Bangalore’s Lake System: Blueprint for a circular water economy?

Nature Based Solutions
Centre for Science and Environment
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Two water futures

A linear system

“High infrastructure” scenario:

1. Large inter-basin mega-projects
4. Transfer of wastewater to parched rural districts

The question is: What are the ecological and financial implications?
“Integrated urban water management” scenario:

1. Limit dependence on external sources
4. Storage of tertiary treated water in lakes for blending with Cauvery piped supply.

The question is: Is the feasible? Desirable? If so, what will it take to get there?
AN INTEGRATED FRAMEWORK
WATER SUPPLY AND USE
Bangalore’s water situation

Both unsustainable and inequitable

Water pumped 300 m, rest is unsustainable GW

Source: 2011 Housing Census Data
Analysed by Lele and Kuttawa
Bangalore’s water situation

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Water pumped 300 m, rest is unsustainable GW

% HH
0-10%
10-20%
20-30%
30-40%
40-50%
- Billed BWSSB piped water use = 109 MLD
- Estimated groundwater use = 273 MLD
- Estimated total freshwater use = 381 MLD
- Treated water use ~ 15 MLD
- Construction water ~ 40 MLD
- Public park water ~ 10 MLD
- Total Gross use ~ 396 MLD

• Price response > GW use
WASTEWATER TREATMENT
Problems with the current system:
Sewage in storm water drains

- Actual Sewage Treatment capacity
- Needed Sewage Treatment capacity

- Million litres per day

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<th>Year</th>
<th>1960</th>
<th>1980</th>
<th>2000</th>
<th>Current</th>
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<td>Actual</td>
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<td>Needed</td>
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Problems with the current system: Sewage in storm water drains

- Treated Sewage (35%)
- Reuse (<1%)
- Untreated Sewage (64%)

Data Source: Jamwal, 2017
Even where there are STPs, they are not actually getting sewage

Recycled water (3 MLD)

Treated Water (127 MLD)

VV Treatment Plant (for Domestic sewage)

SEWAGE from Underground drainage network (26 MLD)

Lift (104 MLD)

VV RIVER carrying sewage & industrial effluents (~600MLD)
LAKES AS INTERMEDIARIES
Most were originally irrigation tanks built centuries ago,
The tanks were built on stream channels to form a cascading chain.
As tanks became “lakes” the management mandate changed from storage to balancing multiple uses.
Bangalore’s Cascading Lake System
Bangalore’s Cascading Lake System
Bangalore’s Cascading Lake System

Hebbal Valley
Bangalore’s Cascading Lake System

- Vrishabhavathy Valley
- To Cauvery River
- To Dakshin Pinakini
Problems with the current system:
Encroachment and Development

Kanteerva Stadium

Majestic Bus Terminus
Problems with the current system: 
Sewage in storm water drains

Bangalore “rivers” are really open drains.
One solution is to divert

Throwing the (rainwater) out with the bath (sewage) water.
Problems with diversion:
Saul kere – mostly dry lake

Sewage AND Storm water completely diverted
The second solution is a lake side sewage treatment plant (STP)
Problems with the current system: Jakkur – full throughout the year

Receives 10 MLD of treated sewage each day
Problems with the current system: Jakkur – full throughout the year

Even Jakkur suffers from hyper-eutrophic conditions

Source: Jamwal, 2017
Problems with the current system: Jakkur – full throughout the year

This causes huge fluctuations in Dissolved Oxygen levels

Source: Jamwal, 2017
CURRENT WATER BALANCE
Sources and Uses of Water (MLD)

Only 30% of rainfall shows up as surface runoff. The rest evaporates or infiltrates the soil.
A Linear Water Economy

Surface Water → Water Utility → Consumer → STP → Water bodies

- Cauvery
- BWSSB
- Domestic
- Treated Wastewater
- Stormwater
- Downstream Flow
- Lakes
- Stormwater
- CII
- ET

*CII = Commercial, Industrial, Institutional
ET = Evapotranspiration
Is a Circular Water Economy possible?

Lake Storage Volume
~60,000 ML
or about 30 days of storage
How do we get there?

1. Laws (Legal Clarity)

2. Agencies (Fragmented Agencies)

3. Citizens
3. Empowering Citizens

Problem: Deteriorating lake water quality

Solution: Citizens empowered to act

Information Gap: Nutrient balance of lakes

Citizens + Government + Domain Experts

Domain Experts + ICT

Sensing, Analytics: Measuring N, P, DO

ICT + Citizens
Thank you!

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