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CASE STUDY:

SURFACE WATER BIO REMEDIATION USING NOVEL NON-INVASIVE TECHNIQUE FOR INTEGRATED WASTE WATER MANAGEMENT

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Introduction

Lakes, ponds and reservoirs ensure a sustainable balance to the environment and its surrounding locality. By acting as a nutrient sink, providing drinking water, lowering climatic vulnerability, enhancing flood protection capabilities and acting as a source of groundwater recharge, these natural resources play a vital role to mankind. Recent anthropogenic activities have led to changes in the physical, chemical & biological characteristics of water quality eventually leading to soil degradation, increase in health problems. eutrophication and a sharp decline in fauna.

In this study we evaluate the application of nature-based bioremediation solution for the Upparpally lake, Hyderabad along with its validation-verification using satellite-based imaging spectroscopy.

Upparpally Lake

Upparpally lake situated in Attapur area of Hyderabad is a cesspool with two sewage inlets draining garbage, sewage over a volume of 1.5 lac cubic meters of water spread across 12.32 acres of land. Recently the Greater Hyderabad Municipal Corporation (GHMC) had been receiving complaints from the local residents regarding the increase in debris & foul odour as a result of untreated sludge and slurry. In order to identify and mitigate the deteriorating water quality of the lake, a preliminary study was carried out by the GHMC ground action team.

After a detailed analysis, the ground action team identified problems of debris accumulation, increase in algae and hyacinth leading to foul odour and finally increase in CDOM and detrital material as a result of untreated sewage from STP.

Image 1: Upparpally Lake, Hyderabad

Date of Sample	pH	TSS	Turbidity	COD	BOD	Ammonia
Pre-Treatment Analysis						
28.05.2022	6.89	980mg/L	164 NTU	33000mg/L	12900mg/L	750mg/L

Bioremediation

With the lake quality deteriorating fast, GHMC invited proposals for the condition assessment of Upparpally lake using bioremediation techniques and one such contract was awarded to Magnatree Ventures Private Limited to manufacture sewage digesting enzymes for sewage water treatment.

After initial sample collection, lab testing and preliminary analysis, nature based probiotic enzymes were prepared using cow dung and enriched nutrient concussions. This diluted solution was mixed with lake water using drone-based spraying and the results were observed over a period of 4 months.

Image 2: Initial conditions on 24th June 2022

Image 3: Drone Spraying probiotic solution

Validation and Verification

Laboratory samples certified by NABL certified water testing observatories and satellite imaging spectroscopy generated by Aumsat Technologies LLP was used to as a source of validation and verification.

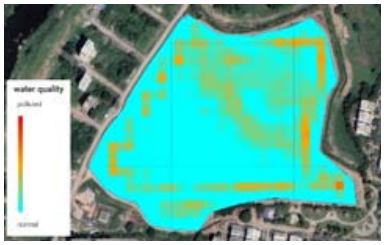


Image 4a: 15th June 2022

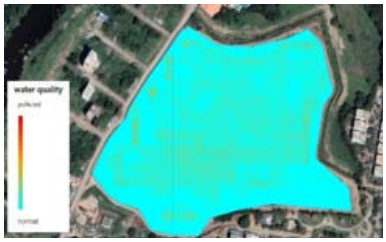


Image 4b: 15th July 2022

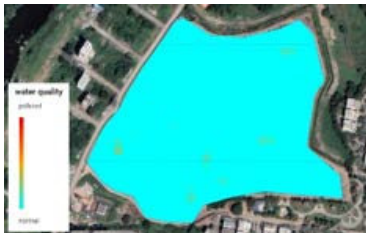
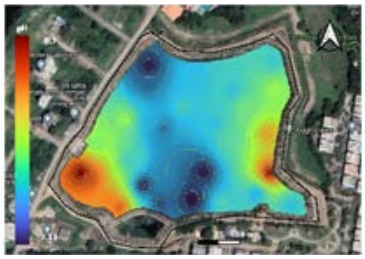
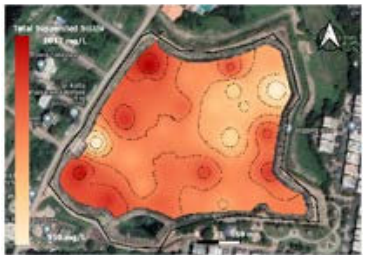
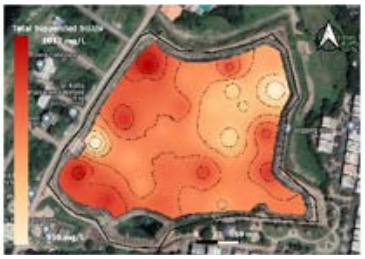


Image 4c: 15th August 2022

Date	pH	TSS	Turbidity
Before Treatment 28.05.2022			

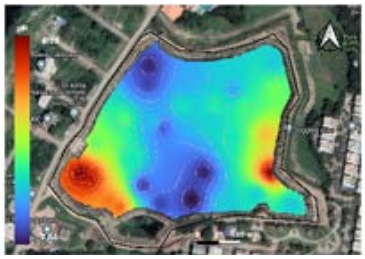
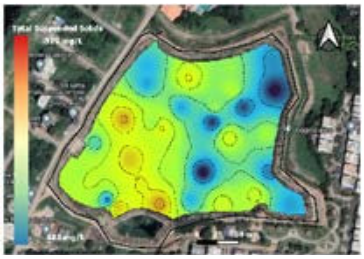
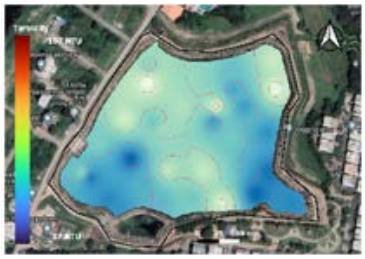
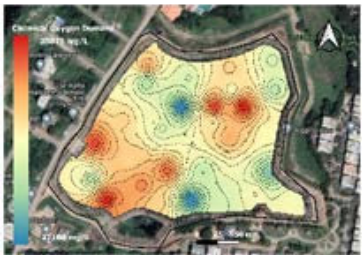
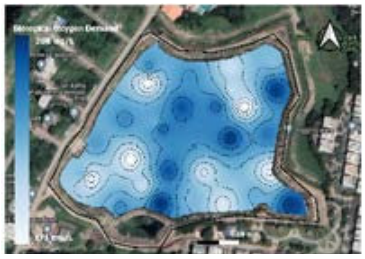
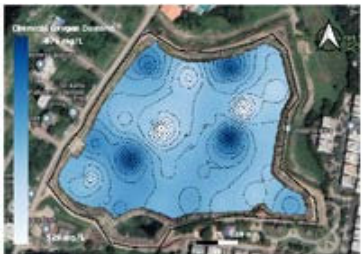
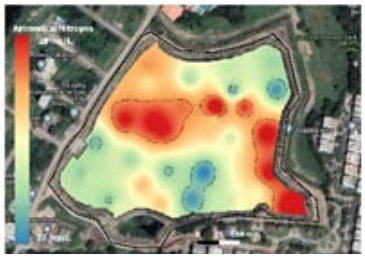
After Treatment 15.07.2022			
Date	BOD	COD	Ammonia
Before Treatment 28.05.2022			
After Treatment 15.07.2022			

Image 5: Water Quality Data

Results

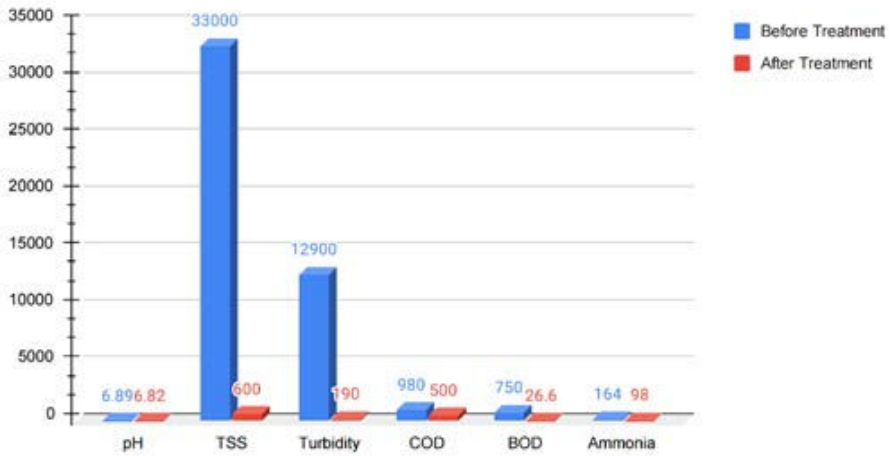


Table 1: Data Analysis

As observed from the results of Table 1, the bioremediation has demonstrated an effective solution for waste water treatment. The Chemical Oxygen Demand reduction from 33000 mg/L to 600 mg/L is an indicator that the residual organic chemicals had been converted as gases by the action of enzymes. Furthermore, the reduction in Biological Oxygen Demand, Total Suspended Sediments and Ammoniacal Nitrogen attributes to the reactions caused by the Probiotic Enzymes.

Conclusion

Population, urbanization, and water scarcity are on the rise again and Climate Change continues to affect millions of people today. Public investment in water management requires much greater support and increased investment in water infrastructure.

Image 6a: Before Treatment

Image 6b: After Treatment

About the Author

Riddhish Soni: Ex-ISRO Scientist and part of Chandrayaan 2 Mission. He comes with 9 years' experience in Space Application Industry.

Jenil Shah: Co-founder & director of Magnatree Ventures pvt ltd. He has work experience of 16yrs in Sanitation & Hygiene.

Prayag Patel: co-founder & director of Magnatree Ventures pvt. Ltd. Has a experience of 14 years in food & water industry.

Tejeswin Jagdesh: director of Magnatree Ventures pvt. Ltd. Has an experience of 2 years in construction industry.

Jagadesh Reddy: director of Magnatree Ventures pvt. Ltd. Has an experience of 26 years in food, water and construction industry.

Divyang Soni: GIS Analyst at Aumsat Technologies LLP. He has 2 years' experience in Radar signal processing and Geodatabase creation

Anurag Wasnik: Innovation Lead, NITI Aayog 8+ years of Consulting, Government Affairs, Social Sector and Social Policy experience.

Nirmal Chittora: National Water, Sanitation & Hygiene (WASH) Expert, Ministry of Jal Shakti GoI, having experience of 38 years in WASH Sector.

Dr. Faruk Kazi: Professor & Dean of Research at VJTI Mumbai. He has around 25 years of academic & research experience.

Ashok Samrat: Zonal Commissioner and Charminar Zone, GHMC. Having more than two decades experience in water sector.

Lokesh Kumar: Commissioner GHMC Hyderabad with more than two decades of experience.

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