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

Augustine Crispin C, Sivakumar R

Abstract: Industrial pollution and urbanization is a major threat to the 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 noyayal 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 sub watershed 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), (NO3-56.28mg/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 noyayal and flows through many villages and cities of coimbatore. The environmental conflict is due to the enormous growth of industrialization and urbanization[26]. According to the TNPCB 88 million litres of effluents after primary treatment are let out into Noyyall 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.

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.

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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 PO₄ 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. 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. 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 nooyal stream exceeding upto 104.2mg/l. Copper was found to be above the acceptable limits in sulur lake, singanallur lake and noyayal river stream and ranging upto 0.09mg/l. Chromium is high in noyayal 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)
Tab1: Analysis of water samples

| No. | Parameter                                      | RESULTS                                                                 |
|-----|-----------------------------------------------|-------------------------------------------------------------------------|
|     |                                               | sulur-1 | sulur-2 | noyyal | singnallur-1 | singnallur-2 | valankulam | 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 | 191    | 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 CaCO₃ (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 SO₄ (mg/l)                         | 38.55   | 39.11   | 83.1   | 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   | 73.0   | 58.41        | 63.28        | 34.07      | 43.82      | 44.29      | 30mg/l  |
| 10  | Nitrate as NO₃ (mg/l)                          | 11.28   | 12.56   | 56.2   | 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     | 228    | 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 PO₄ (mg/l)                        | 0.86    | 0.92    | 2.56   | 2            | 2            | 3.24       | 0.96       | 0.98       | 0.1mg/l |

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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. Continuous periodical monitoring of the lakes through advanced techniques such as remote sensing is recommended. Dumping of municipal 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 existence 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 as 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.
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