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A Review Paper on the Impact of Municipal Solid Waste Surface Water Quality

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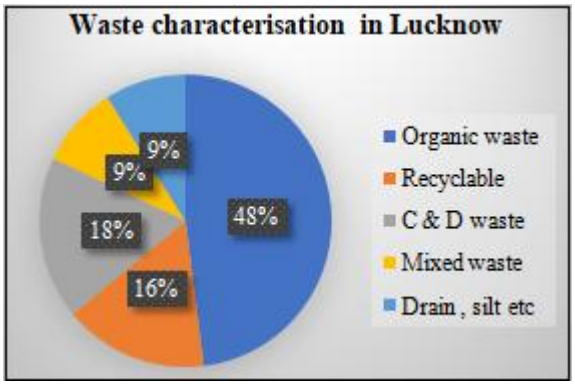
Abstract: ***Water is the source of our life existence in our ecosystem and in present situation natural resources of water getting contaminated and polluted due to some human activities by their interference and misuse. Improper human activities such as throwing of garbage openly, improper disposing of materials such as plastic and paper etc. Due to these activities, quantity of solid waste is increasing day by day and this is caused because of lack of solid waste management and lack of proper knowledge behind the proper dumping of waste among the people. Also causes due to open dumping and throwing with no precautions and techniques. These improper dumping activities causing many environmental problems and health hazards. Most common problems created by these activities are contamination of surface water and is causes contamination of drinking water. In field of agriculture, irrigation by contaminated water causes loss of fertility in soil and this makes reduction in the availability of food. Climate change which causes a disastrous problem, including irregular rainfalls and flash floods. In this review paper, a vast study of the surface water quality parameter assessment is carried out around the sites Khurram nagar (SAMPLE 1), Kukrail nala (SAMPLE 2), Jagrani (SAMPLE 3), Tedhipulia (SAMPLE 4) and Bharwara treatment plant (SAMPLE 5) of LUCKNOW. The parameters which are studied in this paper are pH, TSS, TDS, Total hardness, Chloride content, iron content, turbidity, colour, taste and odour.***

Keywords: Municipal solid waste, Contamination, Dumping, Waste management, Quality parameters

1. Introduction

Mostly waste is categorised under the term “solid waste “. Solid waste is any garbage, sludge, or any other discarded material from homes, business halls, industries, commercial places, mines, agricultural fields and community active places. This includes municipal and non - municipal solid waste. The sources of solid waste include residential, commercial, institutional and industrial activities. Certain types of wastes that cause dangerous for the environment, health of human beings and animals etc. are classified as municipal waste; are discussed in the article municipal solid waste management. Municipal solid waste (MSW) – more commonly known as trash or garbage – consists of everyday items we use and then throw away, such as product packaging, grass, clippings, furniture, clothing, bottles, newspapers, appliances, paint and batteries. This comes from our home, schools, hospitals and businesses. Improperly managed waste can affect the environment at different scales. Open dumping of wastes contaminates nearby water bodies with organic and inorganic pollutants. It also threatens public health by attracting disease vectors and exposing people living near the waste to the harmful product within. Open dumps refer to uncovered areas that are used to dump solid waste of all kinds. MSW compost contains large amount of organic matter and both organic nitrogen and inorganic nitrogen. The organic matter plays a key role in improving soil properties such as soil structure, retention capacity etc. The local corporation have adapted different methods for the disposal of waste – open dumps, landfills, sanitary landfills and incineration plants. One of the important methods of waste treatment is composting.



Source Composition of Municipal Solid Waste in the Lucknow (U. P. Jal Nigam, Lucknow, 2020)

2. Literature Review

2.1 K. Riaz ahamed, S. Manikandan did research on the “ASSESSMENT OF GROUNDWATER QUALITY IN SOME TOWNS OF VELLORE DISTRICT, TAMIL NADU, INDIA. “Their study also sums up a collective, synthetic effort that improves the implementation of legal frameworks, institutional arrangements, financial provisions, technology, operations management, human resource development, and public participation and awareness of heavy metals which makes water unsuitable for drinking purpose.

2.2 WHO, Recommendation, Water and Sanitation (2011) Guidelines for drinking water quality, Vol. III, Geneva, WHO. “Countries have an opportunity to make substantial public health progress by setting, applying effective and appropriate standards for ensuring safe water, “said Dr Maria Neira, WHO Director for Public Health and Environment. “Shifting to a primary prevention approach is more effective, costs less, and gives us the flexibility to deal

with new pressures threatening water safety such as climate change, population growth and urbanisation".

2.3 Pandey Sandeep K, Tiwari S. did research on "Physiochemical analysis of groundwater of selected area of Gazipur city – A case study, Nature and Science. **(2009)"**. In this paper, they analysed groundwater pollution they also studied how it's affecting the people who live in the vicinity economically. An analysis of the above factors was done with Gazipur waste dumping site. From the study, they observed that this MSW on these sites has an adverse effect on the surrounding environment. They also found that both the sites negatively affected the lives of residents of the surrounding area.

2.4 Sundari, S. and Kanakarani, P. (2001) investigated the impact of journal of industrial pollution control 2001, 17 (1): pp.83 - 97. The overall results indicated that the water from the water sources located in the vicinity of solid waste dumping sites indicating pollution was unfit for drinking and the quality of water from open well, tube well and WTP located away from solid waste dumping sites was good indicating no pollution.

2.5 Chavan B. L., and ZambareN. S. (2013) published a paper on the "International journal of research in civil engineering, architecture and design 1 (2): 46 - 53. The purpose of this study was to assess the industrial pollution of water which makes the disintegration of water quality.

2.6 Jain C. K. Bhatio, K. K. and Kumar, S. R. (2005) have carried out a study to find out Groundwater quality in Malaprabhasub - basin Karnatka, International Journal of Environmental Protection, 2005: 23 (3): 321 - 329. They analysed various physio - chemical parameters of collected groundwater samples, Drinking - water quality management are often outside the direct responsibility of the water supplier, a collaborative multiagency approach the adopted to ensure safe drinking water. Preventive management is the preferred approach to drinking – water safety and should take account of the characteristics of drinking water supply from catchment and source to its use by consumers.

2.7 H. B. N. Yongsi, et al (2008) 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.

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

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

2.10 UNEP (2013) The problem of waste management, tied with scare 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.

2.11 Ogbeibu, A. E., Chukwurah, N. A. and Oboh, I. P (2012) 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.

2.12 Anil Kumar, A. Sukumaran, D. and Vincent, S. G. T. (2015) 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.

2.13 J. A. Nwanta and E. Ezenduka (2018) 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.

2.14 O. M. Omorogieva and O. Andre - Obayanju (2020) Impacts of solid waste dumpsites leachate on Ground water quality and suggested mitigation measures by targeting specific pollutant sources: Ikhueniro, Nigeria.

2.15 Anju Anilkumar, Dipu Sukumara, Salom Ganana Thanga Vincent (2015) Effect of Municipal solid waste leachate on ground water quality of Thiruvananthpuram District, Kerala, India.

2.16 Ohwoghere - Asuma, O.1 and Aweo, K. E (2013) Leachate characterisation and assessment of ground water and surface water qualities near municipal solid waste dump site in Effurun, Delta state, Nigeria.

2.17 Taswar Abbas 1, Muhammad Fahad Ullah 1, Omar Riaz * 1, Tariq Shehzad 2 (2008) Impact of municipal solid waste on groundwater quality in Jhang City Punjab, Pakistan.

2.18) DEOLI KANCHAN BAHUKHANDI 1 * AND AAEON 1 (2016) Impact of improper disposal of municipal solid waste on ground water quality in and around the solid waste dumping site of Visakhapatnam, Andhrapradesh, India.

2.19 ZhiyongHan, Haining Ma, Guozhong Shi, Li He, Luoyu Wei, Qingqing Shi (2016) A review of groundwater contamination near municipal solid waste landfill sites in China.

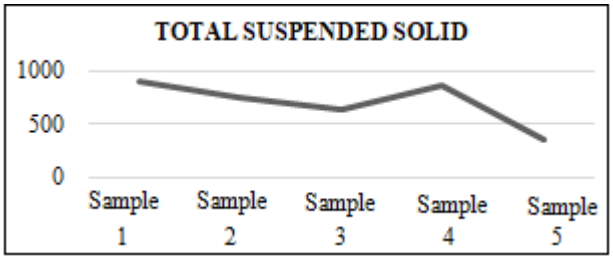
3. Analysis of Water Quality Parameters

Following are the parameters that are analysed in this paper: TSS, Turbidity, Colour, Taste and Odour, TDS, Ph value, Hardness, Chlorides, Iron and Manganese.

3.1 TSS

TSS are defines as solids in water that can be trapped by a filter. To measure TSS, the water sample is filtered through a pre - weighed filter. The residue retained on the filter is dried in an oven at 103 - 105°C until the weight of the filter no longer changes. Suspended solids are measured by

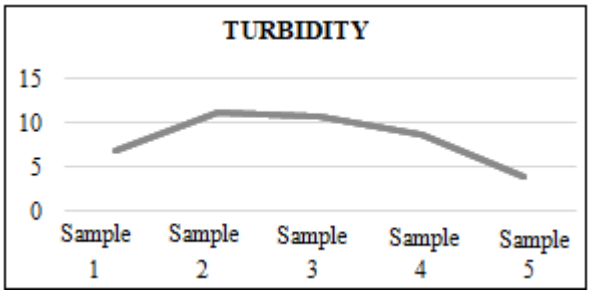
Graviometric Technique. Suspended solids are calculated by passing water through filter paper and heating residue on the filter[at]104 C.



Graph 2.1

3.2 Turbidity

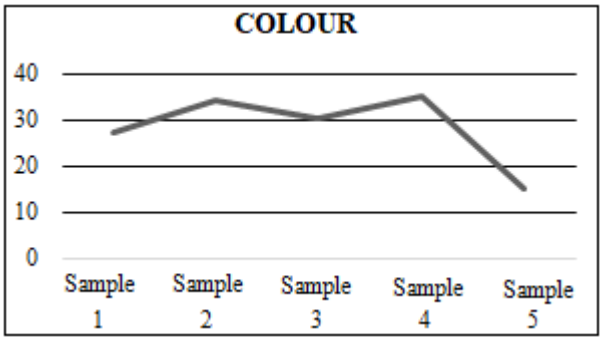
Turbidityis the cloudiness or haziness of a fluid caused by large numbers of individual particles that are generally invisible to the naked eyes, similar to smoke in air. The measurement of turbidity is a key test of both water clarity and water quality. Unit of turbidity is NTU.



Graph 2.2

3.3 Colour

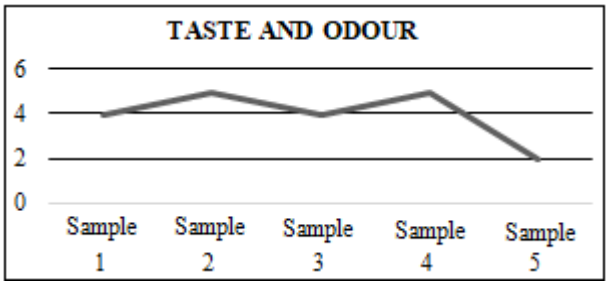
Colour matching technique by using "TINTOMETER" the above method is used only if colour of water sample is yellow - brown. If colour other than yellow - brown is to be measured then "spectrophotometry. Tintometer is a device to determine colour in water. The unit of colour measurement is TCU.1TCU is the colour produced by 1 mg of platinum cobalt in the form of chloroplatinate ions dissolved in 1 litre of distilled water. The Tintometer uses a series of gradient red - , yellow - , blue - , and neutral - coloured gases. It is arranged with two adjacent fields of view, seen through the viewing tube, so that the product in the sample field and a white reflective surface in the comparison field are observed side by side, suitably illuminated.



Graph 2.3

3.4 Taste and Odour

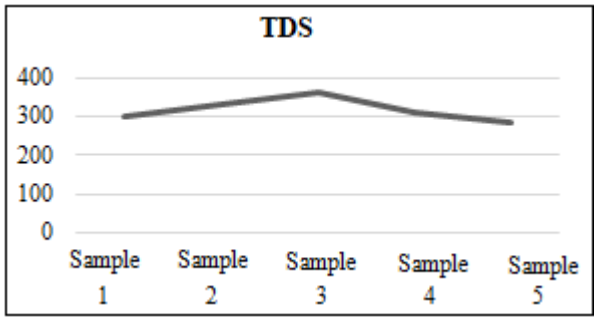
Taste and Odour comes from dissolved Organic matter inorganic salts and dissolved gases. H2O gives rotten egg smell. Algae releases oil like substances which may impart taste and odour in water. Effects of taste and odour: - These components are "carcinogenic". Measurement of Taste and Odour: - "OSMOSCOPE" instrument used for measurement. The sample is screened at 25ºC by two or three panellists to ascertain if any taste / odour is detected the sample is recorded as having a taste / odour Cl2of 0 and Quantitative TTN/TON of 1 (Dilution Number 0) and the analysis is complete.



Graph 2.4

3.5 TDS

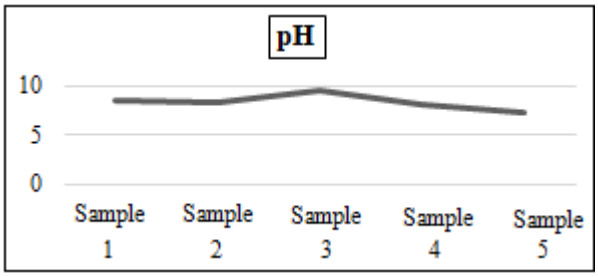
Total dissolved solids (TDS) are a measure of the dissolved combined content of all inorganic and organic substances present in a liquid in molecular, ionized, or micro - granular (colloidal solution) suspended form. TDS are often measured in parts per million (ppm). TDS in water can be measured using a digital meter. It can also be measured approximately by measuring electrical conductivity or specific conductance of the water. Instrument: - "Di - Ionic Tester".



Graph 2.5

3.6 pH Value

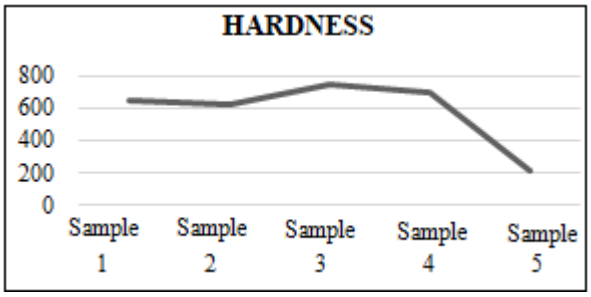
pH is indicator of acidity or basicity of water sample. pH= - log [H+] moles/ lit. Higher will be concentration of H+ ions lesser will be the pH & vice versa. For acidic water pH 0 to 7. For basic water pH 7 to 14. Alkalinity is a measure of the capacity of the water to resists a change in pH that would tend to make the water more acidic.



Graph 2.6

3.7 Hardness

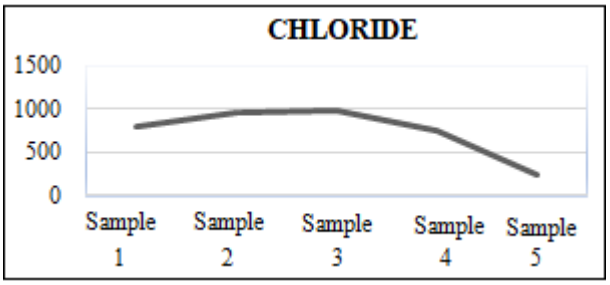
It is the property of water which prevents the leathering (from) of the soap. It is caused due to presence of carbonates and sulphates of calcium and magnesium in the water. Also, in the presence of chlorides and nitrates of calcium and magnesium cause hardness in water. Hardness is usually expressed in mg/lit or p. p. m. of calcium carbonate in water. Carbonates and Non carbonates hardness. Procedure 1. Dilute 25mL of sample (V) to about 50mL with distilled water in an Erlenmeyer flask.2. Add 1mL of buffer solution.3. Add two drops of indicator solution. The solution turns wine red in colour.4. Add the standard EDTA titrant slowly with continuous stirring until the last reddish tinge disappears from the solution. The colour of the solution at the end point is blue under normal conditions.5. Note down the volume of EDTA added (V1).



Graph 2.7

3.8 Chlorides

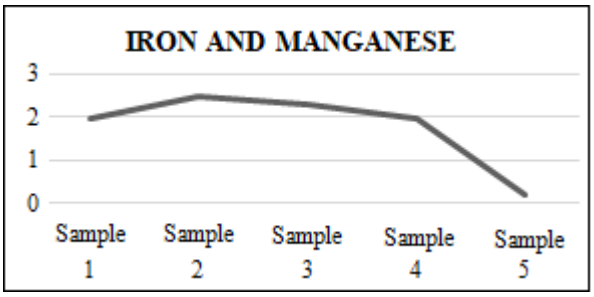
The presence of chlorides may be due to the mixing of saline water and sewage in the water. Excess of chlorides is dangerous and unfit for use. The chloride can be reduced by diluting the water. Chlorides above 250 ppm are not permissible in water. The chlorides can be determined by titrating the water with silver nitrate (AgNO3) and potassium chromate (K2CRO4), In the titration process reddish colour will be formed if chlorides are present. Reagents: - Standard silver nitrate solution 0.0282 N (1mL = 1mg of chloride). Potassium chromate indicator, (5%) dissolve 10g of K2CRO4 in 20 mL distilled water. Stored it in dark glass bottle.



Graph 2.8

3.9 Iron and Magnese

These are generally found in ground water. If these are present less than 0.3 ppm the water is not suitable for domestic and laundering purposes. In these methods some colouring agents are added in the water and compared with standard colour solutions. 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 calorimetric methods.



Graph 2.9

4. Conclusion

The surface water quality near sites from where sample is taken is not very good and it is also not for drinking purpose or any other domestic use. Heavy treatment is required for purification of water as like the analysed data of Bharwara treatment plant is under limits. The review paper helps to understand the water quality parameters of the given water samples and their specified ranges according to IS: 10500 - 2012 standards. Proper solid waste management must be involved by government to reduce waste generation. Government initiatives such as Swachh Bharat Mission, National Water Mission and Waste to Wealth Mission as a part of its commitment to effective waste and pollution management.

References

[1] OECD (Organisation for Economic Co - operation and Development). OECD Environmental Indicators. Development, Measurement and Use; OECD Environment Directorate: Paris, France, 2003. Available online: http: //www.oecd. org/env/ (accessed on 14 December 2021).
[2] Guerrero, L. A.; Maas, G.; Hogland, W. Solid waste management challenges for cities in developing countries. Waste Manag.2013, 33, 220–232. [CrossRef] [PubMed]
[3] World Bank. Solid Waste Management.2018. Available

online: http: //www.worldbank. org/en/topic/urbandevelopment/brief/
[4] Solid - waste - management (accessed on 9 November 2021).
[5] UN - Habitat. Solid Waste Management in The World's Cities: Water and Sanitation in the World's Cities 2010, United Nations Human
[6] Settlements Programme; Earthscan: London, UK, 2010.
[7] Scarlat, N.; Motola, V.; Dallemand, J. F.; Monforti - Ferrario, F.; Mofor, L. Evaluation of energy potential of municipal solid wastefrom African urban areas. Renew. Sustain. Energy Rev.2015, 50, 1269–1286.
[8] UN - Habitat. Planning Sustainable Cities. Global Report on Human Settlements, Abridged Edition, United Nations Human Settlements Programme; Earthscan: London, UK, 2009.
[9] Abul, S. Environmental and health impact of solid waste disposal at Mangwaneni dumpsite in Manzini: Swaziland. J. Sustain. Dev. Afr.2010, 12, 64–78.
[10] Yang, Q.; Fu, L.; Liu, X.; Cheng, M. Evaluating the Efficiency of Municipal Solid Waste Management in China. Int. J. Environ. Res. Public Health 2018, 15, 2448.
[11] Abubakar, I. R.; Aina, Y. A. Achieving sustainable cities in Saudi Arabia: Juggling the competing urbanization challenges. In Population Growth and Rapid Urbanization in the Developing World; IGI Global: Hershey, PA, USA, 2016; pp.234–255.
[12] Balogun, A. L.; Adebisi, N.; Abubakar, I. R.; Dano, U. L.; Tella, A. Digitalization for transformative urbanization, climate change adaptation, and sustainable farming in Africa: Trend, opportunities, and challenges. J. Integr. Environ. Sci.2022, 19, 17–37.
[13] M N Murty, S Kumar Measuring Cost of Environmentally Sustainable Industrial Development in India: A Distance Function Approach Economics of Water Pollution: The Indian Experience, volume 7, p.467–86Posted: 1999.
[14] M N Murty, UR Prasad Emissions Reduction and Influence of Local Communities in India Economics of Industrial Pollution Abatement: Theory and Empirical Evidence from the Indian Experience Posted: 1999.
[15] FDOwa Water Pollution: Sources, Effects, Control and Management Mediterranean Journal of Social Sciences, volume 4, issue 8, p.65 – 73 Posted: 2013.
[16] S Pargal, D Wheeler Informal Regulation of Industrial Pollution in Developing Countries: Evidence from Indonesia Journal of Political Economy, volume 104, p.1314–1341.
[17] M J Pawari, S Gawande Ground water pollution & its consequence international journal of engineering research and general science, volume 3, issue 4, p.773 –76Posted: 2015.
[18] Smart Urban Water options: Recycle waste water Posted: 2016 - 02 - 02.
[19] Gupta Vijaya, G Mythili Willingness to Pay for Water Quality Improvement: A Study of Powai Lake in India Asian Journal of Water, Environment and Pollution, volume 8, issue1, p.15–21Posted: 2011.
[20] K Yogendra, E T Puttaiah Determination of Water Quality Index and Suitability of an Urban Water body in Shimoga Town, Karnataka Proceedings of Taa2007: The 12thWorldLake Conference, p.342–346Posted: 2008.
[21] M Zafar, BJ AlappatEnvironmental mappingof waterquality of theriverYamuna in Delhi with landfill locations An International Journal, volume 15, issue 6, p.608–621Posted: 2004.