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Assessment Of Heavy Metal Concentration And Their Effects In Mining Waste Disposal Area Of Shervaroyan Hills, Tamil Nadu

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There is a great demand for mineral resources throughout the world due to a great increase in the population. Mining activity has increased largely due to these reasons. As a result of increased mining activity generation of waste is also increasing to a greater extent. Shervaroyan hills are the main source for various mineral ores, mining activities has become predominant in this area for more than five decades. The mining waste become dangerous due to its toxic level, reactivity, corrosivity and so on due to the presence of excessive minerals. Hence the present study aims to investigate physical properties, major elements, minor trace elements (heavy metals) and health effects of heavy metals by estimating ecological risk assessments. This is to highlight the impacts to concerned authorities to take immediate preventive steps for the betterment of ecology and mankind. The collected topsoil sample was digested, analysed and compared with Indian and WHO standards. The level of major elements found is arranged as phosphate < chloride < available nitrogen < sulphate < total organic carbon in the study area. Minor trace elements were estimated in the samples which were collected from the mining waste disposal area of Yercaud. The level of profuse heavy metals found is arranged as copper > arsenic > lead > cadmium. Ecological risk assessments of pollution load index average (5.339) of the study area is exceeding one, which proves it is polluted by heavy metals. The geo-accumulation index analysis (Pb: - 2.856, As: 0.051, Cu: 0.962) signifies that the soil in the study area is moderately contaminated with copper and arsenic heavy metal and not polluted with lead. To maintain biodiversity in the study area, mining waste should be treated properly before disposal and phytoremediation may be adopted to reduce the destructive effect of heavy metal in soil.

KEYWORDS

Mining waste, Heavy metals, Contamination factor, Pollution load index, Geo-accumulation index

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Productivity Improvement Of Seaweed (*Gracilaria verrucosa*) Fertilized With Vermicompost Made From Different Organic Wastes

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The development of profitable *Gracilaria verrucosa* seaweed cultivation is possible because of the high market demand for gelatine (agarose). These advantages make *Gracilaria verrucosa* cultivation attractive but problems of decreasing productivity are encountered, due to the use of chemical/inorganic fertilizers. In this study, we investigated the use of vermicompost fertilizer, from different organic wastes feed waste, reed waste (Imperata) and banana stem waste and their effect on the productivity of *Gracilaria verrucosa* seaweed. The data were analysed using ANOVA and the Tukey test. The results showed that the lengths of the short and long axes of the seaweed cells were 165.0-227.3 μm and 170.3-253.7 μm, respectively. The daily growth rate was 0.95-1.61% per day. The agar yield quality on day 0 was 12.4-16.0% and on day 42, it was 24.6-30.6%. The nitrogen content of *Gracilaria verrucosa* seaweed on day 0 was 1.50-1.86% and 2.93-3.60% on day 42 while the phosphorus content on day 0 was 0.13-0.22% and 0.41-0.61% on day 42. Treated banana stem waste is the best waste to increase the growth and quality of seaweed.

KEYWORDS

Gracilaria verrucosa, Mineral content, Growth, Cell size, Vermicompost

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Comparative Study Of Leaching Potential Of Atrazine And Carbendazim Pesticide In Low Organic Content Soil

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In this paper, the leaching potential of atrazine and carbendazim pesticides in soils having 1.52% organic content is presented. The studied soil was a sandy clay loam (53% sand, 19% silt and 28% clay) collected from an open field near the Phulwarisharif, Patna, India. The results showed that both pesticides were adsorbed on the soil. It was also found that carbendazim is significantly depleted by degradation as compared with atrazine since the unaccounted for carbendazim and atrazine were 7.5% and 1%, respectively. Only 2.8% of the applied atrazine leached out and 96.2% was accumulated in the soil at different depth. This shows that the affinity of atrazine with soil is very high as compared to the water. Not only this but it was also observed that the percentage of atrazine that was leached out, has taken only 10 hr and no atrazine was found in the leachate sample collected afterwards. Whereas the behaviour of carbendazim was almost the opposite. About 43.7% of the applied carbendazim leached out and the rest amount 48.8% was accumulated in the soil at different depth which reflected that the affinity of carbendazim with water and soil is almost equal.

KEYWORDS

Pesticides, Leaching potential, Low organic content, Groundwater ubiquity score

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Self-Compacting Concrete With Manufactured Sand And Recycled Coarse Aggregate

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Self-compacting concrete (SCC) is the concrete that can be easily placed and compacted due to its own weight and does not need any external compacting effort. This type of concrete is cohesive enough so that it is easy to handle without segregation and bleeding of concrete. Generally, after completing the useful life, the structures are demolished. This demolition waste can be converted into coarse and fine aggregate, which may find use in SCC also. In recent years, many researchers have tried to replace the natural coarse aggregate with waste material in concrete. The use of recycled coarse aggregate is commercially sustainable and technically good for the environment. The construction and demolition wastage are putting an adverse effect on the environment so the use of this waste shows the effective utilization of resources. For sustainable construction, C and D wastage are the main and important resources. The environmental problem due to C and D waste are landfills, illegal deposit, etc. Therefore, the reuse of C and D waste, such as recycled aggregate is the solution to these problems. Recycles concrete aggregate is obtained after crushing and screening old demolition waste. In mortar and concrete, sand is used as fine aggregate. For fine aggregate river sand is mostly preferred. When weathering of rock takes place over a period of million-year natural sand is formed. This sand is obtained from river beds and sand mining which are calamitous environmental concerns. Nowadays river sand is very difficult to get. Manufactured sand (M- sand) is that sand, which is obtained from crushed rock to required grain size distribution. For the required grain size of coarse aggregate, the rocks are crushed in special rock crushers and the crushed material is washed by clean water to remove fines.

KEYWORDS

Construction and demolition, Manufactured sand, Recycle concrete aggregate

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IoT Based Intelligent Robot For Railway Track Cleaning And Monitoring Applications

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Waste disposal is a decisive problem in emerging countries particularly in India due to the high population. Currently, sanitary workers in India using the oldest devices for cleaning the tracks are indeed unhygienic and it cannot be done manually. The main reason for this is the huge distance which cannot be covered. To find a solution to this waste disposal problem, a cost-effective waste cleaning robot is developed. The system is very simple and cost-effective. The system is highly efficient and holds an effective mechanism. The components of the robot are a rotating brush assembly (Rake), a unique tilting wedge, a conveyor system and a garbage collection unit. The main work of the brushes is to help sweep and pick the very light waste, such as papers, leaves, cups and plastics. The DC motors present here are used to drive the sweeper as well as the conveyor system. The conveyor brush carries the waste and drops it in the garbage disposal unit placed at the back. The railroad system, railway track security is a primary concern. This robot alongwith cleaning identifies the cracks and using IoT it shares this information with the concerned people.

KEYWORDS

Railways track cleaning, Arduino based robot, Raspberry pi, DC pump, Camera, Teachable machine, Ultrasonic sensor, Cloud, WiFi module

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Production And Analysis Of Compost Fertilizer From Kitchen Waste And Its Application Study On *Alternanthera sessilis*

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Solid waste management is a major problem in India, where population growth, urbanization and industrialization have resulted in increased municipal solid waste generation. The main objectives of the research are to produce a compost fertilizer that can be used to support plant growth and as a soil amendment. Secondly, to compare the three recipes of the compost A, B and C which comprises of kitchen waste with goat manure, kitchen waste with groundwater and kitchen waste with rice cleaned water, respectively. Finally, to evaluate the compost produced in terms of temperature, pH, moisture content, nitrogen, phosphorous and potassium (N:P:K), C:N, rate of degradation, soil porosity, water retention and growth of *Alternanthera sessilis.* Temperature of 54.7°C for compost-C at week-4 was highest due to the high microbial activity, N:P:K and C:N of compost-C were 4:1:3 and 15.89:1, respectively. End results of all the parameters, good soil porosity, fast and healthy plant growth indicated were effectively fulfilled with compost-C proving to be the best compost fertilizer recipe than composts A and B; demonstrating the compost-C may replace the harmful chemical fertilizers in the market leading to a greener nation.

KEYWORDS

Soil waste management, Compost fertilizer, Kitchen waste, Soil amendment, Rate of degradation, NPK, *A. sessilis*

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Environmental Assessment And Institutional Ecology Tools: Exploring Integrative Approaches

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Rapid industrialization and population explosion in India have led to the migration of peoples from villages to cities which increase human settlement in the world's growing cities and towns. This generates several issues with regard to the environment. Environmental impact assessment (EIA) is becoming a very important study before commissioning any project plan or development in our country. In order to study either its beneficial or harmful effect; evaluation of any project through EIA has become a must. Indian construction industry is rapidly growing at a rate of 9.2% as against the world average of 5.5%. Undertaking EIA for the construction industry and improving site management can reduce environmental impacts both on and off-site [1]. Several agencies use procedures for EIA of construction projects which might result in significant environmental impacts. The EIA study is necessary to prepare a detailed account of the environmental impact of the proposed activity so that appropriate interventions could be taken. An attempt has been made in this project to study the environmental impact of building construction project using computer-based analysis methodology. The study focuses on various parameters, such as total area, parking area, rainwater harvesting system, basement area, sewage treatment plant, water quality, solid waste, source of water, depth of groundwater, distance from the city centre, nearest sensitive zones and overall settlement density. The plan seeks to define the project in a holistic manner and suggest possible mitigation measures for development. The primary purpose of the study is to establish a consensus vision of an eco-friendly of building environment over the next five years.

KEYWORDS

Environmental impact assessment, Term of references, State expert appraisal committee (SEAC)

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Physico-Chemical Analysis And Comparative Assessment Of Groundwater And Surface Water In Mumbai

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The study was carried out to assess the impacts of anthropogenic activities mainly industrial activities on groundwater and surface water quality around Babrekar Nagar in Kandivali West, Mumbai. The water quality was assessed in terms of physico-chemical parameters. Groundwater (from the open well) and surface water (from pond) samples were collected from Babrekar Nagar in the month of April 2019. The physico-chemical parameters, such as pH, electrical conductivity, turbidity, TDS, hardness, chloride concentration and BOD were determined as per the standard methods mentioned in APHA [1]. Analysis of data was done to detect any sign of deterioration in the groundwater and surface water quality. The results were compared with the drinking water quality standard (IS 10500) [2]. It was found from laboratory investigation that both groundwater and surface water were contaminated at sampling sites. This study will help to demarcate the polluted source so that suitable measures can be taken in reducing water pollution.

KEYWORDS

Physico-chemical analysis, Groundwater, Surface water, Water quality, Water pollution

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Sequential Extraction Of Heavy Metals In Soils Evolving From Dumping Of Municipal Solid Wastes

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Twenty five sub-surface soil samples collected from agricultural fields, used to cultivate local vegetables adjoining the open municipal solid waste dumpsite in Dhapa of Kolkata town, were analyzed for some heavy metals (Cu, Pb, Mn, Zn, Ni and Cr) using atomic absorption spectrophotometer. The analysis of the aqua regia digestion for total metal showed an average concentration of Cu (465.32 $\pm$ 7.6 ppm), Pb (679.09 $\pm$ 5.78 ppm), Mn (987.35 $\pm$ 8.84 ppm), Zn (1982.37 $\pm$ 10.52 ppm), Ni (67.39 $\pm$ 4.21 ppm) and Cr (595.61 $\pm$ 6.28 ppm). The concentration of Cr, Pb and Zn in the soil evolved from solid waste dumping was exceptionally high in comparison to the Indian compost standard. Sequential extraction studies were also carried out for the metals using Tessier method [1]. Most of the Cr, Pb and Ni were found to be associated with the residual fraction whereas Zn and Mn were more in the reducible phase. Cu was found to be present more in the oxidizable phase. The bioavailability order (sum of exchangeable and acid extractable phase) of metals was Ni > Mn > Pb > Zn > Cu > Cr. The recovery obtained by comparing the aqua regia extracted metal content with the sum of sequentially extracted fractions was in the range of 101–108%.

KEYWORDS

Dhapa, Municipal solid waste, Heavy metals, Sequential extraction, Bioavailability

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Pilot Plant Of SHEFROL Phytoremediation Technology For Treating Greywater Of A Typical Indian Village

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The appropriateness of a recently patented phytoremediation technology based on a sheet flow root level (SHEFROL®) bioreactor was tested by installing and operating a pilot plant in a typical Indian village (Chinnakalapet, Puducherry). The system was able to handle significant diurnal variations in greywater inflows and strength with remarkable robustness. It reduced suspended solids, chemical and biological oxygen demands and total Kjeldahl nitrogen of the greywater to the extents of 96.1±1.5, 79.8±3.3, 77.7±0.4 and 41.8±3.9% at hydraulic retention time of just 2.2±0.3 hr. The treated water met the standards of discharge on land set by India's Central Pollution Control Board.

KEYWORDS

Greywater, Water hyacinth, Salvinia, Treatment, SHEFROL bioreactor

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Removal Of A Dye From The Textile Industry By Adsorption On Natural Pozzolana

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In the present work, study of the adsorption of the yellow dye G (azo type) which is found in the discharges of a textile factory ENADITEX of the industrial zone of wilaya of Oran, Algeria on pozzolana which is a natural and easily available adsorbent was conducted. Experimental results showed that the adsorption of the yellow dye G on pozzolana showed a removal rate of 78.80% for a maximum time of 60 min at initial pH (13.09) and room temperature. The study of isotherms revealed that both Freundlich and Temkin models fit well with the process of dye adsorption. The kinetic data were modelled by the pseudo-first order and pseudo-second order equations and reveal that the adsorption of the yellow dye G is governed by the second order kinetic model. The thermodynamic study indicates that the adsorption process is of spontaneous physical and endothermic nature.

KEYWORDS

Natural pozzolana, Yellow dye G, Adsorption isotherms, Kinetics study, Thermodynamic study

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A Novel Two-Stage Invertebrate Biofilter Design To Treat Wastewater

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Water treatment is a prime thrust area of research these days. A number of techniques have been developed to optimize water treatment practices. Approximately 7300 m^3 of wastewater and sludge is generated annually in India and most of it is disposed into the rivers as such. There are significant types of wastewater treatment filters, like trickling filter, horizontal rock filter in a polluted stream, granular activated carbon (GAC) or sand filter. In the present research, the wastewater filtering potential of mollusc and annelid is explored. A small invertebrate biofiltration setup was constructed by using different substrates (gravels, ash, peels) aided with local mollusc (*L. marginalis)* and earthworm (*E. fetida*). Alongside another setup prepared with the same layers but without aiding invertebrates was considered as a control to analyse the filtration potential of invertebrates. Four respective filtration cycles were considered to observe changes in chemical parameters. There was a significant increase in pH (9.04% compared to control). Invertebrate filter caused a significant decrease in the level of EC, TDS and hardness. Results thus suggested that an integrated invertebrate filtration system is more efficient in treating wastewater. However, a preliminary idea to use invertebrates for wastewater treatment is developed through this work. Further detailed studies to fix the role of each group in filtration, density-based filtration rate and examination of other crucial parameters are areas which are still unexplored.

KEYWORDS

Biofilter, *Eisenia fetida, Lamnellidens marginalis,* Wastewater, Reactor

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An Overview Of Various Treatment Processes Of Dairy Wastewater

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In the present scenario, the consumption of milk and its products is increasing day to day due to the increase in population for which a number of dairy industry is growing every year. It requires a huge amount of water for the processing purpose which produces plenty of wastewater containing a number of pollutants, such as organics, suspended solids, total dissolved solids, sulphur, phosphorous and nitrogen, discharged in the open field. It becomes a challenge to get the usable water by removing these pollutants from this wastewater and make it fit for cultivation. The process for the treatment of wastewater generated from the milk processing plant has been described and discussed. Characterization of dairy wastewater with respect to various inorganic and organic constituents presents therein and the consequent harmful health effects have been highlighted. Different treatment techniques for environmentally acceptable disposal of wastewater have been presented. A few recent techniques being developed for the treatment have also been highlighted.

KEYWORDS

Dairy wastewater, Physico-chemical treatment, Biological treatment, Advanced treatment

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Assessment Of Cauvery River Water Quality Using Water Quality Index In Bhavani - Kokkarayanpettai, Erode Zone

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Understanding the water quality for drinking and agricultural uses is important. The main sources for the water contamination in the rivers are industries, agriculture and domestic sources. Most of the industries and cities are located along the river basin which is a convenient place to discharge waste materials. Chemical waste products from the industries, like paper mills, leather industries and dyeing industries sometimes accidentally discharge harmful chemicals into rivers in high concentrations that affect all living beings. In order to assess the water quality in the Cauvery river, samples were collected and analyzed for turbidity, pH, chloride, total hardness, total dissolved solids, chemical oxygen demand, dissolved oxygen, biochemical oxygen demand, etc. Qualitative ratings classified the river waterfalls into the category very poor according to the water quality index. The water quality ranges from 112.27-348.5. The overall quality of the waterfalls under the very poor category. The Cauvery river water gets polluted by the discharge of untreated wastewater from the industrial sectors.

KEYWORDS

Cauvery river, Water quality index, Bhavani, Kokkarayanpettai

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Pilot Model Study For Artificial Recharge Of Treated Domestic Sewage In Unconfined Aquifer

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Disposal of treated sewage has been increasingly important in the development and planning of wastewater management. The objective of the study is to investigate the impact of artificial recharge of treated domestic sewage in an unconfined aquifer. Once the pollutant reaches the soil, there are several factors that affect the soil behaviour. Therefore, it is imperative to know the impact of disposal of treated sewage in different soils available locally in the coastal belt of the southwest coast of India. This study will help in easing the disposal in streams by adding up a new form of disposal in all-time weather conditions. The objectives of this study include treatment efficiency and its quality before and after the recharge in sand and soil as a dispersion media. The experimental model has shown enough potential in the removal of pollutant concentration in media dispersion. The percentage removal of dependent variables, such as biochemical oxygen demand and chemical oxygen demand is found to be 51.65% and 83.01%, respectively in the sand and also 83.34% and 50% in soil, respectively.

KEYWORDS

Artificial recharge, Biochemical oxygen demand, Chemical oxygen demand, Treated domestic sewage, Unconfined aquifer

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An Assessment Of Groundwater Quality Using Water Quality Index In Ennore, Neighbourhood Chennai

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The water quality index (WQI) plays a vital role in determining the drinking water quality in an urban, rural and industrial area. WQI is defined as an index reflecting the composite influence of different water quality parameters which is considered and taken for calculation of the water quality index. In the present study, ten groundwater samples were collected from the Ennore area in the neighbourhood Chennai, Tamil Nadu, India. The thirteen water quality parameters have been considered for the calculation of water quality index, namely pH, electrical conductivity (EC), total hardness (TH), total dissolved solids (TDS), total alkalinity (TA), sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), nitrate (NO_3^-), bicarbonate (HCO_3^-), chloride (Cl^-), sulphate (SO_4^{2-}). In this study Bureau of Indian Standard has been used to assess the suitability of groundwater for drinking purposes and for the calculation of WQI.

KEYWORDS

Ennore, Groundwater quality, Physico-chemical parameters, Water quality index, Water pollution

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Experimental Study On Soil Stabilization Using Geotextiles

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For pavement constructions, such as runway and highway construction, fine-grained soils are not suitable due to their undesirable properties, such as poor grading, low bearing capacity and more plasticity, ability to swell. To improve these soil properties various soil stabilization methods are needed. The stabilization is done by adding various stabilizing materials with the fine-grained soil. Geotextiles are one of the materials used in soil stabilization. This experimental study has been carried over to improve the bearing capacity of soft soil (from Sholinganallur, Chennai) by using natural and artificial geotextiles. During this study, the soil samples which has been stabilized with various geotextiles was prepared, that is soil with natural geotextile (jute fibre) and soil with artificial geotextile. In this experimental study, index properties and engineering properties of soft soil or unstabilized sample and stabilized soil sample with geotextiles were determined. Samples are subjected to various soil tests which have been used to determine the engineering properties of soil. The soil tests, such as the standard proctor compaction test, unsoaked California bearing ratio (CBR) test and unconfined compression (UCC) test had been done to determine the characteristics of the samples. In order to determine the properties of stabilizing materials, the geotextiles underwent various geosynthetic laboratory tests. The results of the study show that the bearing capacity of Shollinganallur fine grained soil can be improved subsequently and water absorption by soil has been reduced significantly by using geotextiles.

KEYWORDS

Bearing capacity, California bearing ratio test, Fine-grained soil, Geotextile, Stabilization, Unconfined compression, Unstabilized sample

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Performance Analysis Of Sewage Treatment Plants In Delhi

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Nowadays, water quantity and quality are the major problems especially in urban areas arising due to rapid urbanization and industrialization. Due to the insufficient capacity of sewage treatment plants in Delhi, the discharge of wastewater from domestic and industrial sources is mainly responsible for pollution in the river Yamuna. A study has been carried out to analyze the efficiency of various sewage treatment plants located in Delhi based on different technologies. The sewage treatment plants located at Okhla, Chilla and Akshardham have been chosen for the study which are based on technologies, such as conventional activated sludge process (CASP), sequential batch reactor (SBR) and membrane bioreactor (MBR), respectively. The results have shown that the sewage treatment plants based on SBR and MBR are functioning satisfactorily but the sewage treatment plant based on CASP at Okhla is not working properly, where the biochemical oxygen demand (BOD) of treated wastewater was found to be 62 mg/L which is not within the permissible limit as prescribed by the Central Pollution Control Board of India. Hence, there is a need for continuous monitoring of the sewage treatment plants and also to remove any inefficiency in operation and maintenance as and when it is observed.

KEYWORDS

Sewage treatment plant, Wastewater quality, Pollution, Biochemical oxygen demand

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