



## Current Status of Pollution in Sagar Lake Using Geoinformatics

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### Abstract

*Water Pollution is the presence of harmful and objectionable material in water to make it unfit for use. In recent time, quantity of fresh water is reducing day by day and there has been increasing awareness and concern about water pollution all over the world and new approaches towards achieving sustainable water resources have been developed globally. In general, problems affecting water quality and aquatic ecosystems are untreated domestic sewage, uncontrolled industrial discharges, deforestation and poor agricultural practices that result in soil erosion and leaching of excess nutrients and pesticides, ultimately polluting the water sources that we drink from. Similar is the case in the Sagar Lake, here the waste-water from all around is polluting the water day by day. In the past, it was fresh water natural lake but now it has been polluted. In order to understand the current status of pollution, author(s) have attempted to compare the result of chemical analysis spreads of pollutants in lake water observed on satellite images and finally identified four major spots. Further, spots on the basis of these studies planning can be made to abate this serious problem.*

**Keywords:** *pollution, water quality, chemical analysis, satellite image.*

### Introduction

Sagar district is located in the north central part of the state of Madhya Pradesh and occupies an area of 10252 sq. km. The district extends between the latitude of 23°10' and 24° 27' north, longitude of 78° 04' and 79° 21' east (fig.1.). Sagar Lake is situated in the heart of Sagar city (23° 50' N: 78° 45' E and 517 MSL) with an area of 82 hectares. It falls on the toposheets no. 55 I/9 and 55 I/13. It is a shallow natural lake which has been polluted due to ill-mannered discharge of pollutant from surrounding areas.

### Methodology

Water samples from five sampling locations namely: - S1-Near Hospitals, S2-Bus stand, S3 – Teen Madiya Mandir, S4- Chakra Ghat, S5-Lake, were collected during pre- and post-monsoon. The sample bottles were washed with nitric acid and after collection, analyses were performed as soon as the samples were carried to the laboratory. All the samples were stored in an ice chest.

### Results & Discussions

Sagar Lake is infested with environmental, ecological, biological and hydrological problems. Lake water quality is degrading day by day because of more and more developmental activities in the catchment area. The life of lake is also decreasing because of sediment entering into the lake through city waste water and catchment runoff during monsoon season. The major inflow to the lake is surface runoff which accounts for nearly 56% of the total annual flow. (NIH,2000). Eutrophication promotes excessive plant growth and decay which favors growth of certain weedy species over others, and is likely to cause severe reductions in water quality. The DO levels decline to hypoxic levels, fish and other marine animals suffocate. Finally, this ecosystem experiences an increase in nutrients, species such as algae experience a population increase (algal bloom). Hence, lake water becomes unfit for drinking, irrigation and domestic use. The alkalinity has exceeded due to improper drainage system. The

consumption of unsafe water has been implicated as one of the major causes of disease. (Pathak & Pathak, 2012). The concentration of Cu, is higher than the permissible limit, which is found much above than permissible limits, only in the month of June, due to the inflow of waste from garages automobiles servicing shop, painting shops for car décor, etc. (Nahid & Rohan, 2012). Nitrate ion assessment studies indicates that the concentration of nitrate is higher than permissible limit. The source of nitrate pollution in the study area is agricultural activities, human and animal wastes. Fertilizers were found as the main sources of nitrate pollution. (Jhariya et. al, 2012). The lake is grossly contaminated by the inflow of waste water and shows high levels of organic matter associated with coliform bacteria etc. The gradual accumulation of nutrients involving increased productivity and decrease biological diversity is responsible for deterioration of water quality. Higher values of suspended solids, chlorides, nutrients and organic matter have been observed near the Chakra Ghats compared to bus

stand area indicating that the drains joining the Chakra Ghat carrying the municipal wastes from residential colonies and the government hospital contain high pollution loads. The water near the bridge on Sanjaydrive has also high amounts of eutrophication. The Sagar lake has a great importance for the human activities, like boating, recreational, washing of cloths, bathing etc. As a result of these anthropogenic activities, dumping of liquid and solid wastes including garbage into the lake through open drain as well as flushing of solid waste lying along its back slopes has caused considerable deterioration in water quality. About 1/3rd of the town drains into Sagar Lake. Thus, accumulation of dead organic matter has threatened lake to eutrophic conditions. The satellite images showing the pollutions in the lake during pre-monsoon and post-monsoon seasons. In pre-monsoon image we can clearly see the accumulation of dead organic matter and in post-monsoon image the drains are adding the polluted water i.e. the pollutant into the lake water.

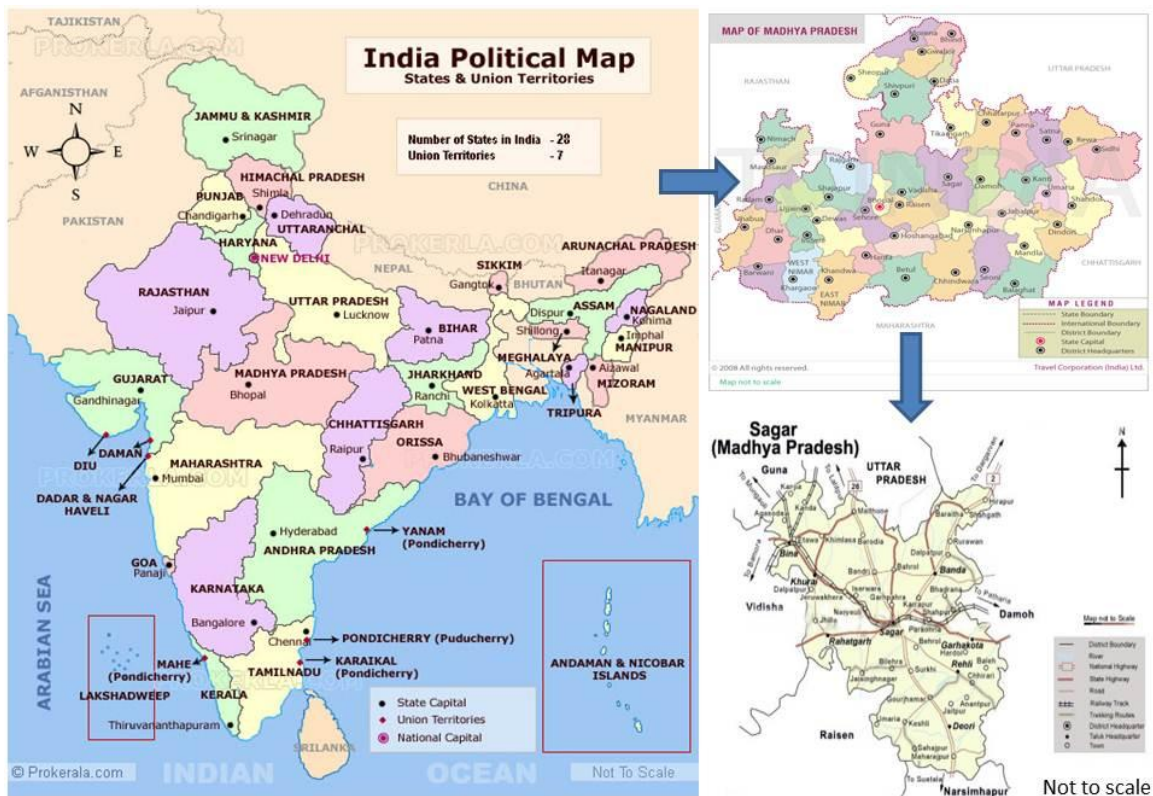


Fig.1. Location map of study area. (Source: Google Maps)

**TABLE.1. TDS, CHLORIDE AND COLIFORM BACTERIA CONCENTRATION AROUND LAKE WATER**

	TDS	Chloride (Cl)	Coliform Bacteria
Hospitals	441	70	1940
Bus stand	366	60	1880
Teen Madiya	834	200	1200
Chakra Ghat	1020	375	1380

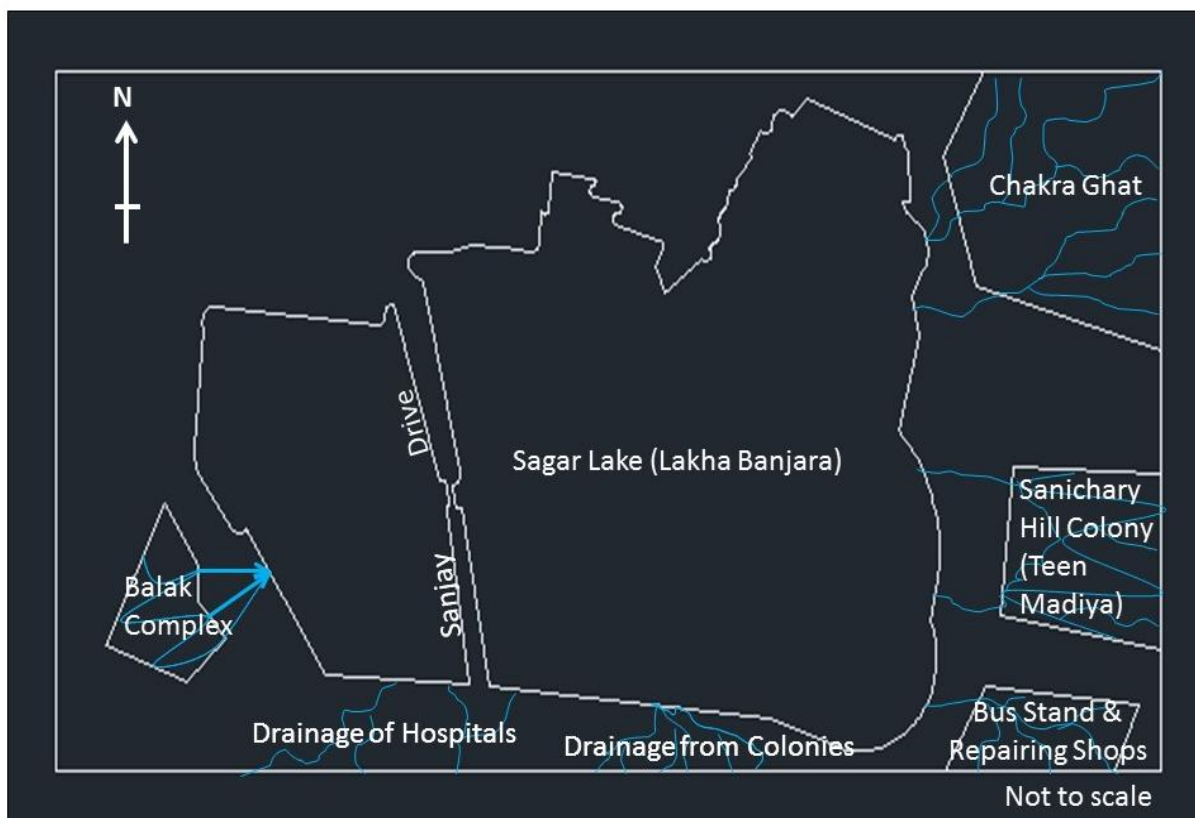


Fig.2. Base Map showing polluting spots. (Rawat et.al, 2013)

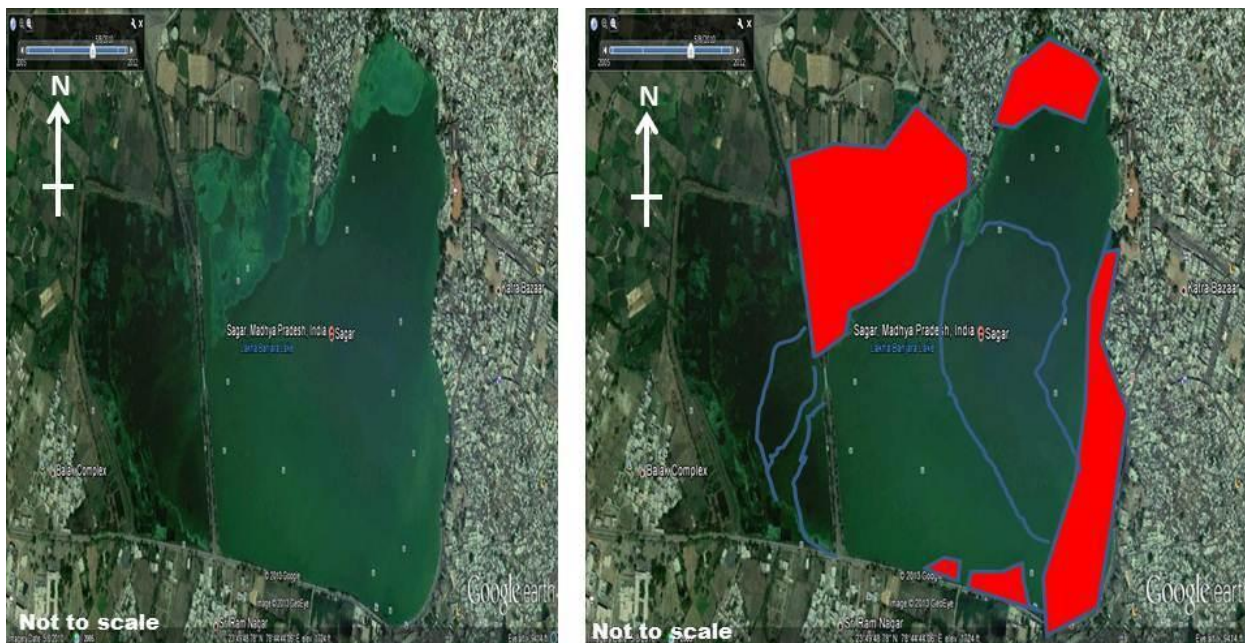


Fig. Satellite image showing pollution in Sagar Lake (Pre Monsoon)

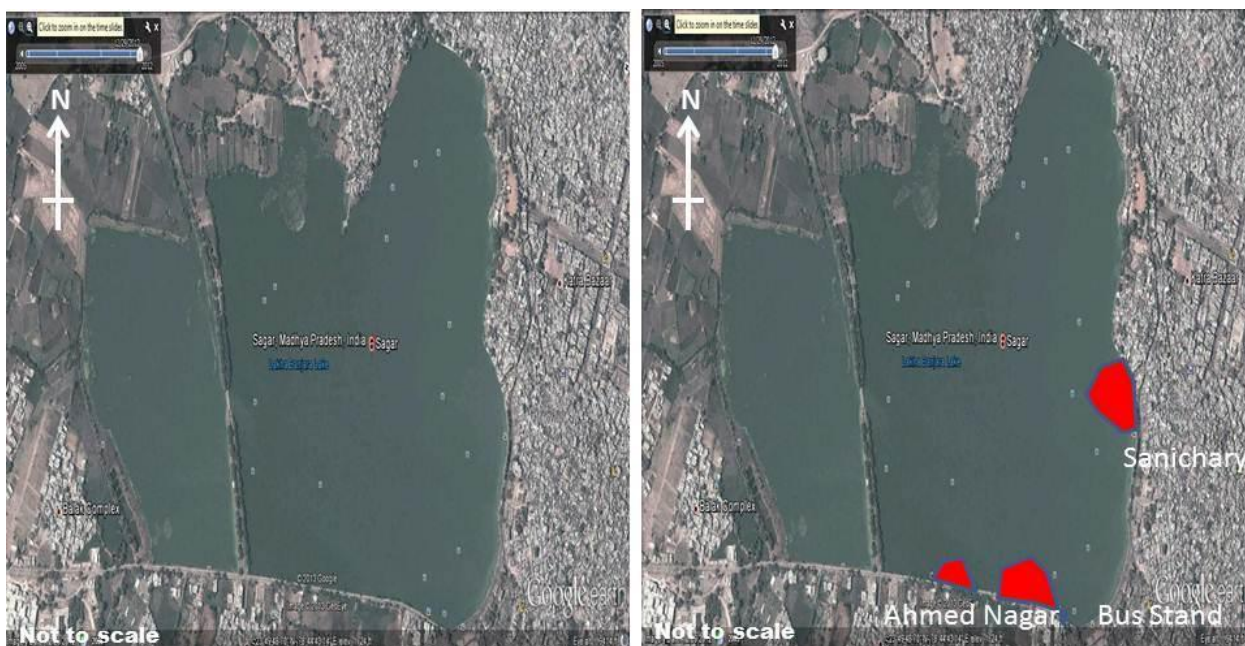


Fig. Satellite image showing pollution in Sagar Lake (Post Monsoon)

### Conclusion

Through, detailed remote sensing and chemical analysis of lake water, four main spots such as Hospitals (Chetaniya, Maurya, Tili District & Bhundelkhand Medical College), Bus Stand, Teen Madiya and Chakra Ghat areas from where pollutants are being directly added to lake water have been identified and marked on the base map (fig. 2.) on the basis of pre and post monsoon satellite data and chemical analysis of lake water.

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## References

1. Jhariya, D.C., Shandilya, A.K. & Dewangan, R. 2012. Nitrate Pollution in the Groundwater around Sagar Town, Madhya Pradesh, India. International Conference on Chemical, Ecology and Environmental Sciences. Bangkok. pp. 151-154.
2. Parveen, N. & Rohan, Y. 2012. Heavy Metal Contaminations in Sagar Lake and Drinking Water Sources of Sagar City. International Journal of Applied Biology and Pharmaceutical Technology. Vol. 3. pp. 379-389.
3. Pathak, H.&Limaye S.N. 2011. Seasonal study with interpretation of the chemical characteristics of water Lake in reference to quality assessment: A case study, Analele Universităţii din Oradea – Seria Geografie 2. pp. 233-238.
4. Pathak, H. & Pathak D. 2012. Eutrophication: Impact of Excess Nutrient Status in Lake Water Ecosystem, J Environ Anal Toxicol, Vol. 2. Issue 5. pp. 1-5.
5. Rawat, R.K. & James, N.F. 2013. Identification of Sources of Pollution in Sagar Lake Using Remote Sensing Techniques, Indian Cartographer, Vol. XXXIII, pp 373-375
6. Subramanyam, V. 1973 Geomorphology and its applied aspects of the area around Sagar (M.P.) University of Sagar, Ph.D. Thesis (Unpublished).
7. West, W.D. & Choubey V.D. 1964. The Geomorphology of the Country around Sagar and Katangi (M.P.). Journal Geological Society of India. Vol. 5. pp. 41-55.
8. WHO Guidelines to drinking water quality, World Health Organization, Geneva, 1983.
  - <http://www.indiawaterportal.org>
  - [http://en.wikipedia.org/wiki/Sagar,\\_Madhya\\_Pradesh](http://en.wikipedia.org/wiki/Sagar,_Madhya_Pradesh)
  - [www.googleearth.com](http://www.googleearth.com)