A STUDY ON WATER QUALITY OF PERUNGUDI PALLAKARNAI DUMPING AREA

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ABSTRACT

All living organisms are dependent upon pure oxygen, water, soil etc. in one form or other to maintain metabolic processes that produce energy for growth and reproduction. Due to the rapid increase in industries air, water, soil and the nature are being polluted. The water pollutants are due to the presence of high organic content, toxic, tetragenic mutagenic, carcinogenic materials. In our present study, we are going to examine ground water and surface water quality in and around Perungudi and Pallikaranai. For that, water samples are collected & analyzed for their physicochemical characteristics. The investigation is focused on the determination of physicochemical parameters such as temperature, turbidity, electrical conductivity, pH, hardness, total solids, total dissolved solids, total suspended solids, chlorides, dissolved oxygen. The result of physical and chemical parameters of surface water and ground water in the study area are discussed.

KEY WORDS: Dump site, surface water, ground water & physico-chemical properties.

INTRODUCTION

For any land-based structure, the inspiration is Pallikaranai wetland is a freshwater marsh in the City of Chennai, India. It is arranged adjoining the Bay of Bengal, around 20 kilometers (12 mi) south of the downtown area, and has a geological range of 80 square kilometers (31 sq mi). Pallikaranai marshland is the main surviving wetland environment of the city and is among the few and final common wetlands of South India. It is one of the 94 distinguished wetlands under National Wetland Conservation and Management Program (NWCM) operationalized by the Government of India in 1985– 86 and one of the three in the territory of Tamil Nadu, the other two being Point Calimere and Kazhuveli. It is likewise one of the organized wetlands of Tamilnadu .The geology of the marsh is with the end goal that it generally holds some stockpiling, in this way shaping a sea-going biological system. A task on 'Inland Wetlands of India' authorized by the Ministry of Environment and Forests, Government of India had organized Pallikaranai swamp as a standout amongst the most huge wetlands of the country. The marsh contains a few uncommon or imperiled and undermined species and goes about as a rummage and reproducing ground for a great many transitory fowls from different places inside and outside the nation. The quantity of winged creature species located in the wetland is essentially higher than the number at Vedanthangal Bird Sanctuary. Unpredictable dumping of harmful strong waste along the street, release of sewage, and development of
structures, railroad stations and another street to associate Old Mahabhalipuram Road and Pallavaram have contracted the wetland all things considered. In 2007, as a push to shield the rest of the wetland from contracting further, the undeveloped regions in the locale were informed as a save timberland.

Chennai City, capital of tamilnadu has a population of about 4.68 million (census 2011). Due to urbanization, increase in population and consumption pattern, the problem of solid waste management in chennai has been rapidly increasing. Chennai generates more than 3200 metric tones of solid waste every day. The solid waste generated consists primarily of organic waste, different kinds of plastics, packaging waste, paper, metal, glass, construction debris, bio-medical waste and slaughter house waste. According to central pollution control board estimates, an average person in a class i city (urban areas of population of 100000 and above), produces about 0.4 kg of garbage a day. Per capita waste generation in lower income and higher income groups is 0.18 kg and 0.80 kg respectively of garbage a day respectively. In chennai, on an average of 0.6 kg/capita/day of solid waste is being generated and the municipal corporation of chennai is responsible for garbage collection and disposal on a daily basis. The solid waste generated from the chennai city finds its way to two major landfills, perungudi in south and kodungaiyur in north both of which are being used as open dumps. To study groundwater contamination due to solid waste disposal in Perungudi dumpsite an area of 68 sq. Km is chosen for the present study. The Survey of India toposheet was georeferenced and digitized to delineate the study area based on the six micro watersheds around the dumpsite from 30 Mambakkam sub watershed. It lies between 12o 53’ 16” N to 12o 58’ 43” N latitudes and 80o 10’ 18” E to 80o 16’ 0.8” E longitudes and shown in Figure 3.1. The study area includes Perungudi, OkkiumThuraiapakkam, Pallikaranai, Madipakkam and Medavakkampanchayat unions. The study area watershed boundary on north, west and southern part and coastal boundary on eastern part.

LITERATURE REVIEW


Despite the fact that catchments have been involved as an essential wellspring of metals to lakes, the catchment commitment of various metals is ineffectively known, and the anthropogenic commitment isn’t known in any way. We decide the anthropogenic lake silt weights of Zn, Cu, Ni, Cr, and Pb for a few Quebec and Ontario lakes, not subject to point source stacking, to acquire assessments of air stacking and contributions from earthly sources. To do this, we initially gathered numerous centers crosswise over 11 lake bowls to gauge the entire lake Pb loads. As the entire lake Pb loads did not contrast among lakes that crossed more than two requests of extent in waste proportions (seepage bowl are lake region), we reason that catchment maintenance of anthropogenic Pb is finished. The anthropogenic Pb loads were then utilized as an amendment for centering for alternate metals. Among the metals, Cr and Ni were the most promptly sent out from waste bowls, trailed by Cu. Zn demonstrated no expansion with seepage proportion, showing Zn to be adequately held by catchments. The fare coefficients of the Pb rectified metals correspond well with sea living arrangement time, uncovering a comparable metal sorption/precipitation succession in the two soils and seas. Residue metal weights give a moderately simple approach to acquire metal fare coefficients from waste bowls, as well as the climatic affidavit of anthropogenic metals (e.g. Pb: S.E. Quebec, 950 mg*m⁻², Laurentians, north of Montreal, 420 mg*m⁻²). The fare coefficients are not just less complex to get than by mass adjust estimations, at the same time, moreover, recognize the anthropogenic segment.

In Pallikaranai wetland has high biological importance as it has been a home for other related biodiversities. This wetland is very contaminated because of the fast industrialization, urbanization and dumping of strong waste. The water nature of the Pallikaranai wetland has been examined with reference to poisonous metals. The metals investigated incorporate lead, chromium, press, copper, nickel, zinc and cadmium. The substantial metal investigation in surface waters were in the accompanying reach; Cd : BDL – 0.019 mg l\(^{-1}\), Fe : BDL – 1.52 mg l\(^{-1}\), Cu : BDL – 0.02 mg l\(^{-1}\), Ni : BDL-0.60 mg l\(^{-1}\), Pb : 0.03 – 1.13 mg l\(^{-1}\), Zn : 0.002 – 0.14 mg l\(^{-1}\) and Cr : 0.10 – 1.52 mg l\(^{-1}\) separately. The strength of different substantial metals in the surface water of the Pallikaranai wetland took after the succession: Pb > Cr > Fe > Ni > Zn > Cd > Cu. The nature of water has deterioted because of the different anthropogenic exercises. A large portion of the metal particles were in higher fixation contrasted with the principles. It has been watched that the nature of the surface water isn’t ok for sea-going and residential life, thus vital administration moves ought to be made to control the nature of the surface water.


Wetlands give incalculable important administrations to the general public everywhere, for example, energizing ground water, reusing supplements, constriciting surges and as characteristic living space supporting different species biodiversity. Because of fast urbanization and industrialization the main accessible rain water reaping wetland of Chennai city, the Pallikaranai marsh arrive which has been assigned as a save timberland region has been decreased to one-tenth of its unique degree because of anthropogenic weights. The nearness of a noteworthy dump yard and sewage treatment plant worked in the biologically delicate zones of Pallikaranai swamp represent an incredible risk to the biodiversity populace of the wetland. Henceforth, the status of data created in this examination from distributed outcomes will give a pre-imperative standard information on Pallikaranai marsh land and Perungudi strong waste office. The paper traces the procedure by which a proposition was made to establish the Pallikaranai swamp in Chennai, Tamil Nadu, India, consolidating the standards of Landscape Ecology, Landscape Urbanism and Ecological Urbanism, all of which work towards discovering methods for incorporating nature with engineering and urban outline. The outline proposition depends on Landscape Ecological Urbanism, an approach set forth by Frederick Steiner, for arranging of districts in light of a delicate way to deal with environment and nature, and in the meantime utilizing propelled programming and imaging methods to achieve a successful arranging arrangement. Pallikaranai marsh is a profoundly environmentally delicate and powerless crisp water overwhelm and is one of the not very many outstanding freshwater overwells in South India. This rotting swamp arrive earnestly should be established, and numerous proposition for the reclamation of the range are being investigated by different organizers, engineers and offices. However the reclamation of the range firmly relies on the rebuilding of encompassing biological environment pieces and water bodies, which should be connected and arranged together. Such a joining of environment pieces call for utilization of most recent imaging methods and learning of organic and common frameworks. In the meantime, it requires an extremely touchy approach, which ought to be plausible for the area also.


The water quality is resolved in five pieces (water tests taken from Urban and country areas of BangaloreHAL third stage (Kaveri water), HRBR lay out (kaveri water blended with Bore well water), Bore well water
(Srinivasapura, Kolar District) and Mineral water tests. From each square water tests are under concentrated for Physico-synthetic status of water tests. In Physico-compound examination, different quality parameter are measured including pH, Specific conductivity (SP), add up to broke up solids (TDS), total hardness, contrasted and who models of water quality; likewise in show explore paper grouping of water tests of five squares was examination on the premise of TDS, anions, cations. The pH of all water tests were discovered practically nonpartisan. The TDS, conductance, hardness expanded towards the urban water when contrasted with rustic water. All Parameters were inside as far as possible. The outcomes showed and talked about.


Since one of the main dumpsites of Chennai, the Perungudi dumpsite, is situated within the marshland, the waste dumping in the marshland has also increased rapidly since the urbanization of the city. With patches of the marshland being protected, it is prohibited to dump waste in certain areas. After surface water analysis on trace elements, the heavy metal concentrations are however higher in a protected area than in a non-protected area, implying an increase in contamination in the protected patches. The marshland has once been a source of fresh water for the local community in Thorapakkam, but with the increase in waste dumping they do not longer feel safe to use the water from the marsh for consumption. Other consequences that the community assumes are caused by the dumpsite, are an increase in smell, mosquitoes, diseases and soil contamination. The Chennai Corporation says it is aware of the implications, and works both on moving the dumpsite as well as removing the waste from the marshland.


Filling of Municipal Solid Waste in an unlined dumping site is the general practice of waste disposal in the developing countries. It pollutes the resources such as land, air and water which inturn affects the people residing around the dumpsite. Groundwater pollution is the first and foremost effect by which the residing people were affected severely. Since the people were living near the dumpsite for three or four descendants, the local native people were unaware about the quality of water which has been polluted due to dumping yard, emerged before 20 years. Perungudi dumpsite in Chennai Metropolitan Area, India has been chosen to study the quality of groundwater and the awareness regarding the groundwater pollution. The water quality analysis shows that two villages (Oggium Thuraipakkam and Perungudi) have been affected significantly.


The relationship of man with environment is necessarily symbiotic and hence the equilibrium between the two must be maintained in all aspects. During the last few decades, man’s relationship with environment has drastically changed due to industrialization. Large quantities of solid wastes are disposed of on land, being an effective medium for disposal of solid wastes. The quantity of municipal and industrial waste generated by the society is constantly increasing. The growth of Municipal Solid Waste (MSW) generation in India has outpaced the population growth in recent years. Improper dumping and management of solid waste cause hazards to the ground water and inhabitants. The average solid waste generated in the Chennai City, India is around 3500 Metric Tonne (MT) per day. Perungudi near Chennai is one such open dump site with a capacity of 1600 MT per day. This disposal causes threat to the ground water in and around the dumpsite. Hence an attempt is made to analyse the amount by which the groundwater is contaminated in recent years. The contamination from an unplanned solid waste disposal system becomes a threat to
the environment. The presence of bore well at the landfill sites to draw ground water threatens to contaminate the ground water[1,2]. The landfill site nearer to Perungudi are open dumpsites, because the open dumpsites are low operating costs and lack of expertise and equipment provided no systems for leachate collections. Open dumps are unsightly, unsanitary, and generally smelly. They attract scavenging animals, rats, insects, pigs and other pests. Surface water percolating through the trash can dissolve out or leach harmful chemicals that are then carried away from the dumpsites in surface or subsurface runoff. Among these chemicals heavy metals are particularly insidious and lead to the phenomenon of bioaccumulation and bio magnifications.

[8] ANALYSIS OF GROUNDWATER QUALITY NEAR THE SOLID WASTE DUMPING SITE
S.SHENBAGARANI (2013)
Water is essential for life. Water covers majority of earth’s surface a very small percentage is available as fresh water that human can use. Groundwater is one of water resources. As Ground water provides drinking water to the people and it contains over 90% of the fresh water resources, the quality of ground water is of paramount importance. In recent years the risk of groundwater pollution has become one of the most important environmental concerns, particularly in developing countries, where most of the landfills have been built without any sound engineering design such as engineered liners and leachate interception and collection system. Unless properly treated, leachate that seeps from a landfill can infiltrate and contaminate the underlying groundwater.

The paper looked at municipal solid waste generation, disposal and the consequent environmental impacts. Primary data was generated by carrying out oral interviews and field observations for holistic and in–depth assessment of the environment and the secondary data was obtained from desk review method, information on effects of municipal solid wastes on environment were obtained from relevant literatures. The interviews were semi structured and a purposive sampling method was adopted and analysed descriptively. The results of the findings showed that population growth and unplanned urban expansion has exceeded the expected limit in recent time with resultant ugly system of solid wastes disposal. Municipal solid wastes which contain both biodegradable and non-biodegradable wastes are disposed at the shoulders of major highways in temporary dumpsites and are later evacuated by a waste management agency on a weekly basis. There is no organized house to house or street to street collection of the solid wastes. The study revealed that roadside disposal of municipal solid wastes has serious impacts on the environment. Some of these impacts include physical nuisance of the solid wastes to the environment, the solid waste dumps also serve as hideouts for rodents and snakes which are dangerous. The solid wastes are blown around by wind making the environment filthy, most of the wastes are also been washed by overland flow during heavy downpour to block drainage channels and subsequently lead to flooding of the environment. Most of the non-biodegradable solid wastes contain toxic chemicals which have serious implications on the environmental sustainability and human health. The paper therefore recommends that Government should come up with proper orientation and environmental laws should be put in place for the general public and also to provide necessary facilities and arrange for better methods of collection of solid wastes.

Humans are carrying out an “uncontrolled experiment on a global scale” by dumping vast amounts of plastic into the natural world, according to researchers who estimated the total amount produced since the artificial material
became widely used in the 1950s. They found 8.3 billion metric tonnes of plastic had been produced over the period, creating 6.3 billion tonnes of waste. And 79 per cent of that was thrown away, either into a landfill site or the environment with just 9 per cent recycled and the rest incinerated.

“A world without plastics, or synthetic organic polymers, seems unimaginable today, yet their large-scale production and use only dates back to about 1950,” the researchers wrote. “The ensuing rapid growth in plastics production is extraordinary, surpassing most other man-made materials.” Plastic waste could be destroyed by burning or other processes or recycled. But recycling, the researchers stressed, only “delays, rather than avoids, final disposal”.

Some researchers estimate that there are over six kilos of plastic for every kilo of naturally occurring plankton in the Pacific plastic waste dump. Besides being a danger in themselves these vast areas plastic pollution act as chemical sponge attracting other damaging pollutants, such as persistent organic pollutants (POPs), hydrocarbons and DDT that have been dumped in the oceans, creating even more highly damaging toxins for marine wildlife to mistake for food.

The northern Pacific plastic dump is deceptive to the eye. While it contains huge amounts of plastic waste it is not all floating on the surface. Wave action and the heat of the sun degrades the plastic into smaller and smaller particles which can form a sinking toxic soup that extends down to 6 meters below the oceans surface. But there is still enough plastic floating on the surface to create a false habitat for plant and animal organisms to live on. Once attached to the floating surface these species are transported far beyond their normal ecosystems. These ocean hitchhikers can then invade new habitats to become possible nuisance species in environments that nature didn’t originally intend them to inhabit. Not all plastic floats. As it breaks down it can begin to sink towards the oceans bottom. Dutch scientists have discovered that over 70 percent of discarded plastic eventually sinks to the sea bed.

[12] ASSESSMENT OF WATER QUALITY IN RIVER YAMUNA DURING IDOL IMMERSION
Rajeev Kumar M (2016)
Water Pollution, a major concern in India has been thriving since the past few decades. The introduction of contaminating and hazardous pollutants into the natural water leads to adverse changes leading to unavailability of fresh water for drinking and daily use. The river Yamuna, a sacred river originating from Yamuna in the Himalayas and is a life-line of Delhi. Yamuna, the most polluted river in the country and the causative factors contributing to pollution of the Yamuna are untreated sewage, industrial effluents, pollution due to in stream uses of water, dumping of garbage and dead bodies and immersion of idols. During festive season, immersion of idols has become a cause for concern because of the use of chrome based paints and cheap lead while making the idols. Along with the idols, puja articles such as flowers, food offerings, metal polish, plastic sheets, cosmetic items, polythene bags are also submerged into the water. This on degradation decreases the dissolved oxygen concentration in the river causing the death of the organisms living in the water body. To analyse the water quality following parameters are to be checked for: Dissolved oxygen, Biological oxygen Demand, Chemical oxygen Demand, Total Solids, and pH.

CONCLUSION
The concentration of the heavy metals Cr, Cd, Cu and Iron in the ground water samples are beyond the permissible t. But the survey shows that the leachate sample is percolating from the landfill site to the ground water and it also affects the other subsurface water sources. Due to the penetration of the leachate produced from the landfill site, contaminates the existing landfill site. The findings indicate the
contamination is severe in localities around the dumpsite. The long term exposure of excessive amount of copper and cadmium causes kidney damage and lung cancer. Chromium is also said to cause cancer if exposed for long time. Water sample no. 1, 2, 3 and 4 shows very high level of contamination and is alkaline it indicates the water is partially toxic in nature and not suitable for any domestic purposes. According to our observation the concentration of ammonia in these samples are high enough to cause irritation to eyes, nose and throat of the most sensitive individuals. The samples which were taken closer to the dumping ground contain high level of fluoride, nitrate and nitrite which indicates that the sample is toxic. The presence of chemicals, calcium, magnesium, manganese, chloride and sulphate shows that the water is hard in nature and is of low quality and it may cause various health hazards. It is observed that the water sample no. 5, 6, 7, 8 and 9 shows lesser amount of contamination compared to previous samples. It can be use for washing, cleaning, bathing etc. but it is not suitable for drinking purposes. These are within the desirable limit as per Indian standard. It has been observed that the amount of contamination in the water sample decreases with increase in the distance from the dumping zone.

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