Sustainable Treatment Options for Sewage, In-situ Drain and Lake/River Rejuvenation in Indian context

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Decentralised Wastewater Treatment and Local Reuse for Citywide Sanitation and Improved River Health
August 13, 2020
Establishment of CSIR-NEERI

- CSIR-NEERI was established in 1958 due to Jaundice epidemic, as Central Public Health Engineering Research Institute (CPHERI).

- It was renamed in 1974 as National Environmental Engineering Research Institute (NEERI).

- With the initial mandate of water and sanitation, currently it deals with all aspects of environmental science and engineering including climate change.

- NEERI supports and acts as regional center for many International conventions and treaties on environmental issues.

- CSIR-NEERI has five zonal laboratories (Delhi, Mumbai, Kolkata, Chennai, Hyderabad)
CSIR-NEERI - Core Strengths

1. Water Technology and Management
2. Wastewater Technology
3. Solid & Hazardous Waste Management
4. Air Pollution Control
5. Cleaner Technology & Modelling
6. Climate Change and Policy Studies
7. Eco-Restoration
8. Environmental Biotechnology & Genomics
9. Environmental Impact & Sustainability
10. Environmental Materials
11. Sustainable Urban Management
12. Centre for Strategic Urban Management
NEERI’s Technologies

- Environmental technologies including Electro-Defluoridation, Phytorid, Iron removal Plant, RENEU
- NEERJHAR, HRTS, Hazardous waste disposal, PHYTORID
- CETPs for leather industry, International projects with USEPA, EU, JICA, WHO, UNICEF etc.
Issues with Wastewater generation & treatment

- About **66000 MLD** of wastewater is generated in urban India comprising Class I and Class II cities (CPCB report).

- Only about **30% gets treated** across the country.

- Treatment level available in cities with existing treatment plant varies from 2.5% to 89% of the total sewage generation.
Centralised systems failed due to:
  > Power availability
  > High O&M
  > Technology upgrades, trained manpower...

Drains across Cities and Villages carrying Sewage:
  > Interceptors? Why and How?
  > Sewer conveyance and Pumping systems
  > Costs and Operational Issues
LAKE CLEANUP SYSTEMs
NEERI’s solution: Floating rafters - Principle behind Floating Rafters (also called Florafts)

Biofilm covers the island and the plant roots

Matrix

Root hairs

Microbes (Biofilm)

BOD/TOC
P
Cu
Zn
N
Ammonia

VARIABLE WATER DEPTH

Benthic layer
Lake Area: 11 Ha
तेलीबांधा झील शुद्धिकरण परियोजना

निर्माण एवं पांच वर्षीय परिचालन एवं अनुरक्षण लागत 4.44 करोड़
(संविदाकार : भारत हैवी इलेक्ट्रिकल लिमिटेड : तकनिकी एवं प्रोधणिकी साझेदार : CSIR-नीरी)

जीरी फायटेंट नीरी सी सी में अपशिष्ट जल के उपचार
है 1.5 MLD क्षमता के अपशिष्ट जल के प्रबंधन हेट स्टी प्रकार का निर्माण कार्य

एवं तालाब में मिलकर शीर्षी ऑक्सीजन (DO) की मात्रा में वृद्धि किया जाना।

राष्ट्रीय हरित प्राप्ति के के नवीनतम माप दंड के
हिजाईन पैरमीटर के अनुरूप
(BOD < 10, COD < 50, TSS < 20,
N < 10, NH3-N < 5,
Fecal Coliform < 100)

उपचारित जल का तालाब में उत्सर्जन
सुनिश्चित किया जाना।

परियोजना के अंतर्गत जल परिवर्तक
का उत्पादन करण एवं प्राकृतिक रूप
से दर्शनीय एवं सुन्दर परियोजना।

झील में तैयार हुए गार्डन (जीरी पेटेंटेड)
(प्राकृतिक तरीके से तालाब का गहरीकरण एवं जामी हुई ग्राम से मुक्त)

(फोटो में तैयार हुए धारा में अच्छी जल का उत्सर्जन)

(प्राकृतिक तरीके से तालाब का गहरीकरण एवं जामी हुई ग्राम से मुक्त)
RSCL’s Telibandha Lake model bags National Excellence Award

Telibandha pond has been taken as a model, where maintaining environmental balance, naturally, the cleaning of pond was undertaken with technical assistance from Bharat Heavy Electrical Limited (BHEL) and NEERI, Nagpur.

The Telibandha model is being appreciated across the nation and experts from various parts of the country had visited the Telibandha pond and are contemplating to adopt it in their respective cities.

During the summit, Pulak Bhattacharyya also gave a presentation of different work plans being undertaken and briefed various schemes being undertaken in order to upgrade the civic amenities.

STAFF REPORTER • RAIPUR

Raipur Smart City Limited’s (RSCL’s) initiative to rejuvenate Telibandha lake situated at Marine Drive in capital city bagged the ‘National Excellence Award’ at National Urban Development Summit held at Gurugram, Haryana on Friday.

Official sources in the RSCL informed that the award was given to it for purification as well as for revival of the Telibandha pond.

Union Minister of state for planning, statistics and programme implementation Rao Inderjit Singh handed over the award to Raipur Municipal Corporation Additional Commissioner Pulak Bhattacharyya.

Using innovative mode of biological process the ponds based in Raipur capital city under Raipur Smart City Limited and Municipal Corporation, Raipur was revived.

Notable, The RSCL and Raipur Municipal Corporation jointly used the innovative biological method for revival of the pond. This model has been adopted for the first time in the state.
In-situ Nallah/Drain Treatment

Restoration of Nallah with Ecological Units
CSIR-NEERI has designed, developed and demonstrated in-situ nallah treatment technology known as RENEU - Restoration of Nallah with Ecological Units.

**RENEU** refers to “treatment of sewage in the running flow without displacing/disturbing the shape/structure of Nallah; and by employing physical and biological operations to treat the sewage.

**Various Applications of RENEU**

1. Storm Drains which carries Sewage
2. Sewage Drains
3. Drains which meets Water Bodies like Pond, Lake, Reservoir etc.
4. Flood prone low lying area Drains
5. Small Tributary meeting in River
Incoming Sewer-Storm Drain inside NEERI’s Campus before Implementation of RENEU
Drone View after Implementation of RENEU
Inside NEERI’s Campus
Sedimentation – Clear Effluent
BioMat
Solar based Diffused Aeration
FloRafts
### Completed Projects - RENEU

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Drains</th>
<th>Date of Project Commissioning</th>
<th>Discharge (MLD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NEERI Head Quarters Campus, Nagpur, Maharashtra</td>
<td>08/04/2018</td>
<td>1.5</td>
</tr>
<tr>
<td>2</td>
<td>Kriya Yog Ashram, Jhunsi, Prayagraj, Uttar Pradesh</td>
<td>07/11/2018</td>
<td>3.0</td>
</tr>
<tr>
<td>3</td>
<td>Old GT Road Drain, Jhunsi, Prayagraj, Uttar Pradesh</td>
<td>30/12/2018</td>
<td>3.0</td>
</tr>
<tr>
<td>4</td>
<td>Savitri Nagar Bazaar, Jhunsi, Prayagraj, Uttar Pradesh</td>
<td>31/12/2018</td>
<td>4.0</td>
</tr>
<tr>
<td>5</td>
<td>Savitri Nagar (New Jhusi), Jhunsi, Prayagraj, Uttar Pradesh</td>
<td>31/12/2018</td>
<td>3.5</td>
</tr>
<tr>
<td>6</td>
<td>Ulta Kila Drain, Jhunsi, Prayagraj, Uttar Pradesh</td>
<td>31/12/2018</td>
<td>3.0</td>
</tr>
<tr>
<td>7</td>
<td>Lakkariya Drain, Jhunsi, Prayagraj, Uttar Pradesh</td>
<td>30/01/2019</td>
<td>4.5</td>
</tr>
</tbody>
</table>

### Performance Chart of Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Performance (% Removal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Suspended Solids (TSS)</td>
<td>80-95</td>
</tr>
<tr>
<td>Biochemical Oxygen Demand (BOD)</td>
<td>80-85</td>
</tr>
<tr>
<td>Chemical Oxygen Demand (COD)</td>
<td>65-70</td>
</tr>
<tr>
<td>Total Nitrogen (TN)</td>
<td>60-70</td>
</tr>
<tr>
<td>Phosphate (P)</td>
<td>60-75</td>
</tr>
</tbody>
</table>

As per IITR regular monitoring of Drains at Prayagraj (Kumbh-19)

**BOD (Before Treatment)**

80 - 110 mg/L

**BOD (After In-situ Treatment)**

14 - 24 mg/L
NEERI tech will turn four ‘nullahs’ into green belts

LOCAL MINISTER SIGNS IN NAGPUR
SIGNED WITH NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INSTITUTE

The NEERI tech will be used as a model for the nullahs in Nagpur. The minister signed the agreement with the National Environmental Engineering Research Institute (NEERI) to carry out the project.

LOCAL MINISTER SIGNS IN NAGPUR
SIGNED WITH NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INSTITUTE

The agreement will be used to transform four nullahs in Nagpur into green belts. The minister signed the agreement with the National Environmental Engineering Research Institute (NEERI) to carry out the project.

NEERI finds solution to unplug city drains

The research institute proposes innovative treatment of wastewater using natural methods to give new lease of life.

NEERI To Showcase Its Solution to Sewage Treatment Process On Its Foundation Day

The research institute will showcase its solution to sewage treatment on its foundation day. The solution involves using natural methods to treat sewage and prevent pollution.

Cleaning city’s drains in a natural way

RENEW in News
Phytorid Technology in Ranchi at Harmu river
8 STPs of total 11.5 MLD capacity
Godawari River Cleaning through Nalla treatment before Kumbh Mela
Overview of Rejuvenation Shahdara Lake, New Delhi
Thank You!