



Effect of Musi River Pollution on Human Anthropogenic Activities

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Abstract

At the present day the world is mainly focused on the depletion of the atmospheric ozone layer by environmental pollution. Environmental pollution is unfavorable alteration of our surroundings. The water is most important resource and one of the universal solvent, it is used by living organisms. The major source of water is mainly oceans, rivers, lakes, ponds and makes 65% of human body. The water is using for daily activities and also used for several industries may causes water pollution. In present study, an extensive investigation of physico-chemical parameters of water samples of river Musi located in Hyderabad was carried out. For this area sampling sites were selected along the river Musi in and around Hyderabad on affected areas like Himayath Sagar-1, Langer House-2, Govt. City college-3, Nagole-4 and Peerjadiguda-5 (Ground water). Water samples were collected during a month of February 2016. The observed values of different parameters such as Colour, Odour, pH, EC, TDS, Turbidity, CO₃, HCO₃, Cl, F, NO₃, SO₄, Na, K, Ca, Mg, TH, BOD and COD of samples were indentified in different locations in and around Hyderabad city.

Keywords: Monitoring, Parameters, Water pollution, Total Dissolved Solids (TDS), BOD and COD.

Introduction

Hyderabad is fifth largest city in India and capital of telangana state with a population of 12 millions. Hyderabad is the creation of the Quthubshahi rulers and located on the Deccan plateau along the Musi river. The physiography of Hyderabad is dominated by hills, monuments, tanks with a rich and varied heritage. Water is natural resource and it gives habitate for diverse types of aquatic life in rivers, lakes and oceans and human body contains two third percentage of water¹. Produce of waste water is due to increased population, urbanization, domestic, industrial and commercial sectors²⁻⁶. Day by day the world population increases the demand for food production, industrial activities and domestic purposes grows and leads to heavier withdrawals of the limited renewable fresh water resource⁷⁻⁹.

The major portion of the wastes disposed off into the atmosphere and the land is washed out by precipitation and runoff, filtration processes and human waste load accumulates in surface water bodies and ground water aquifers. Simultaneously these human activities generate wastes which are discharged into the depleted water resources despoiling them. The industrial wastage as well as domestic sewage/wastes are disposed in the rivers and release of wastes containing wide variety of organic, inorganic pollutants including solvents, Oils, grease, plastics, plasticizers, phenols, heavy metals, pesticides and suspended solids are hazardous substance into rivers, might lead to environmental disturbance¹⁰⁻¹².

The Musi river originated in Ananthagiri Hills located at Vikarabad Ranga Reddy District 90 kilometers to the west city of Hyderabad. The river flows through the Nalgonda district and the water is used for agricultural and horticultural purpose through small reservoirs. In the city of Hyderabad Musi flows through the telangana high court, Govt City College, Osmania general hospital, salarjung museum, state central library, Mahatma Gandhi bus station. Many bridges built on the river, which connects old and new city. The old bridge known as purana pul constructed by the Ibrahim Qutub Shah in 1579AD. New bridge at Nayapul near high court telangana other bridges at Dabirpura, Chaderghat, Amberpet, Nagole and Uppal Kalan in the city of Hyderabad. In the year of 1908 great flood was there on the Musi river. Much damage was there, 80,000 houses damaged and 15,000 people died. That is why Osman Sagar (dam) built by the engineer Nawab Ali Nawaz Jung Bhadur and later on Himayth Sagar dam was builded. The water was used for drinking purpose and through this water one lack hectors is cultivating at the down streams of the river Musi during and after the monsoon rains. In rural area the major crop is rice and grass is the crop in the city. Must River received large scale of untreated sewage from city of Hyderabad through industrial and domestic, disposal dumping sometimes medical wastage also dumped in the river. It is because rapid and uncontrolled urbanization. Due to water demand increased day by day in and around the greater Hyderabad, now drinking water inflows from Krishna, Manjeera and Godavari through the water pipelines to Hyderabad city and waste water release the city is disposed into the Musi river, Due to these reasons water smells unobjectable odour and people afraid to touch the river water. It became 6th

most polluted river in India declared by the Central Pollution Control Board (CPCB), India.

Sample Locations: Samples were collected at 5 sites in and around Hyderabad city, each site has 10km distance variation. site-1 Himayath Sagar, site-2 Langar house, site-3 Govt. City College, site-4 Nagole and site-5 Peerjadiguda.

Himayat Sagar: This place is situated at 17°18' North latitude and 78°21' East longitude. It is major reservoir for Musi river. Himayat Sagar was built by the 7th Nizam of Hyderabad (Who named the lake after his youngest son Himayat Ali Khan).

Langar House: This place is situated at 17°22'43" North latitude and 78°25'9" East longitude. Two reservoirs water combines before this site is also known as Langar Houz.

Government City College: This place is situated at 17°36'85" North latitude and 78°47'4" East longitude. Upstream of the site has partial water treatment plant at Attapur.

Nagole: This place is situated at 17.373576° North latitude and 78.568726° East longitude. This site is also having partial treatment plant at Amberpet, but much sewage inflows into this site, from nearby areas of the city and through Hussian sagar, Secundrabad sewage water also inflows into this site It is located east of Hyderabad city on inner ring road and Northern bank of River Musi.

Peerjadiguda: This place is situated at 17°24'25" North latitude and 78°35'17" East longitude. Ground water collected at this site, because this ground water is affected by Musi river.

Materials and Methods

Colour: Colour in the water is the result of dissolved extracts from metals in rock, from organic matter in soil and plants and from industrial products. Colour identified by visual method.

Odour: Odour is not a direct significance but it indicates the quality of water or pollution, Dark colour water usually gives unobjectable Odour.

pH (Hydrogen ion concentration): pH with a range of 0-14. pH meter is used to know pH of the samples.

Electrical conductivity (EC): EC expressed in $\mu\text{mho/cm}$. Standard conductivity meter has range of 1412 $\mu\text{mho/cm}$, electrical conductivity of samples are measured with EC meter.

Total dissolved solids (TDS): TDS concentration expressed in mg/L. A dish is evaporated at high temperature and cooled it in air and noted weight of the dish. Sample filtered through Whatmanns filter paper, the filtrate taken in evaporating dish and dried at high temperature and cooled then weight recorded.

Turbidity: Turbidity it contains mud and some minerals. It also represents and measures of the water quality. It is calculated with Nephelometer.

Alkalinity: Alkalinity in the presence of hydroxide (OH) carbonate (CO_3) and Bicarbonate (HCO_3). The compounds are mostly the carbonates and bicarbonates of Sodium, Potassium, magnesium and Calcium ions. It is calculated the units are of CaCO_3 mg/L by titration method.

Chloride: Chloride ions present in the sample reads with silver nitrate (AgNO_3) and forms silver chloride. Chloride estimated on titration method in the laboratory. It is calculated in mg/L units.

Fluoride (F): Fluoride measured with Ion Meter, The fluoride content in surface and ground water will depend on availability of the minerals. Which contain fluoride the porosity of the rocks and the reading is taken in mg/L.

Nitrate (NO_3^-): Nitrates are salts of nitric acid. UV-Spectrophotometer is used, Standard wavelengths are used to obtain and determine the nitrate. If it is more than standard wavelengths 10% sample taken to determine.

Sulphate: Sulphate measured by nephelometer the units are Nephelometer turbidity units (NTU), standard solution are used.

Sodium/Potassium (Na/K): A flame photo meter is an instrument used for measuring of metals. The estimation of sodium and potassium is based on emission spectroscopy, System gives Na, K readings.

Total hardness (TH): Ca and Mg: Total hardness determines the total concentration of calcium and magnesium ions reported as calcium carbonate. Hardness is due to the presence of carbonates, bicarbonates, chlorides and sulphates. TH is expressed as mg/L of CaCO_3 and measured by titration method.

Biochemical Oxygen Demand (BOD): The Biochemical Oxygen Demand (BOD) is used as a parameter to express the strength of sewage and amount of organic matter. If the amount of organic matter in sewage is more, the more oxygen will be utilized by bacteria to degrade it. Domestic and industrial dumping in the river digests the organic compounds results sewage percentage increases. BOD is estimated with winkler method, BOD is measured by incubating the samples at 20°C for the five days in the dark under aerobic conditions.

Chemical Oxygen Demand (COD): Solid concentration is important characteristic of sewage water. COD determines the oxygen required for the chemical oxidation of organic matter. Hence chemical oxygen demand (COD) is a better estimate of the organic matter, which needs no sophistication. The amount of organic matter in water is estimated by their oxidability by chemical oxidants.

Results and Discussion

Results and discussion of analyzed different parameters such as Colour, Odour, pH, EC, Total Dissolved Solids (TDS), Turbidity, Carbonate, Bicarbonate, Chloride, Fluoride, Nitrate, Sulphate, Sodium, Potassium, Calcium, Magnesium and Total hardness are within the permissible limit at some sites. BOD, COD exceeds WHO acceptable limits.

Colour: All sites data presents in Table-1. The colour is due to turbidity of suspended solid particles, pure water do not give any colour. Site-1 and Site-5 are colourless and other sites gives coloured water due to the waste dumping in the river.

Table-1
Colour

Site	Colour
Site- 1	Colourless
Site- 2	Grey
Site- 3	Black
Site- 4	Black
Site- 5	Colourless

Table-2
Odour

Site	Odour
Site- 1	Odourless
Site- 2	Unobjectable
Site- 3	Unobjectable
Site- 4	Unobjectable
Site- 5	Odourless

The Unobjectable Odour is because of waste dumping in the river it became sewage.

pH: As per investigations highest value of pH found at site-1 and minimum pH value at site-5.

Electric Conductance (EC): Specific Electric Conductance (EC) is used as a measure of water quality it determines Total dissolved solids of water and represented at 25°C temperature. It makes unsuitable water. Investigations reported that EC at 25°C have highest value at site-2 and minimum at site-1 and normal range is 750. Suspended solids are the reason for highest EC values at site-1 (Figure-1).

Table-3

Analytical report of water samples at proposed site in and around Musi river at Hyderabad

Site	pH	EC	TDS	Turbidity	Alkalinity	Cl	F	NO ₃	SO ₄	Na	K	Ca	Mg	TH	BOD	COD
1	8.11	461	295	21	151	30	0.64	1.09	30	15	2	56	19	220	7.8	13
2	7.15	2010	1286	28	546	260	1.82	6.88	55	263	3	114	38	440	18.7	28.9
3	7.11	1471	941	33	448	160	0.98	4.86	36	230	2	88	16	240	22	45
4	7.28	1495	957	40	363	180	0.94	6.98	95	159	1	80	38	560	32.4	68.4
5	7.05	1154	739	08	269	140	1.58	11.80	60	110	3	96	24	340	11.8	19

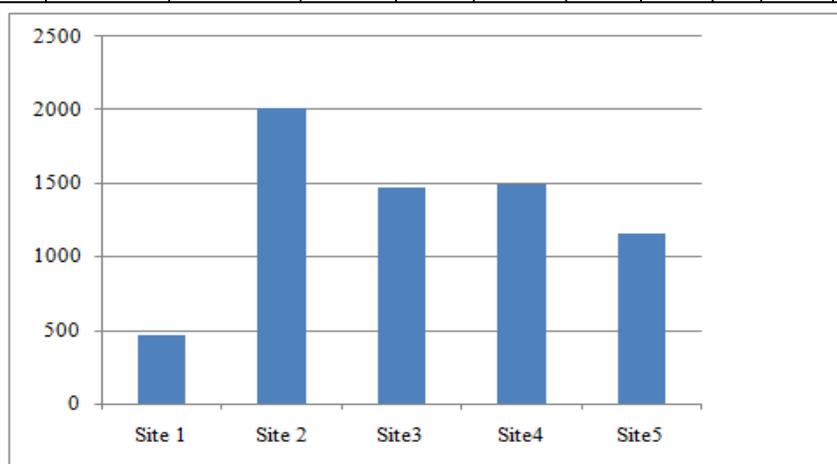


Figure-1

Electric Conductance (EC) investigated by proposed areas

Total Dissolved Solids: Total dissolved solids can be determined by measuring the EC. It is the measure of organic and inorganic substances dissolved in water are in suspended form. Results reveal that TDS is high at site-2. The high TDS is due to domestic wastage dump into the river and the site-2 do not having partial water treatment (Figure-2).

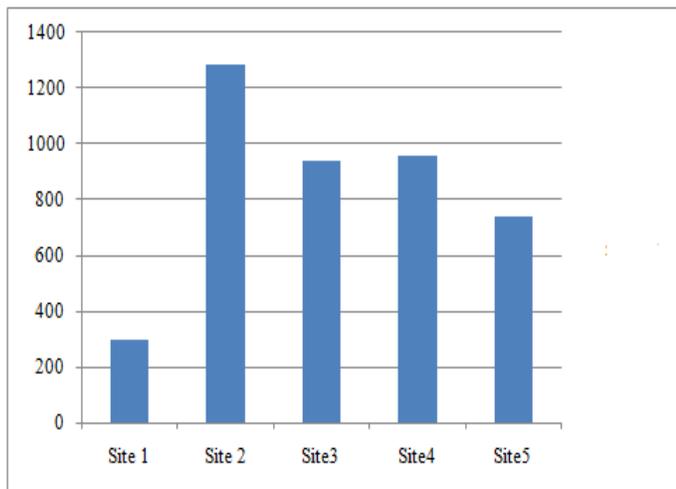


Figure-2
 Total Dissolved Solids investigated by proposed areas

Turbidity: Turbidity more at site-4 is because of more sewage than other sites (Figure-3).

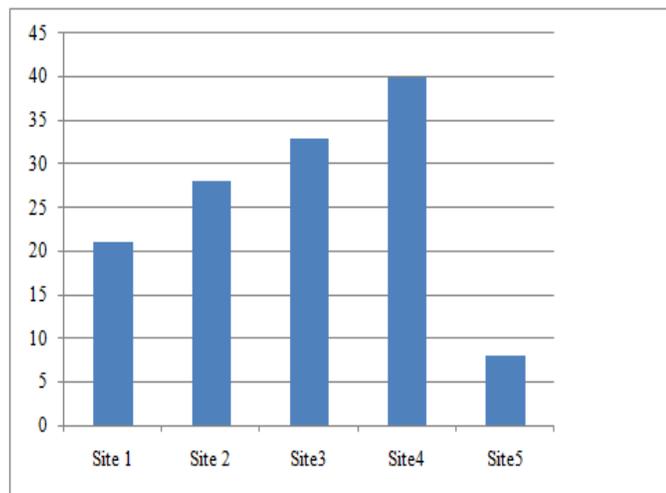


Figure-3
 Turbidity investigated by proposed areas

Alkalinity: Carbonate: Carbonate (CaCO_3) mg/L is nil at all proposed sites.

Bicarbonate: The alkalinity is due to the presence of bicarbonates in the form of calcium carbonate. In rainy seasons the river gives low alkalinity, results shows that alkalinity is

maximum at site-2 and minimum at site-1. It is due to the addition of industrial and domestic waste water (Figure-4).

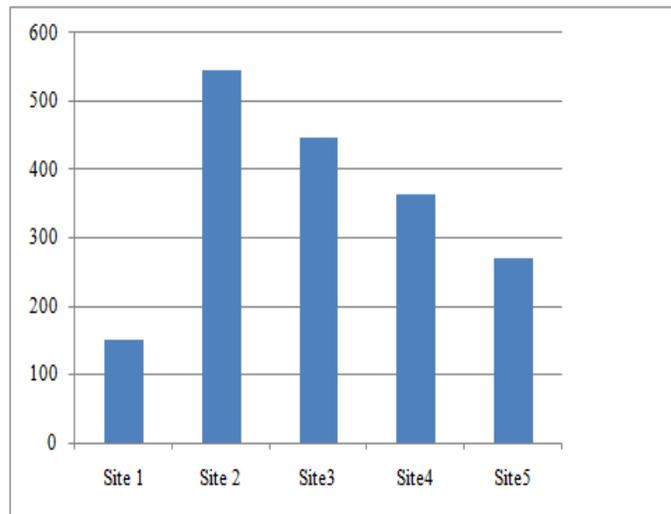


Figure-4
 Bicarbonate investigated by proposed areas

Chloride: In the water chloride concentration is varies. It is the major anion and generally available as Ca, Mg, Na chlorides. Site-2 has maximum and site-1 has minimum values (Figure-5).

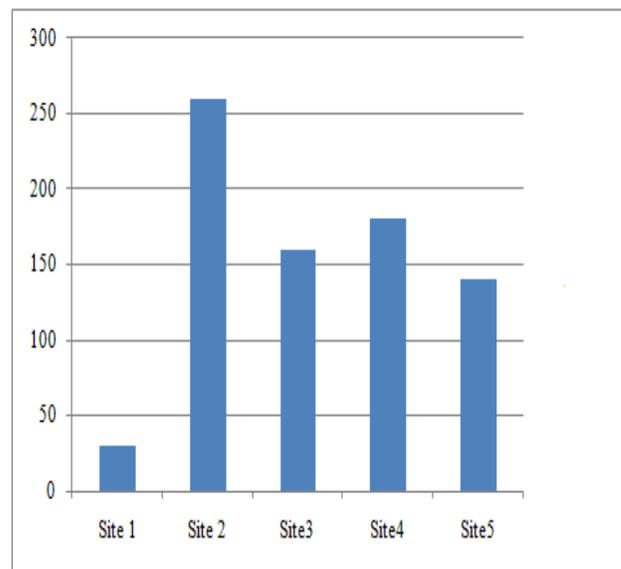


Figure-5
 Chloride investigated by proposed areas

Flouride: Fluorosis is the result of excess of fluorine in water, if the water contains fluoride range more than 1.5 mg/L effects on bone and teeth of human beings. Investigated values reveals that site-2 has highest value, other sites are in within range it is due to the water treatment at various locations of the river (Figure-6).

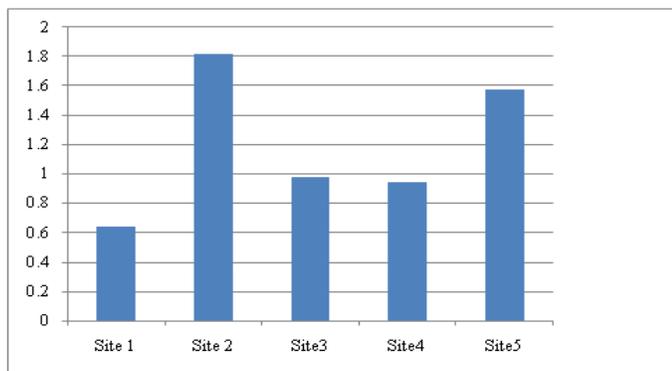


Figure-6
 Flouride investigated by proposed areas

Nitrate: Due to the industrial wastage and domestic wastage nitrate concentration increases. Site-5 having maximum value it is because the site is affected by Musi River. This water is polluted and not useful for drinking and agricultural purpose (Figure-7).

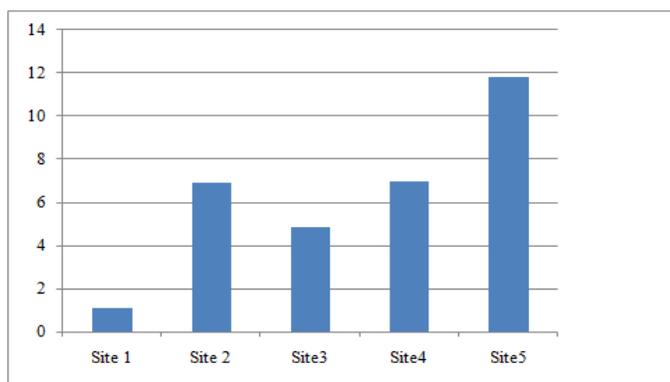


Figure-7
 Nitrate investigated by proposed areas

Sulphate: In general sulphate occurs in natural water, it is also an important anion for the hardness of water. Site-1 having maximum value which is in normal range.

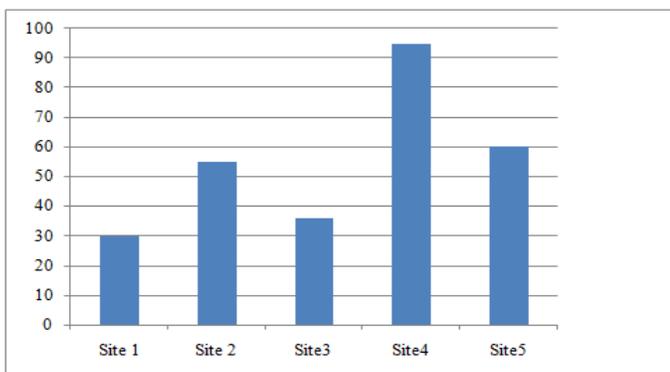


Figure-8
 Sulphate investigated by proposed areas

Sodium: Generally the sodium ions in water is good for health, risk level causes many diseases like high blood pressure, high content of sodium is also not suitable for agricultural purpose. Site-2 and site-3 are having high concentrations and site-4 and site-5 values are also more than marginal range, these are of very risk levels.

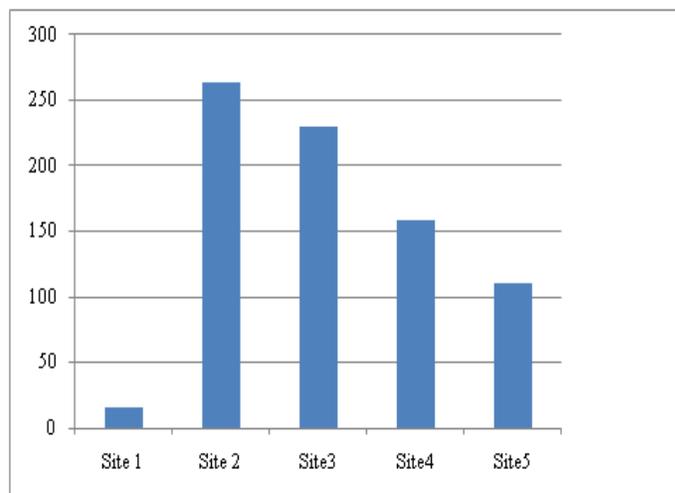


Figure-9
 Sodium investigated by proposed areas

Potassium: Potassium concentration is lower than sodium in common and the role is same as sodium. Potassium is in water gives good health to the limiting range. Here the results shows that the potassium is within range at all sites.

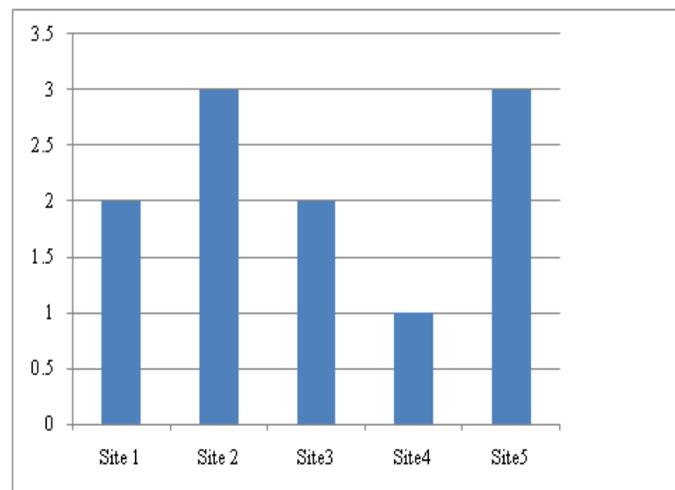


Figure-10
 Potassium investigated by proposed areas

Calcium: Calcium combines with carbonate, bicarbonate, sulphate and chloride. It is the main parameter to measure the hardness of water, it prevent the lather formation with soap. Investigating results reveals site-3 has more calcium concentration.

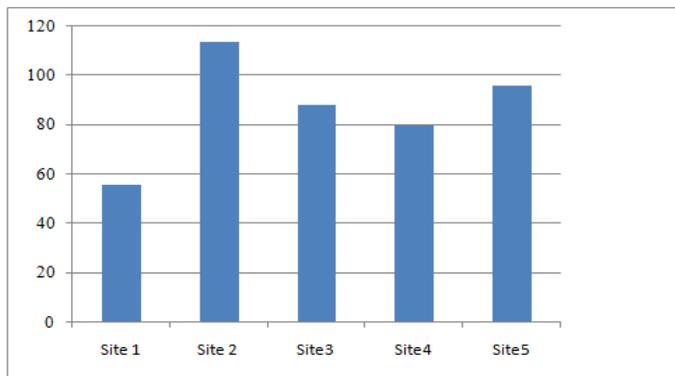


Figure-11
 Calcium investigated by proposed areas

Magnesium: Magnesium also causes hardness to water it is available in water as $MgCO_3$, $MgSO_4$ and $MgCl_2$ the site-4 has maximum concentration.

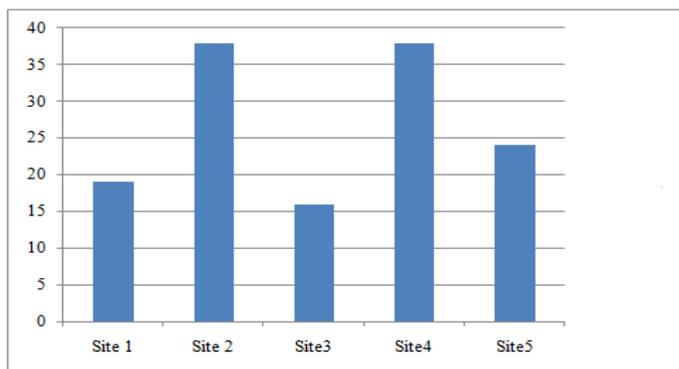


Figure-12
 Magnesium investigated by proposed areas

Total Hardness: The total hardness to the water due to the concentration of calcium and magnesium. The pollution of water is not due to total hardness, but hard water is not useful for domestic and agriculture. Given results represents that site-4 has maximum value and the range is not good at proposed sites.

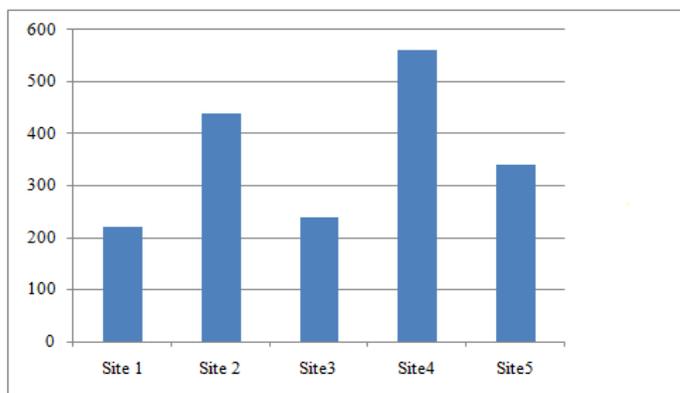


Figure-13
 Total Hardness investigated by proposed areas

Biochemical Oxygen Demand: The BOD levels more at site-4, it is because much dumping of plastic disposal and addition of Hussain Sagar polluted water, at this levels fishes can't survive, due to this reason at down streams of Musi river fisher men stopped fishing in Musi river.

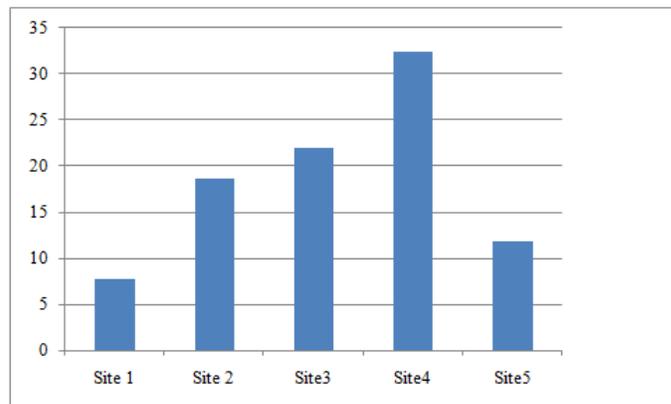


Figure-14
 Biochemical Oxygen Demand investigated by proposed areas

Chemical Oxygen Demand: The COD levels more at site-4, it is because much dumping and addition of Hussain Sagar water.

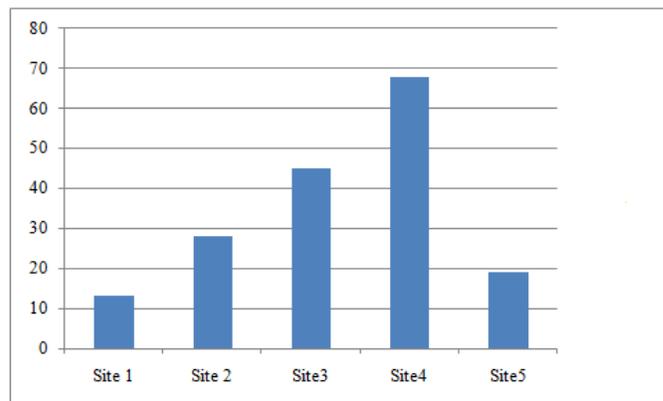


Figure-15
 Chemical Oxygen Demand investigated by proposed areas

Himayath Sagar (Site-1) having all parameters are within range, the water is in marginal range for the agriculture, this water without treatment not good for drinking purpose. Langer House (site-2) has maximum values of all parameters and are in unsuitable range, results represents that the water is unsafe for agriculture. Govt. City College (site-3) has unsuitable range parameters, this water also unsafe for agriculture because it has more sodium concentration. Nagole (site-4) is also have unsuitable parameters and the water unsafe for agriculture and domestic purpose. Peerjadiguda (site-5) is also have more values of all parameters nitrate is more at the site it is harmful for the human health. This water also have marginal range for agriculture and not suitable for domestic and drinking purpose.

Conclusion

In conclusion analyzed different parameters such as Colour, Odour, pH, EC, Total Dissolved Solids (TDS), Turbidity, Carbonate, Bicarbonate, Chloride, Fluoride, Nitrate, Sulphate, Sodium, Potassium, Calcium, Magnesium and Total hardness are within the permissible limit at some sites. BOD, COD exceeds WHO acceptable limits. The high level indicates that there could be low oxygen available for living organisms in the waste water. Whereas the high value of BOD is an indication of the contamination. The BOD levels in Musi at Nagole is 32.4 mg/L and at Govt. city college 22 mg/L and COD levels are 68.4 mg/L, 28.9 mg/L at respective sites. The more nitrate is harmful, excess of Fluoride causes fluorosis and BOD levels has an impact on the flora and fauna of the river and underground water surrounding it, Fishes in the river can't survive in this conditions and marine life is affected. Because of this polluted water people have major health problems in the city of Hyderabad and at the down streams of Musi river, are like arthritis, diarrheic, stomach pain, malaria, food poison, body pains, knee pains, kidney problems, skin allergies and jaundices diseases, poor eyesight, skin lesions, Many had miscarriages and also fisher men stopped fishing in the river, ground water also effected and are not useful for the cultivation with the pollution of Musi river.

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