Water Quality Assessment of Isnapur Polluted Lake using Remote Sensing and GIS Applications

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ABSTRACT

The Ground water and Surface water are the major sources for the drinking water. In Telangana, Isnapur areas, Hyderabad District, the major water supply is contaminated due to the rapid increase of population, industrial growth, activities of the people with industrial effluents discharged on the lake water and on the soil. The uncontrolled hazardous waste sites are involved in contaminating the ground water and surface waters. The Surface water and groundwater are contaminated it is difficult to restore the water quality. It is very much essential to protect the surface water bodies in order maintain the ecological balance and provide proper management plans for the conservation and water management. The Environmental problems are highly complex, and management procedures have to be developed to achieve coordination for need to initiate the environmental measures for protection. The contaminant in this lake was predominantly 2,4D and 2,6D organic compounds, which termed as the hazardous in the lake water. The study of Isnapur Lake water included physico-chemical and suitable remediation techniques were identified. A very less value of dissolved oxygen and a high amount of values for hardness, chlorides, TS, TDS were observed during all the seasons. GIS will serve as important computational tool and facilitate multi map integrations and will also assists in data capture and process. By using RS and GIS mapping its shows the lake water quality analysis effectively. The Satellite data and GIS has good potential to transfigure the groundwater and surface water monitoring and management in the future.

Key words: Surface water, Groundwater, Pollution, RS & GIS, Industrial Effluents.

1. INTRODUCTION

The Isnapur Lake situated in the Pashamylaram Industrial Estate is one of the natural fresh water lake systems in and around the Hyderabad. Due to the more industries developments and more population growth and fertilizers usage in the agricultural areas has led to the pollution of the Isnapur lake area. The Pashamylaram Industrial Estate is the main part of MedakDistrict;PatancheruvuMandal is about 35 Kilometers of the North East of Hyderabad City.

2. DESCRIPTION OF THE STUDY AREA

The Isnapur Lake is situated in Pashamylaram, Industrial Estate. It covers area of 0.5 km^2 approximately and in between 78º 10' N, 17º 34'

E and 78º 13' N, 17º 31' E which gets recharged by the rain water. The Isnapur Lake water surplus into other downstream tanks like Rudraram, Chitkul and Komatkunta. This Lake has a total catchment area approximately 25 sq. km. The location of the lake Isnapur with reference to the surroundings the lake water irrigates more than 200 acres of land. It is covered on eastern side by hilly The study area is situated at the coordinates of 160 By keeping this in view this study has taken for effective monitoring and management of ground water to promote sustainable development at study area.rock area of Isnapur village Western side by Rudraram Tank (kottacheru), northern side by NH– 9 and adjacent komatkunta and southerly by Mailarm village road. This Isnapur lake is natural situated at a hilly area at about 540 feet above the mean sea level and collecting the water drained from the near bythe higher grounds. The Geology of the catchments area is granite and granite nices. The Isnapur lake water is mainly used for agricultural purposes to grow Jowar and Paddy. Around 30 to 20 industries of various capacities of large, medium, and small manufacturing a variety of organic chemicals like drugs, and drug intermediates are located in the Pashamylaram industrial estate surrounding the Isnapur lake. Location and sample collection has shown in Figure 1.

3. OBJECTIVES OF THE STUDY

Preparation of base map using Survey of India Topo sheet and the Satellite imagery. And to create the surface lake water maps by integrating Spatial and Attribute Database.

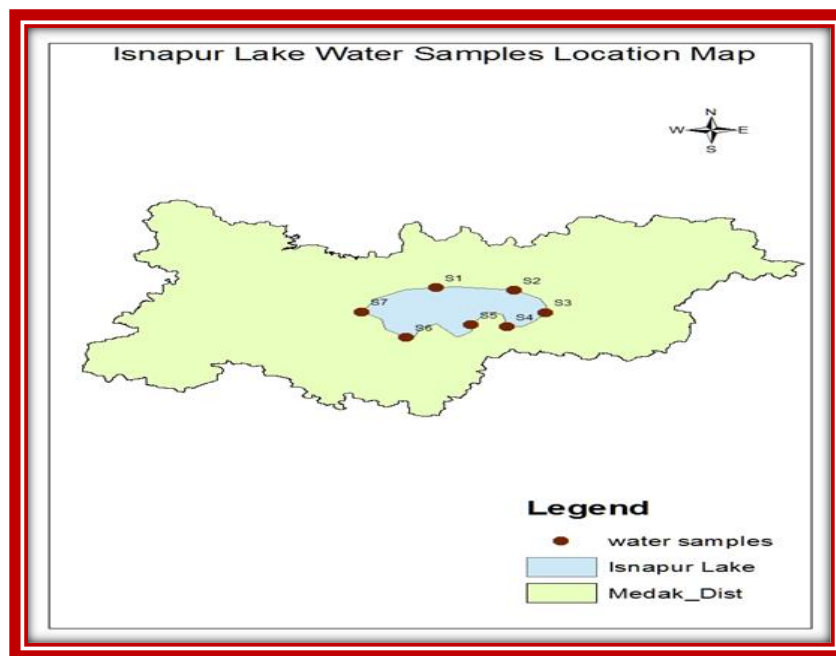**Figure 1. Location and sample collection Map at study area**

Figure 2. Pollution levels in summer season in study area

METHODOLOGY:

i.   Collection of different season's Satellite data and Base map prepared from SOI, for preparing the land use and land cover map.

ii. All seasons, satellite data of PAN (Panchromatic) and LISS-III (Linear Imaging Self Scanning Sensor) are geometrically corrected and enhanced.

iii. Then both LISS III and PAN satellite data are merged using principal component method and Cubic Convolution resampling technique. Finally, after map. Composition satellite imagery is printed in FCC in 1:50,000 scale.

iv. Updating land use maps with reference to base map and satellite photograph by

using visual interpretation techniques. The Preliminary quality check and necessary corrections are carried out for all the maps prepared.

v. The Land use maps were finalized by incorporating the field visit data observations.

vi. Surface lake water prospects maps are prepared by incorporating the values of lake water quality assessment. Necessary corrections are incorporated after the quality check for all the prepared maps. The environmental maps prepared are converted into soft copy by digitization.

vii. The Report was prepared with map representation, A4 size layout preparation, editing /composition and annexure preparation.

viii. The Preparation of Arc Map data file with exporting into Jpeg for land use and land cover map.

ix. Preparation of environmental map final deliverables in soft copy format for the submission.

x. The methodology for this lake study is also to assess the environmental condition of the Isnapur lake with respect to the level of pollutant concentration in the lake water.Considering the different methods in the lake water treatment like bioremediation, phytoremediation based on the quantity of the pollutants of lake waterbody. Recommendations to the development of the lake and concern of the protection of the lake ecosystem.

5. RESULTS ANALYSIS OF THE LAKE WATER:

The Isnapur Lake water samples are collected at a depth of 1 meter in different locations of Isnapur Lake and sampling were are done three seasons for one year. Physical and chemical analysis of lake water was done by the standard methods to find out the level of concentration of the pollutants in the Isnapur Lake waters. (All units are mg/l, except for pH, E.C, Turbidity) pH has no units, E.C units are μmhos/cms, Turbidity units are NTU.Physical and Chemical analysis of lake water inSummer Season has shown in Table 1.,Rainy Seasonhas shown in Table 2 and Winter season has shown in Table 3. And Pollution levels in various season of sampling station in study area has shown in Figure 2 (Summer Season), Figure 3 (Rainy Season) and Figure 4 (Winter Season).

Table 1.Physical and Chemical analysis of lake water in Summer Season.

S. NO	pH	EC	Turbidity	Alkalinity	TDS	Chloride	TS	P	N	DO	BOD	Hardness
1	9.1	4824	54	542	3040	720	3210	320	150	1.4	260	920
2	7.8	4286	38	485	2680	650	2820	220	112	2.4	184	880
3	7.6	4144	36	470	2720	640	2892	210	109	2.6	162	836
4	8.1	4684	48	490	2950	660	3040	260	123	2.1	208	892
5	7.6	4158	42	485	2680	630	2720	236	118	2.8	172	828
6	8.7	4785	58	512	3020	684	3160	292	134	1.6	222	884
7	8.9	4719	59	524	2978	695	3184	304	142	1.4	246	896

As per the analysis the values of pH, E.C, Turbidity, Total Soilds, Hardness, Alkanity, Chlorides and TDS, Nitrates and Phosphates and BOD values are high which indicates water pollution in the lake water in the summer season.

The analysis reveals that the water is not good at all the sampling locations in all parameters of water quality of the Lake water, were not within the limits.

Table 2. Physical and chemical analysis of lake water in the Rainy Season

S. NO	pH	EC	Turbidity	Alkalinity	TDS	Chloride	TS	P	N	DO	BOD	Hardness

1	8.6	4952	48	504	3124	680	3362	290	152	1.6	245	890
2	7.4	4288	32	462	2724	614	2920	190	108	2.6	162	840
3	7.2	4080	34	454	2640	606	2764	184	105	2.6	146	786
4	7.8	4512	38	478	2842	620	3120	232	118	2.2	188	862
5	7.4	4326	36	456	2756	596	2954	212	106	2.6	152	798
6	8.1	4892	42	488	3084	646	3252	252	136	1.8	192	854
7	8.2	4728	46	496	2985	658	3195	268	138	1.6	210	876

As per the lake water analysis is done for different parameters, the values of Phosphates, Nitrates, E.C, Turbidity, Total Soilds, Hardness, Alkanity, Chlorides and BOD and TDS values are very high which indicates there is water pollution in the lake during the Rainy Season.

Table 3. Physical and chemical analysis of lake water in the Winter Season

S. NO	pH	EC	Turbidity	Alkalinity	TDS	Chloride	TS	P	N	DO	BOD	Hardness
1	8.8	4886	48	552	3080	732	3220	326	156	1.3	272	924
2	7.6	4280	36	496	2696	652	2868	232	122	2.2	196	888
3	7.2	4376	36	482	2760	646	2912	218	116	2.5	178	834
4	7.8	4728	42	496	2982	672	3112	272	132	2.0	215	898
5	7.4	4296	38	492	2710	642	2844	244	126	2.4	184	832
6	8.6	4845	42	516	3052	698	3202	312	142	1.5	234	892
7	8.6	4776	44	520	3012	712	3186	320	150	1.4	252	896

As per the above analysis the values of pH, E.C, Turbidity, Phosphates, Nitrates, Total Soilds, Hardness, Alkanity, Chlorides and TDS, D.O and BOD values are very high which indicates there is badly water contamination and pollution in the Isnapur lake water during the winter season compared to other seasons.   In all seasons, water pollution is most prevelant in this lake season. Monitoring must be done properly there at all sampling locations, by adopting new technological solutions like pre-treatment of effluents before they are releasing in to the open atmosphere, periodical assessment of surface water quality to suggest suitable the remedial measures.
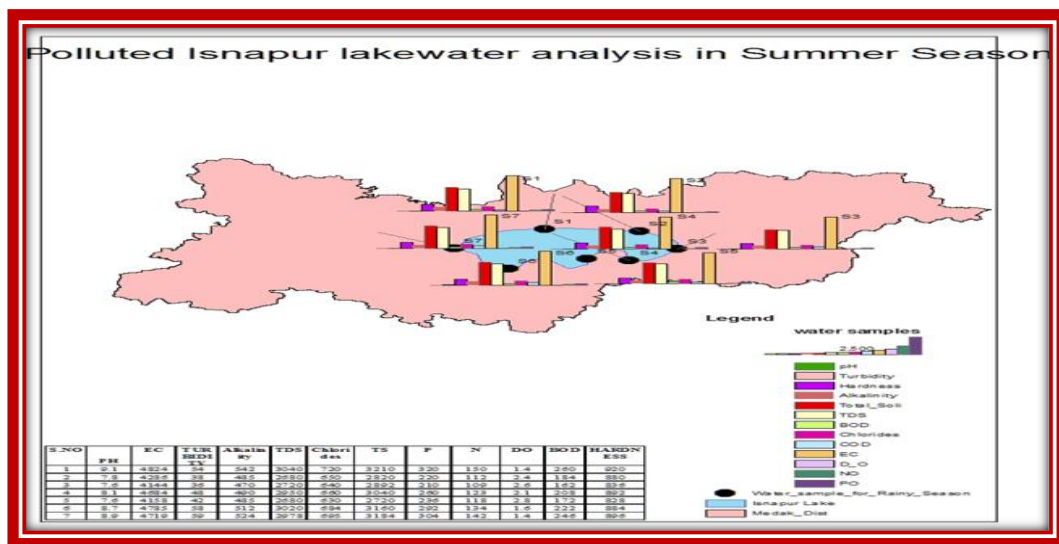

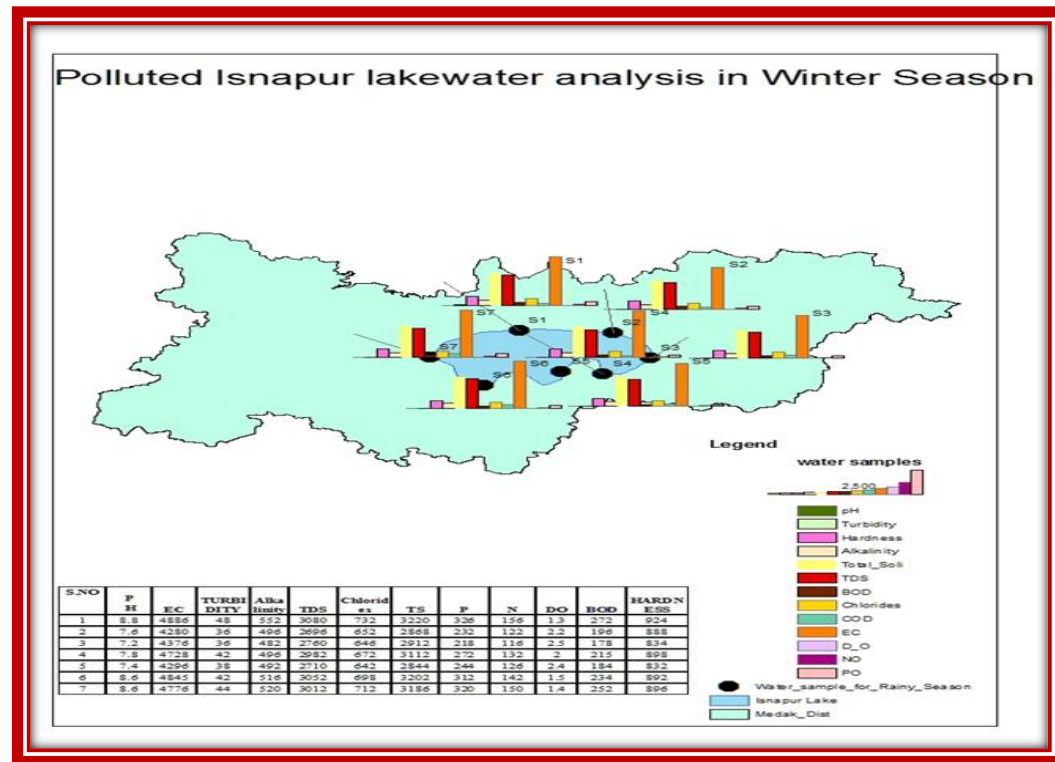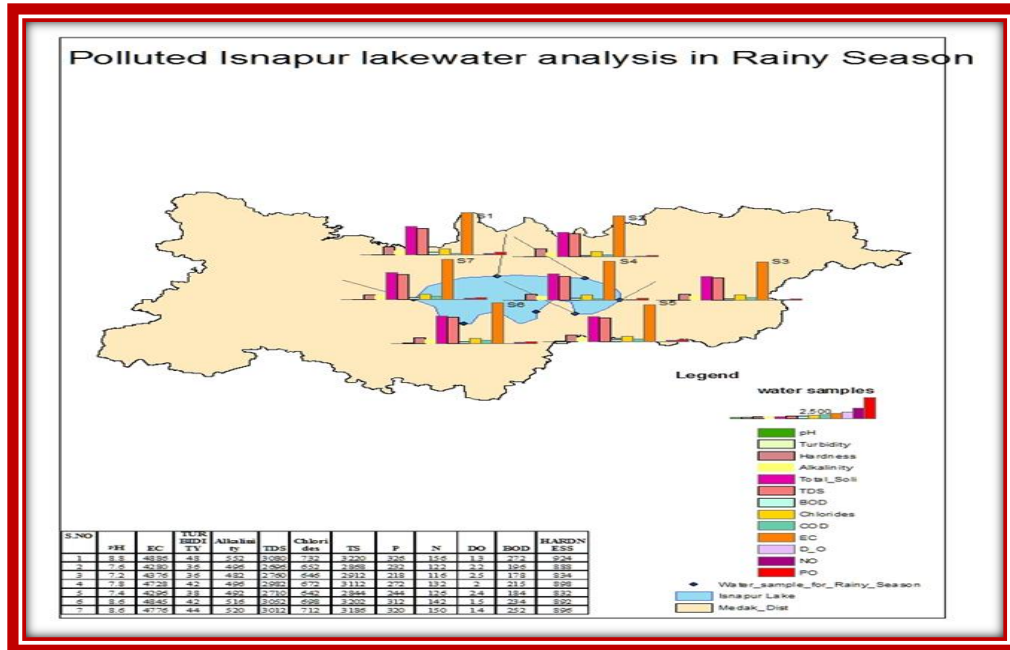**Figure 3. Pollution levels in Rainy season in study area**

Figure 4. Pollution levels in Winter season in study area

6.

CONCLUSIONS

1. The lake water quality is influenced by all three seasons, rate of consumption, and the activities of human beings. The present Isnapur Lake study analysis it was confirmed that the study area has been badly polluted and not suitable for the irrigation activities and for the domestic usages.Isnapur Lake proper

monitoring and management should be carryout periodically to assess the existed lake water quality conditions.

2. The essential steps in the protection of the lake waters to rejuvenate and conservation of the lake water is done by restoring the water quality by controlling the pollution through different remedial measures like bioremediation and phytoremediation.

3. Isnapur Polluted Lake water is focused on the water treatment analysis by using GIS spatial distribution mapping.By representing results in spatial distribution maps they can be used as future reference for easy understanding and correlation of the lake water quality at study area.

4. Mass awareness programmes to be implemented by NGO for recognition of the importances of lakes and aquatic biodiversity. The Public needs to be educated about importance of the lake waters for good health and steps to improve and protect the lake.

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