Study on Ground Water Contamination by Leachate in Uruli Devachi Hadapsar, Pune

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Abstract- *A common problem in economically developing countries is the disposal of Municipal Solid Waste in a manner that frequently results in environmental degradation. Waste disposal has always been an important issue for humans. Solid wastes are disposed on or below the land surface resulting in sources of groundwater contamination. This communication reveals the problems of air and groundwater pollution caused due to unscientific disposal of solid waste observed at Urali-Devachi village.*

Pune Municipal Corporation (PMC) disposes the solid waste at Urali- Devachi Depot which is 20 km away from pune city. Pune produces large quantity (1000-2000 mt/day) of Municipal Solid Waste (MSW)1. The analytical data showed that concentration of all water parameters in leachate is objectionable, which is more than permissible limit of MPCB (Maharashtra Pollution Control Board). Leachate is a polluted liquid emanating from the base of the landfill, which contains innumerable organic and inorganic compounds generated due to which serious ground water contamination was observed in wells. PMC was spraying the waste with water to prevent fires, resulting in even greater quantities of leachate generated due to which Serious ground water contamination was observed in wells.

Keywords- leachate, landfill, contamination, heavy metals, Solid waste disposal.

I. INTRODUCTION

There has been a significant increase in the generation of MSW in India over the last few decades. National level data do not exist for municipal solid waste generation, collection and disposal. The daily per capita generation of municipal solid waste in India ranges from about 100 g in small towns to 500 g in large towns.

Pune city contains lots of commercial industries, Hospitals, hotels, residential buildings as well as high population which generate 0.12 kg of waste per capita/day (Personal communication with PMC office Pune). The municipal solid waste is heterogeneous in nature and contains papers, Plastics, rags, metals, glass pieces, ashes and combustible materials. In addition to these it also contains other substances like scrap materials, dead animals, discarded chemicals, paints, hazardous waste generated from hospitals, industries and agricultural residues.

The waste generated from biomedical waste, clinics, hospitals, nursing homes, pathological laboratories, blood banks and veterinary centres have also been disposed along with municipal solid waste at disposal site. This waste is hazardous to human being and environment. Pune Municipal Corporation disposes this waste of pune city at mantarwadi (Urali-devachi depot) which is 20 km away from pune city. About 1200-1300 metric tones of solid waste from pune municipal area is disposed per day at Mantarwadi (Urali-Devachi village). During the early period, MSW was conveniently disposed off at Mantarwadi disposal site in low lying areas with large open land space. The unscientific disposal of solid waste created lots of environmental problem in this area. It resulted into air pollution and ground water pollution problems. The Well water near to disposal site in Urali-Devachi village is now not safe for domestic use (drinking, outdoor bathing, propagation of aquatic life, industrial cooling and for irrigation). It has been found that due to waste disposal the people living in this area face many environmental and health problems.

II.GENERATION OF LEACHATE

"Leachate" refers to liquids that migrate from the waste carrying dissolved or suspended contaminants. Leachate results from precipitation entering the landfill and from moisture that exists in the waste when it is disposed. Contaminants in the buried refuse may result from the disposal of industrial waste, ash, waste treatment sludge, household hazardous wastes, or from normal waste decomposition.

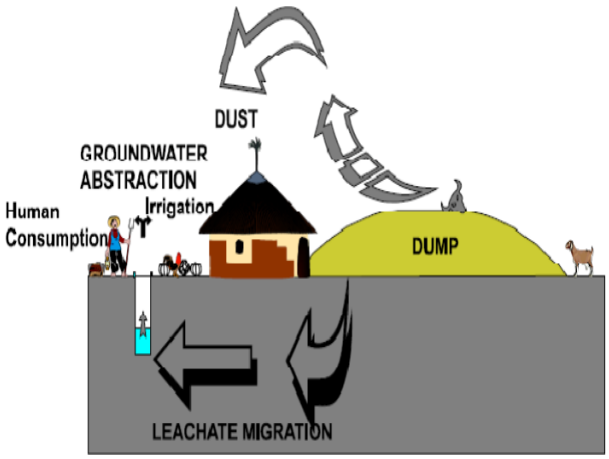

Figure 1: Outline of the process to generate leachate

Leachate is known as the liquid collected at the bottom of the landfill. In general, leachate is a result of the percolation of precipitation, uncontrolled runoff, and irrigation water into the landfill, the water contained in the waste and also infiltrating groundwater. It contains a variety of chemical constituents derived from the stabilization of the materials deposited in the landfill and from the products of the chemical and biochemical reactions occurring within landfill.

Many studies investigated the health effects of contaminated groundwater due to landfill leachate. It contains a host of toxic and carcinogenic chemicals, which may cause harm to both humans and environment.

Further more, leachate-contaminated groundwater can adversely affect industrial and agricultural activities that depend on groundwater. The use of contaminated water for irrigation can decrease soil productivity, contaminate crops, and move possibly toxic pollutants up the food chain as animals and humans consume crops grown in an area irrigated with contaminated water. Due to the health impacts caused by landfill leachate it is very important to estimate its quantity of leachate might reach the groundwater and study the effect of this leachate on groundwater.

III. EFFECT OF LEACHATE

Landfill leachate contains chemicals, biological and metal ions such as iron. It is both toxic and acidic, and has a distinct odor. Unless a landfill has a method of collecting and purifying the leachate, it will enter and contaminate ground water supplies. The health risks, if leachate is left untreated and allowed to contaminate groundwater supplies, include skin irritation, nausea, vomiting, and headache, while chronic exposure can lead to anemia, kidney damage, prostate cancer, lung cancer, memory loss, coma, headaches and depression. The people residing in these areas are using well water for drinking, domestic and for agricultural use. It is observed that the people living in this area having health and hygienic problems such as allergic, asthmatic, bronchitis, skin irritation and gastro intestinal diseases.

IV. TECHNIQUES USED IN URULI DEVACHI LANDFILL PROJECT

Wastes are openly dumped and then odofresh solutions are sprayed on dumped waste for reducing odour. For faster decomposition process (45 days) they spray Effective Microorganism Solution (2 kg Molasses +100 liter water for 7days). Due to these techniques used in Uruli-Devachi Landfill Project more leachate were generated.

Table No 1. Leachate and well-water characteristics

Parameter	Samples			
	W1	W2	W3	W4(L)
pH	7.22	7.26	7.23	8.14
Conductivity(µs/cm)	1749	1758	2450	21100
Turbidity(NTU)	02	02	04	>5.00
Alkalinity(mg/l)	160	156	186	2820
Total Hardness(mg/l)	850	720	1330	8100
Total Dissolved solid (mg/l)	907	886	1234	10710
COD(mg/l)	68	57	129	11920
BOD(mg/l)	17	13	32.15	2098
Chloride(mg/l)	489	430	628	1078
Calcium(mg/l)	172	168	316	3456
Magnesium(mg/l)	165	134	246	1129
Lead(mg/l)	11	14	17	29
Cadmium(mg/l)	<0.0005	<0.0005	<0.005	<0.0005
Iron(mg/l)	0.42	0.35	0.67	2.56

The Table no.1 shows Leachate sample value of pH is Increases. The Heavy Metal of leachate sample Contains such as lead, cadmium, calcium, magnesium and iron are increases.

Fig. No.1: Well-water sample no. 1(W1)

Fig. No.2: Well-water sample no. 2(W2)

Fig. No.3: Well-water sample no. 3(W3)

Fig.No.4: Leachate Sample no.4(W4)

Samples of leachate and groundwater were collected from the following locations. Sample I: Well water (well located 500 m away from the landfill site; Figure.1). Sample II: Well water (welllocated 800 m away from landfill site; Figure.2). Sample III: Well water (well located 1200 m away from landfill site.Figure.3).Sample IV: Leachate sample collected from landfill storage tank.

Table No.2 Comparison of Well Water samples and with Corporation Water sample 2015.

Parameter	W1	CW	Remark
pH	7.22	6.5	Alkaline
Conductivity (µs/cm)	1749	129.60	More Polluted
Turbidity (NTU)	02	<01	More Polluted
Total Hardness (mg/l)	850	79.99	More Polluted
Alkalinity (mg/l)	160	20	More Polluted
Total Dissolved solid (mg/l)	907	64.40	More Polluted
COD (mg/l)	68	10	More Polluted
BOD (mg/l)	17	1.15	More Polluted
Chloride (mg/l)	489	21	More Polluted
Calcium (mg/l)	172	19.90	More Polluted
Magnesium (mg/l)	165	14.58	More Polluted
Lead (mg/l)	11	<0.005	More Polluted
Iron (mg/l)	0.42	0.10	More Polluted

The Table no.2 shows comparison between analysis of Well water smaple and with corporation water sample 2015. The increased value of parameters like hardness ,alkalinity& heavy metals contained indicates worsen condition of Well water in a year. All the water parameters are more polluted in Uruli-Devachi area.

V. CONCLUSIONS

For Indian environment ground water depth, soil at selected site and water supply well are importantcriteria. Concentration of all parameters found in well water is exceeds

the limit so it is not safe for drinking, commercial used, irrigation and industrial purpose. These leachates have corrosive activity which is also dangerous for human health. So the dumping ground not only affect environment but also damage the property in the vicinity area. The current practices needs to improve for managing waste. Year by year the Ecosystem is losing life and conditions are becoming worst for the living things. It is the call of time to addressed the issue on Priority basis.

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