International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 07 | July 2020 www.irjet.net p-ISSN: 2395-0072

Geospatial Study of Contamination of Groundwater and Health Hazard Due to Solid Waste Disposal Site- Ahmedabad City

Hetal patel[1], Neelam Dalal[2], U.P. Nigam[3]

[1]Water Resources Engineering, L. D. College of Engineering, Gujarat Technological University, Ahmedabad 380015, India.

[2]Professor, [3]assistant Professor, Civil Engineering Department, L .D. College of Engineering, Gujarat Technological University, Ahmedabad 380015, India

---

Abstract - : *Solid waste management is a big challenge in urban areas for most of the countries throughout the world. An efficient waste management is a pre requisition for maintain a safe and green environment as there are increasing all kinds of waste disposal. There are many technologies are used for waste collection as well as for well managed recycling. It is very important to properly deal with the solid waste and this can be done by sufficient disposal and treatment of the solid waste. i.e. leachate collecting system is not provided, proper lining is not done, gas collection system is not there and the whole waste is dumped into the open landfill site. When the rain water falls on the waste, a liquid known as leachate is produced and it enters into the ground and creates the groundwater pollution. The Pirana is located near the highway away from the central part of the city. The industrial and residential areas are also nearby to the dumping site. The leaches of the open dump yards directly contaminate the groundwater and surface water resources leading unsuitability of water for drinking at many places. Hence, a detailed study has been carried out using Geographical Information System (GIS) to understand the spatial variation of groundwater quality.*

Key Words: contamination o groundwater, groundwater quality, solid waste management, Geospatial study, kriging method

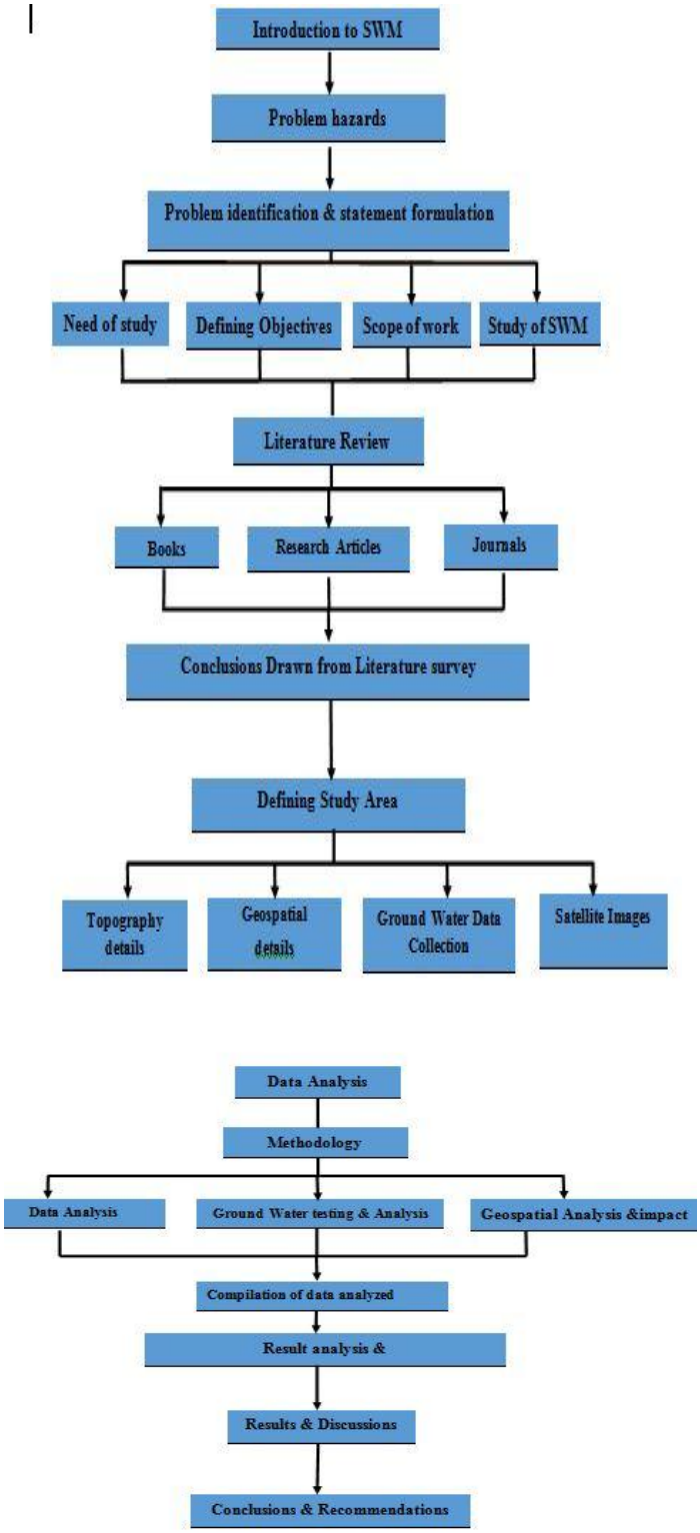
1. INTRODUCTION

The most important reason for waste collection is the protection of the environment and the health of the population. Rubbish and waste can cause air and water pollution. Rotting garbage is also known to produce harmful gases that mix with the air and can cause breathing problems in people. At present the whole world is lacing the problem of the solid waste and its management. Daily thousands of tons of solid waste is generated which requires proper disposal and treatment. If this waste is not properly disposed and treated then it will be very hazardous for the environment and t h e people. This study focus on the solid waste, its management, types, sources, impacts preventive measures against the hazardous effect of the solid waste. Improper solid waste management is a major environmental problem in Ahmedabad City due to the absence of modern engineered landfills, therefore posing serious contamination risk to both groundwater and surface water. Groundwater is the major source of potable water supply in the study area and its contamination is a major environmental and health concern. This study was therefore undertaken with the objective of assessing the possible impact of leachate percolation on groundwater quality of an unlined MSW landfill site at Pirana in Ahmedabad city.

1.1 study area

The total area of Pirana landfill site is 84 hectares. 65 hectares land has been used up so far for the disposal of waste since 1980. The average depth/height of the waste is 22 meters. As per survey conducted by Abellon Clean Engg. in Feb 2010 at Pirana dump site, food waste constitute around 40% of sample tested. There is no mechanism in Ahmedabad for ensuring Recycling of food waste. It was found that around 70,000 flies can live in 1 cubic foot of garbage. The landfill started operation in 1980 and on an average about 2500 tons/day of waste is dumped on the site with the waste filling heights varying from 20 to 22 meters. The wastes dumped into this site are largely from domestic and commercial sources. Nearly 61% of the accumulated waste is collected from municipal bins and street sweeping. More than 12500 workers are employed by AMC and they work on all 365 days of a year and twice a day – 6:30 am to 11:30 am and 3:00 pm to 6:00 pm.

Fig. 1 pirana site



1.2 The kriging method

Kriging is a geostatistical gridding method that has proven useful and popular in many fields. This method produces visually appealing maps from irregulary spaced data. Kriging attempts to express trends suggested in your data, so that, for example, high points might be connected along a ridge rather than isolated by bull's eye type contours. Kriging is a very flexible gridding method. The Kriging defaults can be accepted to produce an accurate grid of your data, or Kriging can be either an exact or a smoothing interpolator, depending on the user- specified parameters.

2. Geostatistic

Geostatistics is a class of statistics used to analyze and predict the values associated with spatial or spatiotemporal phenomena. It incorporates the spatial (and in some cases temporal) coordinates of the data within the analyses. Many geostatistical tools were originally developed as a practical means to describe spatial patterns and interpolate values for locations where samples were not taken. Those tools and methods have since evolved to not only provide interpolated values, but also measures of uncertainty for those values. The measurement of uncertainty is critical to informed decision making, as it provides information on the possible values (outcomes) for each location rather than just one interpolated value.

2.1 Calculate the Empirical Semivariogram

Kriging, like most interpolation technique, is built on the assumption that things that are close to one another are more alike than those farther away (quantified here as spatial autocorrelation). The empirical semivariogram is a means to explore this relationship. Pairs that are close in distance should have a smaller measurement different than those farther away from one another. The extent that this assumption is true can be examined in the empirical semivariogram.

3. Georeferencing

Most GIS projects require georeferencing some raster data. *Georeferencing* is the process of assigning real-world coordinates to each pixel of the raster. Many times these coordinates are obtained by doing field surveys - collecting coordinates with a GPS device for few easily identifiable features in the image or map. In some cases, where you are looking to digitize scanned maps, you can obtain the coordinates from the markings on the map image itself. Using these sample coordinates or GCPs (Ground Control Points), the image is warped and made to fit within the chosen coordinate system. In this tutorial I will discuss the concepts, strategies and tools within QGIS to achieve a high accuracy georeferencing.

4.Data collection from AMC:

Sr No.	Parameters	Unit	Concentration							
1	pH		7.40	7.73	7.98	7.31	7.71	7.93	7.42	7.30
2	Sulphates	mg/L	68	144	153	282	89.4	364	168.45	374.1
3	TDS	mg/L	1356	1644	1284	2564	1185	1650.5	1415	2350.67
4	Iron	mg/L	2.9	2,6	3.1	2.6	1.8	2.1	2.7	2.9
5	Total Hardness	mg/L	230	360	220	460	230	340	200	390
6	nitrates	mg/L	168	138	127	146	153	140	132	168
7	Chloride	mg/L	384	510	456	729	370.4	557.86	405	525.3
8	Total Alkalinity	mg/L	320	420	350	870	320	460	360	600

Table 1. data collection

5. Ground water sampling and analysis

The aim of this study is to Identifying environmental problems due to landfill site. In an effort to study the extent of groundwater contamination, several sample will be taken on the landfill site. The samples will be transported to the laboratory and all the samples might be analyzed for relevant physio-chemical parameters according to the standard methods. The parameters analyzed in the samples include pH, total dissolved solids (TDS), total hardness (TH), sulphates, chlorides, acidity, magnesium and calcium. The experiments will be performed in a certified Environmental laboratory. The comparison of these relevant data with the Bureau of Indian Standards (BIS) and World Health Organization (WHO), and observation of the water quality parameters will be carried out.

6. CONCLUSION

Based on analysis it can be deduced that a radical paradigm shift is need of the hour to boost this waste management scenario in Ahmedabad, and to position its future as a contemporary, clean, enticing and live able city. From the study it has been found that the areas such as Behrampura, Nagma Nagar, Faisal Nagar, and Chhipakuva and nearby other areas are heavily contaminated. The results shows that values of various parameters are too higher than the stipulated limits given by the Indian Standards of Drinking Water (BIS 1500:991) and World Health Organization. So, it's not recommended for drinking purpose.

REFERENCES

[1] Contamination of Groundwater Quality Due to Municipal Solid Waste Disposal – A GIS Based Study in Perungudi Dump Yard 2017 S. Mageswari1, L. Iyappan2, S. Aravind3, N. Mohammed Sameer3, R. Vignesh3, P. Vinoth Kumar3

[2] Suitable Solid Waste Disposal Site Selection Using Geographical Information System (GIS): A Case of Debre Berhan Town, Ethiopia 2019 Bedasa Asefa* , Wondwossen Mindahun

[3] Forecasting of Municipal Solid Waste Generation for Medium Scale Towns Located in the State of Gujarat, India 2013 Vatsal Patel , Srinivasarao Meka

[4] Groundwater Contamination Due to Municipal Solid Waste Disposal – A GIS Based Study : L.Elango, T.Subramani and N.Rajkumar International journal of Environmental science, 2010

[5] Municipal solid waste and its relation with groundwater contamination in Multan, Pakistan 2017 Ghulam Murtaza, Rehman Habib, Ali Shan, Kamran Sardar, Faiz Rasool and Tariq Javeed

[6] Study of Effect of Bhandewadi Dump Yard on Ground Water Shubham Gillurkar1 Chiranjeev Mohota2 Vicky Baraskar3 Nilesh Pal4

[7] Using GIS-Based Weighted Linear Combination Analysis and Remote Sensing Techniques to Select Optimum Solid Waste Disposal Sites within Mafraq City, Jordan

[8] Ahmad Al-Hanbali*, Bayan Alsaaideh, Akihiko Kondoh Center for Environmental Remote Sensing (CEReS), Chiba University, Chiba, Japan. Ahmad Al-Hanbali*, Bayan Alsaaideh, Akihiko Kondoh

[9] ASSESSMENT OF GROUNDWATER QUALITY AROUND KODUNGAIYUR DUMP YARD USING GEOSPATIAL TECHNOLOGY S. Mageswari#1and L. Iyappan*2, P. Kasinatha pandian*2

[10] Assessment on Landuse Changes in Coimbatore North Taluk using Image Processing and Geospatial Techniques A.Varadharajan*, Iyappan. L**, P. Kasinathapandian**

[11] "GIS Digitization," Maps of world. [Online]. Available: http://www.mapsofworld.com/gis-remotesensing/gis-digitalization.html. [Accessed: 28-Apr-2017].

[12] ArcGIS Geostatistical Analyst Tutorial.