

Impact of Petrochemical Industry on the Environment of Dibrugarh: A Study of BCPL, Assam

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ABSTRACT

In the sphere of industrialization, Assam is yet to make much headway. Although the base for industrial development in Assam was created more than a century ago with the establishment of tea, coal, oil and plywood industries, it could hardly accelerate the pace of industrial development during the subsequent period. Thus, in order to promote the economic development of the state, Brahmaputra Cracker and Polymer Limited (BCPL) plant was set up in Dibrugarh District which came as a part of the historic Assam Accord signed on 15th August 1985. Though the plant has positive externalities from the point of view of employment and income opportunities but with the operation of this plant there have also been some negative externalities i.e. environmental pollution and the impact of pollution are being felt by the people residing around this industry. If the wastes generated from this industry are being properly managed then certainly it will have lesser impacts on the surrounding environment. Therefore, the main objective of this paper is to investigate the environmental problems faced by the surrounding villagers due to the establishment of this plant. Field surveys in the study area and interview with the respondents have been conducted for the purpose.

1. Introduction

Man by modifying many of the natural ecosystems through fast rate of urbanization and industrialization has disturbed the stability of ecosystem and ecological balance. Though, industrial revolution caused industrial development at a rapid rate and enhanced the economic prosperity of nations yet it has created manifold environmental problems at local, regional and global levels. Among the various industries, the Petrochemical a complex and an integrated industry is one of the fastest growing industries in the Indian economy. Today, petrochemical products permeate the entire spectrum of items of daily use, ranging across clothing, housing, construction, furniture, automobiles, toys, agriculture, irrigation and packaging to medical appliances. Although the petrochemicals give us innumerable useful products but they can also be injurious to the health of living beings and the earth's ecosystems. The aromatic compounds present in petrochemicals are important environmental pollutants which are introduced in the environment through industry waste products and emissions accidental spills from pipelines, and others. Xylene is one of the most common petrochemicals in the environment which is one of the leading cause of smog, birth defects, increase the risk of miscarriage and cleft palate. These petrochemical industries have been identified as important sources of emissions of wide range of chemical substances some of which have been recognized as environmental carcinogens. (Chen, Ya- Mei *et al*, 2014).

2. Review of literature

Due to the high potential of petrochemical industry in the creation of environmental impact, environmental impact assessment of the development of petrochemical industry is very important. The results show the most important environmental impact of petrochemical projects are water, soil,

air and noise pollution as well as it has socio- economic consequences (Ghobadi, M *et al*, 2015).

High levels of carcinogens have been determined from petroleum and chemical refinery air emissions. Petrochemical air pollution results in severe health problems to the public who are exposed in the vicinity particularly children (Iyer & Mastorakis, 2009).

Petrochemical industries have been identified as important sources of emissions of chemical substances and adverse health outcomes have been reported for residents who live nearby. Countries including Taiwan and the US, embracing petrochemical industries now face the challenge of environmental injustice. The findings suggested that life expectancy lengthening was slowed and income growth was slatted for residents living in the industrial communities (Chen, Ya- Mei *et al*, 2014).

Petrochemical industries play a crucial role in various manufacturing sectors. However, potential environmental hazards associated with these industries have raised increased concern for societies. This industry release large quantities of toxic and deleterious substances as effluents into the atmosphere and generates solid waste i.e. difficulties both to treat and to dispose of (Sharma, A. *et al*, 2017).

3. Brahmaputra Cracker and Polymer Limited (BCPL)

BCPL a petrochemical complex spread over 3000 bighas of land at Lepetkatta is situated approximately 15 kms. away from Dibrugarh Town. In order to promote the economic development of the state, BCPL plant was set up in Dibrugarh which came as a part of the historic Assam Accord signed on 15th August 1985. The plant was successfully commissioned

on 2nd January 2016 and Prime Minister Narendra Modi dedicated BCPL to the nation on 5th February, 2016. This is the first ever petrochemical project in the entire North- East. The 10,000 crore plant having a capacity of 3 lakh tones per annum of polymers and other products will make raw materials for manufacturing plastic. The objective of this complex is to produce petrochemical products using natural gas, naphtha or any petroleum products as feedstock and devise an effective distribution system for the same in North- East India.

4. Objective

The objective of this paper is to investigate the impact of BCPL (Brahmaputra Cracker and Polymer Limited) on the environment of the nearby villages in Dibrugarh District.

5. Methodology

The study is based on both primary and secondary data. The secondary data are collected from books, journals, census report and web. The primary data were collected through field surveys and interview with the respondents. BCPL is situated in Borboruah Development Block which has 13 Gaon Panchayats (GP). A multi- stage simple random sampling was used to select a GP and village in the block. 20 % of the 13 GP was selected for conducting the study. The GP selected were Lezai GP, Garudhoria GP and Dulia Kakoti GP. At the next phase, 10% of the 43 villages within the 3 GP were selected namely Sessa Kuch gaon, Lezai gaon, No.2 Garudhoria gaon, Lepetkata Kachari gaon and Ghoronia TE. In the last phase 5% of the population of the sampled villages was selected for the study. The researcher also undertook an extensive interview using a standardized questionnaire to identify the potential risk factors.

6. Results and discussion

Though BCPL has positive externalities from the point of view of employment and income opportunities but with the operation of this plant there occurred environmental pollution whose impact are being felt by the people residing around this industry. The BCPL has been violating norms by discharging industrial waste directly into the nearby water bodies without meeting the required specification laid down by the Pollution

Control Board. The industry has become lethal for the people of the region. Moreover, the Eastern Zone Bench of National Green Tribunal (NGT) in 2017 through the analysis report of the sample waste water found that the level of discharge of effluent from BCPL at least in five components were in excess of the permissible standards. Through field survey in the surrounding villages, the effects of the BCPL on the health and environment were assessed. These effects are grouped into eight categories as discussed below-

6.1 Effect on Human Health: Petrochemical industries cause a myriad of health disorders and diseases. The most concerning effect they have is on the future generations of humans as well as all life on the earth. Most sensitive and vulnerable are the unborn. In a study published by the Environment Working Group, entitled Body Burden II, the core blood of the average body at birth contains 200 chemicals. If the parents are toxic, then the child has little chance of living a healthy life. But almost nothing is said about the far greater danger of petrochemical solvents. Amphibians, reptiles, fish and mammals are experiencing the change worldwide. The people in the nearby villages suffer from chemical based chronic/ acute diseases such as ulcer, allergic dermatitis, premature death, etc. The details of the diseases suffered by the nearby villagers are as follows-

Table- 1
Incidence of Sample Population Affected By Diseases

Disease	Sample Population Affected	
	Frequency	Percent
Respiratory Disease	22	12.22
Chronic Disease	63	35
Endemic Disease	95	52.78
Total	180	100

Source: Field Survey

The above Table reveals that the highest percentage of the sample population in the study area suffers from endemic diseases which recorded 52.78 percent followed by chronic disease 35 percent and respiratory disease 12.22 percent respectively.

Table- 2
Incidence of Sample Population Affected By Chronic Diseases

Chronic Disease	Frequency	Percent	Endemic Disease	Frequency	Percent
Blood Pressure	7	3.9	Skin Disease	41	22.8
Eye Disease	10	5.6	Stomach Pain	15	8.3
Cancer	4	2.2	Dysentary	10	5.6
Heart Disease	11	6.1	Gastritis	25	13.9
Others	28	15.6	Others	7	3.9

Source: Field Survey

The chronic diseases that were reported by the sample population were Blood Pressure, Eye Disease, Cancer, Heart Disease and Others which include cold and cough, diabetes, running nose, etc. Among these diseases the highest percentage of sample population are affected by others which recorded 15.6 percent followed by heart disease 6.1 percent as presented in Table- 2.

Chronic Disease

- It was reported by the villagers that at a young age the children are found to suffer from less eye- sight.
- People suffering from blood pressure are on the rise. After the establishment of BCPL, many people have died of pressure stroke.
- During the survey in No. 2 Garudhoria gaon, it was reported that there were people suffering from throat cancer.

- d. People suffering from lung disease are found in all the surveyed villages.
- e. Cough, cold, fever are also common.
- f. Increased irritation of eyes, nose and throat due to smog was reported in all the surveyed villages.
- g. The most important issue is that when the pregnant women comes in contact with the gas emitted by BCPL, they suffers from head- ache, vomiting and finally they end up with miscarriage.
- h. Due to unchecked air and water pollution in the area, people are unable to sleep.

The endemic diseases that were reported by the sample population were Skin disease, stomach pain, dysentery, gastritis and others which include headache, urine infection, etc. Among these diseases the highest percentage of sample population are affected by skin diseases which recorded 22.8 percent followed by gastritis 13.9 percent as presented in Table- 2.

Endemic Disease

- a. Many residents of Lepetkatta alleged that they have developed skin diseases after the commissioning of the project. They told that as they come in contact with the rain water their body starts itching and then it turns to ring worm. Aged people are also vulnerable to skin disease.
- b. The female folk in the surveyed village reported of suffering from urine infection.
- c. People suffer from breathing trouble due to the foul gas emitted from BCPL.
- d. Stomach pain, Dysentery is also common.

6.2 Effect on Water Pollution: BCPL is violating effluent standards and polluting surrounding rivers and water bodies. The effluents are discharged directly into rivers through underground pipes without being treated. These effluents contain a large amount of polycyclic and aromatic hydrocarbons, phenols, sulphides and other chemicals. Due to the inefficient purification systems, toxic products present in effluents accumulate in the Brahmaputra river and its tributary Sessa and Burhidihing resulting in water pollution which is fatal to both aquatic and human life. The Sessa river was once famous for its fish and about more than 70 percent of the respondents of Lezai gaon, Kalakhowa gaon and Sessa Kuch gaon No. 2 were engaged in fishing occupation. But after the discharge of toxic products by the BCPL in the Sessa river the water became oily and greasy and bear a foul smell. Due to abundant growth of algae, the oxygen content becomes lesser, causing the death of fishes and other organisms. Earlier the fishermen were doing a good business as the fishes of the Sessa river namely Pabta and Chital fetched high prices but now their demand has declined in this few years and thus the fishermen had to struggle for their livelihood. This is because the fishes developed distasteful kerosene like odor with changes in the skin colorations and brightness and because of this they have become unfit for human consumption. These fishermen are now engaged in other works and only about 20 percent of them retain their fishing business (Table- 3). Further, the villagers reported that the drinking water of the tube- well have a sour taste after the BCPL started its operation. Upto 40 foot drinking water is available but beyond

that the water is contaminated by chemical pollutant. This problem is severe in No. 2 Garudhoria gaon and Modhupur Nepali FV.

Table- 3
Occupational Structure of the Sample Population

Occupation	Frequency	Percent
Agricultural workers & Cultivators	65	36.00
Tea Estate Workers	50	27.78
Fishermen	36	20.00
Others	29	16.11
Total	180	100

Source: Field Survey

6.3 Soil Pollution: BCPL is violating the pollution norms by discharging industrial wastes directly into the nearby areas through underground pipes without being treated which contaminates the soils and thus reduced the fertility of the soil in the surveyed area.

6.4 Loss of Biodiversity: This industry comes up with the loss of biodiversity and destruction of ecosystems as there was a big tea garden and biggest orange garden of Assam in the area where BCPL now stands. The biodiversity of the whole area is at stake now. The senior people of No. 2 Garudhoria gaon, during interview reported that they have not seen crow for months. Earlier there were many crows in the area but now after the establishment of BCPL, crows are rarely seen. They believe that this might be due to the air pollution.

6.5 Noise Pollution: Elevated sound levels coming from BCPL, induce noise pollution in the nearby villages. The villagers opined that this pollution is associated with feelings of headache, annoyance, uneasiness, stress, impatience, displeasure, hypersensitivity, extreme anxiety, anger and violence.

6.6 Air Pollution: Petrochemical industry is an important source for the principal greenhouse gases responsible for global warming. This industry is of great concern because of the difficulty in controlling the emission of pollutants from them. In a study "Unsafe Petrochemical Refinery Air Pollution and its Environmental Impact Assessment" conducted by Prof. V.G. Iyer and Prof. Dr. N.E. Mastorakis, it was revealed that petrochemical air sampling measurement reports show that during the course of gas leak there were about 30 toxic chemicals which get discharged into the atmosphere. In an another study "Health Effects of People living close to a Petrochemical Industrial Estate in Thailand" it was revealed that 12 respiratory and health symptoms such as most likely caused by industrial air pollutants, Particulate Matter, Carbon Monoxide, Volatile Organic Compounds and Nitrogen dioxide. The BCPL is a chemical manufacturing industry which emits acid vapours in air. As this industry is located near residential area, we can imagine the kind of air inhaled by the residents of the localities surrounding this unit. This unit release their potentially harmful substances noxious, foul odour and gases like nitrous oxides, hydrocarbons, etc. These gaseous hydrocarbons in atmosphere help in forming photo- chemical smog in the sky. This smog remain for nearly one hour. These harmful substances mostly pollute the area between 4.00 AM to 10.30 AM. This smog is responsible for respiratory and cardiac difficulties. Among the surveyed villages, Ghoronia

T.E. suffers the most from air pollution. Even from a distance of 20 km., one can see thick smoke billowing out of the gas cracker plant. Acid rain has become a great threat to the environment. The use of solvents is increasing with the growing use of paints, spray, polish, etc. Due to the presence of hydrocarbons in these materials, acid rain is caused. The respondents of Lepetkata Kachari gaon reported that when they get in touch with the acid rain water their body start itching and takes the shape of ring worm. Some other cases of air pollution in the study area are as follows:

- a. Throughout the day, the villagers suffer from the nuisance odor.
- b. The roof of the houses turns black colour due to the smoke emitted by the BCPL. Moreover, the leaves of the trees also appear black.
- c. During cloudy days, Lepetkatta Kachari gaon also get the foul odour. The villagers opined that if they come in contact with this dirty smell for a long time they developed dizziness, sore throat and fatigue.
- d. Due to this foul smell the villagers cannot remain outside their houses.

6.7 Effect on Plants:

The impact of BCPL is not only limited to human lives but even the traditional home garden which plays an important role in our environment are affected. Traditional home garden a source of herbs, vegetables, fruits, betel nuts and leaves was found in almost every household in the surveyed area. These gardens have been maintained as a part of rural survival over generations. They conserve plant, animal and microbes, protect soil, holds water and fixes nitrogen and is a source of food, fodder, fuel, etc. These gardens are affected by BCPL in various ways such as:

- a. About 90 percent of the respondents replied that trees like betel nut, guava, mango, orange, banana, jack-fruit, etc. does not bear fruits. Moreover, a villager said that their trees and plants are dying because of the excess pollution caused by the industrial effluents.
- b. Prior to the establishment of BCPL, betel leaves were consumed by the villagers for 2- 3 years but now they last for hardly 1 year as the betel leaves are infected by chemical pollutant.
- c. The betel trees after growing for about 2 foot becomes dry, does not bear leaves and die.

- d. There appears dark spot on the leaves of trees.
- e. Even the production of leafy vegetables and potatoes has also declined.
- f. Bananas don't ripe naturally.
- g. Though the farmers apply chemical fertilizer in their agricultural field yet, the production of rice has declined. The farmers reported that an underground pipeline of BCPL is responsible for polluting their agricultural field. Even the production of tea has declined.
- h. The hydrocarbons released from BCPL causes premature leaf fall, curling of petals and discolouration of flowers. Moreover the dust and smoke cover the surface of the leaf and thus reduce their photosynthetic activity.

6.8 Effect on Poultry: Indigenous poultry plays an important role in family poultry production in the surveyed area. This poultry are also affected by the chemical pollutant of BCPL. During interview with the veterinary field assistant it was revealed that

- a. Earlier the hens laid ten eggs at a time but now it has decreased to three to four eggs.
- b. The cows, buffalo, goats and pigs are prone to infections and diseases. Even their reproductive capacity has declined.
- c. Swine fever is common in the surveyed area.

7. Conclusion

The economic importance of petrochemicals towards our society cannot be ignored but the large quantities of toxic and deleterious substances released from this industry is posing a threat to the health and environment of the people living near to BCPL in Dibrugarh. On the basis of two separate complaints against BCPL for creating pollution filed by Dibrugarh Fishery Co- operative Society Ltd. and Saikhowa Sadiya Min Samabai Ltd. the NGT instructed BCPL to close its operation in 2017. But the authority had denied the allegations and however BCPL got the order stayed in Guwahati High Court till further order. Though actual prevention of pollution is not so simple yet much of the pollution could be minimized or controlled by proper planning of BCPL.

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