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## **INDUSTRIAL EFFLUENT AND HEALTH STATUS- A CASE STUDY OF NOYYAL RIVER BASIN**

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### **Abstract**

*Industrial pollution has been and continues to be, a major factor causing the degradation of the environment around us, affecting the water we use, the air we breathe and the soil we live on. But of these, pollution of water is arguably the most serious threat to current human welfare. Environmental pollution is an 'externality' in welfare economics. An externality is present whenever individual A's utility and production relationships include real (i.e. non-monetary) variables, whose values are chosen by others (persons, corporations, governments) without particular attention to the effects on A's welfare (Baumol and Oates, 1988). An externality can be either beneficial (positive) or harmful (negative). Negative externalities include noise pollution by aircrafts using an airport, which enters as a real variable in the utility functions of persons living in the neighbourhood, and the pollution of a river, which enters as a real variable in the production function of water-supply undertakings drawing from the river or agriculture.*

*The present study is mainly aimed at studying the nature and impact of water pollution in the Noyyal river basin in Coimbatore, Erode and Karur districts. The main thrust of the study is on the health status of villagers, agriculture and the livestock population. For this purpose 31 villages and 600 households have been selected for primary survey. To understand the magnitude of the impact of water pollution on the health status of the villagers, 3 major health camps were conducted. It was evident from the study that almost all the 31 sampled villages were affected by the industrial effluent. Health problems such as skin allergy, respiratory infections, general allergy, gastritis and ulcers were the common diagnosis by the medical team. The impact of water pollution was significant on the rural community in the areas of health, agriculture, livestock and drinking water.*

### **Introduction**

Industrial pollution has been and continues to be a major factor causing the degradation of the environment around us, affecting the water we use, the air we breathe and the soil we live on. But of these, the pollution of water is arguably the most serious threat to current human welfare. Water is polluted not only by industries but also by households. Both industries and household wastewater contain chemicals and biological matter that impose high demands on the oxygen present in water. Polluted water thus contains low levels of dissolved oxygen as a result of the heavy biological oxygen demand (BOD) and chemical oxygen demand (COD) placed by industrial and

household waste materials discharged into water bodies and water systems, both above and below the earth's surface. In addition to low levels of dissolved oxygen in water, industrial wastes (effluents) also contain chemicals and metals that are directly harmful to human health and the ecosystem.

The supply of water through river valley projects and ground water extraction thus has repercussions for the health and safety of people. Apart from health effects, which indirectly affect human productivity, polluted water also affects land productivity. Crop production suffers from using contaminated irrigation water from both surface sources and from groundwater aquifers. The definition of pollution in economics is based not only on the physical effect on the environment but crucially on the human response to the physical effect. The physical effect can be biological (e.g. change in biodiversity, or ill-health) or chemical (e.g. effect of harmful chemicals from industrial waste on aquatic life in a river). The human response is a result of a loss of welfare (Seneca and Taussig, 1984, Pearce and Turner, 1990). Thus, while physical scientists base their perception of pollution solely on the physical effect on the environment, economists rely on perceived utility losses to recognize and define pollution.

### **Theoretical Background and Previous Studies**

Environmental pollution is an 'externality' in welfare economics. An externality is present whenever individual A's utility and production relationships include real (i.e. non-monetary) variables, whose values are chosen by others (persons, corporations, governments) without particular attention to the effects on A's welfare (Baumol and Oates, 1988). An externality can be either beneficial (positive) or harmful (negative). Examples of beneficial externalities are, a neighbour's rose garden entering as a real variable in the utility functions of others living in the neighbourhood, and services of a lighthouse entering as a real variable in the production function of shipping companies. Negative externalities include noise pollution by aircrafts using an airport, which enters as a real variable in the utility functions of persons living in the neighbourhood, and the pollution of a river, which enters as a real variable in the production function of water-supply undertakings drawing from the river or agriculture.

Following are a few important studies related to the impact of water pollution on agriculture, livestock and human health. **Murthy, James and Smitha Misra's (1998)** study on, "Economics of Water Pollution" has mainly focused on the impact on water pollution on different sectors. This study has traced the theoretical and applied approaches to pollution control and its accountability in particular. The study by Smita Misra, a case study of the Nandesari Industrial Area has been considered as a significant work in this field. The urban survey conducted for Vadodara city and the rural survey conducted for six villages surrounding Nandesari Industrial Estate are attempts to estimate these villages. The findings indicate that large potential welfare gains could be generated by water pollution abatement practices at Nandesari and also underscore the need to undertake the necessary abatement measures.

Another very relevant work by **Xia Guang (2000)** on "An Estimate of the Economic consequences of Environmental Pollution in China" has empirically and quantitatively assessed the impact of environmental pollution. **Bhagirath Behera and Ratna Reddy's (2000)** study on "Environment and Accountability- Impact of Industrial Pollution on Rural Communities" has

attempted to study the environmental impact of water pollution on rural communities in general and on agricultural production, human health and livestock in particular.

*Some of the important issues analysed in this study are:*

- a) Linkages between industrial development and changes in the micro (local) environment*
- b) Damage to crops and animal husbandry due to industrial pollution*
- c) Impact on health and sanitation in rural communities.*

To conduct this study the authors have selected a village under the patancheru industrial belt in Metak district of Andhra Pradesh. It is one of the oldest and most environmentally degraded areas by industrial pollution. The entire village has been suffering from various diseases arising out of water pollution. From this study it was observed that most of the diseases are water-borne, such as skin infections, defective vision, fever, teeth corrosion, joint pains, loss of appetite, abdominal pain, respiratory diseases, and diarrhoea. With this background, the present study has also been undertaken to assess the impact of polluted water on the health status of the villages in Noyyal river basin.

### **Study Area – Noyyal River Basin**

The major and minor rivers flowing in Tamilnadu were the major source for surface and ground water. One of such rivers flowing in Coimbatore, Erode and Karur districts is the Noyyal River. The river Noyyal is a seasonal river and it originates from Vellingiri hills in the Western Ghats of Coimbatore district. It flows through Coimbatore, Erode and Karur districts and finally joins into Cauvery River near Noyyal village. It flows over a distance of 175 kilometers. The catchment area of the river is 3.49 lakh hectares. Throughout its distance on both sides of the banks of river Noyyal more than 100 villages are situated. Noyyal was the major source for irrigation, drinking water and other activities of the people living on both sides of the river and even for people living beyond 3 kms from the river.

The average rainfall in the basin is about 700 mm. This river is the only source for 31 tanks and many minor canals. All the supply canals and tanks are having a command area of 6550 hectares. All these activities and systems were working well until 1989, the farmers were also growing commercial and food crops. What happened afterwards is the major issue of this study. In this context the industrial effluent released by dyeing and bleaching factories in Tirupur, a major hosiery centre in South India has become a serious issue because it has had severe impact on water bodies. After semi-treatment or without treatment, the effluents are released into Noyyal river. At present there are about 750 dyeing and bleaching industries in Tirupur. The effluents released by these units are stored in Orathupalayam Dam, which was constructed in 1991 at the cost of Rs. 1646 lakhs. The water-spread area is 1049 acres and it was expected to irrigate 500 acres in Erode district and 9875 acres in Karur district.

### **Objectives and Methodology**

The specific objectives of this study are as follows

1. To study the nature and impact of water pollution in Noyyal river basin
2. To study the impact of the industrial effluent on human health in Noyyal river basin.

After the careful review of theories and literature related to the present study, the methodology was formulated. The previous studies in this area have suggested the relevant theoretical background, suitable methodology and certain limitations. The present study was

undertaken to assess the impact of polluted water (industrial effluent) on the agricultural sector, health, livestock and fisheries activities. There were 31 villages selected for this study and a household survey was conducted using pre-tested questionnaires during November and December 2002. Around 600 households have been selected using assistance from the concerned VAOs and using random sampling technique to get first hand information about pre and post pollution agricultural and allied economic activities of the farmers, health status, water source and availability, livestock details and participation in fisheries activities.

To identify the impact of industrial effluent on human health, and to have first hand information, three health camps were conducted at 3 centres on different dates. In total around 1120 villagers attended the three medical camps. 20 villages have been covered in the camp. The villagers were given due publicity about the camp. 11 doctors from Indian Medical Association, Tirupur and adjoining places conducted the camp. The villagers were also able to get some of the basic medicines prescribed by the doctors as the medicines worth of Rs.25,000 were donated by different medical agencies in Coimbatore. It was evident that conducting the medical camp to assess the health status of the people resulted in receiving first hand information. It was verified by the competent medical personnels in the study area itself. The primary survey of health status was undertaken through medical camps. This methodology was successful in tracing the evidence and impact of industrial effluent on human health.

### Assessment of Health Status

The health status of the villagers of the study area was assessed through health camps exclusively conducted for the present study. For this purpose three health camps were conducted covering 21 villages. In the first medical camp, conducted at Arugampalayam center around 250 villagers attended. In the second camp around 445 villagers attended. In the third medical camp around 425 villagers attended. It is observed from all the three camps that there were symptoms of skin allergy, gastritis and respiratory problems among the villagers. The details are presented in the Tables 5.1, 5.2 and 5.3.

**Table-5.1 Health status - First medical camp**

Name of the villages covered	Date of the camp	No. of doctors participated	No. of patients attended	Specific diseases identified
Anaipalayam Anaipalayam pudur Suppanoor Arugampalayam Kullayoor Edakkadu Pallapalayam	15.12.02	4	250	Skin allergy, Gastritis, Hypertension, Joint pain, Respiratory problem

Source: Medical camp 2002

**Table-5.2 Health Status - Second Medical Camp.**

Name of the villages covered	Date of the camp	No. of doctors participated	No. of patients attended	Specific diseases identified
Kathanganni	29.12.02	4	445	Skin allergy,

Reddipalayam Kannimarkovil pudur Karaipudur Pallanaickanpalayam Vayakkatupudur Thottipalayam				Gastritis, Hypertension, Joint pain, Respiratory problem
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Source: Medical camp 2002

**Table-5.3 Health Status - Third Medical Camp**

Name of the villages covered	Date of the camp	No. of doctors participated	No. of patients attended	Specific diseases identified
Orathupalayam Ramalingapuram Kodumanal Siviarpalayam Pallakkatupudur Sokkanathampudur	5.01.2003	4	425	Skin allergy, Gastritis, Joint pain, Respiratory problem, Ulcer

Source: Medical camp 2003

### **Village-wise Details**

In Table 5.1, the village-wise details regarding the first medical camp are presented. The first camp was conducted at Arugampalayam center in which public from 6 villages attended. 39 per cent of the villagers who attended the medical camp from Suppanoor village were identified with symptoms of water- borne diseases. There were 21.90 per cent from Arugampalayam, 34.40 per cent from Anaipalayam, 28 per cent from Pallapalayam, 23.07 per cent from Edakkadu and

**Table-5.4 Health Status - Percentage of villagers attended (1<sup>st</sup> camp)**

Name of the village	Villagers attended the camp	Normal health	Identified diseases	Percentage
Arugampalayam	105	82	23	21.90
Anaipalayam	61	40	21	34.40
Suppanoor	23	14	9	39.00
Pallapalayam	25	18	7	28.00
Edakkadu	13	10	3	23.07
Kullayoor	23	17	6	26.08
<b>Total</b>	<b>250</b>	<b>181</b>	<b>69</b>	<b>27.60</b>

Source: Medical camp 2002

26.08 per cent from Kullayoor. On an average one- fourth of the villagers attended the camp had one of the symptoms of water-borne diseases.

**Table-5.5 Health Status - Percentage of villagers attended (2<sup>nd</sup> camp)**

Name of the village	Villagers attended the camp	Normal health	Identified diseases	Percentage
Kathankanni	143	109	34	23.78
Reddipalayam	167	129	43	25.75
Kannimarkovilpudur	10	7	3	30.00
Vayakattupudur	31	23	8	25.81
Karaipudur	37	26	11	29.73
Pallanaikenpalayam	27	21	6	22.22
Thottipalayam	30	22	8	26.67
<b>Total</b>	<b>445</b>	<b>332</b>	<b>113</b>	<b>26.28</b>

Source: Medical camp 2002

The same details are presented in the Table 5.5 for the second medical camp conducted at Kathankanni center. There were 23.78 per cent of villagers identified with one of the diseases mentioned earlier from Kathankanni village. There were 25.75 per cent villagers from Reddipalayam, 30 per cent from Kannimarkovilpudur, 25.81 per cent from Vayakattupudur, 29.73 per cent from Karaipudur, 22.22 per cent from Pallanaikenpalayam and 26.67 per cent from Thotipalayam. There were one-fourth of the villagers identified with any one of the diseases mentioned earlier.

**Table-5.6 Health Status - Percentage of villagers attended (3<sup>rd</sup> camp)**

Name of the village	Villagers attended the camp	Normal health	Identified diseases	Percentage
Orathupalayam	66	47	19	28.79
Ramalingapuram	122	91	31	23.41
Kodumanal	54	37	17	31.48
Siviarpalayam	32	23	9	28.13
Pallakattupudur	35	25	10	28.57
Sokkanathanpalayam	46	33	13	28.26
Ellaikumarapalayam	32	24	8	25.00
Sakthinagar	38	30	8	21.05
<b>Total</b>	<b>425</b>	<b>310</b>	<b>115</b>	<b>27.05</b>

Source: Medical camp 2003

In Table 5.6, the details regarding third medical camp conducted at Ramalingapuram center is presented. In this center also, on an average, one fourth of the villagers were suffering from any one of the water-borne ailments. Out of the 425 villagers who attended the camp, 115 were identified with some diseases. The percentage share was 28.79 for Orathupalayam village. Kodumanal had 31.48 per cent, which was highest among the villages. Sakthinagar had the lowest percentage i.e 21.05.

### Percentage of Persons Affected by Different Diseases

The percentages of persons affected from each category of diseases identified in the medical camps are presented in the Table 5.7. Out of the total patients identified most of them were

agricultural labourers and daily wage earners. 31.65 per cent of the patients were suffering from skin allergy problems. 22.56 per cent of the patients had respiratory infections. There was general allergy in the case of 13.13 per cent, gastritis for 9.43 per cent of patients, 10.44 per cent had joint pain, 7.07 per cent had ulcer problems and 5.72 per cent had other general ailments. The significant observation made in the study was that most of the villagers were avoiding the use of polluted water in the system tanks and wells. Otherwise the percentage could have been at higher rate.

**Table-5.7 Percentage of persons affected from different diseases**

S.No	Category	No. of persons affected	Percentage
1	Skin allergy	94	31.65
2	Respiratory infection	67	22.56
3	Allergy	39	13.13
4	Gastritis	28	9.43
5	Joint pain	31	10.44
6	Ulcer	21	7.07
7	Others	17	5.72
	<b>Total</b>	<b>297</b>	<b>100.00</b>

Source: Medical camp 2002

## Conclusion

The Health Status of the villages in the study area was assessed through three medical camps. Doctors participated in the medical camps were able to identify the symptoms of waterborne diseases. Health problems such as skin allergy, respiratory infections, general allergy, gastritis and ulcer were scanning among the villagers who attended the medical camp. It was medically accepted that the polluted water had significant influence on these diseases. It was assessed that one-fourth of the villagers has any one of the listed of diseases. Most of the identified patients accepted that they were using either the river water or well water or both for washing purpose, cleaning the cattle or fishing in the tank etc. After realizing the ill effects of the water they started avoiding the use of it.

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