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WATER POLLUTION IN RIVER NOYYAL

River Noyyal, an important tributary of the Cauvery, was a significant source of water in Coimbatore, Tiruppur, Erode and Karur districts in the 1980s. Since the 1990s, effluent discharge from the dyeing and bleaching units in and around Tiruppur has ecologically damaged the river basin, bringing agriculture to a standstill. Despite judicial intervention and the setting up of common effluent treatment plants, the water quality remains unchanged.

Rivers are among the key natural resources of any country. Since a river flows over a large terrain, it supports a wide range of biodiversity and sustains the livelihoods and the well being of a myriad people and civilisations. Over the last few decades, haphazard urbanisation, unbridled expansion of manufacturing activities, burgeoning growth in the use of chemical inputs in agriculture and the sheer pressure of growing populations—both resident as well as floating, has made river ecosystems unsustainable in many parts of India. Many river basins are either moderately or severely polluted irrespective of the vastness of the respective basin area. For example, the Ganga, which boasts of the largest river basin in India, remains polluted in most stretches despite its overall drainage accounting to 6080 million litre per day (MLD).

To address pollution, the government of India launched the Ganga Action Plan (GAP) way back in 1986. This was followed by GAP-2 in 2009. However, till date the scenario remains unchanged or even worse in certain stretches. In Varanasi alone, over 250 MLD of untreated sewage is discharged into the Ganga (Singh, 2014).

The river Noyyal in Tamil Nadu which commands one of the smaller river basins in the country is among the most polluted in India. The Noyyal basin is a classic example of upstream business—related operations having serious agro-economic and ecological overtones downstream.

In 2013, the Madras High Court ordered the closure of all dyeing units in Tiruppur that failed to comply with the ZLD requirement—yet pollution continued unabated.

Water Pollution in the Noyyal Basin

Noyyal originates in the pristine Vellingiri hills in the Western Ghats of southern India, which is a major biodiversity hotspot in India. Considered an important sacred river, it is a river with an illustrious history. Way back in the tenth century BC, the Chola kings built 40 check dams and lakes to offset the low rainfall in the basin so as to make the most of this riparian ecosystem.

Notwithstanding the scanty rainfall in this region, the many lakes in the upper reaches of the river basin are important habitat for rare pelicans and ibis. Unfortunately, rapid urbanisation of the industrial centers of Coimbatore and Tiruppur over the last couple of decades has turned the Noyyal into a cesspool (Sivakumar et al., 1996; Mohanraj et al. 2000). The canals, lakes and check dams are in a sad state, and prolonged negligence by civic officials has totally destroyed the river basin, along with the canals designed to irrigate an area of 8052 hectares gradually shrinking in their capacity. The same is true of the 3510 sq km catchment area.

The industrial town of Tiruppur, located 40 km down the river, has emerged as an important garments production centre during the past three decades. A centre for knitwear production, particularly summer garments, Tiruppur exports nearly 80 per cent of its production. Its exports have grown from less than 2.2 million USD in 1984 to 3019 million USD in 2014 (The Hindu, 2015).

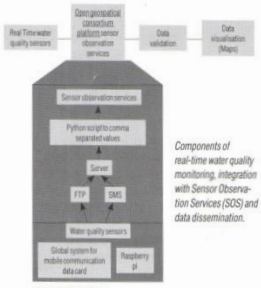
During the (1995–2004 boom period), more than 600 dyeing and bleaching units mushroomed in Tiruppur. For every kilogram of yarn production, nearly 200 litres of water is used. The daily intake of water here is about 80,000 to 1,20,000 m^3. Both natural and synthetic dyes, along with more than 150 chemicals, such as common salt, detergent, caustic soda and hydrogen peroxide are used to colour the textiles.

In the initial years, since most units lacked effluent treatment facilities, the effluents and solid waste were disposed off into the river. Thus, the effluent discharge into river Noyyal was around 75000m^3 to 100000 m^3 per day (Senthinathan, 2004). Consequently, the water quality downstream, and the groundwater in the area ended up highly deteriorated.

Growing pressure from the public, intervention from judicial bodies and various governmental agencies forced the dyeing industries to ultimately consent to treat their effluents prior to discharging them into the river. While some units installed their individual plants, others subscribed to common effluent treatment plants (CETP) to collect and treat effluents from member units.

Unfortunately, the existing CETPs largely follow conventional treatment techniques which end up producing a large quantity of solid waste, which is another serious problem. When 5000 m^3 of effluents are treated, about 6000 kg sludge is produced. A suitable and safe site for the disposal of this huge

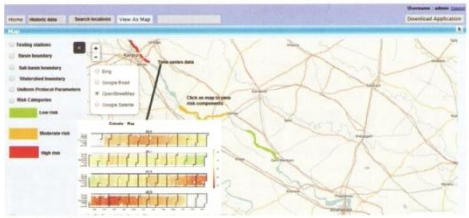
Fig. 1: A river management information system (MIS) may typically contain



Components of real-time water quality monitoring, integration with Sensor Observation Services (SOS) and data dissemination.

Source: Mohanraj R, et al

Fig. 2: Data visualization (MIS)



Source: Mohanraj R, et al

quantity of sludge, classified as hazardous waste, is not easy to find. Moreover, solid waste needs to be managed in an eco-friendly manner to avoid any untoward environmental contamination in future.

For reuse and recycling of water, reverse osmosis (RO) is now generally done in Tiruppur, notwithstanding the high initial cost, running costs and power requirements. However, the issue of pre-treatment prior to RO/ion exchange/nano-filtration techniques is daunting. Certain treatment plants have opted for membrane bio-reactors (MBR) and such techniques. But, till date, no cost-effective treatment has been implemented to alleviate the problem of water pollution either individually or in an integrated manner in Tiruppur. In 2013, the Madras High Court ordered the closure of all dyeing and bleaching units in the Tiruppur knitwear cluster that failed to comply with the zero liquid discharge (ZLD) requirement. Yet, the pollution in River Noyyal continued unabated.

According to a recent report, in the last three years, the Tamil Nadu Pollution Control Board (TNPCB) reportedly found over 300 units involved in illegal operations and discharging of untreated effluents into the water bodies (Kumar, 2014 & Kumar, 2015). Rajeswari, Subashkumar and Vijyaraman (2013) in a study noted high concentration of total dissolved solids (TDS) ranging between 6800–9870 mg/l in the CETP effluent. It should be noted, though, in tandem with the growth of knitwear industries, the urban population of Tiruppur has shown a 27.4 per cent decadal growth (2001-2011). However, there is a substantial lack in the development of sanitation and sewage treatment facilities for the growing population. This has resulted in discharge of substantial quantities of untreated/partially treated sewage into the river (Matthews, 2015).

MIS for Water Quality Management

Given the complexities involved in managing pollution in the Noyyal basin, a management information system (MIS) can provide the best solution to the problem. MIS has been long used as a tool for decision making in agricultural management. Today, in tandem with open-source computing, MIS is being increasingly used in various other sectors such as disaster management, agricultural forecasts, river water management and urban sanitation. Although the concept of MIS is complex; however, it can be simply expressed as: data – transformation – information – decision - action.

In MIS, a set of observations (data) made manually or by automated systems is transformed into information, which contributes to decision-making process (Fig. 1).

The MIS system has the following components:

- Data capture and processing (from sensors)—The data from sensors is integrated with sensor observation services (SOS) via a serial connection and networking with central server for real time updating of the SOS. As per the deployment situation either Internet file transfer protocol (FTP) based networking or short message service (SMS) based networking is used to communicate between server and monitor. In the case of River Noyyal, sensors which could monitor real-time parameters such as total dissolved solids (TDS), dissolved oxygen (DO) and chemical oxygen demand (COD) can be installed to monitor the surface water quality of the river and check dams within Tiruppur (near the locations of CETP and dyeing units) and downstream (around Kasipalayam, Orathupalayam, Chinnamuthur).
- Data dissemination – through analytics as well as through maps. Here the web map application based on – open source tools comprising a web map and various menu links, which provides for viewing the SOS in different formats, can be used. Fig. 2. shows the various processes and components involved in the web application.
- Geographic information system (GIS) – MIS flags for action: in the MIS concept, it is possible to integrate flagging of issues from real-time data. For instance, if the data from a particular sensor has crossed a pre-fixed threshold level, then the particular flag may be alerted (along with the geo-reference) so that the authorities get immediate information either through SMS or emails to act upon.

Thus MIS linked GIS can alert the authorities as well as public (through relevant mobile apps) about the pollution on real-time basis and consequently pave the way for better management of the water quality in the basin.

Endnote

Creation of MIS linked to GIS can be a starting point in river management for sustainability. With data on industries (by type of industry), population density around rivers loaded in the same MIS linked to GIS, it is possible to build a full-fledged information system in the form of 'value-at-risk' model. This can help not just monitor the pollution in river Noyyal, but other Indians rivers as well.

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