CHAPTER-5

INDUSTRIAL POLLUTION AND HEALTH

The socio-economic situation in Punjab presents an inextricably complex relationship between its economic growth and health. The state has been experiencing several imbalances vis-à-vis its economic growth and deteriorating social sector development which in some areas like mother and child health care and female feticide have taken alarming proportions and have caused national concern. Another such emerging sector is the inter-relationship between the rapid industrial growth and the resultant increased toxicity in localities that are close to the industrial units in the state.

Global experience has shown that developmental activity carries with it the seeds of environmental degradation which are assisted and abetted by both the needs and demands of man. Activities such as manufacturing, processing, transportation and consumption not only deplete the stock of natural resources but also strain the natural live-sustaining richness of the environmental system by accumulating a lethal stock of non-degradable and many a times toxic wastes. While water, soil, air, forest and fishery resources are productive assets the pollution of water, air and soil are the by-products of economic development, particularly industrialization, the untreated or improperly treated wastes cause and result in pollution. Global warming, acid rain, green house effect, smog, poisoned water resources, noise pollution etc., are different forms of pollution which are unanticipated outcome of industrial development. Other pollutant sources include accidental release from a process, leakages from pipelines or containers when material is being transferred or is awaiting shipment as also emissions from chimneys, stocks, end-of-pipe liquid discharges, noisy machinery and noise from other processes within the factories.

Environmental health, thus, is at risk because of the medical effects of chemicals and physical factors that influence the immediate environment. As the
environment effects nearly every aspect of the lives of a people in a variety of ways the special focus of environmental health as a discipline is to analyze effects of polluted air, contaminated food and water and toxic or hazardous materials that are steadily depleting the environment. The health hazards posed by the endangered environment may pose both short-term and long-term risks and mal-effects. It is necessary, therefore, to acknowledge that the level of environmental problems of a State vary with the stages of development, current production technologies, and the environmental policies in place or being enforced. Unchecked economic development without adequate environmental considerations can result in serious environmental damage affecting the quality of life of a people in their present and in the future for generations to come.

Rapid industrialization and economic growth have led to an intensification of consumerism, which in turn has added to the problem of disposing of colossal amounts of garbage generated each day. Unfortunately, very few reliable statistics on solid waste generation are available at the national level. In the year 1984, the national per capita generation of waste was estimated to be 250 gms / day (Holmes106, 1984).

Table 5.1: Health Effects Associated with Different Types of Air Pollution

<table>
<thead>
<tr>
<th>Cause</th>
<th>Effects due to prolonged exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>Affects circulatory, reproductive, nervous and renal systems; suspected of lowering learning ability in children, hazardous even after exposure ends.</td>
</tr>
<tr>
<td>Particulate Matter</td>
<td>Fine particles may cause lung cancer; a strong correlation exists between suspended particulate and infant mortality in urban areas.</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>Affects fetal growth in pregnant women and tissue development of young children; impairs perception and thinking, slows reflexes and causes drowsiness, can cause unconsciousness and death.</td>
</tr>
<tr>
<td>Sulphur Dioxide</td>
<td>Exacerbates asthma, bronchitis, and emphysema; causes coughing and impairs lung function.</td>
</tr>
<tr>
<td>Toxic Substances</td>
<td>Suspected of causing cancer, reproductive problems and birth defects; benzene is a known carcinogen.</td>
</tr>
</tbody>
</table>


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According to environment surveys\textsuperscript{107} conducted by various studies, some of the main causes of industrial pollution are:

Prevalence of out-dated inefficient technologies that generate a large amount of waste.

Large unplanned industrial conglomerations that have encroached upon and severely polluted their environs.

The existence of a large number of small scale industries that escape land use and some time even environmental regulation.

Poor enforcement of Pollution Control Laws.

Lack of resources in implementing pollution control programmes.

Industrial pollution is concentrated in certain sectors. The government has identified 17 heavily polluting industrial sectors with critically polluted areas, as given below:

1. Cement
2. Thermal Power Plants
3. Iron and Steel
4. Fertilizer
5. Zinc Smelters
6. Copper Smelters
7. Aluminum Smelters
8. Oil Refineries
9. Distilleries
10. Pulp and Paper
11. Dyes and dye Intermediates
12. Pesticides
13. Petro-Chemicals
14. Tanneries
15. Sugar
16. Basic Drugs

For example, the paper and pulp industry, considered relatively the safest for setting up in a healthy environment has the following drawbacks.

\textsuperscript{107} http://wmc.nic/chapter 2- environmental scenario. asp. Waste Minimization Concept, Legal Aspects, Policy Instruments for Pollution Abatement
### Table 5.2: Effluents Generated in the Pulp and Paper Mill Industry

<table>
<thead>
<tr>
<th>S.No</th>
<th>Effluent Problems</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Fiber liquors</td>
<td>Fiber mats on streambeds, suspended solids, increased BOD Recovery and removal of fiber through secondary treatment, aeration of the affluent in ponds</td>
</tr>
<tr>
<td>2.</td>
<td>Liquor</td>
<td>Toxic to aquatic organisms In-plant recovery and recycling of chemicals</td>
</tr>
<tr>
<td>3.</td>
<td>Slime inhibitors</td>
<td>Bio-accumulation of mercury in fish; mercury poisoning Replacement of organo-mercury compounds</td>
</tr>
<tr>
<td>4.</td>
<td>Bleaching By-Products</td>
<td>Bio-accumulation of chlorinated organic compounds Replace chlorine bleach with chlorine dioxide or hydrogen peroxide</td>
</tr>
<tr>
<td>5.</td>
<td>Gases</td>
<td>Obnoxious odours Installation of scrubbers, but difficult to remove completely.</td>
</tr>
</tbody>
</table>

Our study reveals that the pulp and paper industries make little effort to take precautions and fail to implement simple solutions to prevent environment pollution.

Some of the major Environmental Pollution Control Activities in India\(^{108}\) are as follows:


- Notification and implementation of emission and effluent standards for air, water and noise levels. Standards are formulated by a multi-disciplinary group keeping in view the international standards, existing technologies and impact on health and environment.

• Identification and Action Plans for 17 categories of major polluting industries.

• Identification of 24 critically polluted areas for pollution abatement and improving environment.

• Use of beneficiated coal with an ash content not exceeding 34% irrespective of their distance from pit head.

• Action Plans for 141 polluted river stretches to improve quality of river water.

• For controlling vehicular pollution, progressive emission norms at the manufacturing stage have been notified, cleaner fuels like unleaded petrol, low sulphur diesel, and compressed natural gas [CNG] introduced.

• Identification of clean technologies for large industries and clean technologies / processes for small scale industries.

• Setting up of Common Effluent treatment Plants [CETPs] for clusters of SSI units.

• Implementation of an Eco-mark scheme to encourage production / consumption of environment –friendly products.

• Preparation of a zoning atlas, indicating status of the environment at district levels to guide environmentally sound locations / sites of industries.

• Mandatory submission of annual Environmental Statement which could be extended into environmental audit.
• Initiation of environmental epidemiological studies in seven critically polluted areas to study the impact of environment on health.

• Setting up of authorities like the Environment Pollution [Prevention and Control] Authority for the National Capital Region for protecting and improving the quality of environment and preventing, controlling and abating environmental pollution.

• Provision of fiscal incentives for installation of Pollution Control equipment and also for shifting of industries from congested areas.

Industrial pollution\(^{109}\) has been defined as “The unfavorable alteration of surroundings, wholly or largely as a by-product of man’s actions, through direct or indirect effects of change in energy patterns, radiation levels, chemical or physical constitution and abundance of organisms”. Air pollution may be defined as presence in the outdoor atmosphere of one or more contaminates such as obnoxious fumes, gas, mist odor, smoke, or vapor, in quantities, with characteristics of and of durations such as may be injurious to human, plant or animal property and physical entity.

In Punjab the setting up of industries was an advent into an otherwise agricultural area. At present however, the industry and agriculture inputs into the economy are comparable. The adverse effect of the industries however, by far outweighs those of agriculture. As per news reports\(^{110}\) the majority of distilleries and paper mills have been purposely set up near the main flood drains of the State to facilitate water flow into the plants. It is common practice to discharge non-treated effluents into these flood drains. According to the law provisions, however, any disposal into these drains is illegal and yet there are some paper and distillery units which have obtained permission from the State Department of

\(^{109}\) http://www.punabenvironment.com/air_ind.htm Industrial Pollution  
Drainage to spew their effluents into these very drains. The biological oxygen demand [BOD] from these drains should be 3 mg to 4 mg per litre, but almost all the flood drains of the Punjab have a BOD of 100 mg to 150 mg per litre at an average. Not only has this water become unfit for human consumption but it poses a major hazard to the survival of the fauna in these river water systems.

The devastating impact of water pollution can be seen on people, animals, fishes and birds in the long term. Polluted water becomes unsuitable for drinking, recreation, agriculture and industry. It destroys aquatic life and reduces its reproductive ability. According to a report prepared by the Punjab State Council for Science and Technology111, during the past two decades, rapid industrialization practices have heavily polluted the fresh water resources of Punjab in both physio-chemical and biological terms.

The Study Area

Industrialization in the area under study (i.e. in the four villages of Asron, Taunsa, Bannah and Rail Majra) started during the 1980s. Many industrial units were established in the villages. At the time most of the industrial units were engaged in the manufacture of pharmaceuticals, papers, pesticides, iron scraps etc. Pollution caused by these industrial units has resulted in the contamination of soil, water and air.

These industries were established parallel to the Bist Doab river. The river water has been spoiled by pollutants released from the units in one way or the other. Shreyans Paper Mills is put up near the flood drain which meets the Bist Doab river. The industry discharges non-treated effluents (Black Liquor) into the flood drain and during the rainy season these are carried into the river. Thus, the river water had become wholly unfit for human consumption due to pollutants.

The black soot released from the industry can be seen in the villages. This soot affects eyes, spoils the food and other household items. Effluents are also discharged into the shallow pond located at the back of the factory premises by Shreyans Paper Mills. These effluents have such toxic chemicals and harmful substances, that if someone comes in direct contact with chemically polluted water, blisters are sure to erupt on the skin. One of the respondents had reported an incident wherein some children had accidentally touched the pond water and experienced a burning sensation on their skins and later blisters had erupted. Fly ash has become a major source of pollution in this area. It clouds the visibility and causes breathing problems.

One of the industrial units, the DSM Anti-infective Private Limited, a pharmaceutical factory releases chemicals into the air. A bad odor seems to hang over the surrounding villages. Ground water has been contaminated by the industries. The DSM factory had dug evaporation tank with a polythene sheet at the bottom to discharge untreated effluents over, the years, the effluents have percolated into the soil surrounding the units. An ultimatum was given to the factories (including DSM) by the Chairman, Punjab Pollution control board to do away with the tanks and install the waste treatment plants. This has contaminated not only the ground water but it has also damaged the fertile lands surrounding the factories. It was revealed during the study that some of the industrial units (Ranbaxy) even used bore wells to pump untreated effluents down into the earth which led to the contamination of the ground water. Factories have been dumping the hazardous water into the open which has made the land non-productive.

The problem of industrial pollution is serious in the Asron industrial belt. It affects the health of the people who live in the vicinity of the industrial units. The worst hit is either the rural folk who are unaware of its effects or workers who earn their living from the polluting industrial units. While setting up these units, issues of pollution and proximity of these units to villages were not considered.
Industries, on the other hand, still maintain that people’s fear of pollution from effluents released by the units is baseless and unfounded. They stressed that they have waste water treatment plants and no effluents were discharged without being treated. At present, all the three industrial units under study have installed waste water treatment plants.

When the study was started only one of the industrial houses had the waste water treatment plant. But, it is revealed in the study that the waste treatment plants are not properly managed and are of a capacity less than what is actually required\textsuperscript{112}. The Pharmaceutical industries representative, i.e. DSM Anti-lnfectives Pvt. Ltd. has been asked by the Punjab Pollution Control Board to engage a consultant to study the pollution caused to under ground water in the area. They had been asked to come up with new processes and to replace the present system of relying on evaporation of the effluents by releasing them in shallow ponds.

State of Pollution in Punjab

As per information available from Central Pollution Control Board on September 30\textsuperscript{th} 1999 out of a total of 45 units in Punjab six units have been closed and 39 units have adequate facilities to comply with the pollution control standards\textsuperscript{113}.

Recent surveys have shown that large medium or small industries like rice shellers, brick Kilns, industrial furnaces, municipal committees, hospitals and plastic manufacturing units – all are polluting Punjab. Out of 119 municipal councils in Punjab, only three viz., Nangal, Anandpur Sahib and Phillaur – have installed water treatment plants\textsuperscript{114}.

\textsuperscript{112} Interview with industrial workers and Personnel Manager, DSM Anti-Inf ectives and (28\textsuperscript{th} Oct, 2003).
\textsuperscript{113} The Tribune, May 14, 2003 pp 13
\textsuperscript{114} The Tribune, August 29, 2003 pp 13
In another survey conducted by the Punjab Pollution Control Board [PPCB] it was found out that every year 25 thousand tones of industrial waste is being released. Most of these pollution causing industrial units are located in the districts of Ludhiana, Hoshiarpur, Derabassi, Jalandhar, and Mandi Gobindgarh where there is a large scale industrial presence. According to the Punjab Pollution Control Board records, the small scale industries are the main culprits for polluting the environment. About 1,570 units have not installed air pollution control devices and 2153 have sought the boards consent for discharging effluents into water. An overview of pollution in Punjab reveals that tanneries are the main perpetuators of environmental pollution followed by the distilleries and paper mills. Dyeing and pharmaceutical industries are the other industries polluting Punjab's air, water and soil.

In a survey conducted by the PPCB, 56 units were identified as hazardous in the districts of Nawanshahar, Ropar, SAS Nagar, Patiala, Sangrur and Bhatinda. It is highlighted that all major pharmaceutical and chemical industries pose a potential danger to society in case of accident. Taunsa (one of the villages under study) has two bulk drug industries units115. Derabassi, Patiala district, has six bulk drug industries and one pesticide manufacturing unit. These industries use highly inflammable and toxic materials, chemicals and solvents which are potential risk materials and require a high degree of safety standards. Ground-water within a two kilometer radius of the Taunsa industrial belt has become highly polluted with very high content levels of fluorides, and chlorides with a BOD level unfit for human consumption. The pollution was attributed to mainly two pharmaceutical units, namely, the Ranbaxy laboratories and the DSM Anti-Infectives Pvt. Limited. This pollution had been going on steadily for years116.

Rapid industrialization practices have heavily polluted the fresh water resource of Punjab. The industrial waste accumulates and poses a threat to the aquatic ecosystems and secondary and tertiary food chains. In the report funded by the Ministry of Environment and Punjab Pollution Control Board 15,547 units are identified as polluting industries under various Environment Act provisions. The Sutlej river (Nangal) is the most polluted river of the state. Its toxicity level is high in Nangal (due to effluents from National Fertilizers Limited and Punjab Alkalies), Kiratpur Sahib (due to human ashes) and effluent from the Ropar Thermal Plant, and the DCM Engineering Products. In Talwara the water gets polluted at Mukerian (due to effluents from Mukerian Paper Mills and Goindwal Sahib. Another river, Ghaggar, gets effluents from ABC Limited, Stepan Chemicals, Bharat Electronic Limited at Rajpura, Patiala Distillers and Hindustan Wire Products at Patiala.

More than the polluting units the blame for the dismal state of affairs can be laid at the door of the regulatory agencies – the Punjab Pollution Control Board and the Punjab Industrial Development Corporation – which have failed to control and monitor industrialization. Instead these regulatory authorities have been reduced to mere rubber stamps – to promote industrialization at a frenzied pace. This was not true earlier as is evident from the following extract.

Deficiencies in the Factories Act, 1948, as pointed out by the Punjab Industrial Safety Committee 1986 report are given below:

The Act makes it possible for a manufacturer to undertake unsafe production till he has been prosecuted. The prosecution provides for imprisonment which may, at the most, extend to six months (seldom awarded) and/or a

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fine of maximum of Rs. 2,000. For a subsequent offence, the penalty is reportedly stiffer.

It does not empower states to prohibit or suspend an operation if the workers are not exposed to risk, even though the neighboring population may be liable to risks.

It has little provisions for controlling violations once the production starts. H. Pais of the National Labour Institute has explained this deficiency: “Suppose for a factory manufacturing chemicals, the Inspector has prescribed a safety system comprising relief vent valves (RVV), vent gas scrubber (VGS) and flare tower (FT). During an inspection, he finds the RVV and the line connecting VGS to the flare tower in an unsatisfactory condition. Can he in the interest of safety order the owner to stop manufacturing?” The law does not empower the Inspector to stop work under such circumstances.

The Committee’s recommendations were as follows:

1. Factory managements must make full disclosures about the risks involved.

2. A hazardous unit, even if it employs one person, must be registered.

3. Most factory inspectorates are understaffed. As against the ILO norm of one inspector for 50 factories, the usual norm is for one inspector for 150 factories and the actual position is much worse. Inspectors are not given their due position in the official hierarchy. Infrastructural facilities are non-existent, transport is lacking; there are hardly any arrangements for collection of samples in the prescribed format.
In Punjab the total number of industries increased tremendously in the past 20 years. From 43,300 small scale units and 228 large and medium scale units in 1980 to 2,01,736 and 620 units respectively in 2002 as shown in the Table. The Punjab Pollution Control Board has so far identified 15547 industries under the provision of water (Prevention & Control of Pollution Act, 1974) and Air (Prevention & Control of Pollution Act, 1981). Out of the 29,465 Red Category Units, there are 288 LSUs, 340 MSUs & 8,837 SSUs. Out of 6,082 Green Category Units, there are 2,775 SS Moderately Polluting & 3,307 SS Polluting Units. These industries have caused serious air, water pollution problems in the state.

Table 5.3: Status of Air Polluting Industries of Punjab

<table>
<thead>
<tr>
<th>Scale</th>
<th>Units</th>
<th>APCD* Provided</th>
<th>APCD not Provided</th>
<th>APCD Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>288</td>
<td>221</td>
<td>0</td>
<td>67</td>
</tr>
<tr>
<td>Medium</td>
<td>340</td>
<td>220</td>
<td>6</td>
<td>114</td>
</tr>
<tr>
<td>Small Scale</td>
<td>8837</td>
<td>3260</td>
<td>3745</td>
<td>1832</td>
</tr>
<tr>
<td>Total</td>
<td>9465</td>
<td>3701</td>
<td>3751</td>
<td>2013</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category</th>
<th>Units</th>
<th>APCD* Provided</th>
<th>APCD not Provided</th>
<th>APCD Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS Mod. Poll</td>
<td>2775</td>
<td>514</td>
<td>99</td>
<td>2162</td>
</tr>
<tr>
<td>SS Mar. Poll</td>
<td>3307</td>
<td>61</td>
<td>49</td>
<td>3197</td>
</tr>
<tr>
<td>Total</td>
<td>6082</td>
<td>575</td>
<td>148</td>
<td>5359</td>
</tr>
</tbody>
</table>

* APCD – Air Pollution Control Devices

Industries like dyeing units, rice Sheller plants, tyre units, vanaspati ghee [hydrogenated oils] and paper mills are burning rice husk and coal in the boilers for serving their fuel purposes. This is resulting in the generation of a lot of black, sooty, carbon particulate matter. The partially burnt husk gets converted into ash, the disposal of which again results in serious problems.

The other sources of industrial air pollution, are the metallurgical units e.g. arc induction furnaces, rolling mills and small pit furnaces. Arc furnace induction furnaces convert scrap into steel by heating and conducting electricity. These

http://www.punjabenvironment.com/air_ind.htm
Ibid

117
industries emit large quantities of fine metallic particles. Rolling mills in the State are either coal fired or oil fired and quantities of suspended particulate matter and obnoxious gases like Sulphur and Carbon monoxide. These pollutants are received by the villagers as a health hazard.

The fertilizer production industry releases toxic gases like sulphur dioxide, carbon dioxide, acid mist, etc. in addition to dust into the atmosphere. It must be acknowledged, however, that some of the industries in the State have taken suitable measures to minimize some of the pollutants. Thermal plants also contribute substantially towards air pollution. To minimize the effect both the thermal plants of the state have installed electrostatic preceptors to contain the emissions. Fly ash disposal from thermal plants is another pollution factor for which action is being taken like the setting up of the clinker plant in the premises of the Ropar Thermal Plant complex, wherein fly-ash shall be filtered. Sugar industries use bagasse for raising steam but during the heat transfer the Bagasse fired boilers generate particulate matter which proves to be a potential health hazard. The industries have been told to adopt measures to deal with this form of pollutant as well.

In Punjab the industrial system had taken on a mantle of apathy where profits were the main concern and the long term health hazards were steadily given a back-seat. It seemed to make better business sense to the industrialists of the State to carelessly deal with hazardous waste rather than set up mechanisms to deal with the problem as any inputs in this direction would cut into the short term gains and profits.

Industrial pollution causes threat to human health and environment. Of primary concern in the risk posed to the environment is the improper disposal of hazardous industrial wastes and toxic chemicals. This results in the contamination of surface waters, groundwater resources, soil and air. Heavy concentration of chemicals and metals in both surface and ground waters causes
serious damage to the ecology of river systems. A number of studies have shown
that the industrial pollution is taking a heavy toll on human life in the developing
countries. There is plenty of evidence to suggest that toxic pollutants have
resulted in higher prevalence rate of various malignancies in polluted zones.
Linkages between air pollution and respiratory disorders are well documented.

Even in a developed country like the United States, industry is regarded
as the greatest source\textsuperscript{121} of pollution. The waste bearing toxics or effluent is
discharged into streams, lakes and oceans, which in turn disperse the polluting
substances. The pollutants released from the industrial units include grit, sulphur,
asbestos, phosphates, nitrates, mercury, lead, caustic soda and other sodium
compounds, oils and petro-chemicals. Spreading into water and air these
pollutants have contaminated the entire food chain, including humans. In the
USA and in Europe, the cancers have tripled over the last fifty years and breast
cancer today hits 1 woman in 8 as compared to data available for the 1960s.
Little wonder then that the US and other big industrial conglomerates began
relocating their industries [called the sunset industries] and fabricating units to
other smaller developing countries and underdeveloped nations in a
camouflaged garb of aid and ‘outsourcing’ in an effort to protect its own depleting
health zones.

Similarly the Japanese government was forced to act in response to an
indigenous environmental movement which claimed that over half the Japanese
population was suffering from pollution. Japan between 1932 and 1968, suffered
from extreme\textsuperscript{122} industrial pollution which resulted in a number of tragedies such
as mercury poisoning in Minamata where a factory producing acetic acid
discharged waste liquid into Minamita Bay, Japan. The disease experienced
here reached high levels in the 1950s with some of the severe cases suffering
brain damage, paralysis, incoherent speech and delirium

\textsuperscript{121} Industrial Pollution. http://www.google.com
from Industry Mining and Agriculture
Japan's answer to this dilemma was to export industries to countries like Korea, the Philippines and Thailand. Thus, it can be seen that industrial growth brings with it a vicious cycle of survival whereby the environmental hazards threaten the very lives of the people that the industry supports and sustains. It can be concluded that many countries like India are sacrificing their environment to develop their economy resulting in innumerable health hazards and posing a tremendous threat to the coming generations of the animal and plant kingdom.

Human health is one of the most important indicators of quality of life and is critical to economic development. A healthy work force is essential for the development of an economy. That is clean air, water and wilderness. Pears and Warford\textsuperscript{123} have argued that the most important and immediate consequence of environmental degradation in the developing world is the drain on human health.

Industrial pollution causes carcinogenic or cancer causing effects on the endocrine and reproductive systems, developmental delays and other nervous system effects (including methyl mercury poisoning, Minamata disease), renal system (including chronic cadmium poisoning – Itai-Itai disease) and circulatory system (Methyloglobin anemia from nitrate and ammonia and hypertension from lead). It is difficult to assess the exposure caused due to pollution since humans take traces of elements and other compounds in small amounts via air, food and water. The effects depend on factors such as the duration of exposure, varying susceptibility by age and the presence of disease or malnutrition. That may increase vulnerability to the effects of exposure.

Industrialization has affected the health of the people wherever it has taken place. Unregulated growth of urban areas, inadequate infrastructure facilities and lack of proper facilities for collection of garbage and its

transportation, treatment and disposal of wastes have all contributed to increasing pollution causative health hazards.

The Pollution and Disease Occurrence Relationship

A 1994 survey of the groundwater quality at 138 sampling locations in 22 industrialized zones of India revealed that water in all 22 zones was not fit for drinking due to high bacteriological and heavy metal contamination. It is estimated that 1.5 million pre-school children in India die every year from diarrhea, and that cholera dysentery and gastroenteritis are responsible for 60% of the total urban deaths (Sivaramakrishnan, 1993). In 1990, there were almost ten million cases of acute diarrhoeal diseases, 1.8 million of malaria, and 3700 of cholera (MHFW, 1992). And the city of Surat in Gujarat, previously world-renowned for its diamond cutting and art silk, about a decade ago held the dubious distinction of being the “plague city” of India. Plague claimed hundreds of lives in this city in September 1994, owing to abysmal civic conditions. In Punjab the water borne diseases have a large exposure due to the faulty and ill-repaired drinking water system and polluted environment.

All these diseases are water-borne and claim a large number of lives every year in spite of better health facilities and increased expenditure on health. In urban regions, river water is, to a large extent, treated before it is supplied by the municipal authorities to the people for drinking and other domestic purposes. However, most Indian rivers today fall short of the Central Pollution Control Board standards, due to excessive pollution by untreated sewage, as also domestic and industrial waste. Biological oxygen demand (BOD) and most Probable Number (MPN) are direct measures of the extent of organic pollution of any water body. As per the data generated by Central Pollution Control Board from its 270 monitoring stations across all 28 major Indian rivers under its monitoring.

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124 http://www.teriin.org/report/repo2rep0202.htm. (Central Pollution Control Board)
125 Ibid
MINARS programme, mean BOD values have shown a marginal increase over 1979-1991, remaining in excess of the standard value of 3 mg per litre.

In August 1999, *Down to Earth*\textsuperscript{126} got a sample of ground water in Lali village (Gujarat) tested for its mercury concentration. It was found that the mercury concentration was 211 times the permissible limit. Mercury is an extremely toxic heavy metal and is known to cause damage to kidneys and the central nervous systems.

According to Dr. Holdgate\textsuperscript{127}, Director of the Institute of Terrestrial Ecology, it is true that there has been a fall in the incident of cancer of the cervix and of the stomach, as industrialization has proceeded, but this has been more than compensated for by the increase in breast cancer, cancer of the colon and cancer of the respiratory tract. Indeed, the total incidence of cancers is increasing at more than two percent per annum.

In a report prepared by the Indian people’s Tribunal on Environmental and Human Rights headed by retired Madras High Court Judge, Justice J. Kanaraj\textsuperscript{128} (2003), it is confirmed that in SIPCOT industrial estate in Tamil Nadu, pollution has affected the liver, health and livelihood of the villages. It asserts that villagers and local people have suffered material losses due to industrial pollution in the SIPCOT region. There are about 25 chemical industries which include dyestuff pharmaceutical and pesticide plants in a stretch of 4 kilometers without proper facilities to deal with toxic effluents or hazardous waste. Villagers are facing severe health problems which according to Kanaraj et al. are caused by industrial pollution.

According to Shah and Valecha (2004) the villages under the Nandesari industrial\textsuperscript{129} area, Gujarat, are facing various health problems. There is a high incidence of allergies of the skin, nasal and respiratory problems, lung


\textsuperscript{127} Holgate. [www.google.com](http://www.google.com)

\textsuperscript{128} J. Kanaraj. 2003. *‘Peoples tribunal Calls for Reparations for Cuddalore Pollution Victims’*. The Indian Peoples Tribunal on Environment and Human Health. 10th July 20032003.

\textsuperscript{129} in Surekhs Sule’s. 2004. *After the Poisoning*. [www.google.com](http://www.google.com)
abnormalities like emphysema, blood circulatory disorders, high blood pressure, heart diseases, gastroenteritis, kidney and renal stones, impotency, infertility, etc.

Similarly in Punjab, according to Eshwar Anand\textsuperscript{130} (2003), industrial pollution led to the contamination of the Sutlej waters in Nangal. The salt content of the Sutlej water is getting reduced from its normal level. The main culprits here are the National Fertilizers Limited and Punjab Alkalies and Chemicals Limited, Nangal. The discharge from the Punjab Alkalis and Chemicals Limited contained high levels of chlorine, ammonia and other chemicals which affected the groundwater in about 12.15 villages. Moreover, huge quantity of fly ash was periodically dumped into the river bed.

It can be reviewed from above studies that industrialization exerts pressure on infrastructural facilities of human settlements which is manifested in environmental problems in terms of increased incidence of air, water, noise pollution and land degradation. Due to the establishment of various industries in the area under study the local population experienced numerous health disadvantages due to the industrial pollution which has resulted in the contamination of soil, water and air.

The industrial pollutants have severely affected the health of the local pollution. The Table given below shows the villagers whose health has been affected by industrialization.

Table 5.4 : Impact of Industrial Pollution on Health

<table>
<thead>
<tr>
<th>Do you or any member of your household suffered from any disease during the last two decades.</th>
<th>Number of Industrial workers</th>
<th>Number of Agricultural workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>229</td>
<td>267</td>
</tr>
<tr>
<td>90.51%</td>
<td>84.76%</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>24</td>
<td>48</td>
</tr>
<tr>
<td>9.48%</td>
<td>15.23%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>253</td>
<td>315</td>
</tr>
</tbody>
</table>

Source: Field Survey

\textsuperscript{130} Eshwar Anand, V. 2003. The Tribune Industrial Pollution in Ropar district – II. Pp.-II.
It is clear from the above table that about 90 per cent of the industrial workers and 84.76 per cent of the agricultural workers have reported health problems. It is evident that the population in the area is relatively at a higher health risk than is generally reported for populations that are not exposed to abnormal levels of environment pollution.

In the following data analysis, an attempt is made to summarize the nature of existing health complaints. The Table 5.5 examines the health problems faced by the industrial and agricultural workers living in the area under study.

Table 5.5: Health Problems faced by the Industrial and Agricultural Workers.

<table>
<thead>
<tr>
<th>Name of disease</th>
<th>Number of Industrial workers</th>
<th>Agricultural workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin infections</td>
<td>237</td>
<td>282</td>
</tr>
<tr>
<td></td>
<td>93.67%</td>
<td>91.00%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>85</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>10.77%</td>
<td>21.58%</td>
</tr>
<tr>
<td>Asthma, chest diseases and Tuberculosis</td>
<td>137</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>43.49%</td>
<td>29.52%</td>
</tr>
<tr>
<td>Anemia</td>
<td>131</td>
<td>137</td>
</tr>
<tr>
<td></td>
<td>51.77%</td>
<td>43.49%</td>
</tr>
<tr>
<td>Gastro-intestinal infections.</td>
<td>187</td>
<td>173</td>
</tr>
<tr>
<td>(Diarrhea, dysentery cholera)</td>
<td>70.39%</td>
<td>54.93%</td>
</tr>
</tbody>
</table>

Source: Field Survey

Most of the respondents had been suffering from skin infections like skin rashes, ringworm disease, white spots etc., from a long time. It is clear from the above Table that 93.67 per cent of industrial and 93.67 per cent of industrial workers and 91 per cent of agricultural workers had skin infections of various kinds ranging from itching to blisters and discoloration. Also 10.77 per cent of the industrial workers and 21.58 per cent of the agricultural workers were found to be diabetic. While 43.49 per cent of the industrial workers and 29.52 per cent of the agricultural workers had experienced breathing problems and complications.
related to the respiratory tract and there were 51.77 per cent of the industrial workers and 43.49 per cent of the agricultural workers who were anemic. There were 70.39 per cent of industrial workers who had suffered from some or the other gastro-intestinal infection. It is, however, probable that the respondents may have reported to have suffered more than one condition of ill-health.

Table 5.6: Source of Drinking water.

<table>
<thead>
<tr>
<th>Drinking water source</th>
<th>Number of Industrial workers</th>
<th>Number of Agricultural workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dug well</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>Tank</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>Pipe house connection</td>
<td>52</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>20.59%</td>
<td>30.59%</td>
</tr>
<tr>
<td>Hand Pump or Motor Pump</td>
<td>195</td>
<td>263</td>
</tr>
<tr>
<td></td>
<td>77.07%</td>
<td>83.49%</td>
</tr>
<tr>
<td>Tap water</td>
<td>183</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td>70.23%</td>
<td>68.88%</td>
</tr>
</tbody>
</table>

Only 20.59 per cent of industrial workers and 30.59 per cent of agricultural workers had access to piped water connections in their houses. Most of them belong to the influential group of people in the villages. Though 70.77 per cent of industrial workers and 80.36 per cent of agricultural workers have hand pumps or motors pumps in their households, it was found that the water of the hand pumps was unsuitable for drinking purposes due to contamination. Although tap water is preferred for drinking needs only 70.23 per cent of industrial workers and 68.88 per cent of agricultural workers have access to and use tap water for drinking and cooking purposes.

Industrial workers told the investigator that though the working conditions are satisfactory inside the factory but sustained exposure for long durations to the high temperatures and consequent humidity causes diseases that effect the skin and cause lung diseases (tuberculosis, etc.,)
Some of the contractual laborers were living in jhuggis and kaccha houses located in the industrial belt on the Bist Doab river which they use as the major sanitation and drinking water facility. The people use the river water for drinking, washing and bathing purposes as there are negligible facilities available to them. The living conditions of these poor people make them prone to various diseases. It is well known\textsuperscript{131} that occurrence of gastro-enteritis is closely related to poor living conditions, lack of safe drinking water and unhygienic sanitation facilities (Snow). Generally, as they are dependent on these factories for their livelihood the housing is more likely to be situated close to factories or dump sites, which represents a greater health risk. In such locations there is an increased risk of disease.

**Balancing the Boon and the Bane of Industry**

The level of problems caused by environmental degradation varies with the stages of development, current production technologies and environmental policies being implemented. Lack of economic development also contributes to environmental pollution in the form of inadequate sanitation and lack of availability of clean drinking water. Economic development considerations can cause serious environmental damage affecting the quality of life of the people of concerned area. Effluents being emitted from the industrial units particularly the paper and pulp as well as pharmaceutical units are the main sources of health hazards in the area.

The hazardous materials pose health problems to the people living in the vicinity of the industrial units. It is evident that if one were to live a healthy life, it would be essential to have efficient and hygienic means of disposing industrial and domestic wastes. It is acknowledged that progress of mankind can be severely hampered without industrialization yet no one can deny that the very

existence of mankind is impossible in an environment vitiated by the after-effects of unchecked industrialization.

It is a difficult task to balance environmental sustainability and industrial progress. Decades of thinking have gone into thinking out the means and measures for the amelioration of the situation. Several strategies have been evolved and put into place for countering the mal-effects of rampant industrialization. Some of these are related to the different types of pollutants and the variant forms of pollution. A major strategy to control pollution of the environment due to the industrial wastes is the provision of a comprehensive sewerage system to collect the treated waste-water. Toxic effluents from industries are required to be treated where necessary, before being discharged into the sewerage system. Industries that contribute to air pollution must install and operate control equipment to clean gaseous and particulate emissions. Heights of chimneys, which help disperse emissions, are also stipulated.

Treatment of pollutant discharges to reduce the severity of their impact on environmental health would include the elimination of the effluent at the source, water resource strengthening and recovery of the materials and biological methods of treatment which some conscientious industries met. Moreover, various possible steps could be considered and selectively taken up, on a prioritized and phased plan, by the factory managers to minimize the detrimental effects on environmental health. These would include the maintenance of a source emission inventory, continually evaluating process operations to identify potential modifications that might reduce or eliminate environmental impacts. Factory manager should be well-informed on the many state of the art maintenance and prevention programmes that exist and are being evolved. They should be stringent in their enforcement and regularly updating. The factory manager is duty bound to investigate all applicable and emerging pollution control technologies. He should also be well informed of the regulations and regulatory trends in this field to be able to accrue the maximum benefit to the manufacturing unit, its environment and the population living in the vicinity of the
unit. In fact at the very design stage of the industrial unit there should be open communication between factory manager and the government departments about recycling, reclamation and waste reduction. The process should be more of cosmopolitan responsibility rather than mere commercialization.

Thus, for tackling industrial pollution there should be open and nurtured dialogue between the factory manager and industry colleges, followed by discussion with technical specialists and government officials. It can be concluded that only a balanced and responsible approach can benefit the industry, its employees and society at large especially keeping in mind the larger perspective of human comfort and survival within the given natural habitat and environment.

Case Studies of Cause and Effect

Some case studies of the area under study are presented below to be able to ascertain the degree of threat posed by the industrial houses to the immediate environment of the villagers and the potency of the impact on the environment and the population. Also an analysis has been attempted to study the over-all impact suffered by the population and the environment because of the effluents and the waste spewed by the factories in the vicinity of these villages.

Case Study No. 1

Name : Harbans Lal
Village : Bannah
Age : 28 years
Education : Illiterate
Occupation : Agriculturalist

Harbans Lal lives in village Bannah. His land is on the bank of the Bist doab river. For generations the water of the river has been used by his lands and people for irrigation purposes. His father, however, died due to tuberculosis. He reported
that after the industries were set up in the 1980's the water began to get contaminated.

According to him several crops were spoiled when irrigated by the river water. When the factories were prevented from dumping effluents in the river they resorted to reverse boring, that is pumping of the untreated effluents directly into the ground water, a natural resource of the earth, through under-ground aquifers, thus contaminating this major source of natural water.

The villagers, according to him, were at a loss to understand how best they could combat such a situation to be able to survive in a healthy life-sustaining environment. What should they do to save their land from getting poisoned? Moreover, since he was illiterate he had no other option available for earning his living.

He has a severe grievance against the Ranbaxy laboratories. The effluents released by the factory have deteriorated the river water. The pipelines through which the effluents are released into the river can be seen openly on the banks of the river just about 2 kilometers from the factory.

According to him when the wheat crop is ready to harvest, it droops after turning black. He feels he has been dealt a raw deal where he is unable to sustain himself and his family. He has no recourse to any other form of earning and does not want to leave to go someplace else because of the pull of his ancestral lands.

**Caste Study No. 2**

<table>
<thead>
<tr>
<th>Name</th>
<th>Nant Ram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Village</td>
<td>Bannah</td>
</tr>
<tr>
<td>Age</td>
<td>48 years</td>
</tr>
<tr>
<td>Caste</td>
<td>Gujjar</td>
</tr>
<tr>
<td>Occupation</td>
<td>Agriculturalist</td>
</tr>
</tbody>
</table>
Nant Ram lives in village Bannah. He is the head of the household. According to him the nearby industries have polluted the environment of his as well as the villages.

The effluents released from the Shreyans Paper Mills, an industrial unit located in the village, have resulted in the contamination of air, water and soil. The factory is located on the banks of the drain entering the Bist Doab river and its effluents are carried by this water into the river.

He elaborated that the pollutants released into the river from the factory have made the agricultural land barren. Moreover, the ground water also had become unfit for human consumption. He illustrated that sometimes the drinking of this very ground water may cause vomiting.

Fly ash released from the factory is another major problem which has become a health hazard. All over the village there is a fine deposit of the ash. It spoils the utensils and the clothes. The huge dumps of the effluents can be seen lying about in the open almost as if the effluents were some sort of an identification marker for the factory.

He informed that they, the villagers, had complained repeatedly about this problem to the factory managers, but no steps had been taken by them to address the situation. According to them the factory has an effluent treatment plant and no wastes are released by the factory. He asserts that they have to live with two cruel facts. Firstly, the industrial units have never stopped polluting, and secondly the local labor derives employment and can never stop working for them.
Case Study No. 3

Name : Pradeep Kumar
Village : Bannah
Age : 30 years
Education : Masters in Environmental Technology
Occupation : Production Manager (Ranbaxy)

A resident of Ropar district, he belongs to village Bannah. His wife is a member of the Block Samiti and is Sarpanch of the village. Though he himself is working as a Production Manager in the Ranbaxy Laboratories and another relative, his Uncle, is working as a Security Officer in the Shreyans Paper Mills.

He was of the opinion that the industrial units are deteriorating the environment of the village. According to him it is impossible to run these industries without causing damage to the environment. He reported that the rampant industrial pollution had resulted in various health problems.

The water available to them for drinking is not fit for human consumption. All the water borne disease here are due to the presence of effluents in the water sources of these villages. Many of the water borne diseases like diarrhea, gastro enteritis, skin problems, are quite common here, he said.

He acknowledged that the industrial units had installed some water treatment plants, but they were of a much lesser capacity and thus almost useless. More over, these treatment plants were not properly managed because of the high maintenance costs. He asserts that industrial units were thriving only because of the people and if these industries cannot stop polluting the environment they will have to face the harsh reality of having no people to employ and then how will these big units run? Won't they die out if the people loose their trust in them? Pollution caused by industrial waste is an inter-relational issue that needs to be addressed immediately.
Case Study No. 4

Name : Ranjit Kaur  
Village : Taunsa 
Age : 50 years 
Occupation : Teacher

She belongs to village Taunsa, but lives in Ropar. She is working as a teacher in Taunsa for more than five years. She pointed out that the fly ash released by Shreyans Paper Mills can be seen scattered in the Taunsa and Bannah villages. She remembered the incident when one of the school students had accidentally touched the nearby pond water (waste water thick with pollutants is released from the industrial unit into the pond) and almost immediately blisters were formed on the child’s skin. They had to rush the child for some medical attention.

According to the factory’s Manager, the wastewater is released into the pond only after passing it through the effluent treatment plant and thus, it could not harm anybody.

Ranjit Kaur observed that the children who were studying in the school were generally weak with blotchy white patches on their faces. Some of them were facing visible after-effects like whitening of the head hair, sallow skin etc. The chimneys of the industrial units spew gases, which makes breathing difficult. According to her the industrial system is reduced to a state wherein it makes better business sense for the industrialist to carelessly dump effluents rather than set up proper methods to deal with the problem.

The people of the village have lodged complaints against the industrial units, but lack of proper information paralyses them in their fight against the polluting units. The local people are generally unaware of the extent of damage these industrial units are causing.
As a small gesture some of these units have opened small dispensaries in the villages as a step towards compensating for some of the damage. But much more needs to be done. More multi-specialty health camps should be held. She further adds that these units should take up the onus of development activities in and around the villages as a measure to take up their social responsibility. They could become partners with the villagers in this form of progress. She suggested that they could begin by contributing to build more rooms for the local school.

**Case Study No. 5**

<table>
<thead>
<tr>
<th>Name</th>
<th>Dr. Harnek Singh Baidwan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Village</td>
<td>Rail Majra</td>
</tr>
<tr>
<td>Age</td>
<td>52 years</td>
</tr>
<tr>
<td>Occupation</td>
<td>Senior Medical Officer, ESI Hospital</td>
</tr>
</tbody>
</table>

In this detailed interview with one of the Senior doctors of ESI hospital, Rail Majra, it was found out that various diseases are presently found in the area due to ongoing industrial pollution. These include skin infections (rashes, roundworm diseases, fungal diseases), gastro-intestinal diseases (diarrhea, dysentery, gall bladder infections), chest diseases, silicosis, asthma, and tuberculosis which are prevalent in the area. He is working here for almost the past two decades.

Earlier he was in the ESI hospital at Asron. He informed that one of the most significant causes of these diseases is the high temperature inside the factory. He added that some of the chemicals are also carcinogenic in nature. Industrial discharges had, over the years, made the ground water unfit for drinking purposes. Industrial pollution has contaminated the soil, water and air of the area.

According to him, about 40 to 50 people visit the hospital daily for medication. Most of them are unskilled industrial workers. According to him, some of the diseases that infect the migrant labour often are chest and lung
diseases and skin diseases. The hospital records show that most of the labourers and fourth class employees visiting the hospital are found to be anemic.

He further reported that the workers of DCM Engineering Products are prone to tuberculosis while those of the DSM Anti-Infectives India Private Limited are susceptible to skin diseases. Some of the Industrial workers are diabetic also. This may be due to mental stress, long working hours in case of multiple stretches of overtime. He informed that the workers who become handicapped are given pension by the ESI.

Case Study No. 6

Name: Dr. Charan Singh  
Village: Asron  
Age: 48 years  
Occupation: (M.B.B.S. Doctor) ESI Hospital, Asron

Dr. Charan Singh had been employed at the ESI Hospital, Asron since 1990. He reported that on an average 200-250 patients visited the hospital daily.

According to his observations the industrial pollution in the area had adversely affected the health of the local population. It was the causative factor for a number of diseases reported by patients in that area. Some of the common manifestations were skin infestations etc. He commented that large scale prevalence of diseases in the area was due to inadequate sanitation, water intensifications caused by industrial wastes, ignorance of the people and illiteracy. He regretted that laboratory facilities were not available in the hospital and no relevant testing could be done there.

He was not aware of any safeguards being taken by the industrial houses to protect against the ill effects of the pollutants and effluents.
He felt that the industrial houses established since long in the area had a responsibility towards the people and the environment and should take some steps to rectify the harm already done. If they could not do that they should take steps to ensure that no further deterioration should take place. And if this was not done these industries would eventually have to be closed down once the people began suffering at a larger scale.

Case Study No. 7

Name of patients : Mr. Major Singh  
Village : Chahan  
Age : 52 years  
Occupation : Industrial worker

Mr. Major Singh had worked in the DCM Engineering Products, Asron for many years. He is now suffering from tuberculosis. When his problem became severe, he had to leave his job at the factory. He was not given any compensation or other help either monetary or otherwise from the factory. He attributes his failing health to the rigorous and polluted environment he had been subjected to during his tenure at the factory.

Thus the impact of the setting up of the industries in a previously agrarian society could be studied and examined only decades after the population began to see the malefic effects of the contamination in the environment. The people experienced adverse effects on their health as exhibited in the focus group discussions and the case studies. Some of the medical personnel also reiterated the observation that the effluents of the factories were responsible for the states of ill-health that the people were experiencing in the recent times.

The impact of the industrial presence has also been experienced by the land holding population as well as those who are subsisting on the agricultural outputs alone. With the contamination of the surface and ground water as well as
the imbalance in the fertility of the soil, the people are a dissatisfied lot because they are unable to find the means to seek redressal for their many complaints. Some of them had approached the law but were proven helpless before the financial and political clout of the industrialists.

The impact of the pollution has been broad based and widespread. Not only has the impact become apparent as contamination and its ramifications among the human beings and the livestock of that area, the effects are being discerned in terms of the land and water resources as well. This has been discussed in the following chapter.