

## IMPACT OF INDUSTRIAL POLLUTION ON LAND, WATER AND AGRICULTURAL PRODUCTION IN SIPCOT INDUSTRIAL REGION IN TAMILNADU

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### Abstract

*This paper deals with impact of industrial pollution on land, water and agricultural production in Cuddalore SIPCOT industrial region in Tamil Nadu. It outlines the impact of water pollution and land pollution on crop yield. This study makes an experimental analysis of crop yield in SIPCOT industrial region and non industrial region. In this study, impact of industrial activities on land and water quality has been examined on the basis of appropriate scientific method. The crop yield decline is explained with the help of soil and water test. This paper concludes with some interesting findings along with policy suggestions.*

**Keywords:** *Industrial Accident, Communities, Manufacturing SIPCOT Industries, Air Pollution, Water Pollution and Sea Pollution.*

### Introduction

For at least 20 years, residents living in and around SIPCOT chemical industrial estate, Cuddalore, have complained of a variety of illnesses related to industrial pollution in general, and the poor air quality in particular. Regulatory authorities have dismissed these claims without offering any scientific bases or air quality data for doing so. In the absence of regulatory oversight, chemical companies too have seen no reason to curb emissions of harmful chemicals.

### Review on the subject

**Chander & Singh (1983)** were indicating the influencing factors towards QWL from various other scholars conducted on quality of work life, which includes employment conditions, secured employment, income adequacy, sharing of profits, stock options, rewards, employee autonomy, commitment, social interaction, self-expression, self-esteem, satisfaction, democracy, involvement, career advancement, job enrichment, relationships with supervisors and peers.

**Watson et. al., (1985)** there are two kinds of moods and emotions people tend to bring in the workplace; with these while performing their jobs in the organization employees tend to experience positive affectivity and negative affectivity. Positive affectivity employees reflect enthusiastic feeling, active and alert but negative affectivity employees experiencing subjective distress and unpleasant nervousness.

**Danna & Griffin (1999)** Quality of Working Life is a holistic concept, which considers work-based factors such as job satisfaction, satisfaction with wages and relationships with work colleagues and includes factors

that predict the life satisfaction and general feelings of well-being.

**Sirgy et al., (2001)** suggested spillover approach to Quality of Work Life. In this approach satisfaction on one life domain may influence in satisfaction of another life domain. Job satisfaction will affect other life domains such as financial, family, social, leisure, health and so on. There is balance of influence between and among life domains. Dissatisfaction in one domain is compensated by satisfaction in other domain.

**Vasisht AK; Singh, RP; and Mathur, VC (2003)** estimate the land degradation in the country. Widely accepted estimates indicate that nearly 57% of the geographical area or 187.8 million hectares of land are degraded to different intensities.

**Kolotov, BA; Demidov, VV; Volkov, SN (2003)** have observed that chlorophyll content can be a primary indicator of environment degradation due to heavy metal contamination. Most pollutants decrease chlorophyll content, was evident when environmental pollution was monitored in the areas of heavy metal contamination.

**Randall, CW (2004)** study highlights that nutrient pollution of estuaries and coastal waters has resulted in the impairment of ecosystems and major reductions and collapse of fisheries at numerous sites around the world, resulting in major socio-economic implications.

**Umamaheswari, S (2004)** has made an attempt to assess the water quality of river Thamirabarani at Ambasamudram, Tamil Nadu, India, by selecting two sites, one beneath the railway bridge (Up stream site) and the other beneath the highway bridge (Down stream site). Physico-chemical and microbial analysis of water was made from June 2001 to February 2002 at an intermittent

period of four months. pH, alkalinity, BOD, and COD, were found to be greater in the order of 8-3-8.5, 140, 250-320 and 2411.0 mg/l respectively in the downstream site of the river water, whereas the dissolved oxygen analyzed varied from 2.05-2.50 mg/l in the downstream site of the river.

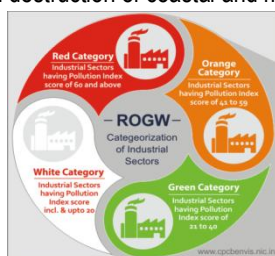
**Paudel, KP, H. Zapata and D. Susano (2005)** have investigated the Environmental Kuznets Curve (EKC) on water pollution with both semi parametric and parametric models using watershed level data for the state of Louisiana, USA.

## Pollution

**Air pollution** occurs when the air contains gases, dust, fumes or odour in harmful amounts. That is, amounts which could be harmful to the health or comfort of humans and animals or which could cause damage to plants and materials.

**Water pollution** is the contamination of water bodies (e.g. lakes, rivers, oceans, aquifers and groundwater). Water pollution occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds.

**Sea pollution** includes a range of threats including from land-based sources, oil spills, untreated sewage, heavy siltation, eutrophication (nutrient enrichment), invasive species, persistent organic pollutants (POP's), heavy metals from mine tailings and other sources, acidification, radioactive substances, marine litter, overfishing and destruction of coastal and marine habitats.



## Sipcot Industrial Units Cuddalore

Set up in 1982 by the State Industries Promotion Corporation of Tamilnadu (SIPCOT), the Cuddalore Chemical Industrial Estate is located 8 kms south of Cuddalore town on the seaward side of the Cuddalore-Chidambaram Highway, stretching from Pachaiyankuppam in the North to Semmankuppam in the South. Phase I of the industrial complex spreads over 200 hectares (519 acres) and is set up to accommodate 53 units. Phase II covers 88 hectares (200 acres) while Phase III of the complex will cover about 300 acres of land and is located about 26 km from Cuddalore town, near Periapattu village

on the Cuddalore-Chidambaram highway. Currently, 22 functional units lie within Phase I of the industrial estate on the western bank of the River Uppanar. A few companies such as EID Parry, Arkema Peroxide, Clariant and Bayer operate outside the SIPCOT limits but in the vicinity of the Estate. These companies manufacture pesticides and intermediates, pharmaceuticals and intermediates, chemicals, plastics and plastic additives, dyes and intermediates and textiles

## Pollution Impacted Communities

### Air Pollution

After visiting SIPCOT, we were convinced that the entire area is severely polluted due to industrial activity. Although monitors told us that many industries had closed down or operating at low capacity in anticipation of our visit, the pollution was quite bad in some spots. In every village people told us about the various kinds of odours that emanated from the units in the area. Some of the residents complained of *chest tightness (maar addaippu)*, *itching of the throat and running nose* as a result of their exposure to the clouds of smoke emitted by the factories. One resident said "when the factories release smoke – it comes like a cloud, we can see it well, we immediately go inside our houses, close everything, close the food." We also observed that trees and plants closer to the factories had a higher proportion of dead leaves than those further away. One of us, Dr. Gaithonde, was also affected by the pollution: "Within about 3 hours after starting the visit, I developed severe itching in the throat, mild breathlessness and watering of the eyes. The breathlessness was certainly a mild wheeze. This, to me, is a clear sign of the presence of pollutants/irritants in the air, given that I do not have a known allergic tendency, and given the timing of the attack and the circumstances it could not be anything else.



Air Quality Index Levels of Health Concern	Numerical Value	Meaning
Good	0 to 50	All health concerned individuals and all pollution sensitive groups are safe.
Moderate	51 to 100	Air quality is acceptable, however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Slightly for Sensitive Group	101 to 150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151 to 200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201 to 300	Health alert: everyone may experience more serious health effects.
Hazardous	301 to 500	Health warnings of emergency conditions. The entire population is more likely to be affected.

## Water Pollution

Looking at people's utensils, hearing their complaints, having read about the NEERI study on groundwater, and seeing the temple pond, we are convinced that the groundwater in the area has been affected by contamination and salinity intrusion due to industrial activity. In Kudikadu, Shasun Chemicals was reportedly supplying water to a limited number of households. In Pachaiyankuppam, the water was yellow-tinged. Women showed us aluminum vessels that had changed colour from silver to rust brown or orange within six months. Women are particularly burdened as a result of the groundwater problems. One woman told us *"I have to travel more than half a kilometer for drinking water and there I have to wait up to 2 hours to get even one pot of water."* Villagers complained that goats and cows fall sick often, especially after consuming local grass or water. They also said that ever since SIPCOT came up, veterinarian's visits to the villages has increased. Industries draw their water from deep borewells. Just as predicted by the Asian Development Bank in the 1990s, the drawal of water from the coastal aquifer has now led to widespread salinisation of groundwater in the SIPCOT area. People complain that their bore wells and water sources are now useless because of salt water intrusion. Water is one of the most important natural resources essential for the survival of living organisms. Water as a commodity generates concern for being an exhaustible resource and also because of the environmental issues related to its degradation. Pollution of water courses may take place due to natural causes such as silt carried by run-off, organic wastes of plants and animals, minerals leaching through soils, thermal pollution and algal blooms. It may also be due to the discharge of domestic and industrial wastewaters. Toxic chemicals used for agriculture and other purposes, solid wastes, oil from garages and cleaning of vehicles, drainage from farms and manure, land surface drainage, cattle washing, watering and dipping agricultural wastes, dust fall, wastes due to recreational use, intrusion of sea water and many more such activities cause pollution of water bodies.



## Coastal Pollution

The major activities that are responsible for coastal pollution in Tamil Nadu are discharge and disposal of untreated domestic and industrial wastes, discharges of coolant waters, harbour activities such as dredging, cargo handling, dumping of ship wastes, spilling of cargo's chemicals and metal ores, fishing activities etc<sup>3</sup>. There are 14 major industries located in the Ennore-Manali areas. The industries at Manali and Ennore are mostly chemical based, manufacturing petro - chemicals, fertilizers, pharmaceuticals, paints etc. There are two power plants at Ennore, namely, Ennore Thermal Power Plant with a production capacity of 200 MW and North Chennai Thermal Power Plant with a production capacity of 600 MW. The fly ash continuously deposits in the sea. The industries at Ennore-Manali are using a wide variety of raw materials and discharge waste products into the air, water or land as gaseous emissions, liquid effluents and sludge, respectively. In the coastal area of Tamil Nadu 488.02 MLD of wastewater is generated and only 226 of MLD is treated

## Health

The following ailments were frequently reported: Skin itching and other skin diseases; breathlessness; difficulty in breathing; tightness in chest; giddiness; dizzy spells; headache; throat irritation; stomach ulcers; diarrhea; nausea; indigestion; mouth ulcers; burning sensation in eyes; hearing problems; dimming of vision; asthma; white discharge and excessive bleeding (for women); uterine cancer; infertility; miscarriages; jaundice. Generally, people are affected by one or more of these ailments. There are no proper medical facilities or experienced doctors. It is very clear that many of these ailments are directly related to pollution. For instance, one woman said: *"The moment the 'cloud' comes there is chest tightness, itching of the throat and running nose."* This is indicative of air pollution. Other statements, such as about a spurt in cancer cases, indicate the need for urgent assessment of health issues. One woman said "There are four women of different ages who have got cancer. We have never seen this before." In Pachaiyankuppam, we heard women complaining that the average age at puberty among girls was getting delayed from a normal of 13 years to 15 years. This is cause for concern and more in-depth study because certain environmental poisons are known to disrupt the endocrine system leading to such disorders.

## Agriculture

The panel witnessed first-hand the air pollution, widespread groundwater pollution, direct contamination of land and indiscriminate hazardous waste dumping. We also saw about 45 acres of land near the Temple Pond in Kudikadu that was lying barren. Agriculture on the Western side of the National Highway seemed to be healthier than on the Eastern side where the industries are located. However, villagers' testimonies indicate that the effects are spreading to the Western side too. Residents of Semmankuppam, a predominantly agrarian village, say they used to get three crops a year until 1995, but have to struggle to raise one crop nowadays. Also, salinity intrusion -- upto 1 km according to some -- has laid waste their borewells and forced them to depend on rains. Paddy yields have dropped from 40 bags per acre to 20 bags (of 75kg each). This has had a disproportionate impact on agricultural labourers and small and marginal farmers.

## Response of Industries and Government

Despite invitations to attend the public hearing, representatives from the industry and Government

departments failed to depose in front of the panel. The panel also saw firsthand that the industry seemed to have an upper-hand over the district administration and pollution control regulators. In the instance of Pioneer Miyagi's illegal construction, we learnt that the company had ignored orders by district authorities and the TNPCB. The authorities too seemed reluctant to punish the violators, and seemed content with repeating their orders. We were given the example of Tagros Chemicals, where the company had expanded production at an illegally constructed factory unit. The illegal factory operated for two years before a public hearing was held by the TNPCB to seek comments on whether or not the factory should be constructed. The illegality was pointed out. But the TNPCB did nothing despite confirming the illegality. By and by, both the Ministry of Environment and Forests and the TNPCB regularized the illegality. It is clear that companies with political clout can and do get away with anything in SIPCOT. Such unregulated and corrupt functioning in dealing with highly hazardous industries located in close proximity to residential populations is a recipe for disaster.

S. No	Conditions	Bhopal	Cuddalore
1	Toxic facility	Untested toxic facility to manufacture pesticide was set up in Bhopal.	Various chemical industries have old and badly maintained plants to manufacture pesticides, paints, dyes, Pharmaceuticals and bulk chemicals. Factories Inspectorate permissions are seldom sought prior to construction of Factories.
2	Location of the plant	The plant was located in an area with dense population, with residential areas at a distance less than 50 mts from the unit	The plants are located next to each Other sandwiching at least 10 villages. At least 30,000 people reside in the Immediate vicinity of the units.
3	Type of Community	Facility located in a working class neighborhood with people from socially, economically and politically marginalized sections of Society.	SIPCOT residents are predominantly working class, and from socially, economically and politically weaker sections of society
4	No information about hazards	No information was shared with the community or workers about the products manufactured in the Plant or the chemicals used. Communities knew little about Disaster response. Hazards and dangers were underplayed to give A false sense of security.	No information has been shared with the communities about the products Manufactured or chemicals used in the SIPCOT industries. The community has been given no information or training on what to do in the event of a Disaster. Serious gas leaks and spills are routinely dismissed as mere odour nuisance. Fire service and hospital infrastructure uninformed and inadequate to deal even with minor incidents.
5	Complaints ignored	Environmental pollution, cattle deaths, worker injuries and deaths due to workplace hazards Were not taken seriously. No root cause Investigations were Conducted. Routine accidents and hazardous incidents in the Union Carbide factory were ignored	5 deaths, 12 injuries, and at least 72 major hazardous incidents and illegalities have been recorded in a 26- Month period. SIPCOT experiences an average of 2.6 major violations every Month. Local complaints, and recommendations against setting up more polluting units in SIPCOT by agencies such as the State Human Rights Commission have fallen on deaf ears.

### Suggestions and Policy Implications

The following important suggestions and policy implications of the study

1. The Health Department should play a proactive role in ensuring that practices to prevent harm are followed within industries. They should do this by coordinating with the Factories Inspectorate.
2. The Health Department should facilitate the routine monitoring of workers health data required to be collected under the Factories Rules to identify problems (if any) of occupational diseases among them.
3. The Factories Inspector should be directed to diligently perform his/her functions, particularly in regard to maintaining industrial safety and ensuring emergency response by industry. The Inspector should also ensure that only trained workers are deployed on hazardous jobs and contract workers are not used for such activities.
4. Hospital infrastructure in the areas near polluting industries should have trained personnel and equipment to deal with cases of industrial injury and poisoning.
5. SIPCOT should be restricted to non-polluting industries which are not water-intensive. Such industries must commit to providing employment locally, beginning with people who may have lost their lands to SIPCOT.
6. The District Administration should be instructed to assist the victim or his/her survivors in accessing compensation and/or pension. An interim compensation fund should be created with advance contributions from polluters.
7. The Health Department should pursue the Factories Inspectorate to initiate statutory criminal proceedings against the TANFAC with a view to delivering exemplary punishment that will serve as a deterrent to corporate negligence on matters related to industrial safety and hygiene.
8. Stop Exposure by Stopping Pollution: Pollution control acts are often not enforced rigorously as a concession to industries. This cannot be tolerated. Polluters must be punished, and repeat offenders must be closed down.
9. Health Care facilities: The Health Department should set up specialized health care facilities to cater to the special needs of pollution-impacted communities.
10. The Tamilnadu Government should ban the extraction of groundwater from coastal aquifers for industrial purposes, and launch an aggressive groundwater

regulatory regime based on scientific assessments of groundwater capacity, and the prioritised needs of drinking water for communities and agriculture.

### Conclusion

The present study concluded that, it supports the spillover theory as employees satisfaction in one life domain is positively influence in other life domains. The needs are major contributor in QWL; sensing of QWL leads to sense job satisfaction, life satisfaction and general well-being. Fulfilling the needs of the employees by the organization can achieve higher level of QWL and organizational commitment from the employees.

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