
  – Water meters in individual flats & bulk meters in colonies
  – No private swimming pools
  – Bulk meters on private wells