Designer Wetlands for Lake Rejuvenation

Centre for Science & Environment
Anil Agarwal Dialogue
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Lake Ecosystems - Life-savers for Urban Regions

- Stabilize Climate
- Aesthetically Pleasing
- Nutrient Sinks
- Religious & Cultural Significance
- Prevent Floods
- Groundwater Recharge
- Rich in resources like water, fish, aquatic flora
- Recreational Activities
- Sediment Retention
- Water Filtration
- Aesthetically Pleasing
Urban Lakes: Under Constant Threat

- **Degradation of quality –**
  - Untreated sewage discharge
  - Solid waste disposal
  - Eutrophication
  - Floating Vegetation

- **Degradation of quantity –**
  - Abstraction of Water for variety of uses
  - Encroachment
  - Drainage & Alternate Land Use
  - Silt influx from degradation of catchment area
Water Bodies of New Delhi - Current Status
## Degraded Water Quality

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Limited data through grab sampling: Preliminary results
Receding Groundwater: The Harsh Reality in New Delhi

The depth to water in the Delhi state varies greatly from 1.2 meter (in the Yamuna flood plain) to more than 64 meters (in the southern part of the Delhi Ridge) below ground level.

The groundwater is declining in majority of the areas of Delhi on account of overexploitation of the resources. The rate of decline is as high as 1.7 to 2 meters/year in some areas (South & South west Dist.).

Seven out of nine districts of Delhi are categorized as overexploited with respect to dynamic groundwater resources.

Groundwater Recharge: Lakes do Help!
Improving Lake Water Quality - No One-Step Solution, No Short-cuts.

Efforts (concentrated & regular)

Stakeholders (lake dependent communities, environmentalists & government)

Methods (physical, chemical and biological) = A perennially clear and deep lake

A Perennially Clear and Deep Lake
Qualities of a Healthy Lake...

High Water Clarity

No Stench

No Floating Vegetation

No Floating Solid Waste

High Dissolved Oxygen (D. O.)

High Biodiversity
Prevent - Prevention is Better than Cure!

- Prevent –
  - Municipal and/or Industrial Effluent disposal
  - Solid waste disposal
  - Idol Immersion
  - Introduction of exotic and/or invasive species
  - Encroachments
  - Over-exploitation of resources like fish, water
  - Catchment Area degradation
  - Slope Instability
Cure is Necessary..

Eutrophication

Floating Treatment Wetlands

Floating Vegetation Removal

Brine Spray

Physical Removal

Introduction of biological predator (insects, fungi, herbivorous fish)
Sedimentation

Dredging: When and Where??

Low D.O.

Does Aeration always Help??
A Healthy Ecosystem in the Lake = A Healthy Lake

- Produce oxygen from photosynthesis
- Dispel wave energy, reduce turbidity and erosion
- Absorb nutrients from water column
- Provide food & shelter for waterfowl, fish, shellfish and invertebrates
Rejuvenate Lakes.. No more a Luxury, but a Necessity

• The Shahadara Lake Project:

The 35 acre Shahadara Lake region – once a lake, now no more...

Drains carrying rainwater run-off clogged by building activities

Rainfall in Delhi region not enough to charge a lake all by itself
NEERI’s Phytorid Technology (IP)

Use of plant species along with their root system along with the natural attenuation processes can be combined together to get the Phytorid Technology.

It is one such technological solution, which can be easily implemented in cities as well as in rural areas for treatment of wastewater. The system is based on use of specific plants normally found in natural environment with filtration and treatment capability.
Contaminant Removal Mechanisms: Multiple Processes At Work

O₂ through plants to root zone

Planting Substrate

Influent

BIOLOGICAL

PHYSICAL

CHEMICAL

Treated Water
Inaugurated by
Shri Suresh Shetty
(Honbl’e State Minister)
Medical Education Higher & Technical Education

On
World Environment Day
5th June, 2006

at
Kalina Campus
Mumbai University
SIEMENS: 5 lakh liter/day
SIEMENS: Payback in 2 years
Typical Lake with Natural Drainage Pattern
Lake With Peripheral Wetland Ecosystem
Groundwater Recharge: Lakes do Help!
The Shahadara Lake Rejuvenation Project

Sewage Water will be treated by the “Phytorid Technology” based on constructed wetland and will be used for Rejuvenating the lake in the Shahadara locality of East Delhi
Floating Treatment Wetland
Advantages..

- Low Cost
- No Power Requirement
- Low on maintenance
- Eco-friendly
Some Work of NEERI’s Technology for Lakes and Nalla Waste Water Treatment
Telibandha Lake, Raipur

Lake Area: 11 Hectar
Phytorid Capacity 2 MLD
Proposed to develop 3 plant at periphery
Lonar Lake (under threat), Maharashtra

Lake Area: 3 Ha
Phytorid Capacity 500 KLD
Plant Construction completed under commissioning
Will Treat entire Sewage from Lonar City
Kot Lake Brahmapuri, Maharashtra

Phytorid Capacity 450KLD
Project Approved
T. Nasripura, Mysure

Under Consideration

River Kamberi

River Kambini

Outfall 1

Outfall 2

Outfall 3

Site at Outfall 2 for PHYTORID 0.12 MLD

Site at Outfall 3 for PHYTORID 0.28 MLD

Narsimha Swami Temple
Proposed Site for Phytorid

**View of Nag Nadi-Naala from University library road**

**View of Nag Nadi-Naala towards Panchsheel**

**Nag Nadi- Naala**
Width: 6.4 meters
Depth: 11 inches (0.2794 meters)
Length: 500 meters (between university road and panchsheel)
Estimate flow : 4 MLD
Proposed design of Phytorid

Estimated land area required: 2563 m$^2$
For a plant capacity of 1000 m$^3$/day

Entire length of the plant: 267m
For a plant capacity of 1000 m$^3$/day

Length of the Phytorid bed: 184 m
Dimension: 1.5m depth X 184m length X 8m width

Project completion period: 12 months
We never know the worth of water till the well is dry.