

**BEFORE THE NATIONAL GREEN TRIBUNAL  
SOUTHERN ZONE AT CHENNAI.**

**ORIGINAL APPLICATION NO. 86 of 2021 (SZ)**

N.Samiraja,  
Perambalur District.

...Applicant

**Vs**

The Chief Engineer,  
Tamil Nadu Public Works Department,  
Chennai and Ors.

...Respondents

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**Filed by  
Thiru. Sai Sathya Jith  
Advocate, Chennai.**

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Vs

The Chief Engineer,  
Tamil Nadu Public Works Department,  
Chennai and Ors.

...Respondents

**REPORT FILED ON BEHALF OF THE 2<sup>nd</sup> & 4<sup>th</sup> RESPONDENTS  
TAMIL NADU POLLUTION CONTROL BOARD**

I, J. Josephine Sahayarani, D/o. Jesu Rajan, Christian, aged about 57 years, having my office at No. 76, Mount Salai, Guindy, Chennai -600032, do hereby solemnly affirm and sincerely state as follows:-

1) I am the Joint Chief Environmental Engineer, Tamil Nadu Pollution Control Board, Chennai and I am filing the status Report on behalf of the 2<sup>nd</sup> & 4<sup>th</sup> Respondents Tamil Nadu Pollution Control Board and as such I am well acquainted with the facts of the case as per records.

2) It is respectfully submitted that the Hon'ble National Green Tribunal (Southern Zone) in its order dated 11.01.2023, has directed inter alia as follows:

*"2. There is a technology developed by the CSIR-NEERI called 'Phytorid Wastewater Treatment Technology' which appears to be cost effective and can be reached the remote villages where they do not have the Common Sewerage Treatment Plant.*

*3. Therefore, we direct the Tamil Nadu Pollution Control Board as well as the Government of Tamil Nadu to adopt the said technique after making a technical study with NEERI and the feasibility of implementing the same in places wherever there are no Sewage Treatment Plants (STPs) "*

  
17/12/23  
JOINT CHIEF ENVIRONMENTAL ENGINEER  
TAMILNADU POLLUTION CONTROL BOARD  
76, MOUNT SALAI, GUINDY,  
CHENNAI - 600 032.

3) It is respectfully submitted that, in accordance with the direction of the Hon'ble Tribunal, a virtual meeting dated 9.2.2023 was conducted by the answering respondent with the Scientists of CSIR-NEERI, Anna University, Directorate of Municipal Administration and the officers of the National Productivity Council and Directorate of Rural Development & Panchayat Raj.

4) It is respectfully submitted that in the said meeting, Dr. Ritesh Vijay, Sr. Principal Scientist & Head, Wastewater Technology Division, CSIR - NEERI, Nagpur made a technical presentation on 09.02.2023 in virtual mode explaining the said technology as follows:

- Phytorid Technology is a unique wastewater treatment process developed by CSIR-NEERI which uses natural treatment techniques like sedimentation, anaerobic digestion, plants & microbial action
- The system is technically named as Phytorid-SWAB (Scientific Wetland & Active Biodegradation) which partially depends on variety of plants that are naturally found in wetlands with filtration & treatment capabilities such as Elephant grass (*Pennisetum purpurem*), Cattails (*Typha sp.*), Reeds (*Phragmites sp.*), Cannas pp. and Yellow flag iris (*Iris pseudocorus*)
- The Phytorid Technology largely focuses on achieving the desired quality of treated sewage without use of extensive energy and chemicals
- In a typical Phytorid-SWAB based treatment plant, Screen Chamber and Sedimentation Tank are provided as pre-treatment units for the removal of floating solids, oil & grease and for the removal of suspended solids & upto 50% Biochemical Oxygen Demand (BOD) respectively
- In the Phytorid-SWAB treatment system, the system has an inlet zone set up with crushed bricks, gravels, stone of various sizes as media and a treatment zone where the sewage is passed through baffles. In the treatment zone, organic matter & nutrients are removed with the help of media & plants respectively

J. J. Kumar  
17/2/23

JOINT CHIEF ENVIRONMENTAL ENGINEER  
TAMILNADU POLLUTION CONTROL BOARD  
76, MOUNT SALAI, GUINDY,  
CHENNAI - 600 032.

- The treatment efficiency of the system is as follows

Total Suspended Solids – 75-95%

Biochemical Oxygen Demand – 80-93%

Chemical Oxygen Demand – 85-95%

Total Nitrogen – 60 -70%

Phosphate – 30-40%

Fecal Coliform – 90-95%

- The treated sewage from a Phytorid system consists of nutrients and is best suited for irrigation & horticultural applications. The treated sewage shall also be disinfected and used in non-potable reuse applications such as landscaping, fountains, toilet flushing.
- Phytorid Technology can also be used in-situ in polluted canals & nallahs by installing in-flow screen chambers & plants which is called the RENEU (Restoration of Nallahs through Ecological Units), a system developed by CSIR-NEERI

5) It is respectfully submitted that the Scientist further stated that this technology is patented and is successfully implemented in 400 places in India. The technology has been transferred to 4 licensees for implementation. A copy of the minutes of the technical presentation dated 9.2.2023 is enclosed as Annexure.

6) It is respectfully submitted that the advantages and limitations of CSIR – NEERI's Phytorid-SWAB system was discussed in the meeting as follows:

**Pros:**

- Environmental friendly technology employing natural treatment mechanisms.
- Negligible Operation & Maintenance cost.
- High potential for non-potable reuse applications like landscaping, fountains and toilet flushing after proper disinfection of the treated wastewater.
- Substantial reduction of organics & solids.

*J. J. Anand*  
18/2/2023  
JOINT CHIEF ENVIRONMENTAL ENGINEER  
TAMILNADU POLLUTION CONTROL BOARD  
76, MOUNT SALAI, GUINDY,  
CHENNAI - 600 032.

- No requirement for extensive infrastructure.
- Energy consumption of the system is insignificant.
- System needs no skilled manpower for operation and maintenance.
- Minimal sludge generation in the system.
- Usage of plants help in retaining the microbial diversity in the system.
- Best suited for agriculture & horticulture.

**Cons:**

- High footprint requirement which is not suitable for areas with land constraints.
- Installation of post-treatment filters and disinfection systems might have an impact on Capital Costs.
- Nutrient removal performance of the technology is not lucrative. Thereforew treated could not be directly discharge into river / other water bodies.

7) It is respectfully submitted that the Phytorid-SWAB system may be a viable option for the treatment of sewage in Town & Village Panchayats with the following characteristics:

- Total Sewage generation up to 1 MLD.
- Availability of sufficient land area for establishing the treatment plant.
- Consistent irrigation water demand so that the treated sewage may be used for agricultural purposes.
- Availability of system for collection and transportation of sewage.

8) It is respectfully submitted that the CSIR – NEERI's Phytorid-SWAB system is technically relevant for the treatment of sewage to prevent pollution in rivers & other surface water bodies however its suitability for specific village/locality needs to be ascertained on a case-to-case basis.

*J. J. Anand*  
17/12/23

JOINT CHIEF ENVIRONMENTAL ENGINEER  
TAMILNADU POLLUTION CONTROL BOARD  
76, MOUNT SALAI, GUINDY,  
CHENNAI - 600 032.

9) It is respectfully submitted that Municipal Administration & Water Supply and Directorate of Rural Development & Panchayat Raj may be directed to explore the implementation of above technology for small local bodies where the sewage generation is less than 1 MLD and the availability of land of adequate area and suitability for specific village / locality.

Under the above circumstances, it is humbly prayed that this Hon'ble National Green Tribunal (Southern Zone) may be pleased to pass such further or other orders as this Hon'ble Tribunal may deem fit and proper in the facts and circumstances of this case and thus render justice.

*J. Josephine Sahayarani*  
17/2/23

JOINT CHIEF ENVIRONMENTAL ENGINEER  
TAMILNADU POLLUTION CONTROL BOARD  
76, MOUNT SALAI, GUINDY,  
CHENNAI - 600 032.  
**BEFORE ME**

### VERIFICATION

I, J. Josephine Sahayarani, D/o. Jesu Rajan, working as Joint Chief Environmental Engineer, Tamil Nadu Pollution Control Board, Chennai, do hereby verify that the contents of above report are true to the best of my knowledge through records.

*J. Josephine Sahayarani*  
17/2/23

JOINT CHIEF ENVIRONMENTAL ENGINEER  
TAMILNADU POLLUTION CONTROL BOARD  
76, MOUNT SALAI, GUINDY,  
CHENNAI - 600 032.



Annexure



## TAMIL NADU POLLUTION CONTROL BOARD

**MINUTES OF THE TECHNICAL PRESENTATION BY CSIR- NEERI ON  
"PHYTORID WASTEWATER TREATMENT TECHNOLOGY" AT THE  
CORPORATE OFFICE, TNPCB, GUINDY, CHENNAI ON 09.02.2023 AT 3.00 PM**

### I. TNPCB Officials:

1. Dr. Jayanthi.M, I.F.S., Chairperson
2. Thiru. R.Kannan, Member Secretary
3. Dr. S. Selvan, Chief Environmental Engineer
4. Er. S. Rajan, Additional Chief Environmental Engineer - I
5. Er.R. Sarasavani, Joint Chief Environmental Engineer - I
6. Er. S. Ragupathi, Joint Chief Environmental Engineer - II
7. Er.J. Josephine Sahaya Rani, Joint Chief Environmental Engineer - III
8. Er.M. Pannirselvam, Joint Chief Environmental Engineer - V
9. Er.D. Vasudevan, JCEE(M), Chennai (Virtual mode)
10. Er.M. Malaiyandi, JCEE(M), Trichy (Virtual mode)
11. Dr. M.Senthil Kumar, DEE, Ariyalur (Virtual mode)

### II. Officials from other departments/institution

1. Dr. Ritesh Vijay, Sr. Principal Scientist & Head, Wastewater Technology Division, CSIR - NEERI, Nagpur (Virtual mode)
2. Dr. M. Thirunavoukkarasu, Chief Scientist & Head, CSIR - NEERI, Chennai
3. Ms. D.Catherine, Technical Officer, CSIR - NEERI, Chennai
4. Dr.S. Kanmani, Professor & Director, CES, Anna University
5. Dr. A. Merline Sheela, Assistant Professor (Sr.Gr), CES, Anna University
6. Dr. Saranya Kuppusamy, Scientist - D, CES, Anna University
7. Dr. M. Vaitheeswaran, Environmental Engineering Specialist, Directorate of Municipal Administration
8. Thiru. R. Idhayachander, Deputy Director, National Productivity Council
9. Ms. M.Kavitha, Superintending Engineer, Directorate of Rural Development & Panchayat Raj (Virtual mode)

No. 76, MOUNT SALAI, GUINDY, CHENNAI - 600 032.

Tel : 044-22353134 - 139 Fax : 044-22353068

Email : [tnpcb-chn@gov.in](mailto:tnpcb-chn@gov.in) Web : [tnpcb.gov.in](http://tnpcb.gov.in)

At the outset, JCEE-III, TNPCB welcomed the officials of TNPCB, officials of NEERI-Nagpur & NEERI-Chennai, Anna University, Directorate of Municipal Administration, National Productivity Council, Directorate of Rural Development & Panchayat Raj and briefed about the Order by Hon'ble NGT(Southern Zone) dated 11.01.2023 in O.A. No. 86 of 2021.

The Hon'ble NGT (Southern Zone) in O.A. No. 86 of 2021 filed by Thiru. N. Samiraja, Perambalur District pertaining to the prevention of pollution of Kallar river water by the discharge of untreated sewage in its order dated 11.01.2023 has directed the following among others:

*"Para 5. In view of the above, we direct the Tamil Nadu Pollution Control Board as well as the State Government to study this 'Phytorid Wastewater Treatment Technology' developed by CSIR - NEERI and file a feasibility report and implement the same in the State of Tamil Nadu, if feasible."*

In this regard, TNPCB requested CSIR – NEERI to make a technical presentation on "Phytorid Wastewater Treatment Technology" to understand about the said technology so as to comply with the Hon'ble NGT order.

Based on TNPCB's request, Dr. Ritesh Vijay, Sr. Principal Scientist & Head, Wastewater Technology Division, CSIR - NEERI, Nagpur made a technical presentation on 09.02.2023 in virtual mode explaining about the said technology as follows:

- Phytorid Technology is a unique wastewater treatment process developed by CSIR-NEERI which uses natural treatment techniques like sedimentation, anaerobic digestion, plants & microbial action
- The system is technically named as Phytorid-SWAB (Scientific Wetland & Active Biodegradation) which partially depends on variety of plants that are naturally found in wetlands with filtration & treatment capabilities such as Elephant grass (*Pennisetum purpurem*), Cattails (*Typha sp.*), Reeds (*Phragmites sp.*), Cannas pp. and Yellow flag iris (*Iris pseudocorus*)

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## TAMIL NADU POLLUTION CONTROL BOARD

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- The treatment efficiency of the system is as follows
  - ± Total Suspended Solids – 75-95%
  - ± Biochemical Oxygen Demand – 80-93%
  - ± Chemical Oxygen Demand – 85-95%
  - ± Total Nitrogen – 60 -70%
  - ± Phosphate – 30-40%
  - ± Fecal Coliform – 90-95%
- The treated sewage from a Phytorid system consists of nutrients and is best suited for irrigation & horticultural applications. The treated sewage shall also be disinfected and used in non-potable reuse applications such as landscaping, fountains, toilet flushing.
- Phytorid Technology can also be used in-situ in polluted canals & nallahs by installing in-flow screen chambers & plants which is called the RENEU (Restoration of Nallahs through Ecological Units), a system developed by CSIR-NEERI

Further he stated that this technology is patented and is successfully implemented in 400 places in India (list enclosed). The technology has been transferred to 4 licensees (list enclosed) for implementation.

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Dr.S.Kanmani, Director, CES, Anna University requested to clarify on the nutrient removal potential and the disinfection demand of the system. Dr. Ritesh Vijay explained that the nutrient removal is limited to nitrates removal which is mainly due to the plant population and by the sinusoidal movement of wastewater through baffle walls which creates aerobic and anaerobic conditions in the system leading to simultaneous nitrification & denitrification in the system. Also, the root zone of the surface plants effectively absorbs the nutrients from the wastewater. The plants also expel Oxygen through roots thus increasing the DO levels in the treatment zone. Further, he mentioned that installing Pressure Sand Filter (PSF) & Activated Carbon Filter (ACF) as a post-treatment system will treat the nutrients in the outlet wastewater. He also pointed out that disinfection is important in cases where reuse of the treated sewage is practised.

Further, when remarked on the retention time of the pre-sedimentation tanks, Dr.Ritesh Vijay mentioned that the retention time is 14-20 hours whereas the de-sludging is done every 3 months from the sedimentation tank which is an anaerobic baffle type tank.

DEE, TNPCB, Ariyalur in his remarks requested to clarify the feasibility of this technology in Ariyalur District as the village is an unsewered habitations and that storm water gets mixed with sewage and disposed into river Kallar. Dr. Ritesh Vijay clarified that clay and silt disturbs the performance of the technology and necessary by-pass arrangements need to be made to avoid the entry of storm-water into the system. However, a pre-settler shall be used for removal of clay & silt wherever required. Additionally, DEE, TNPCB, Ariyalur expressed the constraints on developing special infrastructure for the system in smaller towns for which Dr.Vijay explained that the system does not require concrete wall or casings rather brick masonry walls will be sufficient.

Dr.Merline Sheela in her remarks requested to brief on the consistency of maintaining the plant population for which it was told that trimming of plants is done every 3 – 6 months to stabilize the plant growth.

CEE, TNPCB enquired whether issue of fly & mosquito breeding has been noticed during the system operation. Dr. Ritesh Vijay explained that the Phytoid Treatment system being a subsurface flow system, it does not create mosquito or fly breeding issues.



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## TAMIL NADU POLLUTION CONTROL BOARD

Chairperson, TNPCB stated that as a policy maker, she would be more interested in knowing what could be the possible areas where the system may be recommended for application. Dr. Ritesh Vijay explained that the system requires a land area of 1200 – 1400 sq.m per MLD of wastewater to be treated and a capital cost of INR 2.0 Cr per MLD (excluding land cost). He also remarked that, the Phytoid technology may be an effective option in peri-urban areas, towns & villages where land availability is not a constraint.

Further, the advantages and limitations of CSIR – NEERI's Phytoid-SWAB system was discussed as follows:

### Pros:

- Environmental friendly technology employing natural treatment mechanisms
- Negligible Operation & Maintenance cost
- High potential for non-potable reuse applications like landscaping, fountains and toilet flushing after proper disinfection of the treated wastewater
- Substantial reduction of organics & solids
- No requirement for extensive infrastructure
- Energy consumption of the system is insignificant
- System needs no skilled manpower for operation and maintenance
- Minimal sludge generation in the system
- Usage of plants help in retaining the microbial diversity in the system
- Best suited for Agriculture and Horticulture.

### Cons:

- High footprint requirement which is not suitable for areas with land constraints
- Installation of post-treatment filters and disinfection systems might have an impact on Capital Costs
- Nutrient removal performance of the technology is not lucrative. Therefore, treated sewage could not be directly disposed into river/other water bodies.

The Phytoid-SWAB system may be a viable option for the treatment of sewage in Town & Village Panchayats with the following characteristics:

1. Total Sewage generation upto 1 MLD

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2. Availability of sufficient land area for establishing the treatment plant
3. Consistent irrigation water demand so that the treated sewage may be used for agricultural purposes
4. Availability of system for collection and transportation of sewage

Therefore, it is evident that the CSIR – NEERI's Phytoid-SWAB system is technically relevant for the treatment of sewage to prevent pollution in rivers & other surface water bodies however its suitability for specific village/locality needs to be ascertained on a case-to-case basis.

*[Handwritten signature]*  
18/12/12  
For Chairperson

To

1. The Director,  
CSIR - National Environmental Engineering Research Institute  
Nehru Marg,  
Nagpur  
Maharashtra - 440020
2. The Director of Municipal Administration,  
Directorate of Municipal Administration,  
75, Urban Administrative Building,  
Santhome High Road,  
MRC Nagar, Raja Annamalaipuram,  
Chennai – 600028
3. The Director,  
Centre for Environmental Studies,  
Department of Civil Engineering,  
College of Engineering Guindy,  
Anna University,  
Chennai -600 025
4. The Director,  
National Productivity Council  
No.6, Aavin Dairy Road North,  
Ambattur Industrial Estate,  
Ambattur,  
Chennai – 600050
5. The Commissioner of Rural Development and Panchayat Raj,  
Directorate of Rural Development & Panchayat Raj,  
Panagal Building,  
Chennai - 600 015

**BEFORE THE NATIONAL GREEN  
TRIBUNAL  
SOUTHERN ZONE, CHENNAI**

**Original Application No. 86 of 2021 (SZ)**

N.Samiraja,  
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...Applicant

**Versus**

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**REPORT FILED ON BEHALF OF THE 2<sup>nd</sup>  
AND 4<sup>th</sup> RESPONDENTS - TAMIL NADU  
POLLUTION CONTROL BOARD.**

**Advocate for Respondent- TNPCB:  
Thiru.S. Sai Sathya Jith,  
Advocate, Chennai.**

**Date:17.02.2023**

**Hearing date on:20.02.2023.**