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Contamination of Heavy Metals in Water around the MSW Dump Site at District Raipur in Chhattisgarh

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***Abstract*— The selected site Sarona is a large trenching site for municipal solid wastes. It surrounds the area about 18.49 hectare is an uncontrolled dump site. Water samples were collected from different sources namely open wells, river and bore wells available at varying distance on the site. The analyzed water samples showed the pH value from 8.0 to 8.23, conductivity from 240 to 2360, alkalinity ranged from 350 to 1300, chloride from 40 to 1050, total hardness from 150 to 270, TDS ranged from 396 – 660, ammonia (NH4+) concentration in the samples ranged from 0.5 to 3.5 mg/l. The value of lead in all the samples was observed more than permissible limits of drinking water in accordance with BIS and WHO (0.10 and 0.05 mg/l respectively) i.e. from 0.52639- 0.867955 mg/l. Long-term exposure to lead can affect adversely to nervous system and kidneys [6]. Increasing awareness for health and environmental effects of MSW dumping has the requirement for proper assessment of harmful effects of it.**

***Index Terms*— Municipal Solid Waste, water, pollution, heavy metals.**

I. INTRODUCTION

Municipal solid waste, usually known as rubbish or garbage, is made up of things we commonly dispose off by throwing away. Solid waste disposals (open dumps, landfills, sanitary landfills or incinerators) represent a significant source of metals released into the environment [13], [12], [4], [2], [7]. The amount of MSW is expected to increase significantly in the near future as the country strives to attain an industrialized nation status by the year 2020 [9], [3], [11].

The solid waste dumps if not managed properly, may cause many types of socio-environmental problems (Zurbrugg, 2002), like ground water pollution, air pollution, soil contamination, odour nuisance, fly nuisance etc [5]. Depending on the tendency of the contaminants they end up either in water held in the soil or leached to the underground water. Contaminants like Cd, Cu, Ni, Pb and Zn can alter the soil chemistry and have an impact on the organisms and plants depending on the soil for nutrition [10].

Leachate is produced primarily in association with precipitation that infiltrates through the refuse and normally results in the migration of leachate into the groundwater zone and pollutes it [8].

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II. SITE OF STUDY

The city of Raipur is located near the centre of a large plain. It is the capital of Chhattisgarh. The city is situated in the fertile plains of Chhattisgarh Region. The Latitude and Longitude of the selected site Sarona Raipur is 21.2511 and 81.5733 respectively. Sarona is located in sub-locality Raipur District, Chhattisgarh State of Country. According to the 2011 census, the population within the Municipal Corporation area of Raipur was 1,010,087 and the urban agglomeration had a population of 1,122,555. Raipur Municipal Corporation has a total of 70 wards in 8 zones. The quantity of waste generated in Raipur city is 408 TPD. The household contributes about 55% followed by 16% waste from commercial establishments. Selected site of study Sarona is a large trenching site for municipal solid wastes with an area of 18.49 Ha. Currently there is no segregation at the source and the waste is dumped openly in dump yard at Sarona. About 350 MT of the waste is collected at present but there is no common Solid Waste Management facility.

III. MATERIAL AND METHODS

All the standard solutions were prepared from analytical grade compounds of Merck Company. All the glassware used was of Borosil. EUTECH pc 510 pH and Conductivity meter was employed for all pH measurements. For the analysis of heavy metals in water samples i.e. copper, zinc, lead and chromium Atomic Absorption Spectrophotometer (Varian AA 240) was used.

Water samples were collected from different sources namely open wells, river and bore wells available at varying distance on the site. The samples with suspended matter were filtered on site. The samples for heavy metal analysis were collected in acid rinsed (0.1 N HCl) bottles then very thoroughly washes and rinse with de-ionized water. 2ml 1N nitric acid was added to 1000 ml sample. Thereafter all analyses were conducted following APHA (1995) [1].

IV. RESULT

The effect of Municipal Solid Waste on water quality parameters of the water sources in surrounding of study site is remarkable. Values of water quality parameters in proximity of the study sites were found higher as compared to the values of samples collected away from the site.
The analyzed water samples showed the pH value from 8.0 to 8.23, conductivity from 240 to 2360, alkalinity ranged from

350 to 1300, chloride from 40 to 1050, total hardness from 150 to 270, TDS ranged from 396 – 660, ammonia (NH4+) concentration in the samples ranged from 0.5 to 3.5 mg/l and likely indicates its origin from leachate of MSW. The value of lead in all the samples was observed more than permissible limits of drinking water in accordance with BIS and WHO (0.10 and 0.05 mg/l respectively) i.e. from 0.52639- 0.867955 mg/l. Long-term exposure to lead can affect adversely to nervous system and kidneys [6]. The concentration of Zinc, copper and chromium obtained were found below the permissible limits.

Table 1: Sampling points and types of samples

Sampling Point	Location of Samples	Type of Samples
1	Sarona	Tube well(WS1)
2	Sarona	River(WS2)
3	Sarona	Bore well(WS3)
4	Sarona	Bore well(WS4)
5	Sarona	Bore well(WS5)

Table 2: Physical characteristics of water samples (WS1 – WS5)

Parameters	WS1	WS2	WS3	WS4	WS5
Temperature (^{o}C)	28	27	25	28	29
Ph	8.23	8.21	8.00	8.23	8.13
Conductivity µS/cm	546	1780	2360	560	340
Appearance	Clear	Hazy	Clear	Clear	Clear
Odor	Bearable	Bearable	Salty	Bearable	Bearable

Table 3: Chemical characteristics of water samples (WS1 – WS5)

Parameters (mg/l)	WS1	WS2	WS3	WS4	WS5
Alkalinity	250	130	250	160	160
Chloride	70	50	80	50	50
Hardness	230	150	270	220	190
TDS	660	396	720	516	480
Ammonia	3.5	1.0	0.5	0.5	0.5

Table 4: Heavy metal contents of water samples (WS1 – WS5)

Heavy metal (mg/l)	WS1	WS2	WS3	WS4	WS5	WHO
Zn	0.0237	0.0215	0.02377	1.2933	0.1173	05.0
Pb	0.539282	0.52639	0.568786	0.577921	0.867955	0.01
Cu	0.003616	BDL	0.02774181	BDL	BDL	0.05
Cr	BDL	0.001	BDL	BDL	BDL	0.05

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