Effect of Municipal Dumping Site on Agriculture Water - Case Study

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❖ Abstract:

Municipal Solid Waste Management (MSWM) is one of the major environmental challenges in developing countries. Many efforts to reduce and recover the waste have been made, but still land disposal of solid waste in the most popular. An environmentally, sound landfill site is challenging verdict. Rapid urbanization coupled with increasing industrial, commercial and economic development has given rise to an increased generation of various types of waste. In recent years, the management of solid waste continues to be one of the major issues facing municipal planners due to increased population levels. GIS has proved to be an advantage to such planners by visualizing the real solid waste situations through mapping. The features different tools of GIS in mapping MSWM are discussed in this study. Also, analyze agriculture water samples which taken from near dumping site area.

❖ **Key Words:** Municipal solid waste management, GIS, Mapping, Groundwater parameters.

❖ Introduction:

The challenging of managing municipal solid waste (MSW) in an environmentally and economically sustainable manner is bound to assume gigantic proportions as India's urban population slated to increase from current 330 million to 600 million by 2030. The country has over 5,000 cities & towns, which generate about 40 million tons of MSW per year. Going by estimate of the Energy Research Institute (TERI) this could well touch 260 million tons per year by 2047. Municipal Solid Waste in solid waste generated by household, commercial establishment the industrial or agriculture waste.

In Nanded, approximately 70% of municipal solid waste is disposed on open dump site. Municipal Solid Waste collection (MSWC) has about 85% proportion of the total cost for solid waste management which consists of generation, collection, transfer, treatment and find disposal. Municipal Solid Waste Management is one of the major problems that city planners face all over the world. The problem is especially served in most developing country, cities were increased urbanization. Poor planning and lack of adequate resources contribute the poor state of MSWM. There is a considerable amount of disposal of waste without proper segregation, leading to both economic and environment loss. There is tremendous amount of loss in term of environmental degradation, health hazard and economic descend due to direct disposal of waste. It is better to segregate the waste at the initial stages of generation rather than going for a later option, which is inconvenient and expensive. There has to be appropriate planning for proper waste management by means of analysis of the waste situation of the area.

MSW management is a big challenge due to number of problems including; inadequate management, lack of technology and human resources, shortage of collection of transport vehicle and insufficient funding. Waste disposing is another important part of waste management system, which requires much attention to avoid environmental pollution. Waste is an unavoidable by product of human activities, economic development urbanization & improving living standards in cities, have led to an increase in the quantity and complexity of generated waste. Rapid growth of urban population and industrialization in developing Asian countries in recent years has degraded the urban environment and places serious stress on natural resources, which undermines equitable and sustainable development. The most common problem associated with improper dumping includes; disease transmissions, fire hazard, odor nuisance, atmospheric and water pollution, aesthetic nuisance and economic losses. The effectiveness of solid waste disposal spends upon the selection of proper site and current global trend of waste management problems.

❖ Materials & Methods:

Nanded waghala city is the second largest urban city, after Aurangabad, in the Marathwada region of Maharashtra and is also the administrative headquarters of Nanded district. It is situated in eastern part of the Marathwada region located along the banks of Godavari River. The city is spread across 63.44 sq.km and divided into 4 administrative zone, Zone A (Taroda-Sangvi), Zone B (Shivaji Nagar- Ashok Nagar), Zone C (Vazirabad – Itwara), and Zone D (CIDCO). As per JNNURAM (Jawaharlal Nehru National Urban Renewal Mission) ithas been recognized in the ‘C’ category due to its cultural and historic significance. MSW management includes the collection, transportation and responsible disposal of waste generated in the city. Solid waste generated in Nanded city is collected from all wards from NWCMC (Nanded Waghala City Municipal Corporation).

A Geographic Information System (GIS) is a computer tool for capturing, storing, querying, analyzing and displaying spatial data from real world for a particular set of purpose. This technique is used to generate optimal route for collecting solid waste. Primary data about the solid waste of the study area were collected through questionnaire and Global Positioning System (GPS) survey. The exact location of dumping site, ground water samples, and illegal waste disposal sites were collected by using GPS device. Preparation of thematic maps includes the digitization of collected secondary data. The spatial data and attribute data is entered into a data base to create maps and analysis by Arc GIS 3.2a software. This includes photos, ward boundaries, quantity of waste, etc.

A. Data Entry:

The spatial data and attribute data is entered into a data base to create maps and analysis by Arc GIS 3.2a software. This includes photos, ward boundaries, quantity of waste, etc.

B. Mapping Technique:

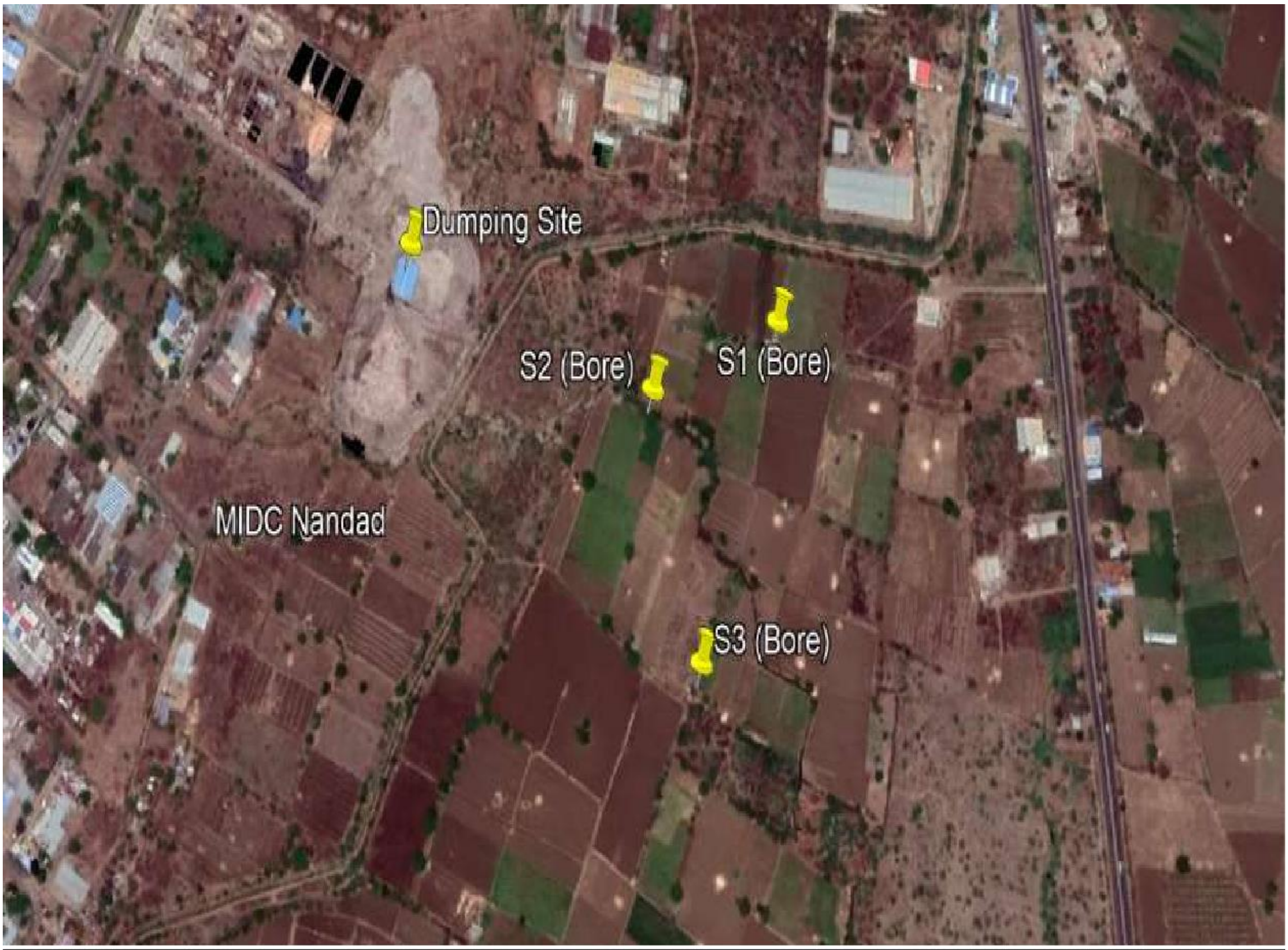
The Nanded Municipal Corporation map was obtained from the Nanded Municipal Corporation office. The details were identified using the geographical coordinates. The map was scanned using the HP Precision scan jet5200c at 600dpi and the scanned images were stored as JPEG files, which were edited wherever necessary, using MS Photo Editor.

Scanning results in the conversion of the image into an array of pixels, thereby producing an image in the raster format. A raster file is an image in a series of dots called pixels or picture element that are arranged in rows and columns in a matrix format. The raster images were opened in Arc GIS 3.2a as a raster layer using JPEG interchange format. Later this image was projected using projection of geographic latitude and longitude.

The development of Geographic Information System(GIS) and its use throughout the world has contributed a lot in improving waste management systems. GIS helps to manipulate data in the computer to simulate alternatives and to take the most effective decisions. GIS can add value to waste management applications by providing outputs for decision support and analysis in a wide spectrum of projects such as route planning for waste collection, site selection exercises for transfer stations, landfills or waste collection points. The use GIS in solid waste management in coastal areas as a decision support system with a case study on landfill site selection. The results of the study are that GIS is becoming a powerful tool inSWM.

Solid waste management comprises several phases, starting from the stage where the waste is generated till it reaches its final destination or at a stage where it is no more a threat to the environment. “It is observed that solid waste management can be bifurcated into mainly two phases. One is the waste management in the area where it is generated and second is the management of waste at dumping grounds.”

Ground water samples which were taken from the bores located near dumping site area. Water sample was collected from the study area to the depth of about 55 to 140 cm from the surface, water samples were collected and put in clean plastic bottle and immediately brought to the laboratory for the analysis of physical and chemical parameters. Total three representative agricultural samples have been collected. The Physio-chemical parameter such as pH, Total Dissolved Solids (TDS) were measured in the field itself by using portable digital meter. The other physio-chemical parameter such as Total Hardness, Sulphate, Phosphate, Chloride, Calcium, etc. were analyzed in the laboratory. After collection of samples there was 3 water samples was collected. The area chosen for the present study is the surrounding of Dumping site MIDC area Nanded.



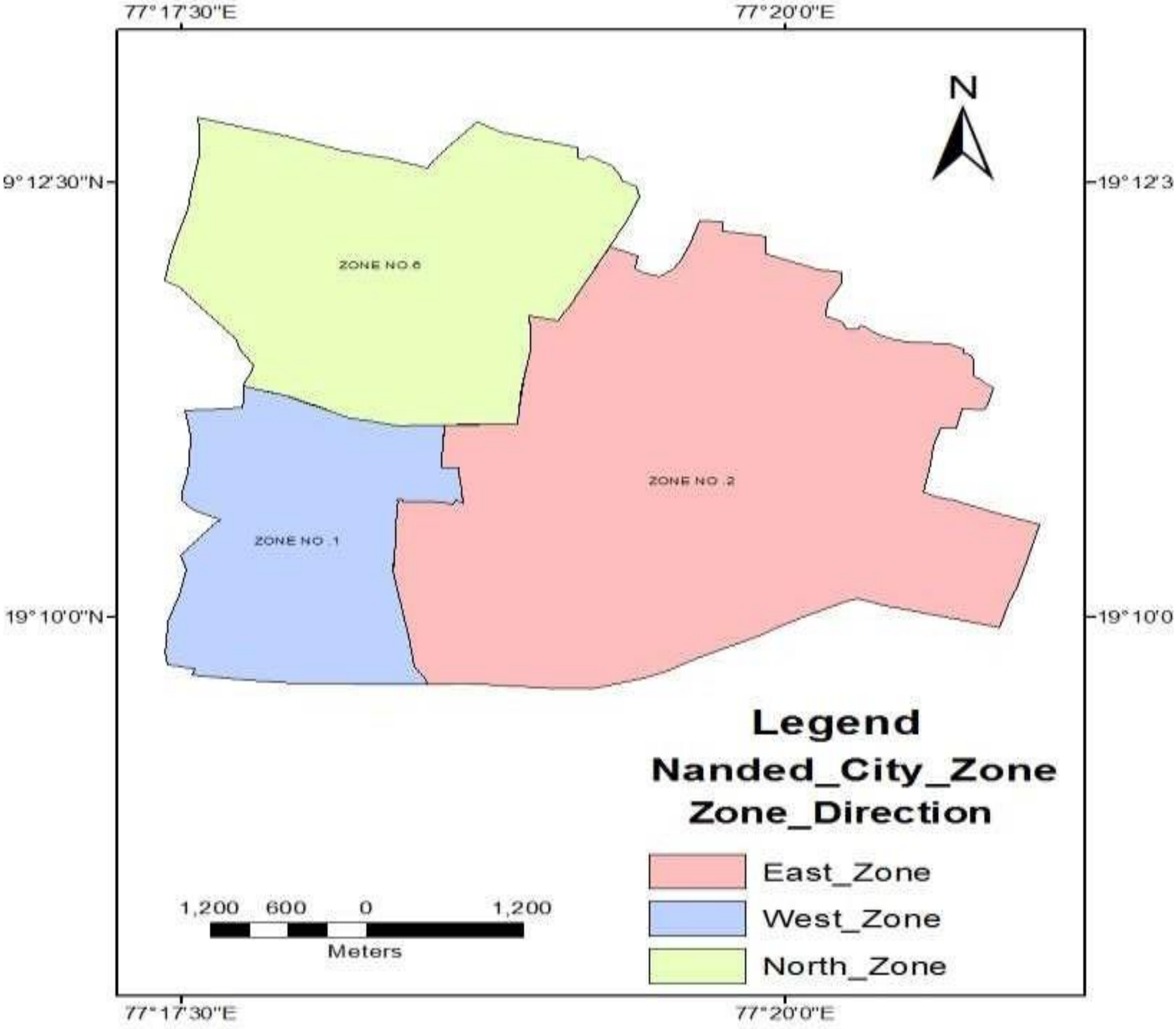
Map No. 1: Sample location map

➢ **Sample Location point:**

Sample No.	Latitude - Longitude
Sample 1	Lat. 19°6'46.42''N Lng. 77°20'33.67''E
Sample 2	Lat. 19°6'43.41''N Lng. 77°20'29.40''E
Sample 3	Lat. 19°6'37.12''N Lng. 77°20'33.30''E

Table No.: 1

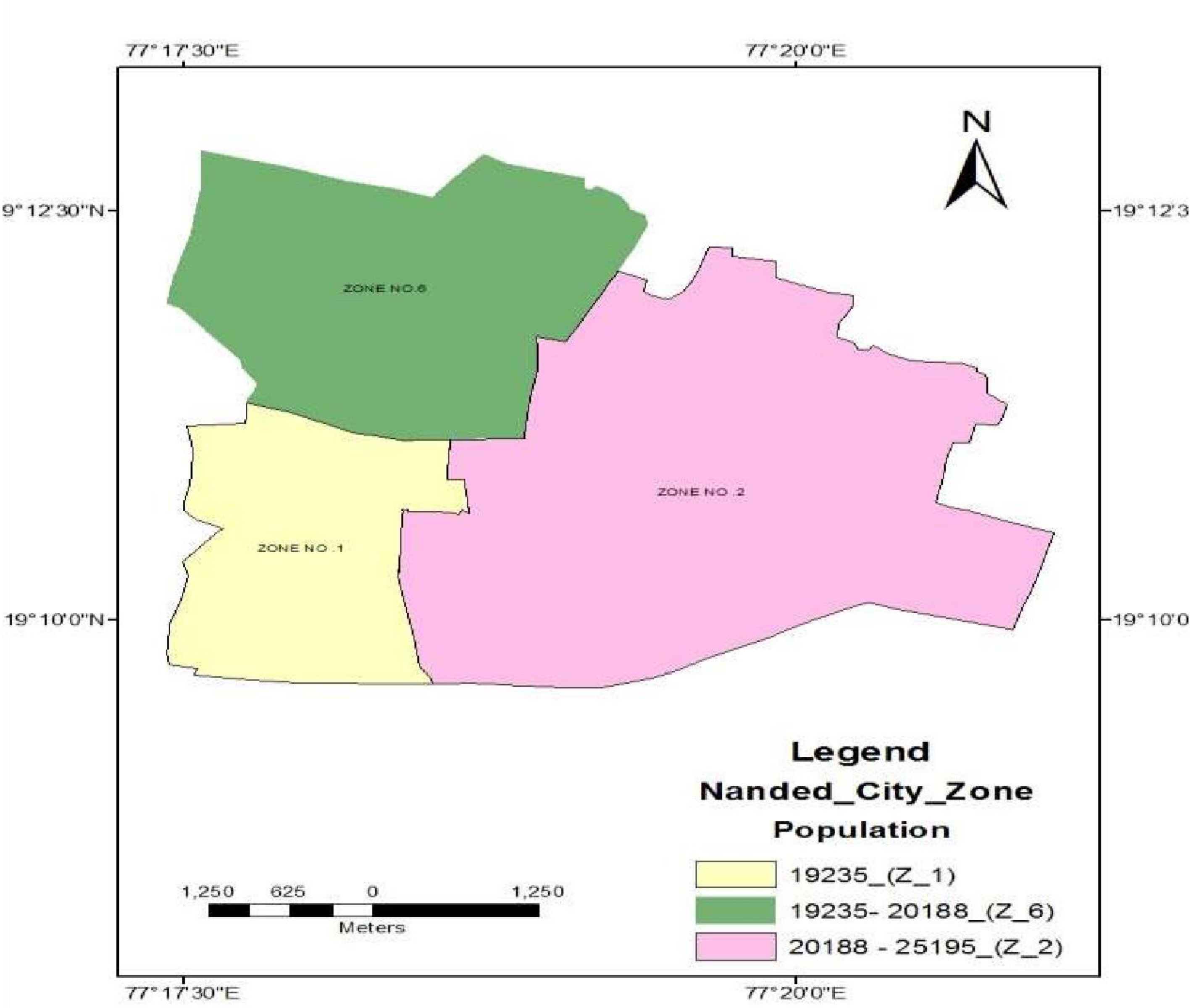
1) The Zonal Map of Nanded Corporation:



Map-2

The Nanded city is decentralized to into six administrative zones each zone is headed by an Assist commissioner who is delegated with adequate powers to discharge his functions effectively. Among that in this study we have taken three zones (Zone 1, Zone 2, Zone 6) the ward administration is being supervised by junior engineers and sanitary inspectors who are also delegated with some powers to discharge his functions at the ward level. The ward number of Nanded Corporation is shown in map.

2) Zonal Map of Population Density:

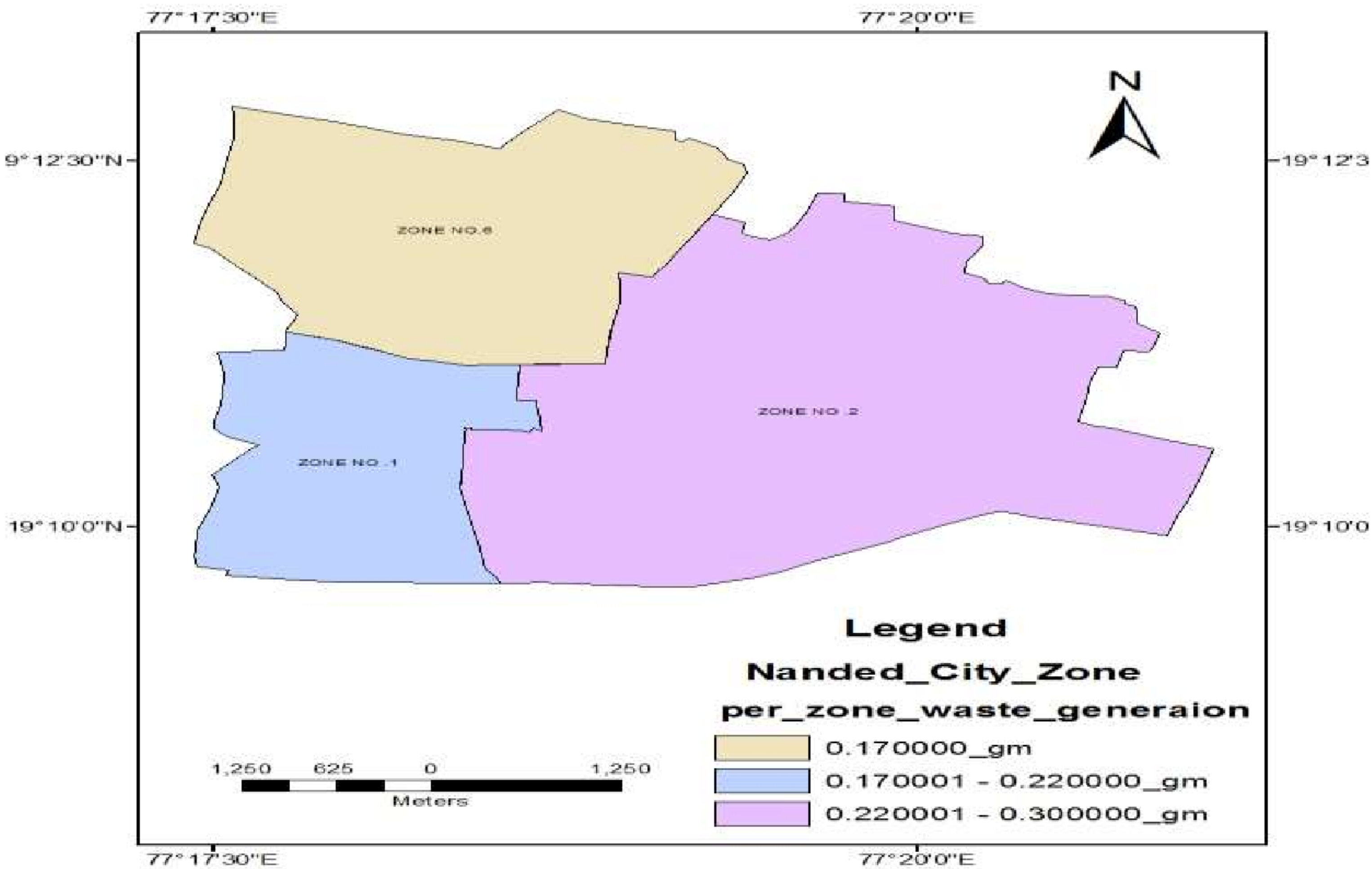


Map-3

A thematic map of population density was prepared for the ward wise population density for Nanded Corporation as shown in map 2. To arrive at the population density values, the formula was adopting

Population density = No. of persons / area of ward (sq.km)
The population value obtained by the Nanded municipal corporation website www.nwcmc.gov.in

3) Zonal Map of per capita Solid Waste Generation in Nanded Corporation:



Map-4

Based on population of each zone and the waste generation of each zone using this per capita waste generation map were prepared. Per capita waste generation is calculated using

Per capita solid waste generation = (total weight of solid waste generated per day) / (population served)

For each zonal area, this method was used to prepare a thematic map of per capita waste generation in Nanded urban. From the results of thematic mapping, it is observed that out of thesethree zones in Nanded urban only two zones namely Zone No.-1, Zone No. -2 are highly waste generated areas in the range of 220-300gm/person/day as shown in map-4.

➢ **Zonal Wise Population density, per capita generation & workers no.:**

Zone No.	Population density	Per capita generation	No. of Workers
Zone 1	20,188	220 gm/day	52
Zone 2	25,195	300 gm/day	60
Zone 3	19,235	170 gm/day	35

Table No. 2

➢ **Composition of Municipal Solid Waste in a Nanded city:**

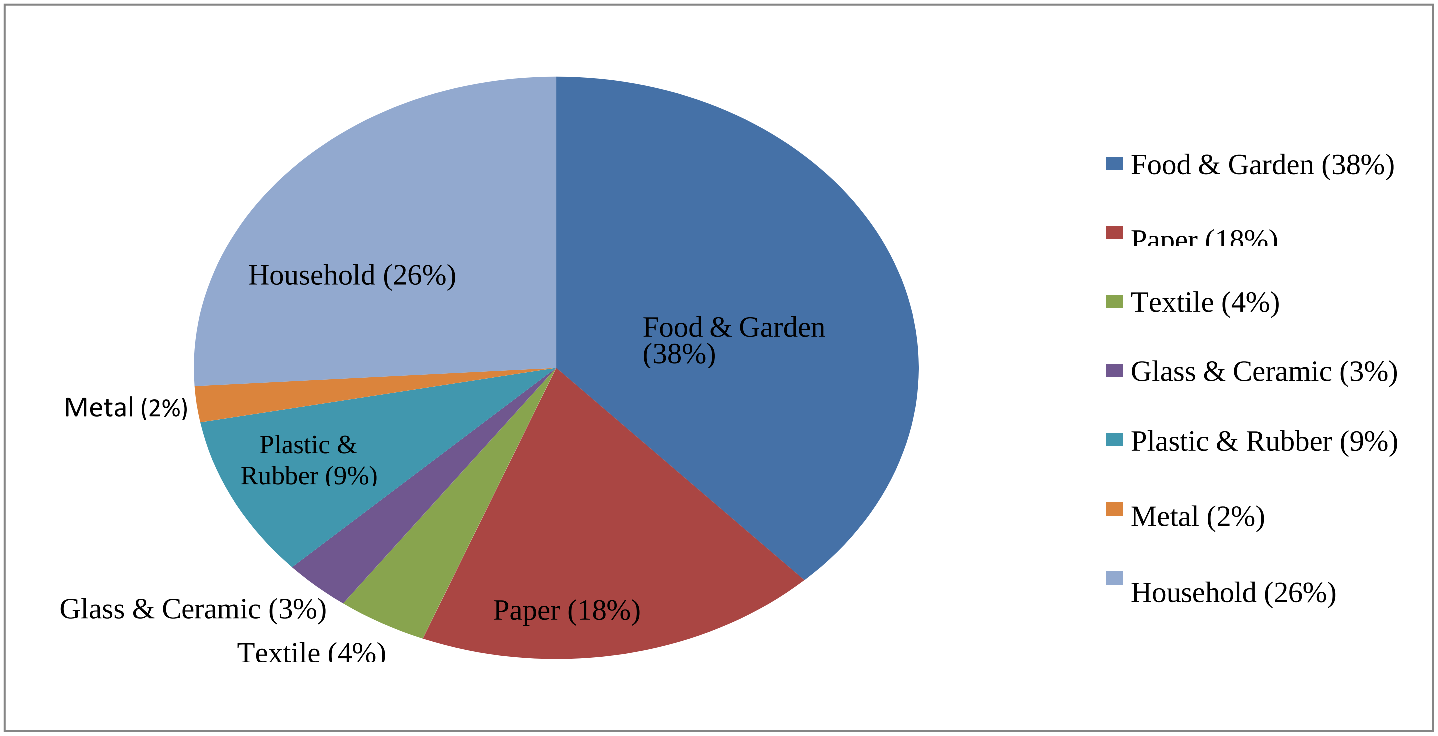


Fig. No.: 1

❖ Results & Discussion:

This Municipal solid waste data of Nanded city is used for the thematic maps which will helpful for visualizing data by colour variation for zonal map, population density map, and per capita generation map. Which will helpful for easy identification of source of solid waste and creation of data base and create database.

Agricultural groundwater samples which were taken from the bores located near Municipal dumping site of Nanded city area. This Water samples was collected from dumping site near about 400-500 meters and depth of about 55-140 cm from the surface. These three different agricultural samples collected in clean plastic bottles and brought to laboratory to analyze the physicochemical parameters by standards methods given by Trivedi and Goel (1984). The present study was aimed to investigate the analysis of physicochemical parameters in agriculture water at Municipal Dumping site of Nanded city (Maharashtra). Physical parameters like pH, TDS and chemical parameters of Sulphate, Phosphate, hardness, Chloride, Calcium were analyzed.

➢ Physico Chemical representation of Agricultural effluents parameter:

Sample No.	pH	TDS (PPM)	Sulphate (mg/L)	Phosphate (mg/L)	Hardness (mg/L)	Chloride (mg/L)	Calcium (mg/L)
1.	6.6	245	1.379	0.052	1678	1299.3	593.98
2.	6.9	167	0.786	0.028	900	631.9	210.0
3.	6.7	249	1.424	0.030	1690	1207	253.44

Table No.: 3

1) **pH: Graphical representation of pH analysis:**

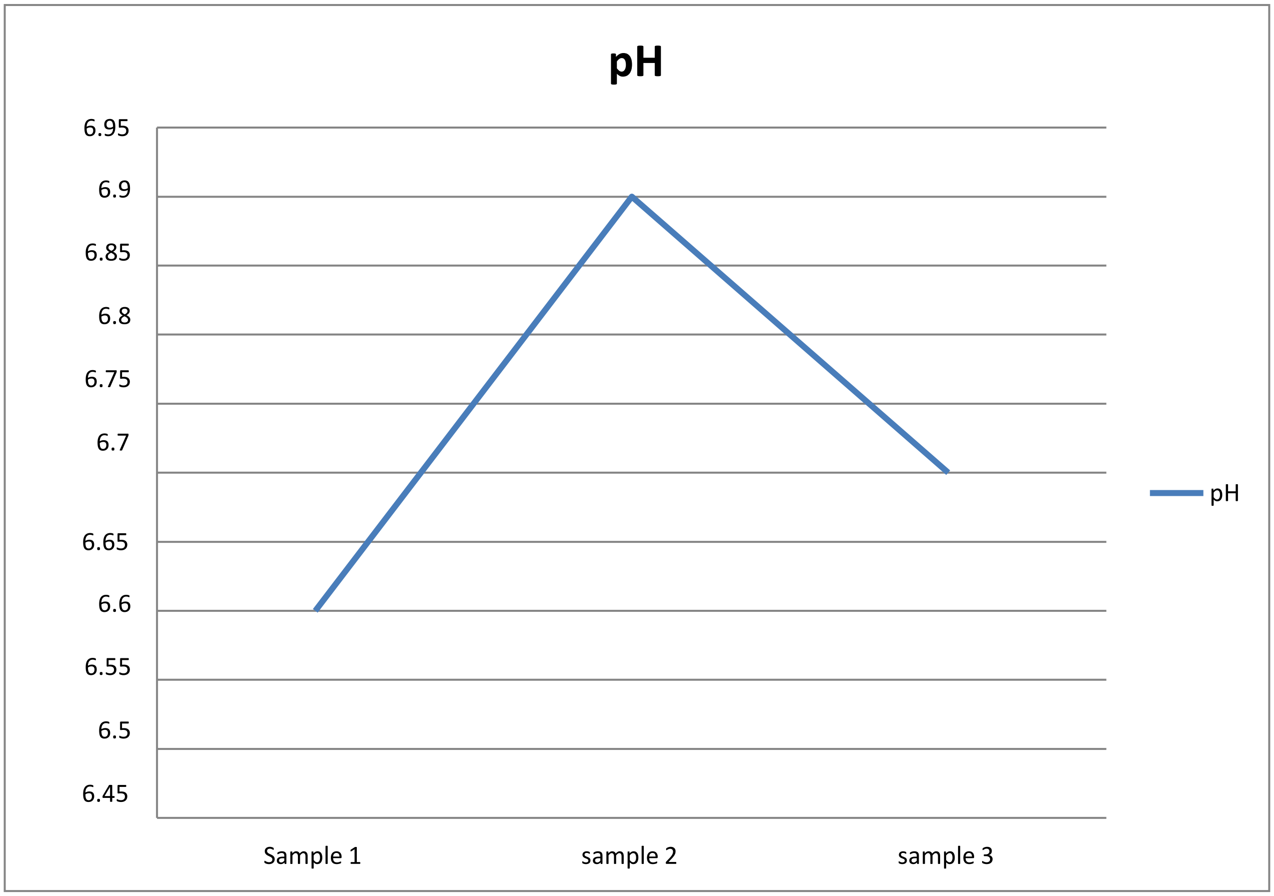


Fig. No. 1

Practical pH scale extends from 0 to 6.99 as Acidic, 7.0 as Neutral and 7.01 to 14 as Alkaline. The pH value is widely used for primary treatment requirements of water and wastewater. The pH is determined by using Digital pH meter for recording approximate pH values. pH is relative hydrogen ion concentration in water and it indicates the intensity of acidity or alkalinity. The pH has no direct effect on human health, but change in it alters the taste of water. The pH of Industrial effluents sample varies from 6.6 to 6.9.

International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 06 Issue: 10 | October - 2022 Impact Factor: 7.185 ISSN: 2582-3930

2) **<u>TDS</u>: <u>Graphical representation of Total Dissolve Solids:</u>**

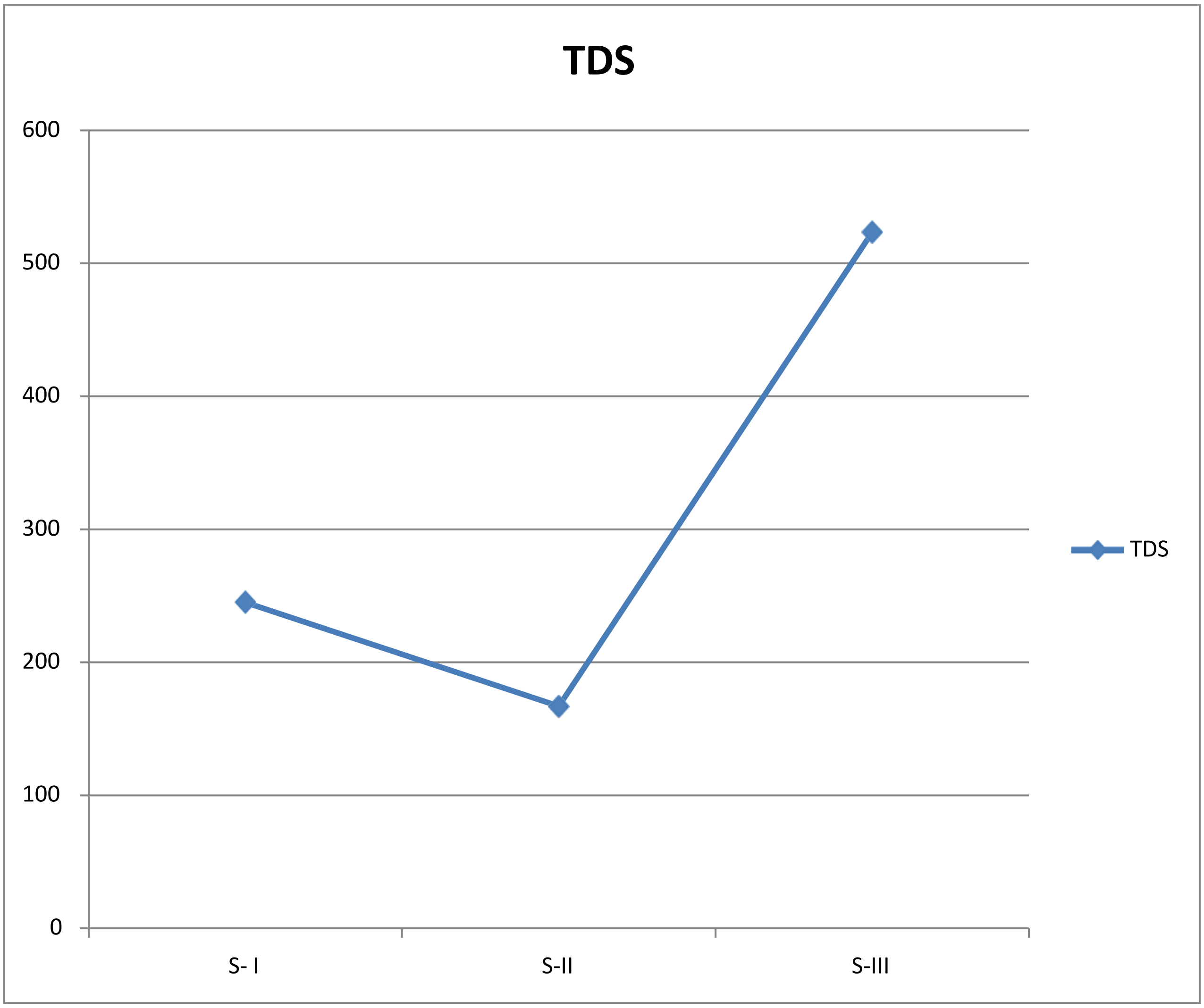


Fig. No. 2

TDS is determined by using TDS meter. Total dissolved solids are composed of carbonated, bicarbonates, chlorides, Sulphate, phosphates and nitrates of Ca, Mg, Na, K and Mn and organic matter, salts and other particles TDS of industrial effluents samples measured. Ranges from TDS values of the different sampling points were ranged from 167 to 249 ppm (parts per million) highest values were observed at the Sample 3 and lowest value is at sample 2, as shown in (Table 3). Water that contains less than 500 ppm of dissolved solid is generally satisfactory for the domestic use and other industrial purposes.

3) Sulphate: Graphical representation of Sulphate analysis:

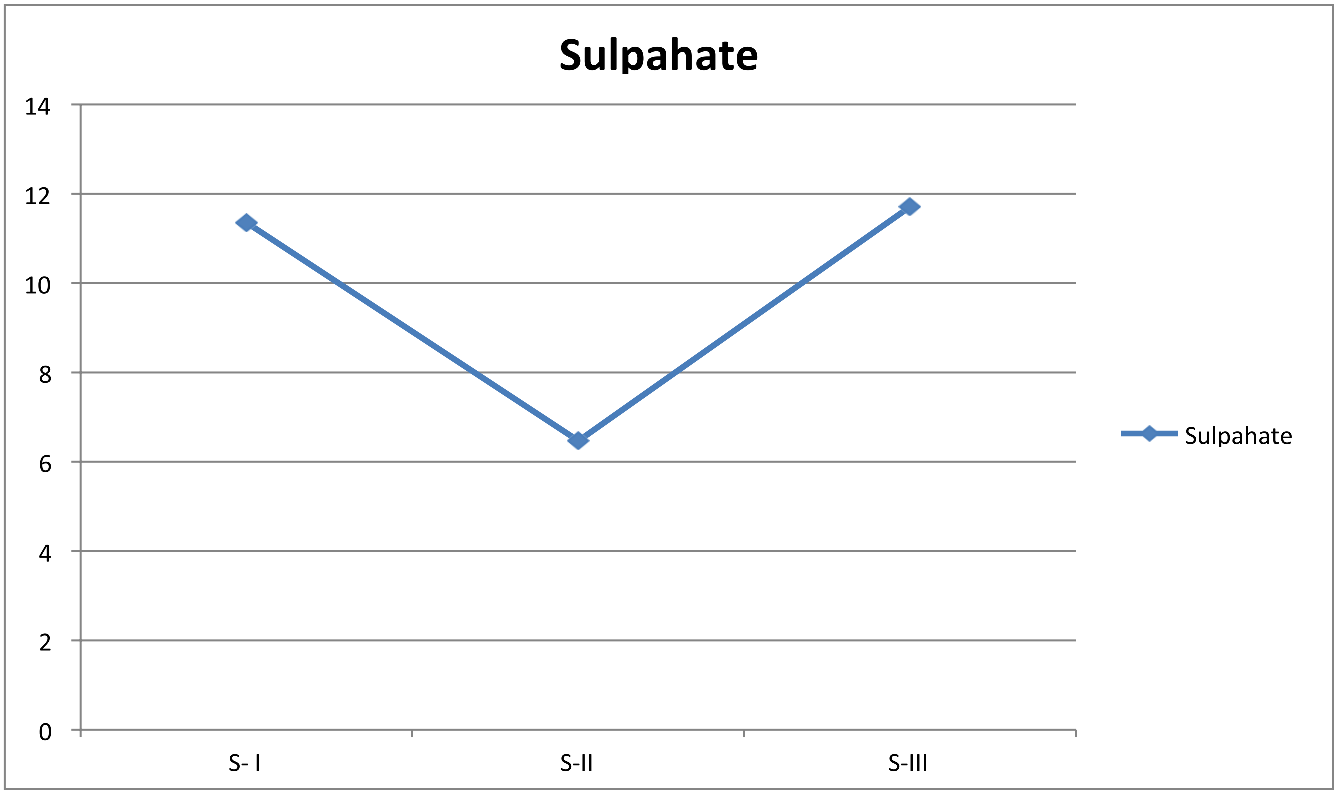


Fig. No. 3

Sulphate is determined by using Spectrophotometric method. Sulphate is a chemical commonly found in air, soil and water. Since it is soluble (easily dissolved) in water, sulphate is found at high concentrations in many aquifers and in surface water. Sulphate, an important ion in ground water, is used to ensure adequate quality control for ground water samples and laboratory analysis. It is useful for identifying different sources of water. Aquifers with a naturally occurring sulphate source, such as gypsum, will have very highconcentrations of sulphate compared to other aquifers. Ranges from Sulphate values of the different sampling points were ranged from 6.468 to 211.71 mg/L. Highest values were observed at the Sample 1and lowest value is at sample 3, as shown in (Table 3).

International Journal of Scientific Research in Engineering and Management (IJSREM)
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4) Phosphate: Graphical representation of Phosphate analysis:

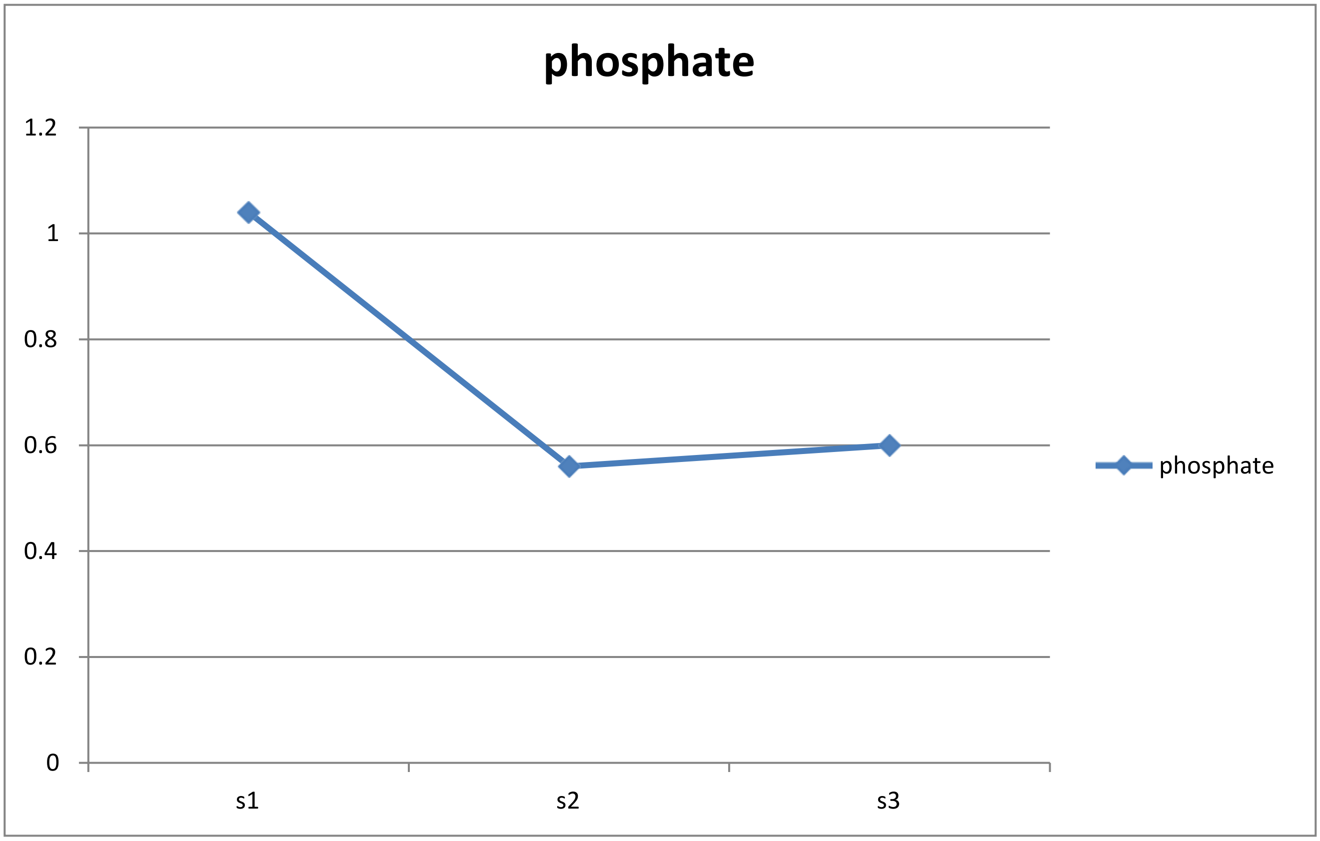

Fig. No. 4

Phosphate is determined by Flame photometric method. Phosphorus is one of the key elements necessary for growth of plants and animals. Phosphates PO are formed from this element. Phosphorus (P) is an essential nutrient for all life forms. Phosphorus plays a role in deoxyribonucleic acid (DNA), ribonucleic acid (RNA), adenosine diphosphate (ADP), and adenosine triphosphate (ATP). Phosphorus is required for these necessary components of life to occur.

Phosphorus is the eleventh most abundant mineral in the earth's crust and does not exist in a gaseous state. Ranges from Sulphate values of the different sampling points were ranged from 0.6 to 1.04 mg/L. Highest values were observed at the Sample 1 and lowest value is at sample 2 as shown in (Table 3).

5) **Hardness: Graphical representation of Hardness analysis:**

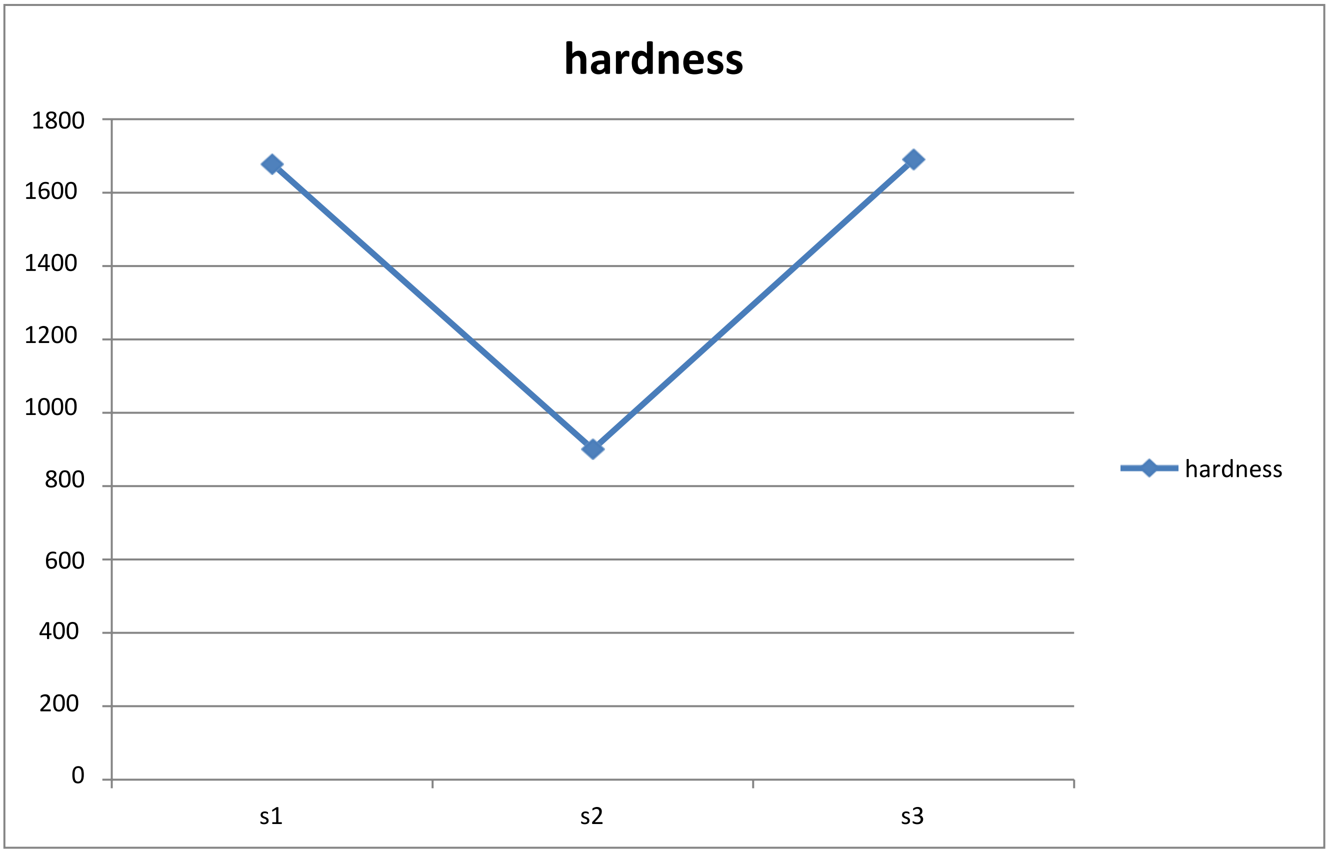

Fig. No. 5

Hardness is determined by Titrimetric method. Hardness is defined as characteristic of water that represent the total concentration of just the calcium and magnesium ions expressed as calcium carbonate. Hardness caused by presence of bivalent metallic ions. Ca, Mg, Sr, Fe, Mn, etc. Hardness determination is important in evaluation of the water. Due to hard water, soap is destroyed and washing is affected. Domestic utensils form scales due to hard water and fuel requirement increases along with reduction in cooling efficiency. Hard water may affect human digestive system. Hardnessof the agricultural effluents samples varies from 900 to 1690 mg/l (Table 3). The minimum TH recorded from sample No. 2, while maximum TH recorded from sample No. 3. The desirable limit of Hardness in industrial effluents is 300mg/l and permissible limit is 600mg/l.

6) **Chloride: Graphical representation of Chloride analysis:**

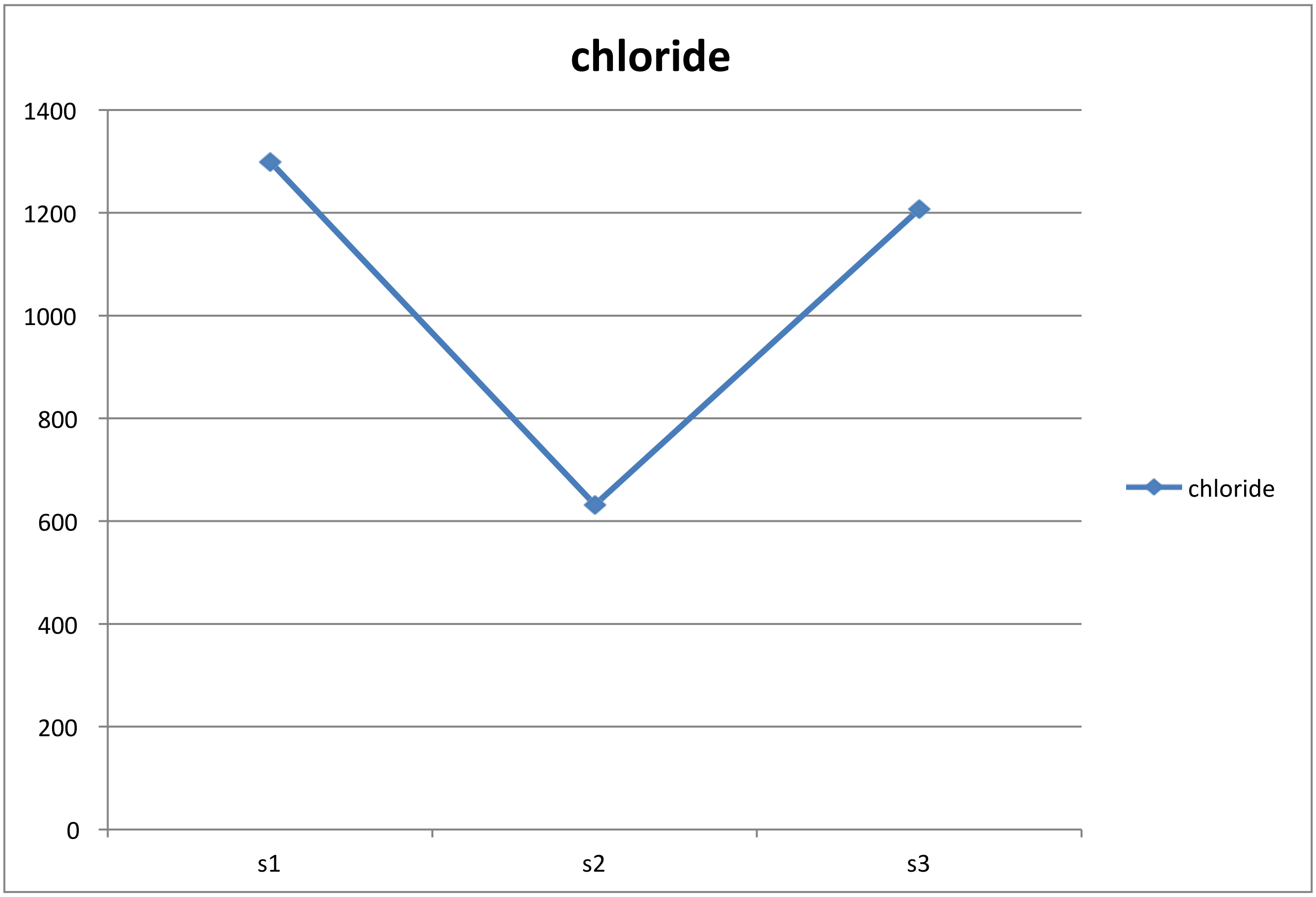

Fig. No. 6

Chloride is determined by Titrimetric method. Chlorides are present in both fresh and salt water, and are essential elements of life. Salts such as table salt are composed of ions that are bonded together. When table salt is mixed with water, its sodium and chloride ions separate as they dissolve. Chlorides constitute approximately 0.05% of the earth's crust. Chloride concentrations of between 1 and 100 ppm (parts per million) are normalin freshwater. Chloride ions come into solution in water in underground aquifers, geological formations that contain groundwater. Ranges from chloride values of the different sampling points were ranged from 631.9 to 1299.3 mg/L. Highest values were observed at the Sample 1and lowest value is at sample 2 (Table no. 3)

7) **Calcium: Graphical representation of Calcium analysis:**

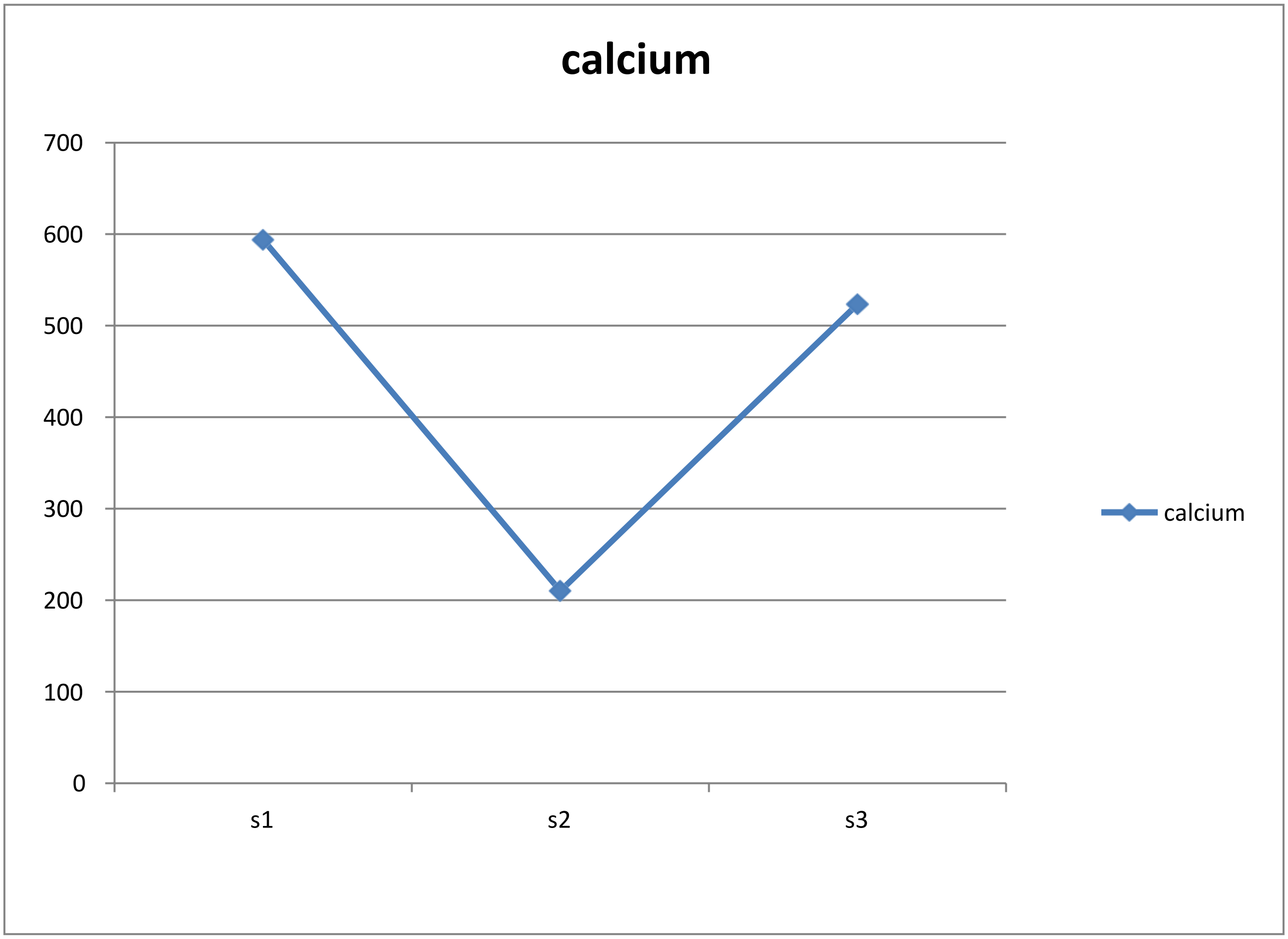

Fig. No. 7

Calcium is determined by Titrimetric method. When water is combined with carbon dioxide to form very weak carbonic acid, an even better solvent result. As water moves through soil and rock, it dissolves very small amounts of mineralsand holds them in solution. Calcium and magnesium dissolved in water are the two most common minerals that make water "hard." The degree of hardness becomes greater as the calcium and magnesium content increases and is related to the concentration of multivalent cations dissolved in the water. If you are on a municipal water system, the water supplier can tell you the hardness level of the water they deliver. If you have a private water supply, you can havethe water tested for hardness. Ranges from calcium values of the different sampling points were ranged from 210.1 to 593.98 mg/L. Highest values were observed at the Sample 1and lowest value is at sample 2. (Table no. 3)

❖ Conclusion:

1. The collected data shows that the maximum proportion of refuse caused by garden and food waste, proportion of refuse caused by food and garden waste, second highest was household waste and third highest was paper material. Percentage of plastic carry bags was higher, where glass, ceramic and metals were nearly equal with each other.
2. On the basis of chloride and sulphate analysis of groundwater it may be that solid waste dumping leachate is a source of pollution of groundwater. And other parameters are also high due to mixing of toxic materials. Excess chloride contain water may be injurious to heart or kidney patients.
3. The solid waste dumping site without environmental precautions may lead to serious health problem on livings things in this area.
4. Paper waste was collected from more in Doglore Naka area due to big market and hotels are located in that area and with less percentage was observed inmain city market.
5. Plastic waste was collected from Torode market, Shivaji Nagar and less from Amirabad and Bhagya Nagar area as compared to other areas.
6. Solid waste problem is very served. All solid waste is not collected for recycling purpose. It is general observation that the collected, recycled waste.
7. The Municipality gives some subsidies to the scarp houses owners to collect and transfer solid waste for recycling. This is helpful for minimizing the solid waste pollution.
8. The 3-R principal approaches (Reduce, Reuse, Recycle) is an appropriate methodology for solid waste management and also for the abatement of leachate induced groundwater pollution.
9. Reduction of solid waste generation at source may be achieved by various awareness campaigns in residential societies.
10. We recommended that proper collection, segregation, treatment and transportation of biodegradable, non-biodegradable and recycled waste should be carried out to stop the further to the natural environment.

❖ References:

1. Pawar R.S, July 2011, Solid Waste Pollution & Collection in scrap houses of Nanded,Maharashtra
2. Ashwini R Mishra, Anurag V Tiwari, Jan 2014 Solid Waste Management Case study

3. Debishree Khan, Sukha Rajan Samadder, October 2014, Municipal Solid Waste Management using GIS System.

4. Hamidu Abdulai, Raft Hussein, 25 March 2015, GIS based mapping and analysis of Municipal Solid Waste Collection System in Wa, Ghana

5. B. Shoba, Dr. K. Rasappan, 10 October 2013 Application of GIS in Solid Waste Managementfor Coimbatore City.

6. Shweta Karsauliya, 2018, Application of Remote Sensing and GIS in Solid Waste Management:A case Study of Surrounding of River Yamuna, India

7. Kafeel Ahmad, R. C. Trivedi, 2013 Municipal Solid Waste Management in Indian Cities.

8. Shaikh Moiz Ahmed, 28 April 2006, Using GIS in Solid Waste Management A case study for Aurangabad city, Maharashtra, India.

9. Ammar, Hussain Taleb, January 24,2007, GIS application in Solid Waste Management.

10. Syed Hafizur Rahman, November, 2009, Urban Solid Waste Management using GIStechnique: A case study on Mohammadpur, Thana at Dhaka of Bangladesh.

11. Trivedi, R.K and Goel, P.K (1984) In: Chemical and biological methods for water pollution studies. Published by Environmental Publication, Karad, Maharashtra (India).

12. www.nwcmc.gov.in