

Customized design of Constructed Wetlands in the Indian Context

Workshop Report

Malaviya National Institute of Technology (MNIT), Jaipur

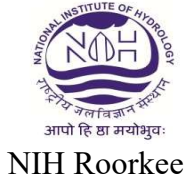
Rajasthan, India

22 September 2021



About this report

This report summarises the discussions and major conclusions of the second stakeholder’s workshop on “**Customized design of constructed wetlands in Indian context**” organized as a part of activities of the research project “**Innovation Centre for Eco-prudent Wastewater solutions (IC-EcoWS)**”. The One-day workshop held on 22nd September 2021 was organized by Malaviya National Institute of Technology (MNIT) Jaipur, in collaboration with the project partners from National Institute of Hydrology (NIH) Roorkee, Indian Institute of Technology Bombay (IITB), Institute of Rural Management Anand (IRMA), Ahmedabad. The workshop was held in online mode and was hosted at MNIT Jaipur.



Funding organization

The IC-EcoWS project is supported by the Department of Science and Technology (DST), Government of India (Project No. DST/TM/WTI/WIC/2K17/83).

Disclaimer

This report summarises the opinions, suggestions and discussions held during the One-day workshop organized by MNIT, Jaipur. The views expressed are those of individual workshop participants, and do not necessarily reflect those of their respective organizations or their funders.

Background of the Workshop

The workshop on **Customized design of Constructed Wetlands in the Indian Context** was organized under the project, “Innovation Centre for Eco-Prudent Wastewater Solutions (IC-EcoWS)”, on 22nd September 2021 at Malaviya National Institute of Technology (MNIT), Jaipur.

The event was led by MNIT Jaipur along with the project implementing partners National Institute of hydrology (NIH), Indian Institute of Technology Bombay (IITB), and Institute of Rural Management Anand (IRMA). The schedule of the workshop is given in Annexure - 1. A total of 71 participants from 32 organisations took part in the workshop, including representatives from the Department of Science and Technology (DST).

The workshop was organized to apprise all the stakeholders from Government and Non-government organizations, private bodies, researchers involved in wastewater treatment and the general public affected by the quality of wastewater treatment about the potential of natural treatment systems in India. The main objective of the workshop was to maximize interaction between researchers, industries and other stakeholders in order to understand their requirements and to offer solutions for the problems persisting in the design and implementation of constructed wetlands in India by the way of collaborative efforts. The online nature of the workshop facilitated huge participation with participants from research institutes, universities, local bodies, NGO’s, industries and private organizations.

Objectives of the Workshop

1. To apprise the stakeholders about the potential of Natural treatment systems in India
2. To summarize the advancements made in the field including the works carried out by the project team
3. To understand the technological requirements of the stakeholders
4. Generating ideas for future research

Workshop Proceedings (22 Sept, 2021)

The workshop comprised four sessions including two technical sessions and an open session for stakeholders besides the inaugural discussions.

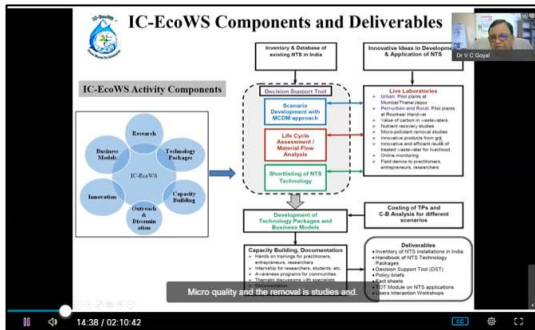
Session I : Opening Session

The workshop commenced with a welcome address by **Prof. A.B. Gupta** from **MNIT Jaipur**, the host institute. This was followed by an address by **Dr. Sanjai Kumar** from Technology Missions Division, **Department of Science and Technology**. Dr. Sanjai discussed the important schemes being run by the Department in the wastewater treatment sector and extended best wishes for the success of the workshop.

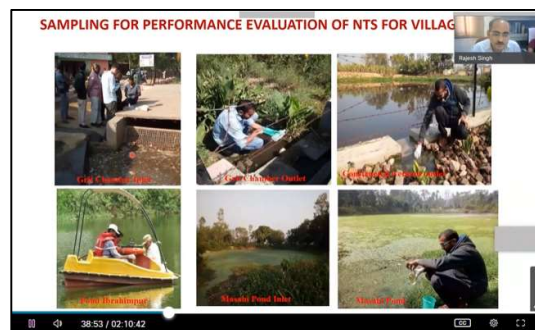


Session II: Technical Session I

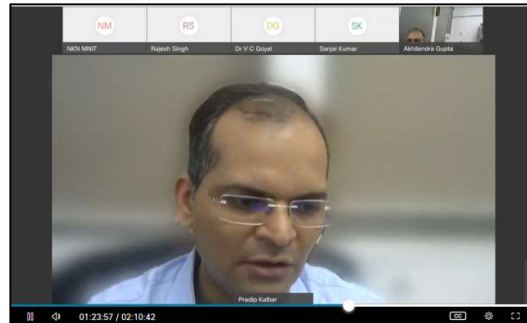
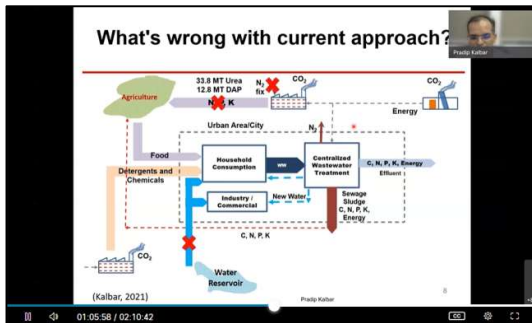
The first technical session was opened by **Prof. V.C. Goyal**, the PI of this project, **NIH-Roorkee** who discussed the overall objectives and different components of the project. Prof. Goyal also apprised the stakeholders about role of different project partners towards the implementation of the project. The main deliverables of the project including inventory of NTS installations in India, Handbook of technology packages, decision support tool, policy briefs, fact sheets and TOT module on NTS applications were discussed.



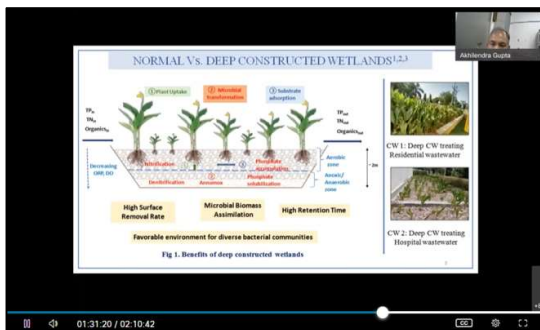
This was followed by a presentation by **Dr. Rajesh Singh** and **Er. Omkar Singh** on the experimental works carried out by the **NIH-Team** on the treatment of domestic wastewater. The results of different experiments being conducted in NIH campus, Solanipuram- Roorkee and some rural areas were discussed. The works described included studies on native Indian wetland plant species, treatment of wastewater in urban drain and domestic wastewater using floating wetlands, HSSF CW for peri-urban residential area and evaluation of CW-NTS ponds.



The next talk in the technical session I was delivered by **Dr. Pradeep Kalbar** from **IIT-Bombay** on **Hybrid Treatment Systems and their Potential for Achieving Sustainable Wastewater Treatment**. Dr. Kalbar shared the learnings of his group from IIT-B on natural treatment systems in India from the inventory of NTS prepared as a part of the project. He also discussed the utility of hybrid treatment systems employing both mechanized treatment systems and natural treatment systems for reducing the land area requirement and operational and maintenance cost of the treatment especially in urban and periurban areas.

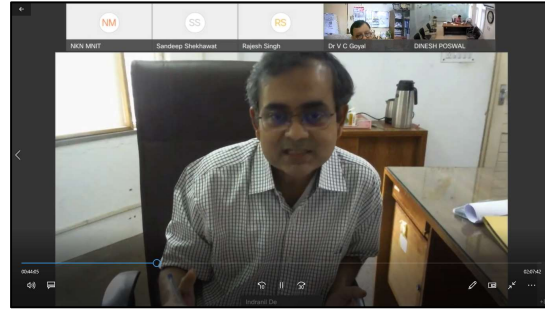
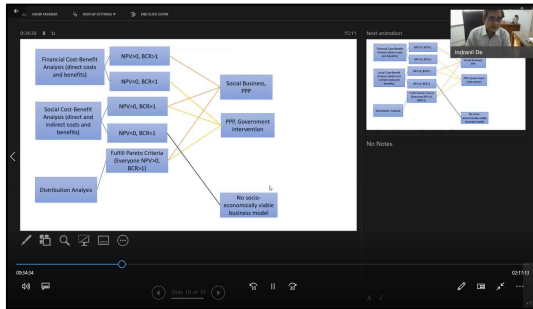


The third talk in the technical session I was delivered by **Prof. A.B. Gupta, MNIT Jaipur** on **Strategies for design and performance optimization of constructed wetlands**. Prof. Gupta discussed the works carried out by the MNIT team on the potential of deep wetlands for removal of organics, nutrients, ARB and antibiotic resistance. Prof. Gupta also discussed how CWs can be customized for Indian conditions by deriving rate constants specific for Indian climate from the literature. The future directions for research on constructed wetlands including their use for greywater treatment, for specific small scale industries, possible integration of CWs with MFCs were also discussed.



Session III: Technical Session II

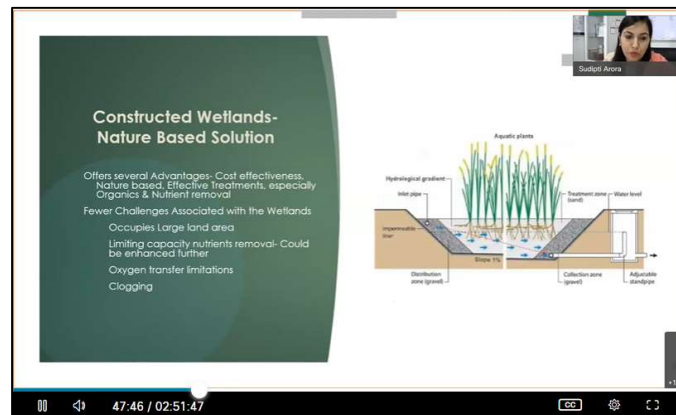
The workshop resumed after lunch break for Technical session II. The session included a presentation by **Dr. Indranil De**, Institute of Rural Management, Anand, Gujarat. Dr. De talked about **Cost-Benefit Analysis and Business Models for Natural Treatment Systems**. Dr. De emphasized the importance of social cost benefit analysis in addition to the financial cost benefit analysis in generating sustainable business models. He discussed various possible scenarios and their implications in cost benefit analysis of natural treatment systems and the strategies for making the natural treatment systems a viable technology for wastewater treatment.



Session IV: Open Session for Stakeholders

The second session after lunch was an open session for the stakeholders in which stakeholders from industries and academia were invited to put forth their ideas in order to promote collaborative research in the field of constructed wetlands.

The first talk of the open session was delivered by **Dr. Sudipti Arora** from **Dr. B. Lal Institute of Biotechnology, Jaipur**. Dr. Arora discussed how Vermifiltration technology can be integrated with the constructed wetland technology for performance enhancement by citing a couple of case studies. The discussion during the presentation led to the conclusion that a more detailed investigation on the gut microflora of earthworms can be performed to understand the benefits of possible integration of vermifiltration with CWs and the modalities for such an integration should be further explored.



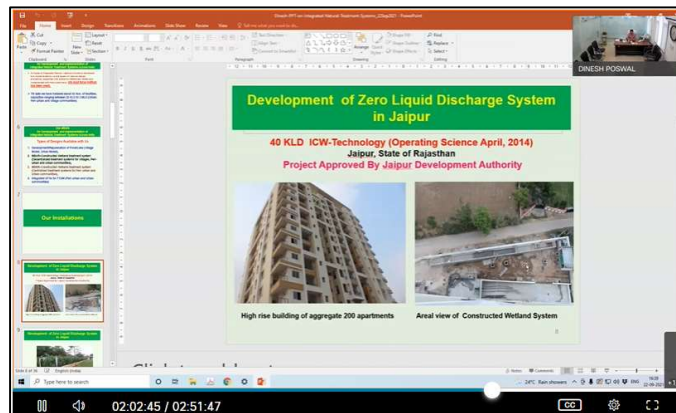
The next talk in the open session was delivered by **Mr. Ganges Reddy** from **Blue Drop Enviro Pvt. Ltd.** Mr. Reddy discussed the application of Natural systems for Complex waste streams. He discussed many field experiences of his team in utilizing constructed wetlands for treating a variety of complex and difficult to treat wastewaters. The results presented during the talk were highly encouraging and merit further exploration. He offered some of his field systems to be analyzed by the project team for finer details.



The third talk in the open session was on **Phycoremediation technology** by **Mr. Sukhdev Singh and Team** from **Trinity International**. The success of the team in treating different types of wastewaters using algae seems exciting and the technique can be easily integrated with surface flow constructed wetlands where combined action of algal species and hydroponic plant varieties may enhance the overall treatment efficiency of nutrient removal. They expressed their willingness for a joint effort on integration of ponds and CWs.



The next speaker in the open session was **Dr. Dinesh Poswal** from **Rebound Enviro Tech Pvt. Ltd.** Dr. Poswal discussed the **Application of Integrated NTS to meet India's contemporary and future water demand**. The presentation highlighted huge potential of deep wetlands for combined carbon, nitrogen, phosphorous and sulfur removal and opened way for further strengthening of the ongoing collaboration with the project team. He also offered some of his field systems to be analyzed by the project team especially for the removal of PCPPs, ARB, ARGs etc and developing comprehensive design parameters for deep CWs.



The final presentation in this series was delivered by the team of **Ms. Aakriti Uttam** and **Mr. Mayank Nautiyal** from **Development Alternatives Group, New Delhi**. The team discussed various interventions from the group for achieving water resilience especially in rural sector. The NGO has been involved in the transformation of several rural localities and showed interest in collaboration with the project partners for integrating the concept of floating islands with surface flow constructed wetlands for low cost treatment in rural areas.



Concluding Session

The concluding remarks for the workshop were delivered by Prof. V.C. Goyal from NIH Roorkee. He congratulated the participants and stakeholders for their active role in making the workshop a success. He emphasized on continued interaction with the stakeholder's for generating a collaborative research environment.

Acknowledgements

This workshop was organized as a part of the activities of our ongoing DST-WTI project and was funded by the Department of Science and technology (Grant no. DST/TM/WTI/WIC/2K17/83). We are grateful to our project partners – Teams from NIH, Roorkee, IIT- Bombay and IRMA, Gujarat for extending all possible help in the successful organization of this workshop. We are thankful to the project team and the volunteers from MNIT Jaipur (Dr. Niha Kulshreshtha, Dr. Sandeep Shekhawat, Mr. Abhishek Soti, Mr. Saurabh Singh and Mr. Pankaj) for their active support during the workshop. Technical assistance from the Video Conferencing Services, Information & Communication Technology Centre, MNIT Jaipur is duly acknowledged for the uninterrupted hosting of this online workshop.



(A.B. Gupta)

Annexure - I

Department of Science and Technology funded
Innovation Centre for Eco-Prudent Wastewater Solutions (IC-EcoWS)
Workshop on “Customized design of constructed wetlands in Indian context”

Date(s): 22 September 2021
Venue: Online, hosted by MNIT, Jaipur

SCHEDULE

Timings	Event	Speaker
Opening Session		
11:00 am to 11:10 am	Welcome Address	Prof. A.B. Gupta, MNIT, Jaipur
11:10 am to 11:20 am	Address by DST-WTI nominee	Dr. Sanjai Kumar, Department of Science and Technology, New Delhi
Technical Session I		
11:20 am to 12 noon	An overview of domestic wastewater treatment studies by NIH using NTS	Prof. V. C. Goyal, NIH - Roorkee
12:00 noon to 12:30 pm	Hybrid Treatment Systems: Potential for Achieving Sustainable Wastewater Treatment	Dr. Pradeep Kalbar, IIT-Bombay
12:30 pm to 1:00 pm	Strategies for design and performance optimization of constructed wetlands	Prof. A.B. Gupta, MNIT - Jaipur
1:00 pm to 2:30 pm	Lunch Break	
Technical Session II		
2:30 pm to 3:00 pm	Cost-Benefit Analysis and Business Models for Natural Treatment Systems	Dr. Indranil De, IRMA - Anand
Open Session for Stakeholders		
3:00 pm to 3:10 pm	Integration of Vermifiltration technology with CWs: Designs, performance Efficacy & Associated Mechanisms	Dr. Sudipti Arora, Dr. B. Lal Institute of Biotechnology
3:15 pm to 3:25 pm	Natural systems for Complex waste streams	Mr. Ganges Reddy BlueDrop Enviro Pvt. Ltd.
3:30 pm to 3:40 pm	Phycoremediation technology	Mr. Sukhdev Singh and Team Trinity International
3:45 pm to 3:55 pm	Application of Integrated Natural Treatment Systems to Meet India's Contemporary and Future Water Demands	Dr. Dinesh Poswal Rebound Enviro Tech Pvt. Ltd.
4:00 pm to 4:10 pm	Achieving Water Resilience	Ms. Aakriti Uttam and Team Development Alternatives Group, New Delhi
4:10 pm to 4:30 pm	Comments, concluding remarks and future extensions	Prof. U. Brighu/ Dr. Niha Kulshreshtha

Annexure-II

LIST OF PARTICIPANTS

All sessions in India Time (Mumbai, GMT+05:30)

Session detail for 'One-day workshop on "Customized design of constructed wetlands in the Indian context "':

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