International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 11 Issue 05, May-2022

Impact of Solid Waste and Leachate on Surface Water in Lucknow

Astha Singh
M.Tech Scholar, Environmental Engineering
Babu Banarasi Das University
Lucknow, India

Kamal Nabh Tripathi
Assistant Professor, Department of Civil Engineering
Babu Banarasi Das University
Lucknow, India

***Abstract*— Waste is referred to as any solid, liquid or gaseous substances or materials which being a scrap or being super flows, refuse or reject, is disposed off or required to be disposed as unwanted. Generally, as people are unaware of the value of waste in some aspect, so also is the ignorance of the danger of solid waste and its resultant effects on groundwater. It is noticed that solid wastes greatly affect the nature of underground water as a result of percolation, infiltration, leachate and dis-integration of wastes material by the activity of precipitation into the ground. Municipal solid waste generally can be classified in terms of three major sources of generators: residential, commercial and industrial. In the traditional scheme of classification, residential(domestic), solid waste consists of household garbage and rubbish, or refuse. The garbage fraction is mostly in the form of wastes derived from the preparation and consumption of food (e.g., meat and vegetable scraps). In the traditional scheme, all wastes not classified as "garbage" are classified as "rubbish".**

Keywords—Solid waste, leachate, waste management , garbage and waste water treatment.

I. INTRODUCTION

For over decades, solid waste management had been the major problem. Due to the fact that refuse management is capital intensive, for instance, private sector participation, highway managers, local government and State waste management authority are responsible for the collection and disposal of all types of waste generated. Due to the rural-urban drift which led to the over population of the state, had contributed in no small measure to the dirty, filthy and deplorable environmental situation. Despite the enormous job of the agencies like State health workers, kick against indiscipline and private sector participation, Lucknow as a popular city is still very far from achieving the desired result, a very clean environment derides of indiscriminate waste disposal. The research study on these aforementioned associated problems as a result of discriminate solid waste disposal cannot be over emphasized due to its effects on underground water which invariably affects public health, hence this study. If solid waste is not collected and allowed to accumulate, they may create unsanitary conditions. This may lead to epidemic outbreaks. Many diseases like cholera, diarrhea, dysentery, plague, jaundice, or gastro intestinal diseases may spread and cause loss of human lives. In addition, improper handling of the solid wastes, a health hazard for the workers who come in direct contact with the waste. If the solid wastes are not treated properly decomposition and putrefaction(decay)may take place. The organic solid waste during decomposition may generate obnoxious (intolerable odour). Besides contaminating surface water another devastating effect of dumping site is on groundwater quality by the formation of leachate. Leachate is a liquid that leaches from a landfill/dump. Municipal Solid Waste leachate contains a large microbial population, and may be heavily contaminated with pathogenic microorganism. The most typical detrimental effect of leachate discharge into the environment is ground water pollution. Discharge of raw municipal leachate into streams impacts aquatic life and causes degradation of water quality.

2.LITERATURE REVIEW

Horton, R.K (1965) [1] The use of water quality index (WQI) in determining the quality of both surface and groundwater-bodies have increased tremendously since the initial WQI developed by Horton in 1965, and improved version by Brown et al. in 1970

E. Marshal (1995) [2] Open landfills release horrible smells that causes infection to those living close to them.

R.A. Frosch (1996) [3] The growing consumption of goods results in enormous amounts of solid wastes from work and domestic actions, which pose substantial threats to human health.

Crook and Ayee (2006) [4] In Sierra Leone, the problem of poor solid waste supervision in Freetown is exacerbated by rapid population expansion and continuous economic development; waste generation in residential as well as business areas remain to grow quickly, pushing pressure on community's ability to process and discard of these resources. This has positioned a massive pecuniary load on local administration, making it tough for them to achieve solid waste sustainably.

Wakawa et. Al (2008) [5] Principally, deterioration of groundwater quality results from wide ranging human activities on land, such as industrialization, urbanisation, agriculture and waste disposals, which are associated largely with urban settlements.

H.B.N. Yongsi, et al (2008) [6] Numerous researches have been carried out in order to scrutinize the health and ecological effects mounting from waste landfills. Such findings disclosed that a relationship exists between the two.

A. Salam (2010) [7] In many unindustrialized countries, solid waste dumping sites are located on the fringes of metropolitan areas. These regions develop teens' sources of infection due to the generation and spread of flies,

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 11 Issue 05, May-2022

mosquitoes, and rodents. These are disease transmitters that distress the health of the populace. The supposed condition produces malaria, cholera, breathing, genetic, and numerous other kinds of communicable disease

Nabegu, A.B. (2010) [8] The continued disposal of solid waste at open dumpsites constitutes an ever-present problem to the health of people living in the developing countries.

M. Aatamila (2010) [9] Improper solid waste supervision can as well upsurge greenhouse gas (GHG) release, hence contributing to climate change.

Ogbeibu, A. E., Chukwurah, N. A. and Oboh, I.P. (2012) [10] There have been many studies on the effect of dumping solid waste indiscriminately at open dumpsites in the developing countries. In some cases, water quality data of boreholes close to a refuse dump have been compared with the data of a control borehole, which is very far from the refuse dump.

UNEP. (2013) [11] The problem of waste management, tied with scarce economic resources, has led to unselective disposing of solid waste into open places and drainages, blocking pipes and causing overflowing, environment contamination and municipal health problems.

Anil Kumar, A. Sukumaran. and Vincent, S.G.T (2013) [12] In many cases, the values of measured parameters in the ground and surface water bodies have been compared with international and national standards to determine their adequacy.

J.A. Nwanta and E. Eze Nduka (2013) [13] Direct management of solid waste can result in numerous types of communicable and lingering diseases with the waste employees and rag pickers being the utmost at risk.

3. DATA COLLECTION

In order to verify the effect of solid waste on the quality of underground water in the case study, facts and information involved in the investigation carried out in the selected approved dumping sites were through the following:

- Research Design
- Method of Data Analysis

Five samples will be picked at 100m distance from each within the study area of the dump site named “KUKRAIL NALA, Tedhi Pulia”.
All samples will be collected same day and will be kept in a bottle. Bottles will be labeled as sample 1,2,3,4,5.
The Five water samples will be analyzed for parameters such as pH, chlorides, hardness, total solids, turbidity, electrical conductivity, biological oxygen demand, phosphate, nitrates, lead.

Figure 1. SITE LOCATION: “KUKRAIL NALA, Tedhi Pulia

Figure 2. SAMPLE COLLECTION

4. METHODOLOGY

- The following are the tests which are done during water quality test:
- Physical test
- Chemical test
- Biological test

TEMPERATURE

The temperature of water is measured by means of ordinary thermometers. From the temperature the mass density, viscosity, vapor pressure and surface tension of water can be determined. The temperature of surface water is generally same to the atmospheric temperature, while that of ground water may be more or less than atmospheric temperature. The most desirable temperature for public supply is between 4.4 degree Celsius to 10 degree Celsius. Temperature above 28 degree Celsius are undesirable and above 35 degree Celsius are unfit for public supply because it is not acceptable to taste.

COLOUR

The colour of water is usually due to presence of organic matter, but sometimes it is also due to mineral and dissolved organic and inorganic impurities. The permissible colour of domestic water is 20ppm on platinium cobalt scale. The colour in water is not harmful but it is objectionable.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 11 Issue 05, May-2022

Figure 3.

TURBIDITY

It is caused due to presence of suspended and colloidal matter in the water. The character and amount of turbidity depends on the type of soil over which the water has moved.

There are two types of turbidimeters:

- A) Based on visual method (through naked eyes)
- B) Based on direct (meter reading) In the chemical testing of water those tests are done that will reveal the sanitary quality of water.

The chemical test involves the determination of total solids, hardness, chlorides, iron and maganese etc.

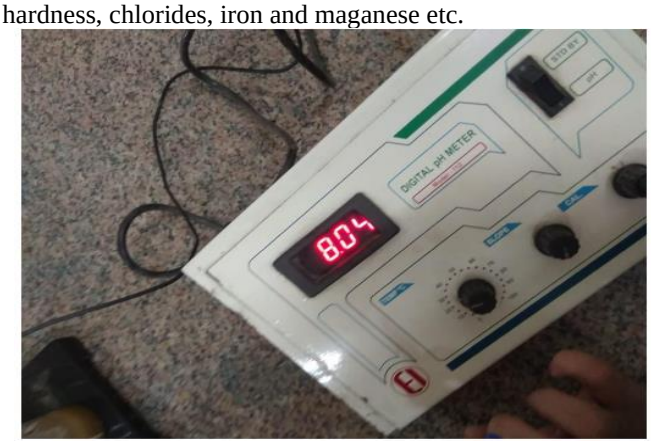


Figure 4.

TOTAL SOLIDS

Total solids are a measure of the suspended and dissolved solids in water. The quantity of suspended solids is determined by filtering the sample of water through a fine filter, drying and weighing. The quantity of dissolved and colloidal solids is determined by evaporating the filtered water (obtained from the suspended solid test) and weighing the water. The total solids in a water sample can be directly determined by evaporating the water and weighing it. By weighing we can determine the inorganic solids and deducting it from total solids.

HARDNESS

It is the property of water which prevents the leathering (from) of the soap. It is caused due to presence of carbonates and sulphates of calcium and magnesium in the water. Also, in the presence of chlorides and nitrates of calcium and magnesium cause hardness in the water. Hardness is usually expressed in mg/lit or p.p.m. of calcium carbonate in water.

CHLORIDES

The presence of chlorides may be due to the mixing of saline water and sewage in the water. Excess of chlorides is dangerous and unfit for use. The chloride can be reduced by diluting the water. Chlorides above 250ppm are not permissible in water. The chloride can be determined by titrating the water with silver nitrate (AgNO3) and potassium chromate (K2CrO4), in the titration process reddish colour will be formed if chlorides are present.

IRON AND MAGANESE

These are generally found in ground water. If these are present less than 0.3ppm the water is not suitable for domestic and laundering purposes. The presence of iron and manganese in water makes brownish red colour in it, leads to growth of microorganisms. The quality of iron and manganese is determined by colorimetric methods. In these methods some colouring agents are added in the water and compared with standard colour solutions.

pH VALUE

In general, a water with a pH<7 is considered acidic and with a pH >7 is considered basic. The normal range for pH in surface water systems is 6.5 to 8.5 and for groundwater systems is 6 to 8.5 Alkalinity is a measure of the capacity of the water to resists a change in pH that would tend to make the water more acidic.

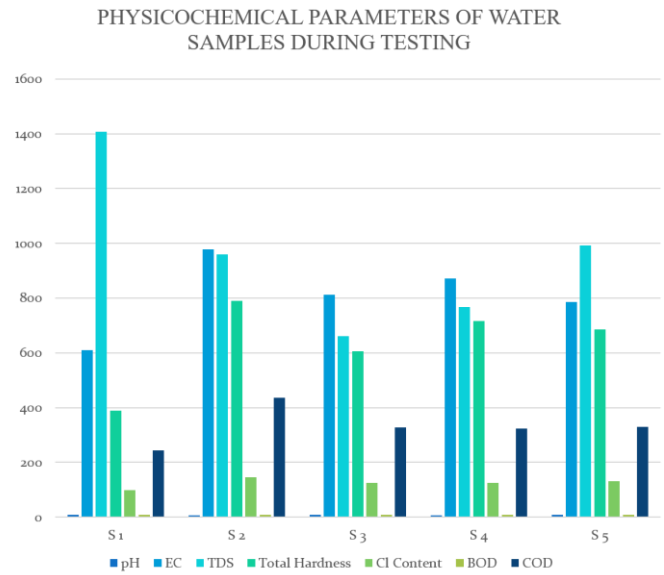
5. RESULTS

The following results are obtained:

S. No.	pH	EC (µS/cm)	TDS (mg/l)	Total Hardness (mg/l)	Cl- (mg/l)	BOD (mg/l)	COD (mg/l)
S1	7.8	610	1408	389	98	8.7	243
S2	7.3	977	960	789	146	9.0	436
S3	7.6	812	661	606	125	8.4	323
S4	7.3	872	768	716	124	8.3	327
S5	7.5	786	992	685	131	8.6	329

TABLE 1 RESULTS FROM VARIOUS TESTS PERFORMED

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 11 Issue 05, May-2022



The ground water qualities of the water near the Municipal solid waste dumping sites are of poor quality since contaminated by the leachate.

6. CONCLUSION

- Preventive management is the preferred approach to drinking-water safety and should take account of the characteristics of the drinking water supply from catchment and source to its use by consumers.
- Drinking-water quality management are often outside the direct responsibility of the water supplier, a collaborative multiagency approach be adopted to ensure safe drinking water.
- New landfill construction methods are designed to prevent pollution of groundwater. Landfills are now built with liners to prevent leachate from seeping through soil into aquifers.
- Leachate collection systems store the liquid away from the water table. Clay caps prevent rainwater runoff from carrying pollutants from the landfill into the groundwater.

REFERENCES

[1] K. Riaz Ahamed, Manikandan, "ASSESSMENT OF GROUNDWATER QUALITY IN SOME TOWNS OF VELLORE DISTRICT, TAMIL NADU, INDIA."
[2] Pandey Sandeep K, Tiwari S.," Physio-chemical analysis of groundwater of selected area of Gazipur city-A case study, Nature and Science, 2009.
[3] WHO, Recommendation, Water and Sanitation Guidelines for drinking water quality, Vol. III, Geneva, WHO,2011.
[4] Sundari, S. and kanakarani, P.," Journal of industrial pollution control 2001, 17(1): pp.83-97.
[5] Chavan B. L., and Zambare N. S., "International journal of research in civil engineering, architecture and design 2013.1(2):46-53
[6] Jain C.K. Bhatio, K.K. and Kumar, S.R. Groundwater quality in malaprabha sub-basin Karnataka, International Journal of Environmental Protection,2005:23(3):321-329