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Urban Environment and Water Quality: Insights from Karamana River Basin, Thiruvananthapuram, Kerala, India

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Abstract

This study mainly focuses on the water quality and urban influence in parts of the Karamana River. The water quality parameters of six selected sites within the urban area were considered. Physico-chemical and biological parameters of water quality were analysed for 2019 (pre-monsoon, monsoon, and post-monsoon). Results have shown a distinct variation of parameters in the less built-up areas than that of the more built-up areas. The indication of the effect of urbanization on water resources has been demonstrated. The pH at Thiruvallom was 5.8, which is located at downstream. The conductivity values range from 69.38 µs/s to 605 µS/cm and from 46.5 µS/cm to 615 µS/cm, and from 76.25 µS/cm to 559.6 µS/cm during pre-monsoon, monsoon and post-monsoon seasons. Ca > Na > Mg > K was the order of cation abundance for the study area. The TC value was 43100 cfu/100ml in Moonnattumukk station. The DO was very low in locations at Moonnattumukk, Thiruvallom and Pallathukadav. Though the deterioration of water quality was limited to a few localized zones, the trend of the quality change was distinct.

Keywords: Land Use/Land Cover, Urbanization, Water Quality, Physico-Chemical and Biological Parameters.

Introduction

The gradual increase in the human population has an effect in the change of both spatial and demographic characteristics (Davis, 1965). The main consequence of urbanization is the spatial expansion of the cities into their intermediate surroundings to house the rising urban population (Mosammam *et al.*, 2016). This affects the elementary amenities and facilities in the urban environment like housing, sanitation, water supply, transport, *etc*.

Contamination of groundwater and surface resources occurs mainly through two ways: diffuse and point sources (Sudhakar and Mamatha, 2004). Pollutions from point sources mainly include the effluents from industries, untreated domestic sewage and waste from sewage treatment plants. The source of diffuse pollution is from anthropogenic activities, like the usage of fertilizers and pesticides in agricultural fields, or from natural geogenic contamination of groundwater sources. The availability of proper sanitation facilities reduces and the direct discharge of wastes in surface water increases the contamination (Subhendu, 2000). But the seepage of waste into the groundwater from faulty pit latrines or septic tanks along with the surface run off and infiltration affect the groundwater quality (Floehr *et al.*, 2013). Characterization of water quality is very essential for identifying the problems for the optimal uses (Chang, 2005; Steven, 2008; Lalitha and Mohammed-Aslam, 2018; Raj *et al.*, 2018; Rizvi and Mohammed-Aslam, 2019; Mohammed-Aslam and Rizvi, 2020; Mohammed-Aslam *et al.*, 2020; Anju *et al.*, 2024; Mohammed-Aslam *et al.*, 2024). As far as urbanization is concerned, parameters such as dissolved oxygen, biological oxygen demand, total coliform and fecal coliform have got direct influence from the urban pollutants (Shanmugasundharam *et al.*, 2023).

It has been documented that, there exist such relation of LULC with water quality variables like nutrients and dissolved constituents (Smart, 1998; Turner and Rabalais, 2003; Ahearn *et al.*, 2005). Among the LULC classes, agricultural activities were found to be dominantly affecting the water quality in terms of its nitrogen concentration (Johnson *et al.*, 1997; Ahearn *et al.*, 2005). The nutrients in water environment are influenced by urban characteristics (Sliva *et al.*, 2001).

Remote sensing techniques are useful in land cover studies (Mohammed-Aslam *et al.*, 2006; Mohammed-Aslam *et al.*, 2010; Kumar and Kumar, 2012; Mohammed-Aslam *et al.*, 2020). Urban growth patterns and physical expressions on the landscape can be spotted, mapped and assessed through these techniques (Angel *et al.*, 2005). Combining spatial information and logical strategies help the stake holders and decision-makers in their activities (Herold *et al.*, 2003). Around 70% of the rivers in India are polluted (Rao and Mamatha, 2004).

In this study an attempt has been made to find out the quality characteristics of surface water in Thiruvananthapuram city covering the parts of Karamana River Basin and the possible influence of urbanisation on seasonal basis.

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