

Assessment of Groundwater Contamination Around Alandur Dumpsite

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Abstract

Contaminated groundwater in a peri-urban area of Chennai is the major issue to be focused as it largely affects the surrounding community. Alandur dumpsite in the southern part of Chennai Metropolitan Area (CMA) located within Alandur Municipality is growing rapidly which contaminates the groundwater in the surrounding areas. To understand the existing problem, a questionnaire survey was conducted which revealed that the groundwater contamination is the major issue concerning the community. Hence, in this study an attempt has been made to address the problem of groundwater contamination due to water quality deterioration and to propose remedial measures for better management practices.

Key words: Groundwater, contamination, water quality testing

Introduction

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 decade man's relationship with the environment has drastically changed due to industrialization. Large quantities of solid wastes are being disposed off on land, land being an effective medium for disposal of solid wastes due to increasing urbanization. In india per capita protection of solid wastes is estimated as 0.45 kg/day in urban areas and half of that in rural areas. For economic consideration the industrial and urban wastes are disposed off mostly by dumping in low lying and waste land areas located in and around the city limits. In the most recent national report on water quality in the united states, 45% of assessed stream miles, 47% of assessed lake acres, and 32% of assessed bays and estuarine square miles were classified as polluted. It has been suggested that it is the leading worldwide cause of deaths and diseases and that is accounts for the death of more than 14,000 people daily Disposal sites for urban trash, also called landfills or open dumps, is a major environmental problem present worldwide account of the health hazards they pose, though this open dumping

may solve the problem of utilizing useless lands for the disposal. An estimated of 580 people in India die of water pollution related sickness every day some 90% of china's cities suffer from some degree water pollution and nearly 500 million people lack access to safe drinking water.

Review of Literature

Esakku et al (2007) stated that the studies on leachate and groundwater characterization show a serious threat to the local aquifer. It is essential to protect ground and surface waters and soil from contamination due to leachate percolation in and around the dumpsites. Jorstd (2004) stated that decrease in groundwater contamination while moving away from the landfill is mainly due to dispersion and dilution process. Mohan and Gandhimathi (2009) stated that heavy metals such as Pb, Cu, Mn, Cd, Cr and Zn were leached out from the dumpsite and contaminate the aquifer. Padmavathi (2002) opined that the Perungudi dumping yard is one of the major menace for the local resident. Small scale investigation at trace levels of water and soil for various chemical constituents has been carried out. The chemical properties such as chloride, sulphate and pH were analyzed and compared the results with the 1999 (ERM). It is noticed that within three years span the contamination level increased three fold. Sanjay et al (2010) studied a dumpsite in the hard rock terrains of a basaltic aquifer and stated that the flow is slow and unstable due to constricted passages. But a negative consequence of mechanism is that the pollutants maintain a constant level of contamination and their toxicities. Singh et al (2008) analyzed samples of solid waste, leachate and groundwater and stated that pollution source is dominated over natural process in the vicinity of the landfill site. Vasanthi et al (2007) stated that high concentration of Total Dissolved Solids, electrical conductivity, hardness, nitrate, chloride, and sulphate were found in groundwater near landfill.

Study Area

The area chosen for the study is around Alandur dumpsite which comes under the Alandur Municipality. The areas covered around the dumpsite are Sathasivam Nagar, Kovinthatasamy Nagar, Kubera Nagar, Balaji Nagar, Ram Nagar and Rajaji Nagar. The Alandur Dumpyard is located on the Velachery Tambaram Road. Alandur is the largest urban center in tambaram taluka in kancheepuram district. The town is situated at a distance of about 80 km from the district head quarters and 14 km from the Chennai city. Alandur located on the southern peripheral of Chennai is well connected by good network of roads located on grand southern trunk road. The location of dumpsite is shown in Figure 1. and the areas surrounding the dumpsite is shown in Figure 2.



Figure 1: Location of the dumpsite

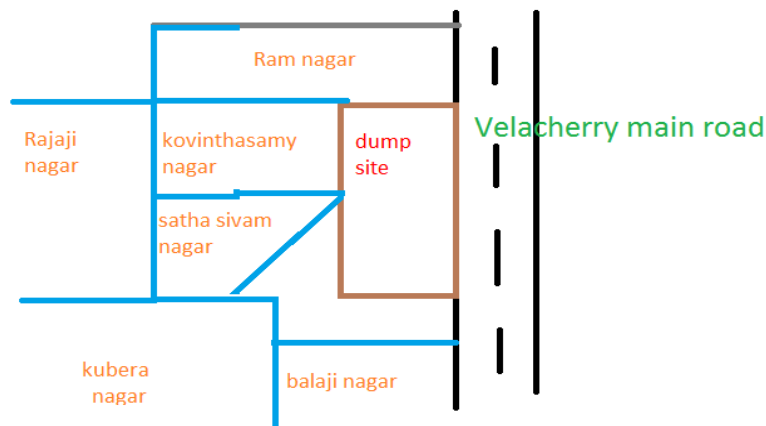


Figure 2: Study Area Map

Data Collection and Methodology

For the present study, the area around the dumpsite was determined and the data related to ground water has been collected. 10 samples near to the alandur dumpsite are collected. The areas covered are Sathasivam Nagar, Kubera Nagar, Balaji Nagar, Kovinthasamy Nagar, Ram Nagar. The water sample is conducted for physical and chemical parameters such as pH, TDS, EC, total hardness, chlorides, alkalinity and dissolved solids. Also questionnaire survey was conducted in all the areas and the opinion of the people is consolidated.

Result Analysis & Discussion

Chloride Test

The test result shows that the chloride present in Ram Nagar is between 1800mg/l to 2000mg/l, Sathasivam Nagar is between 740mg/l to 1600mg/l, Kubera Nagar 2500mg/l to 3500mg/l, Balaji Nagar is between 990mg/l to 1800mg/l and Kovinthatasamy Nagar the concentration is very high of the order of 4500mg/l. The concentration of chloride in various areas is shown in Figure 3.

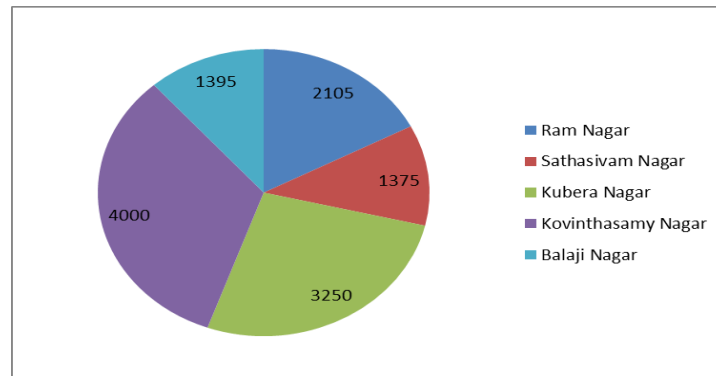


Figure 3: Chloride Test

Alkalinity Test

The test result shows that the alkalinity present in Ram nagar is between 800mg/l to 850mg/l, Sathasivam nagar is between 600mg/l to 1600mg/l, Kubera nagar 500mg/l to 1000mg/l, Kovinthataswamy nagar is between 900mg/l to 1000mg/l and Balaji nagar the concentration is very high the order of 2100mg/l. The concentration of alkalinity in various areas is shown in Figure 4.

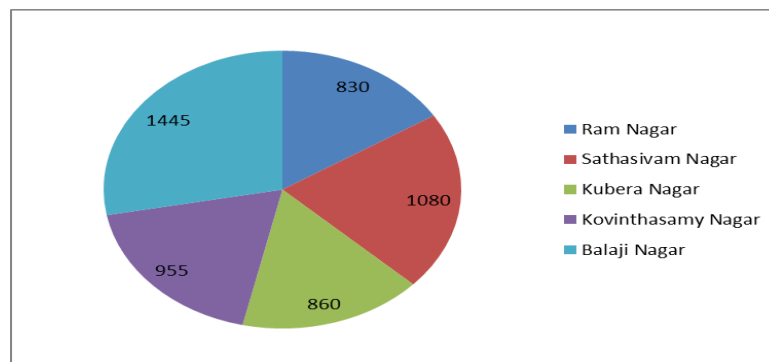


Figure 4: Alkalinity test

Total Dissolved Solids

The test result shows that the total dissolved solid test present in Ram nagar is between 4000mg/l to 7000mg/l, Sathasivam nagar is between 3050mg/l to 4050mg/l,

Kubera nagar 500mg/l to 850mg/l, Balaji nagar is between 3500mg/l to 4500mg/l and Kovinthiswamy nagar the concentration is very high the order of 9900mg/l. The concentration of total dissolved solid in various areas is shown in Figure 5.

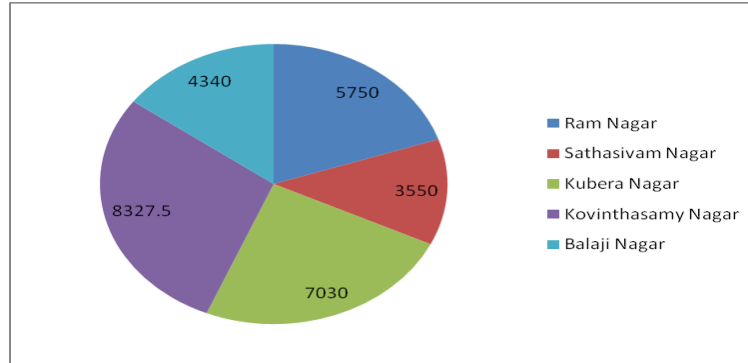


Figure 5: Total Dissolved Solid test

Hardness Test

The test result shows that the hardness present in Ram nagar is between 900mg/l to 1000mg/l, Sathasivam nagar is between 1000mg/l to 1250mg/l, Balaji nagar 900mg/l to 1000mg/l, Kovinthisamy nagar is between 1000mg/l to 1500mg/l and kubera nagar the concentration is very high the order of 2000mg/l. The concentration of hardness in various areas is shown in Figure 6.

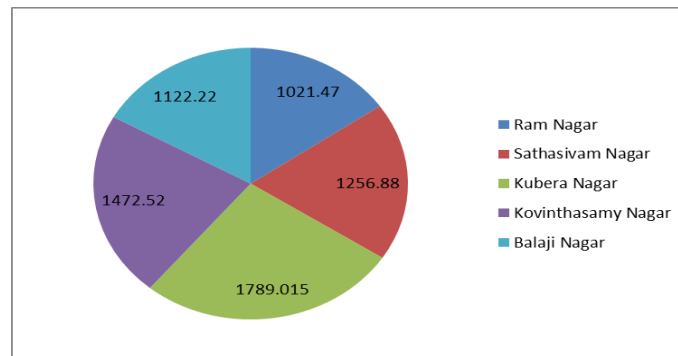


Figure 6: Hardness test

Iron Test

The test result shows that the iron test present in Ram nagar is between 15mg/l to 40mg/l, Sathasivam nagar is between 9mg/l to 12mg/l, Kubera nagar 15mg/l to 25mg/l, Balaji nagar is between 15mg/l to 20mg/l and Kovinda swamy nagar the concentration is very high the order of 30mg/l. The concentration of iron in various areas is shown in Figure 7.

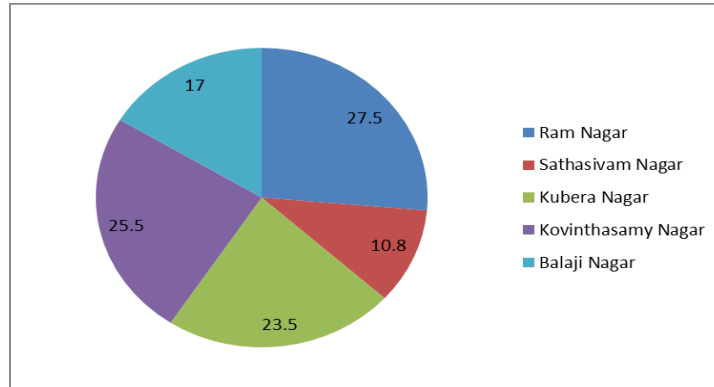


Figure 7: Iron test

Electrical Conductivity

The test result shows that the electrical conductivity present in Ram nagar is between 6500 microsiemens/cm to 10000 microsiemens/cm, Sathasivam nagar is between 5000 microsiemens/cm to 6500 microsiemens/cm, Balaji nagar 6000 microsiemens/cm to 7900 microsiemens/cm, Kubera nagar is between 8000 microsiemens/cm to 14500 microsiemens/cm and Kovinda swamy nagar the concentration is very high the order of 16000 microsiemens/cm. The electrical conductivity in various areas is shown in Figure 8.

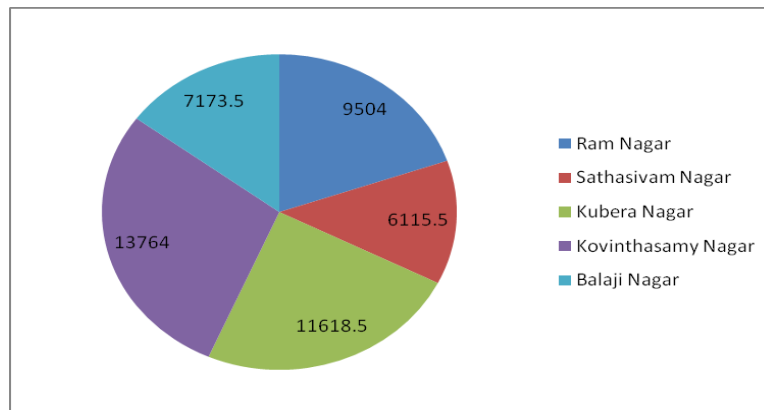


Figure 8: Electrical conductivity

pH Test

The test result shows that the pH test present in Balaji nagar is between 8.50 to 8.90, Sathasivam nagar is between 8.0 to 8.15, Kubera nagar 8.0 to 8.15, Kovintha swamy nagar is between 7.50 to 7.60 and Ram nagar the concentration is very high the order of 9.5. The concentration of pH is in various areas is shown in Figure 9

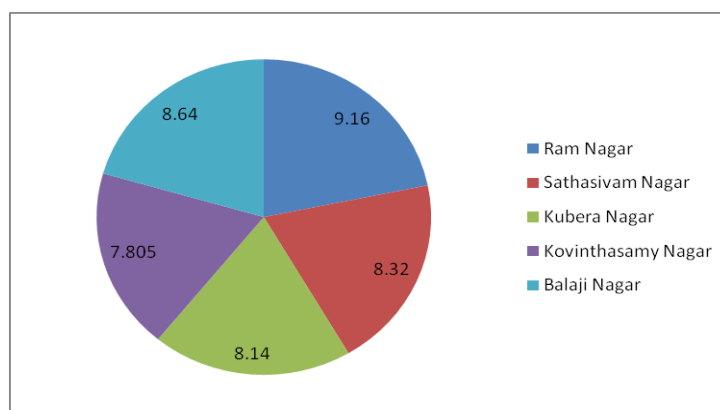


Figure 9: pH test

Conclusion

The chloride concentration in the groundwater surrounding the dumpsite area is 2425 mg/l which is not desirable as it is not meeting the permissible limit of 1000 mg/l and desirable limit of 250 mg/l. The alkalinity concentration in the groundwater surrounding the dumpsite area is 1034 mg/l which is not desirable as it is not meeting the permissible limit of 600 mg/l and desirable limit of 200 mg/l. The total dissolved solid concentration in the groundwater surrounding the dumpsite area is 5799.5 mg/l which is not desirable as it is not meeting the permissible limit of 2000 mg/l and desirable limit of 500 mg/l. The hardness concentration in the groundwater surrounding the dumpsite area is 1332.421 mg/l which is not desirable as it is not meeting the permissible limit of 600 mg/l and desirable limit of 300 mg/l. The iron concentration in the groundwater surrounding the dumpsite area is 20.86 mg/l which is not desirable as it is not meeting the permissible limit of 1.0 mg/l and desirable limit of 0.3 mg/l. The electrical conductivity concentration in the groundwater surrounding the dumpsite area is 8965.7 microsiemens/cm which is not desirable as it is not meeting the permissible limit of 1500 microsiemens/cm and desirable limit of less than 1000 microsiemens/cm. The pH concentration in the groundwater surrounding the dumpsite area is 8.413mg/l. which is not desirable as it is not meeting the permissible limit of no relaxation and desirable limit 6.5 to 8.5. Hence it is concluded that the groundwater is conducted that the groundwater is contaminated and it is not good for people to drink the water or can be used for the domestic purpose.

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