Determinants of Water Pollution in Tiruppur District

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Abstract

The development of industrial sector had caused environmental degradation though it contributed to economic development. Though textile and apparel industry contributes to the gross domestic product and export of the country, it also produces environmental cost. Dyeing industrial wastes include metals, salts and color present in the overall textile effluent. About 75 percentage of the salts end up in the wastewater in some dyeing processes. In the dyeing wastewater, the organic pollutants which include, color and heavy metal ions, created water pollution. In this backdrop, an attempt was made to study the causes of water pollution in Tiruppur district. In the study, 'dumping and mixing of industrial waste in the water bodies', 'pumping of industrial waste in the underground through the bore well', 'mixing of domestic waste in the water bodies', 'pumping the industrial waste in the farm land' and 'mixing the dying industrial wastes into the water bodies with partial treatment and untreated' were identified as the primary causes of water and soil pollution.

Keywords: water pollution, causes, chi square test, Textile industry.

Introduction

The development of industrial sector had caused environmental degradation though it contributed to economic development. The environment would be degraded due to contaminated water, air, land and due to noise. Exports from Indian textile Industry are expected to increase to US$ 82 billion by 2021 from US$ 40 billion in 2014. Demand for apparel is likely to rise to US$ 122 billion by 2017 from US$ 65 billion in 2011(Textile Research Report, 2014).Though textile and apparel industry contributes to the gross domestic product and export of the country, it also produces environmental cost (Priya,2018).

Large amount of dyes in the textile industry leaves the process in an unfixed state in the process of dyeing industrial process. The exact amount and kind of pollution depends on the used dyes and the used process. Dyeing industrial wastes include metals, salts and color present in the overall textile effluent. About 75 percentage of the salts end up in the wastewater in some dyeing processes. The main pollutants are organic matters which come from the pre-treatment process of pulp, cotton gum, hemicelluloses and alkali as well as dyes used in dyeing and printing processes. In the dyeing wastewater, the organic pollutants include, color and heavy metal ions. Other minor sources of metals include impurities in

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materials other than dyes, including fibres, salts, caustic, and soda ash. Chromium concentrations in dyes with chrome as a formulation component vary from 3 to 83 parts per million (ppm). (Textile Research Report, 2014 and Priya,2018). Tiruppur is one of the textile industrial clusters in India. There were 510 small scale textile units in Tiruppur before the year 1990. Number of textile units had increased to more than 9000 units after the economic reform. There were around 700 bleaching and dyeing units in Tiruppur. The chemicals used in the dying process are highly toxic. The waste water from the dyeing units are directly discharged into the noyyal river without any treatment. It created harmful effect on agriculture. Therefore, the present study was conducted in Tiruppur district.

In this backdrop, an attempt was made to study the **"Determinants of water pollution in Tiruppur district"** with the following specific objectives.

To analyse the causes of water pollution in Tiruppur district

To identify the significant causes of water pollution in the study area.

Review of Literature

The discharge of industrial effluents into rivers creates surface water pollution. The number of polluted rivers is increasing. The sewage generated was 38000 million liters per day, but the treatment capacity was only 18000 million liters per day in2009. The sewage generated increased to 62000 million liters per day and the treatment capacity had increased to 24000 million liters per day in 2015. It showed only one-third of the sewage was treated. Therefore the number of rivers polluted had increased from 121 in the year 2009 to 275 in 2015. The polluted river stretches increased from 150 in the year 2009 to 302 in 2015.

The top most polluted rivers in India are Yamuna, Ganga, Sabarmati, and Damodar. Though agricultural production had declined due to decline in the rainfall in above mentioned period, Holm (2004), Akilan (2016), and Yuvasakthi and Kumar (2017) had proved water pollution due to untreated industrial effluent discharge was one of the reason affecting agricultural production and productivity. Chandrasekhar (2007) and Yuvasakthi and Kumar (2017) reported the reason for this as the decline in the area under cultivation. Appasamy and Nelliyat (2007) stated that water pollution was the major factor for the reduction in agricultural production. Khai and Yabe (2012) empirically proved that water pollution had significantly reduced the agricultural production.

The continuous discharge of domestic and industrial waste in the nearby water bodies and farm land polluted water bodies, groundwater and soil due to over pollution load to the nature. Environmental problems related to industrial effluent disposal on land had been reported from various parts of the country. Disposal on land had become a regular practice for some industries and created local/regional environmental problems (Kannan and Oblisami,1990,Narwal et al., 1992,Kaushik et al.,1996,Singh and Parwana, 1998).

Magudeswaran (2007), et.al. conducted a study on "Water quality index of river Noyyal at Tirupur, Tamil Nadu, India". He studied physic-chemical and biological characteristics of Noyyal river at tirupur, Coimbatore district. The water samples from Noyyal River were collected and analysed the water quality. Water quality index was calculated for the water samples collected. The study concluded that the water quality in the noyyal river was affected due to lack of proper drainage system, growing population and industrial development in Tiruppur.

Parameswari and Karunakaran (2010) analysed the ground water issues and community awareness in Perungudi dumpsite, Chennai, India. The dumping of municipal solid wastes had polluted the soil, air and water. The study revealed that the people who lived in and around the dumping site were not aware of

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the water pollution and the poor water quality of ground water. The findings of the study showed that lower income groups were unaware about the problem, though middle income group had awareness, their economic situation precluded them to spend much on water whereas higher income groups completely depended on high cost alternative source.

Chaudhry (2017), et. al. studied the factors affecting water pollution in Gujarat for the period 2016 - 2017. The study reported that pesticides and industrial wastes were the major factors polluted the surface water.

Methodology

The data for the study was based on primary sources. A sample of 60 farmers were selected based on multistage sampling technique. First the polluted and the non polluted villages were selected based on the distance of the villages from the noyyal river in Tiruppur district. The villages located within 3 kilo meter distance from the noyyal river were selected as the polluted villages and the villages located above 3 kilo meter distance from the noyyal river were selected as the non polluted villages. In the next stage, 30 farmers from the polluted villages and 30 farmers from the non polluted villages were selected based on random sampling. Therefore, the sample size was 60.

Interview schedule was framed to collect the information on causes of water pollution. The causes such as dumping and mixing of industrial wastes in the water bodies', 'pumping of industrial wastes in the underground through the bore well', 'mixing of domestic wastes in the water bodies', 'pumping the industrial wastes in the farm land', 'mixing the dyeing industrial wastes into the water bodies with partial treatment and untreated', were identified as the causes of water pollution based on earlier studies. (Akilan 2016 and Priya (2018). The above causes of water pollution were included in the interview schedule and the information were collected in the period between July 2020- December, 2020 in the study area. The above causes were measured based on the responses of the farmers. Five point rating scale was used to measure the responses of the farmers. The following score values were allotted to measure the causes of water pollution in the five point rating scale.

5-Strongly agree, 4- Agree, 3- Neutral, 2- Disagree, 1- Strongly disagree.

To indentify the significant causes of water pollution, chi square test was used. The formula for calculating the chi square was as under;

$$c^2 = \sum_{i=1}^{k} \left[\frac{(O_i - E_i)^2}{E_i} \right]$$

Results of the study

Causes of Water and Soil Pollution

Earlier studies reported the causes of water pollution such as dumping and mixing of industrial wastes in the water bodies', 'pumping of industrial wastes in the underground through the borewell', 'mixing of domestic wastes in the water bodies', 'pumping the industrial wastes in the farm land', 'mixing the dyeing industrial wastes into the water bodies with partial treatment and untreated', 'increased industrialization', 'increased urbanization', 'increased use of fertilizer and pesticide', 'deforestation and increased agricultural activities' as the causes of water and soil pollution (Akilan 2016 and Priya (2018). The farmers in the study area also reported the above causes of water pollution. Therefore, the above causes of water pollution were included in the present study.

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The above mentioned causes of water and soil pollution were measured based on five point rating scale. The scores were assigned as follows;

Strongly agree-5, agree-4, neutral-3, disagree-2, strongly disagree-1

The results of causes of water pollution are given in table- 1

Table- 1

The results of causes of water pollution

Causes	Polluted	Non –polluted
Dumping the industrial wastes in the water bodies	4.27	3.17
Pumping of industrial wastes into the underground through the bore well	3.87	3.07
Mixing of domestic wastes into the Noyyal river	4.23	2.93
Pumping the industrial wastes in the farm land	3.87	2.97
Mixing the dyeing industrial wastes into the water bodies with partial treatment and untreated.	4.67	3.17

Source: Field survey.

The farmers in polluted area strongly agreed the cause 'partial treated water mixed in water bodies' as the major cause of water pollution in Tiruppur district. The farmers also agreed the causes of water pollution such as 'dumping and mixing of industrial wastes in the water bodies', 'pumping of industrial wastes in the underground through bore well', 'mixing of domestic wastes in the water bodies' and 'pumping of industrial wastes in the farm land'. The score values for the above causes were more than 3.5.

The farmers did not agree the above causes of water pollution in non-polluted area. They score value of the above causes was less than 3.5 in non polluted area.

To identify the significant causes of water pollution in the study area, chi square test was used. The estimated chi square values for various causes are given below table-2

Table -2

Association between water pollution and causes of water pollution

Causes	Chi –square value	Sig value
Dumping the industrial wastes in the water bodies	24.594	0.000
Pumping of industrial wastes into the underground through the bore well	14.061	0.003
Mixing of domestic wastes into the Noyyal river	26.400	0.000
Pumping the industrial wastes in the farm land	12.869	0.005
Mixing the dyeing industrial wastes into the water bodies with partial treatment and untreated.	28.370	0.000

Source : Field survey.

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The estimated chi square values pertaining to dumping and mixing of industrial wastes in the water bodies', 'pumping of industrial wastes in the underground through bore well', 'mixing of domestic wastes in the water bodies' and 'pumping of industrial wastes in the farm land' and partial treated water mixed in water bodies' were statistically significant at one percent. It could be identified from the probability value which was less than 0.01. It revealed that the dumping and mixing of industrial wastes in the water bodies', 'pumping of industrial wastes in the underground through bore well', 'mixing of domestic wastes in the water bodies' , 'pumping of industrial wastes in the farm land' and partial treated water mixed in water bodies' were the major causes of water pollution in the study area.

Dhanapakiam (2014), Akilan (2016), Dhivya (2016) and Priya (2018) identified the same causes of water pollution in Tiruppur of Tamilnadu.

Conclusion

To sum up, in the polluted area, 'dumping and mixing of industrial waste in the water bodies', 'pumping of industrial waste in the underground through the bore well', 'mixing of domestic waste in the water bodies', 'pumping the industrial waste in the farm land' and 'mixing the dying industrial wastes into the water bodies with partial treatment and untreated' were identified as the primary causes of water and soil pollution.

Recommendation

The disposal of industrial wastes in the noyyal river at night time was a common practice in Tiruppur. To monitor, the illegal disposal of industrial waste water in noyyal river, the government may appoint a special monitoring board to monitor the illegal disposal of dyeing waste in the water bodies.

All the industrial units must be encouraged to connect with the common effluent treatment plant. It would reduce the water pollution.

The dyeing industrial units pumped the waste water in the underground through bore well which must be monitored by the pollution control board regularly. It may reduce the problem of ground water pollution.

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