

# Impact of Land Use Land Cover Changes on Water Quality of Mithi River, Mumbai

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**Abstract-** The aim of this research is to find out the impact of land use land cover changes on water quality of Mithi river and to determine the current water quality status of river. Freshwater is a valuable natural resource whose quantity and quality is essential for sustainable development. The changes in LULC can affect the quality of water either positively or negatively hence to prevent water contamination and pollution at the source level, it is important to understand the impact of land use pattern on water quality. Many catchments in Mumbai including Mithi river catchment have been negatively affected by the deterioration of water quality, This study therefore aimed at assessing the impact of LULC changes on water quality. Three sampling stations across the pre and monsoon post seasons for year 2004, 2012 and 2017 is considered. Land use land cover analysis will be conducted using GIS and statistical software.

**Keywords-** Land use Land cover, water quality, Mithi river catchment

## I. INTRODUCTION

Water is a prime natural resource, a basic human need and a precious natural asset. However, many rivers have been observed to be negatively affected by the deterioration of water quality. The quality of water is of utmost importance in today's world as it directly affects the human and ecological health and use of water resources.

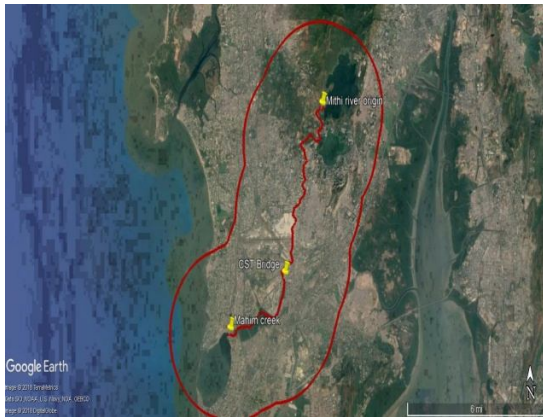
Concerns over the impact of land use on river water quality are not only restricted to local and national levels but they are also found worldwide in both developed and developing countries. These concerns arise from continuous pollution problems relating to sources of water supply for drinking purposes, ecosystem health, water quality problems are found to be associated mainly with land based developments, the impact of rapid urbanization encroachment or catchment protection zones and from other social and economic activities. These adverse effects, as a result of poor land use planning and unsustainable land management practices, tend to adversely impact water quality.

The Changes in land use land cover can affect the quality of receiving water bodies in order to prevent water contamination and pollution at the source level, it is important to understand the impact of land use on water quality. This knowledge will help to improve land use planning to manage and mitigate any adverse impact of river water quality and ecosystem present in river (Ang Kean Hua 2017). The free satellite imagery provided in global landcover facility which can be used to prepare the land use maps as attempted in many studies has certain limitations such as resolution may be lower or medium and it is difficult to obtain latest image hence to overcome this problem Google Earth imagery can be used which gives clear view of buildings, roads etc hence can be used for land use mapping (K. Malarvizhi, S.V. Vasantha Kumar *et al* 2015). Understanding the relationship between land use and water quality is helpful for identifying primary threats to water quality, and the relationships are meaningful for effective water quality management because they can be used to target critical land use areas and to identify relevant measures to minimize pollutant loadings (Jiao Ding *et al* 2015). Major land cover changes in Mumbai during the 2004 and 2013 according to integrated impact assessment of Mithi river (IIT Bombay *et al* June 2014). By using geographic information system and remote sensing, this research investigates the associations between changes in LULC changes and water-quality trends in the Mithi catchment.

## II. MATERIALS AND METHODOLOGY

**STUDY AREA:** The Mithi river also known as "Mahim River" is a river on Salsette Island the island of the city of Mumbai India. It flows for a total of 15 km before it meets the Arabian Sea at Mahim Creek flowing through residential and industrial complexes of Powai, Saki Naka, Kurla, Kalina, Vakola, Bandra-Kurla complex, Dharavi and Mahim. The catchment has an area about 7295 hectares the mean annual precipitation is about 2430mm. As the river has been polluted by dumping of raw sewage, industrial waste and municipal waste into the river. Besides this, illegal activities like washing vessels, animals and oily drums, discharge of unauthorized hazardous waste are also carried out along the course of this river. When the river was not as polluted as it is

today, it used to serve as an important storm water drain for Mumbai but as it has been used as a sewer over the years, its importance as a storm water drain has reduced and on the contrary, it poses as a hazard during high tide bringing polluted water into the city and flooding the city



Source: Google Earth

Fig1:Red Boundary Showing Location of Mithi catchment area

The research required collection of existing land use information ,conducting field water sampling and measurements, analysis of water quality sample for the selected physiochemical and microbiological parameters.

A total three water quality sampling stations were selected:

**Stn1 : Mithi river origin :** The location of origin of Mithi river is behind BMC water works office. The river is accessible and is full of hyacinth indicating sewage coming to the river from Vihar lake overflow.

**Stn2: CST bridge:**This sampling point is surrounded by many small scale industries including Recyclers, Barrel cleaners, workshops and other units. This area has thick density of population.

**Stn3: Mahim creek:** This area is surrounded by residential areas of Police colony, Fisherman colony and many slums surrounded the river. The span from Mahim creek to Dharavi has a very thick mangroves and area includes Salim Ali Bird sanctuary.

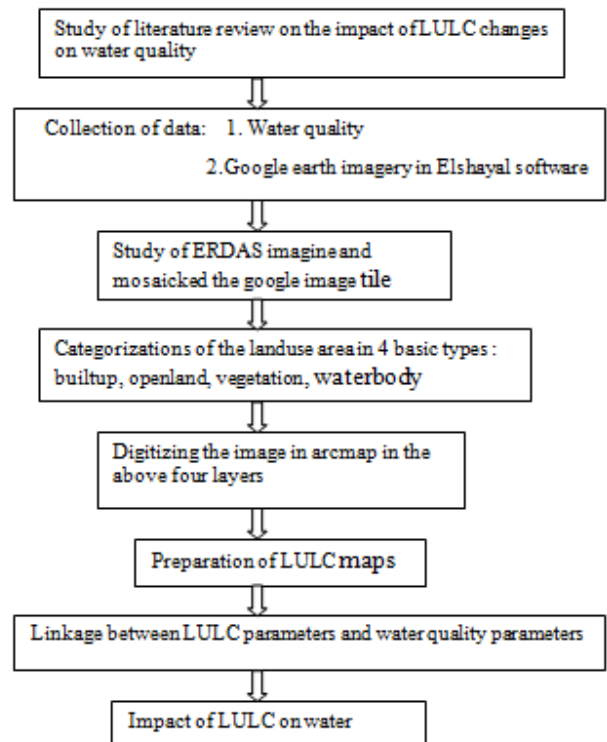


Fig.2: Flow chart of methodology of impact of LULC on water quality

### III. DISCUSSION

The selected parameters for assessment of water quality are pH, C.O.D, B.O.D, dissolved oxygen, total phosphate, T.D.S, alkalinity, chlorides, nitrate, sulphate, suspended solids, lead, the water quality testing will be done according to the standard laboratory procedure .

The land use data will be generated using google earth imagery ,336 individual tiles of google earth images covering the watershed area of Mithi river were extracted using Elshayal smart open source software for the three years 2004.2012 and 2017 and then they were mosaicked in ERDAS imagine software and digitized using Arc GIS 10.3.1.The given area is divided into four LULC classes which are open land, built up land ,vegetation and water body.For this research the water quality data of May and September 2004 ,2012 and 2017 is collected from Maharashtra pollution control board, Mumbai.In this research the impact of various LULC changes across the course of river on water quality of Mithi river is studied.

### IV. CONCLUSION

The various land use land cover patterns will affect the water quality parameters either positively or negatively by

analyzing that, This research will be useful for carrying out the proper and sustainable land use practices in the future and will be helpful to know the status of the river so to improve the water quality status of the river. GIS and RS are the best tool to determine the various land use land cover patterns in the area.

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