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Urbanization and Industrialization Impact on Surface Water in Coimbatore-Sulur Subwatershed

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Abstract*: *Industrial pollution and urbanization is a major threat to the water environment.The advent of urbanization and industrialization for economic growth has adversely affected the biological diversity. Lake water quality deterioration has been evident in the lakes surrounding the city of Coimbatore. The growth of industries in the city has led to the increase of population day by day in the city The present study is mainly aimed at studying the nature and impact of water pollution in the sub basins of noyyal river basin in coimbatore-sulur subwatershed which has a major impact on the Environment, Health and Socio-Economic status. To understand the magnitude of the impact, water samples were collected in and around the Coimbatore city namely Sulur lake, Singanallur lake, Valankulam, Ukkadam lake and Noyyal river stream which falls in Coimbatore-Sulur subwatershed and analyzed for physical, chemical and bacterial characteristics. The study showed that the chemical characteristics were relatively higher (TDS-957mg/l), (Cl-439.58mg/l), (NO_3-56.28mg/l) than the Bureau of Indian Standard acceptable limits and the presence of Escherichia Coli(60cfu/100ml) and Total Coliform(400cfu/100ml) are menacing in all the water samples leading to major health impact in human beings and also the quality of water is deteriorated.

Keywords* : *Lakes, Indian Standard, Pollution, Water Quality.

I. INTRODUCTION

Coimbatore-Sulur subwatershed falls under Noyyal river, it rises from the velliangiri hills and drains into the cauvery river at noyyal and flows through many villages and cities of coimbatore. The environmental conflict is due to the enormous growth of industrialization and urbanization[4]. According to the TNPCB 88 million litres of effluents after primary treatment are let out into Noyyal every day. The effluent discharged into the stream and land has severe impacts on agriculture, fisheries and drinking water.

A. Objectives

- To study the status of urbanization and industrialization in Coimbatore – Sulur subwatershed.
- To Analyze the surface water quality parameters, assess the impact and provide remedial measures.

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B. Study Area

The study area compress mainly Coimbatore city. It Tamil Nadu. It is one of the fastest growing cities in India and a major textile, industrial, commercial, educational, and manufacturing hub of Tamil Nadu.

(Fig 1) **Sulur lake** spreads over an area of 0.332 km^2 and the depth of the lake is 8.50 ft. Sulur comprises many cotton mills that come up with employment to people. **Singanallur lake** spreads over an area of 1.153 km^2 and has an average depth of 4.25 m (13.9 ft).

The lake is fed by canals derived from Noyyal river and also receives water from Sanganur drain and sewage water. **Valankulam** is one of the lakes which is situated between trichy road and sungam bypass road connecting ukkadam. A railway track connecting coimbatore junction and podanur also passes over the lake. **Ukkadam lake** is situated in Ukkadam, Coimbatore, it covers a neighbourhood of 1.295 km^2. The lake receives water from Selvachinthamani lake and has an outlet connecting it with Valankulam lake.

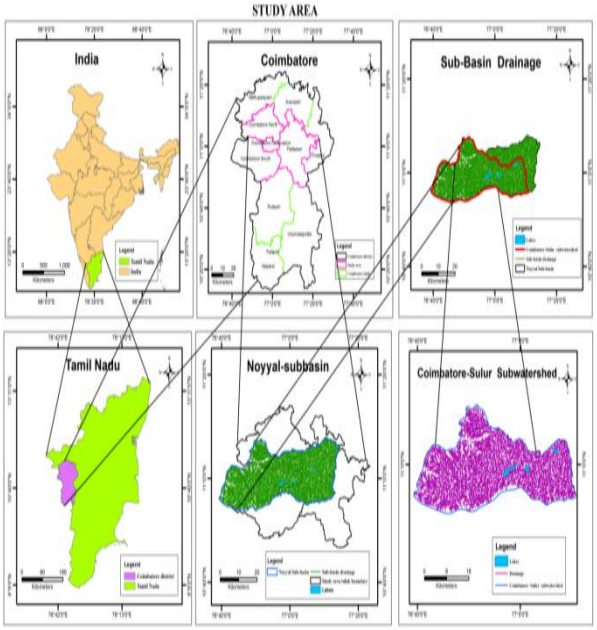
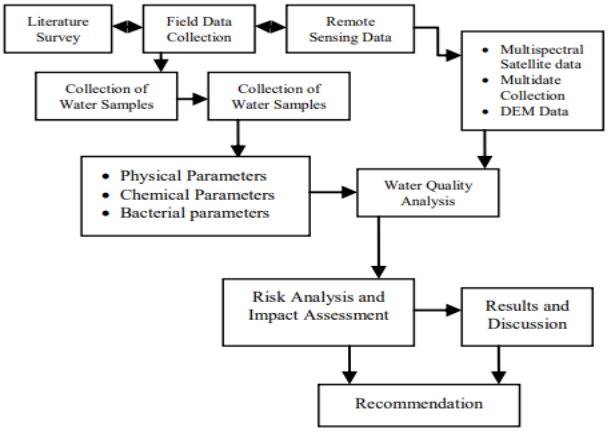


Fig 1: Study Area

II. METHODOLOGY

A detailed methodology of the study is to be carried out with a brief literature survey followed by collection and analysis of samples for the physical, chemical and bacterial parameters along with remote sensing data.



III. RESULTS AND DISCUSSION

Water samples were collected and analyzed in and around the Coimbatore city namely Sulur lake, Singanallur lake, Valankulam, Periyakulam and Noyyal river stream which falls in Coimbatore-Sulur subwatershed. Chemical parameters such as TDS and EC was above the acceptable limits in all sample locations exceeding upto 957mg/l and 1913µmhos/cm respectively. Mg and PO_4 was above the acceptable limits in all sample locations ranging high upto 73.02mg/l and 2.56mg/l respectively. The phosphate level on water exceeds the permissible limit is due to discharge of sewage, domestic waste and human activities[2]. COD was found to be above the acceptable limits of IS in all the sample locations ranging upto 2280mg/l due to domestic waste discharge into the river[3]. Hardness and BOD was found to be above the acceptable limits in Singanallur lake, Valankulam, ukkadam lake and noyyal river stream and exceeded upto 560mg/l and 166mg/l respectively. Nitrate and sodium is higher in Singanallur lake and Noyyal river stream ranging maximum upto 56.28mg/l and 110mg/l. Ca was found to be high in the noyyal stream exceeding upto 104.2mg/l. Copper was found to be above the acceptabe limits in sulur lake, singanallur lake and noyyal river stream and ranging upto 0.09mg/l. Chromium is high in noyyal stream exceeding upto 0.08mg/l. E.Coli and Coliform bacteria was found to be alarming in all sample locations ranged upto 60(cfu/100ml) and 400(cfu/100ml). (Tab 1) (Fig 2)

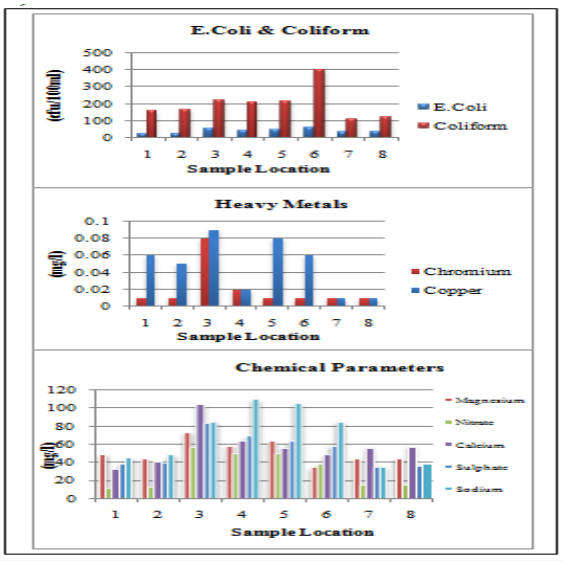


Fig 2: Results of analysis of water samples

C. Remote Sensing Data

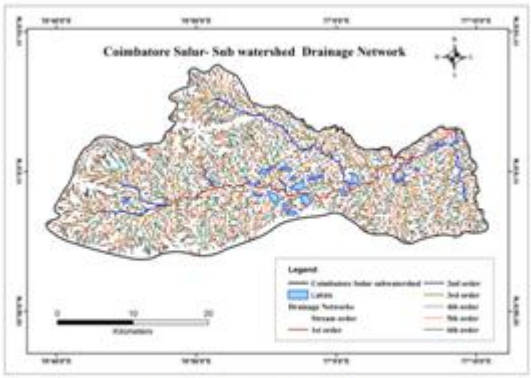


Fig 3: Drainage Map

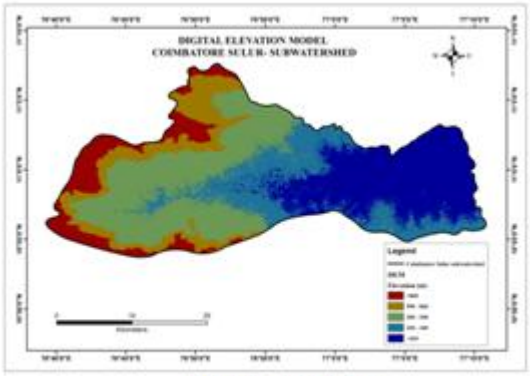


Fig 4: DEM Model

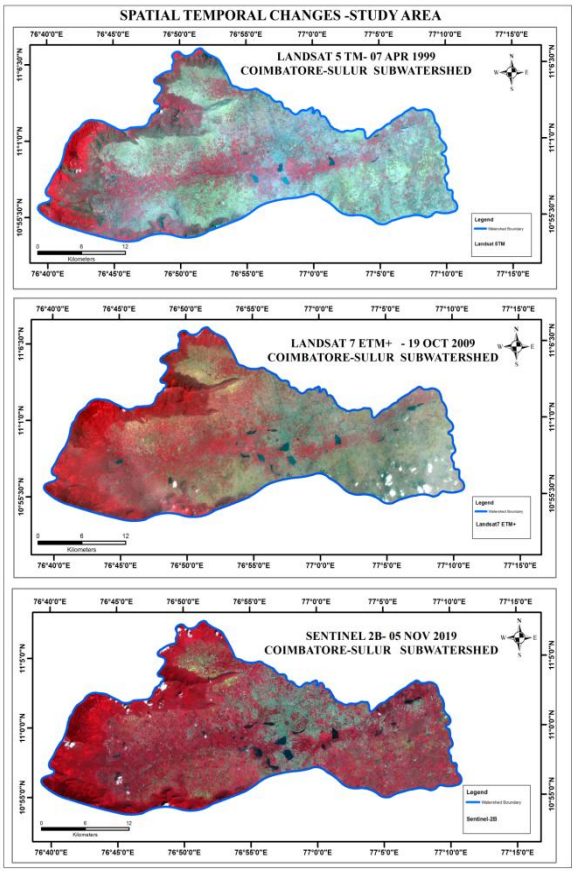


Fig 5: Spatial Temporal Changes (1999,2009,2019)

Tab1: Analysis of water samples

.No.	Parameter	RESULTS								
		sulur-1	sulur–2	noyyal river	singnallur-1	singnallur-2	valankulam lake	ukkadam-1	ukkadam-2	Acceptable Limit
1	pH at 27.0°C	7.22	7.32	7.28	7.82	7.61	7.71	7.45	7.44	6.5-8.5
2	Total Dissolved Solids (mg/l)	554	576	957	912.2	899	728	573	574	500mg/l
3	Electrical Conductivity (µmhos/cm)	1109.11	1245.11	1913	1825.02	1798.11	1456.02	1147	1149	500-1000µmhos/cm
4	Turbidity (NTU)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1NTU
5	Total Hardness as $CaCO_3$ (mg/l)	280.43	280.4	560.76	400.56	400.58	260.35	320.44	324.44	300mg/l
6	Chloride as Cl (mg/l)	226.08	255.24	439.58	368.68	311.96	354.5	241.06	243.89	250mg/l
7	Sulphate as SO_4 (mg/l)	38.55	39.11	83.12	68.98	63.2	58	35.11	35.28	200mg/l
8	Calcium as Ca (mg/l)	32.06	40.08	104.2	64.12	56.11	48.09	56.11	56.91	75mg/l
9	Magnesium as Mg (mg/l)	48.68	43.81	73.02	58.41	63.28	34.07	43.82	44.29	30mg/l
10	Nitrate as NO_3 (mg/l)	11.28	12.56	56.28	50.23	50.02	38.26	14.38	14.56	45mg/l
11	Sodium as Na (mg/l)	45	48	85	110	105	85	35	38	30-60mg/l
12	BOD(mg/l)	26	28	166	68	65	44	38	40	30mg/l (permissible)
13	COD(mg/l)	310	320	2280	650	646	580	320	324	250mg/l
14	DO(mg/l)	2.5	2.8	0.6	1.9	2	4.6	4.8	4.8	4-7 mg/l
15	Phosphate as PO_4 (mg/l)	0.86	0.92	2.56	2	2	3.24	0.96	0.98	0.1mg/l

16	**Chromium as Cr (mg/l)**	0.01	0.01	**0.08**	0.02	0.01	0.01	0.01	0.01	**0.05mg/l**
17	**Copper as Cu (mg/l)**	**0.06**	**0.05**	**0.09**	0.02	**0.08**	**0.06**	0.01	0.01	**0.05mg/l**
18	**E.coli per 100ml (cfu/100ml)**	**24**	**26**	**56**	**44**	**48**	**60**	**35**	**38**	**Nil**
19	**Coliform bacteria per 100ml (cfu/100ml)**	**160**	**164**	**224**	**210**	**214**	**400**	**112**	**124**	**Nil**

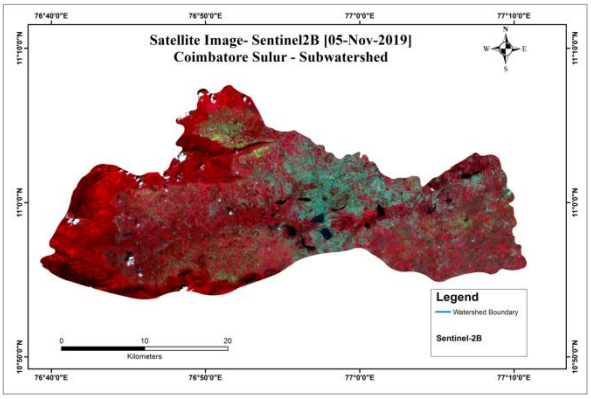


Fig 6: Sentinal 2B Satellite Image

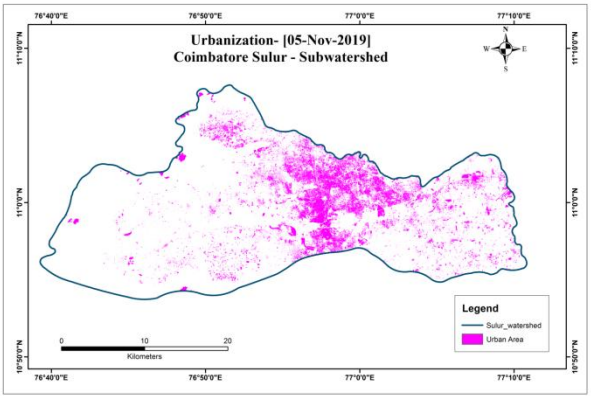


Fig 7: Urban Settlement 2019

IV. IMPACT ASSESSMENT AND REMEDIAL MEASURES

- Consumption of this highly polluted water causes serious ill effects to human such as cardiovascular disease, heart problems, dehydration, bone and muscle problems, asthma, brain tissue damage and gastrointestinal disease.
- Eutrophication , an increase production in algae and aquatic plants which causes deterioration of water quality, depletion of fish species and reduction of oxygen concentration.
- The unsafe use of wastewater in agricultural land can lead to accumulation of microbiological and chemical pollutants in crops and also affect the quality of soil.
- Water pollution also disrupts the natural food chain.

Continous periodical monitoring of the lakes through advanced techniques such as remote sensing is recommended. Dumping of muncipal waste and also discharge of industrial waste into the lakes should be eradicated. Increase in social awareness regarding the conservation of water among the public should be encouraged and improve the technologies to safeguard the quality of water.

V. CONCLUSION

The quality of water is highly contaminated in around the coimbatore-sulur subwatershed due to anthropogenic factors such as industrialization and urbanization. Various industries such as steel, automobile, textile and plastic industries play a vital role in polluting the quality of water. Urbanization is another factor which affects the water quality as the population is increasing day by day in coimbatore due industries and job opportunities. The lake water is unfit for drinking purpose as it is highly polluted with heavy metals, organic matter, TDS, Mg, Cl etc. The exsistence of faecal coliform bacteria in water samples indicate the presence of pathogens responsible for water borne diseases. Consumption of this polluted water causes serious ill effects in human beings[1], aquatic organisms and livestock. The degradation of water quality also has several other direct and indirect implications such aas change in cropping pattern, decrease in agricultural productivity etc. Thus effective techniques and methods should be engaged to safeguard the water environment such as cleaner production and waste minimization are to be encouraged. Regular monitoring of the lakes, collection of domestic waste and setting up common effluent treatment plants would control pollution and prevent the depletion of water quality.

REFERENCES

1. Govindarajalu k, (2003) Industrial Effluent anf Health status- A case study of Noyyal river basin, Proceedings of the third International conference on Environment and health, Chennai, India. Pages 150-157.

2. Usharani K, Umarani, Ayyasamy P M, Shanthi K, Lakshmanaperumalsamy P, (2010) Physico-Chemical and Bacteriological Characteristics of Noyyal River and Ground Water Quality of Perur, India, J. Appl. Sci. Environ. Manage, Vol.No.14(2), pp.29-35.
3. Mariraj Mohan S and Vanalakshmi (2013), Assessment of water quality in Noyyal River through water quality index, International Journal of Water Resources and Environmental Engineering, Vol.No.5(1), pp. 35-48.
4. Jeyaraj M, Ramakrishnan K, Jai Anandhi A, Arunachalam S and Magudeswaran P.N, (2016) Investigation of physico – Chemical and biological characteristics of various lake water in coimbatore district, Tamil Nadu, India, Oriental Journal of Chemistry, Vol.No.32(4), pp.2087-2094.
5. Nirmala Chockalingam, Sambhasan Banerjee and Sridevi Muruhan, (2019) Characterization of Physiochemical Parameters of Textile Effluents and its impacts on Environment, Environment and Natural Resources Journal, Vol.No.17(2), pp.41-53.

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