CHAPTER - II

PROBLEM OF AIR AND NOISE POLLUTION AND ITS IMPACT
2.1 GENERAL

Time and time again, history has proved how problems that have arisen have initially been treated with ignorance. However, as knowledge and experience have increased and been coupled with the new ideas and method, the problems have often been overcome and even eliminated. We believe that this simple observation is worth developing in relation to one of our current greatest and most debated problem: the risk of over utilization of our environment. Here, word ‘Environment’ has considerable scope, encompassing both the material and the energy consumption that effect the external environment in the form of Water, Air and ground pollution which directly or indirectly cause the degradation of health.¹

Pollution is not some thing new. But, the rapid increase in pollution, accelerated exploitation of natural resources and industrialisation, unchecked use of chemicals and pesticides etc. lead to severe pollution. Increase in pollution level causes destruction of environment resulting in depletion of life on the earth.² The problem of destruction of environment is so serious that Dr. Kurt Waldhein, the then UN Secretary General declared in 1972, that ‘no nation, no continent, no hemisphere, no race, no system, can handle it alone’.³ Therefore, we have to find ways and means so that the environment will be kept clean.

2.2 CONCEPT OF CLEAN AIR AND ENVIRONMENT

The gaseous envelop surrounding the earth is referred as the atmosphere, and its content in the form of gases is called as ‘Air’. The natural composition of air is variable in time and space.⁴
Air is a major component of environment. The environment is the sum of the total of surroundings, chemical, physical and biological which affects the growth, reproduction and well being of an organism. There are Continuous interactions between living organisms and non-living parts in the clean environment.5

The concept of clean environment including air and water aims toward taking care of all life. The clean environment is that, where the levels of chemical, physical and biological factors are below the permissible limits, so that it will not endanger the life in general and human life in particular. The concept also holds true for the air and its characteristics.

2.3 PRESENT STATUS OF AIR

Air is one of the five essentials (air, water, food, heat, and light) of the human beings. Man breaths nearly 22,000 times in the day and inhales approximately 15kg of air per day. Generally human beings can live for five weeks without any food, five days without any water but not even five minutes without air. Due to industrialisation in a region, the purity of air has been reducing in the locality to the level which endangers the health of the community.6

Various types of contaminants are entering into the atmosphere by natural and man made activities which are taking place on several places of the earth. We refer it as ‘Air Pollution’ in public discussion. Peace, development and environment are interdependent and indivisible. The methods of economic development, which the mankind has followed, are also creating environmental problem. With the industrial and technological development, the mankind has not only improved the economic conditions but also altered the
natural ecological balance. Industrialisation, urbanisations and erosion of biodiversity have affected the natural environment adversely.

In India, as elsewhere in the world, uncontrolled growth and consequent environmental deterioration are fast assuming menacing proportions. All Indian cities and majority of the population are afflicted with the problem. Global warming, ozone depletion and toxic pollution are some of the negative effects of existing development strategy.

Today, in addition to the vehicular emissions, leakage of poisonous gases and other harmful gases, fumes, Vapours and Suspended solid particulates wastes from the industries has almost become a regular phenomenon of the present day. The problem of noise pollution, particularly, in big cities is at alarming stage.

However, the fundamental question before us today is whether we can allow the destruction of the environment leading to the destruction of all living creatures including human beings on this planet. The answer is obviously – No. it is pollution, it is still possible to protect the deteriorating environment through proper policies and management.

2.4 PRESENT SITUATION OF NOISE

In urban localities all over the world, noise pollution has been recognized as a major factor affecting public health and well being. It is an ever growing nuisance. Man-made sources are mainly responsible for increasing the ambient noise level in urban localities. Automobiles, industrial units, low flying air-craft and loud speakers have been recognised as a major source of noise affecting a large number of peoples. Thickly populated, poverty-stricken third
world countries are however, the most affected ones, wherein the ill effects of noise pollution are rarely given serious attention.\(^{11}\)

A survey in Delhi, Bombay and Calcutta conducted in 1988 revealed day time noise levels ranging between 60 dB to 90 dB in residential localities. Many times during the day this levels exceeded 100 dB. Near aerodromes, railway tracks, busy highways and industrial establishments a noise ranging from 95 to 105 dB has been recorded during most of the day time. On the basis of extensive studies World Health Organisation has recommending permissible noise levels for residential, industrial, commercial localities and silence zones.

### 2.5 PROBLEM OF AIR POLLUTION AND AIR EXHAUSTS

Industry is considered to be a major culprit in pollution air. This is partly because of the utilisation of enormous amounts of energy and partly due to the handling of diverse kinds of materials which themselves, as their intermediates, or as by-products become air pollutants. Thus, the petroleum industry emits a number of hydrocarbons, hydrogen sulphide and sulphur oxides; while the chemical industry, a wide range of substances, usually specific to the processes, as air pollutants. The emission of pollutants in an industry is highly variable depending upon the nature of a specific piece of equipment, materials being processed, and operating procedures and conditions.

Industrial processes, production practices and operations remain more or less similar within each major category in terms of the source and emission characteristics of air pollutants.\(^{12}\)
In India more than 60% of all the power generated comes from the thermal power plants. Concentration of air pollutants in the effluent gases depends largely on the constitution of coal. Burning of coal is estimated to mobilize more than 50 elements into the atmosphere. In general, the major air pollutants emitted from coal fired plants are particulates, sulphur oxides, nitrogen oxides, carbon oxides, hydrocarbons, mercury, chromium, zinc, cadmium, iron and carcinogens like benzo(a) pyrene. Odours and particulates are the main air pollutants emitted from the food and related industries. Odours caused by biological decay of vegetable wastes, animal meats and fish are extremely offensive. Emission from the fermentation process include gases like CO\(_2\) and H\(_2\) posing no specific air pollution problems, but the hydrocarbons emitted during the handling of the wastes may be of some concern.

In wood pulping, cellulose fibers of the wood are separated out by dissolving the lignin in heated caustic solution. Particulate emissions primarily occur from the recovery furnaces, dissolving tanks and lime kilns. Carbon monoxide emissions occur from the lime kiln as well as recovery furnaces. Chemical industry produces a wide variety of chemicals from a wide range of raw materials leading to a production of diverse kinds of air pollutants. Principle emissions are unreacted SO\(_2\), SO\(_3\) sulfuric acid mists, Nitrogen dioxide, HF, tetra fluoride, gaseous fluorides, and fairly large quantity of particulate. Other air pollutants from the industry are various vapours, odours, SO\(_2\), NO\(_2\), CO, CO\(_2\) and particulates. The non metallic mineral industry include cement, glass, ceramics, asbestos, coal cleaning plants, concrete batching plants, asphalts plants, talk and lime processing, gypsum manufacturing, refractories, mineral wood production, and processing of crushed stone, gravel, sand and miscellaneous material, such as phosphate, and
mica. The mineral processing industry is characterized by particulate emission in the form of dusts, both coarse and relatively fine. A wide variety of manufacturing and fabrication, finishing, or coating operations, pharmaceuticals, biologicals and drugs, and textile, etc. are some important industrial groups comprising this category of industries causing air pollution.

Transportation is another important source of pollution. The contribution of automobiles in air pollution is very high, even more than the industries, especially in city areas. The pollution from automobiles is significant particularly in congested and poorly ventilated roads. The air pollution problem is mainly due to poor maintenance of vehicles. The major pollutants of vehicular exhaust are hydrocarbons (HC), Oxides of Nitrogen (NOx) and carbon Monoxide (CO), smoke and lead.14

On an average transportation contributes more than 50% of the total pollutants emitted into the atmosphere. The quantities in recent years have been increased considerably nearly, 400 tons of air pollutant are emitted every day from different kinds of 5 lakhs vehicles in New Delhi alone. The situation is equally severe in cities including Pune. The total number of vehicles in India in 1987 was 12,34,7000 and is growing presently at very high rate and adding a huge quantity of air pollutants, resulting into the worst atmospheric air unfit for a survival of human being, property and other life.15

2.6 NATURE OF PROBLEM

2.6.1 Air Pollution

Scientifically, the nature of air pollution may be divided into two based on their origin. The first group which originate from the mobile sources
contains solid and liquid particles such as dust, carbon, hydrocarbons etc. which are electrically charged and thus kept in suspension by electrostatic forces. The second group, which originate from industrial sources contains gases which are poisonous or obnoxious in nature such as sulphur dioxide, carbon monoxide, oxides of nitrogen hydrocarbons, vapours and other substances.\textsuperscript{16} The sources responsible for air pollution can be classified in three classes.

a) **Domestic Sources**

Domestic sources include domestic fire and domestic incineration which is required for cooking and heating. In rural India 90 percent of households use wood, drug and crop residues as fuel. It has been reported that the biomass fuels particularly in small case combustion as in household stoves emits several important pollutants.

The person who are engaged in cooking activities are exposed to total suspended particles (TSP) and Benzo (a) Pyrene (Bap) of wood smoke. These are in Gujarat village on an average a cooking women is exposed to 7000 microgrammes per cubic meter (\( \mu g/m^3 \)) of (TSP) in 24 hours, as compared to 260 \( \mu g/m^3 \), recommended standard in US and 120 \( \mu g/m^3 \) to 150 \( \mu g/m^3 \) recommended by WHO. An average smoke exposure in three hours in Gujarat homes was equivalent to smoking roughly 20 packs cigarette per day in terms of Bap.\textsuperscript{17}

b) **Industrial Sources**

Industry is a principle sources of air pollution. Among all the industries engaged in production and consumption of energy in the form of oil, coal, natural gas, electricity and nuclear fission and fusion, are the main culprits. The industries including thermal power plants, chemical plants,
cement plants, paper mills, sugar mills, textile mills, are major polluters of air including noise. Industrial pollutants also contain visible particulate matters, a product due to incomplete combustion process.  

**c) Vehicular Sources**

Automobiles are the major contributor of pollution to metropolitan cities. These include, road vehicles, aircrafts, ships, railways and other combustion engines. The problems due to automobile pollution assumes importance as the vehicle number increases as the status of economy. In India two wheelers are multiplied by five times in the last decades while the passenger cars and diesel vehicle population has increased by 2.6 times. Yet another study reveals that around 27,000 tonnes of pollutants are emitted every day by about 46 million vehicles in India. Delhi alone has got 27 lakh registered vehicle and they contribute 70 percent of city air pollution. In motor vehicles high combustion pressure and temperature promote reaction leading to formation of gases such as nitrogen oxide, carbon monoxide, unburnt hydrocarbons, sulphur dioxide and particulate matter and smog (a combustion of smoke and fog). In India the problem is compounded by the use of leaded petrol.

### 2.6.II Noise Pollution

Various sources of noise are industry, road traffic, rail traffic, air traffic, construction and public works, indoor sources like air conditioners, air coolers, radio, television and other home appliances, etc. in Indian conditions, indiscriminate use of public address system and Diesel Generator sets has given a new dimension to the noise pollution problem.  

The sources responsible for Noise pollution can be classified in three classes.

a) **Transport Noise**

Transport noise originates from road traffic (i.e. vehicular), aircraft and rail traffic etc. Noise from road vehicles produces disturbance to more people than any other noise source and this has been increasing over the last decades for a number of reasons. The total number of road vehicles and hence the density of road traffic is steadily increasing. One of the most important causes of noise on the roads is the traffic speed. The faster the traffic travels, the greater the noise volume and modern road development policy is encouraging higher speeds. Road traffic noise fluctuates according to the number of operating factors. Noise is produced by all vehicles from the gear box and exhaust system. Heavy vehicles also produce rattles, squeaks and vibrations according to the degree of loading and age. There is a general noise level as long as any traffic is moving and this varies with the traffic density and the time of day.

b) **Industrial Noise**

Industrial noise is complex and varies with the design, direction of movement of working parts and the method of mounting of machines. The noise is often produced in three stages. There is an initial disturbance at the point of origin of the sound; followed by amplification, often caused by the resonance of the machine parts, the work piece or the floor and finally radiation of the sound to the surrounding environment.
Industrial noise can be classified into three types:

i) **Impact and percussive noise** is produced by presses; punch and stamp machines, pneumatic drills, milling machines, cutters and routers.

ii) The impact noise is caused when two surfaces meet each other, sometimes at high speed and vibration occurs at the point of contact followed by amplification and resonance.

iii) The third type of industrial noise is aerodynamic noise. Aerodynamic noise is produced by a blow lamp or torch, fans and dust extractors.

c) **Domestic Noise**
   Noise is also generated from domestic appliances like washing machines, spin dryers, food mixers, sink waste grinders and vacuum cleaners. Both industrial and domestic noise sources are collectively referred as occupational noise.

### 2.7 SOURCES RESPONSIBLE FOR QUALITY DAMAGE

#### 2.7.1 Air Quality Deterioration

The main factor which influenced the environmental quality is the increasing human population and his developmental activities. Environmental damage is a collective term, includes quality alteration of air, water and soil. Over exploitation of natural resources are responsible for alteration in water, air and soil qualities. Vehicular exhaust, combustion of fossil fuel, chemical fumes and vapours are the major anthropogenic sources of air pollution in addition to natural sources such as typhoon, volcanic eruptions and forest fires. In particular, the use of energy with release of gaseous and particulate pollutant, damages the environment.
2.7.II Sound Quality Deterioration

"Sound" is a form of energy, consisting of wave motion. It requires medium like gas, liquid or solid for propagation. Sound waves consist of variations in pressure or oscillations of the medium in which they travel. The frequency determines the pitch of the sound received by the listener. High-pitched sounds have high frequencies and these are more disturbing to the individual than low frequencies, because of the varying sensitivity of the human.

Most of the machines that have been developed for industrial purposes, for high speed transportation, or to make life more enjoyable, by furnishing additional comfort, reducing the drudgery of everyday living, and speeding up our daily routines to provide additional leisure hours, are accompanied by noise. Noise prevention and control is important as noise affects us in hearing and ability to communicate and behaviour. Undoubtedly, lesser noise can make the environment more friendly and life becomes pleasant.

2.8 INTENSITY OF PROBLEM

2.8.I Air Pollution

According to the World Health Organization (WHO), 4 to 8 percent of deaths that occur annually in the world are related to air pollution. Of all air pollution constituents, the WHO has identified Suspended Particulate Matter (SPM) as the most serious pollutant in terms of its effect on health. The health impacts of exposure to air pollutants affects respiratory and immune systems, skin and mucous tissues, sensory system, the central nervous systems, and the cardiovascular system. A 1994 World Bank Study estimated that SPM led to the premature deaths of over 40,000 persons in the world each year. Air pollution encompasses a diverse array of natural and anthropogenic emissions,
including various gaseous constituents, volatile chemicals, aerosols or particulate as primary air pollutants and their atmospheric reaction products as secondary air pollutants.\textsuperscript{24}

These emissions released are in such small quantities that they get immediately dissipated and absorbed. Continuous release of these pollutants build up in the air and pose hazards to human health. Despite pollution control effects, the atmospheric quality has been threatened to alarming levels in several cities. According to the estimates of The World Health Organisation (WHO) as many as 1.4 billion urban residents in the world breathe air exceeding the WHO air quality guidelines \textsuperscript{25}

The health impacts of exposure to polluted air are considerable. On a global basis, mortality due to outdoor air pollution is estimated to be around 2.0 to 5.7 lacs, representing about 0.4 to 1.1 percent of total annual deaths. The adverse impact of air pollution are more in the developing countries than developed. In the pursuit for rapid economic development, the developing countries are facing a newer set of environmental problems due to increasing air pollution on account of industrialization, urbanization and motorization.

Several air pollution episodes during last century have shown that breathing dirty air can be dangerous for health and at times deadly. On 26\textsuperscript{th} Oct. 1948, air pollutants accumulated forming a 'Killer Fog' in small town of Donora, Pennsylvania that killed 50 and thousands of people were hospitalized with different kinds of illness.\textsuperscript{26}

The virulent 'London Fog' of 1952, in which some 4000 died, were associated with widespread use of high sulphur, coal leading to high
smoke and sulphur dioxides. Since then, many countries have adopted ambient air quality standards to safeguard the public health against the most common and damaging pollutants. These pollutants include sulphur dioxide, suspended particulate matter, ground level ozone, nitrogen dioxide, carbon monoxide and lead. These are directly or indirectly released by the combustion of fossil fuels. Although substantial investments in pollution control in some countries have lowered the levels of these pollutants in many cities, poor air quality is still a major concern throughout the industrialized cities.

2.8.II Noise Pollution

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2.9 AIR POLLUTION AND HEALTH HAZARDS

Epidemiological studies have linked exposure to air pollution with at least four major categories of illness. These are:

- acute respiratory infections (ARI).
- chronic obstructive pulmonary disease (COPD) such as asthma and bronchitis;
- lung cancer and
- pregnancy related problems. Of these, ARI appears to have the greatest health impact in terms of the number of people affected in world especially the children.

Polluted with smoke that contains large amounts of toxic pollutants such as carbon monoxide, oxides of nitrogen (NOx), sulphur dioxide (SO2), aldehydes, dioxins, polycyclic aromatic hydrocarbons and respirable particulate matter. The resulting human exposures exceed the permissible norms by a factor in multiples.

Particulate means the minute particles of solid or semi solid material dispersed in the atmosphere. It is this dirt in the air, that is visible as a 'Brown Cloud', haze or smog. Particulates that range in size from less than 0.1 micrometre (μm) upto approximately 45 μm are designated as dust or Total Suspended Particulates. Some of the smallest particles, called respirable particulates may tend to be deposited in the alveoli (tiny air sacs in the lungs). In the lungs, particulates slow down the exchange of oxygen with carbon dioxide in the blood, causing shortness of breath. Respiratory diseases like emphysema, bronchitis, asthma or heart problems. Sulphur dioxide, can react with moisture to form sulphates. Sulphates react with moisture in the air or in
the respiratory tract to form a corrosive liquid (sulphuric acid) that irritates delicate membranes and slow down the body's ability to remove harmful bacteria, increasing the possibility of infection. Sulphur dioxide causes its irritant effects by stimulating nerves in the lining of the nose, throat and the lung airways.
### Some Common Health Effects of Basic Air Pollutants

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<thead>
<tr>
<th>Pollutant</th>
<th>Health Effects</th>
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<tbody>
<tr>
<td>Carbon Monoxide</td>
<td>Poor reflexes, Breathing Difficulties, Reduced work capacity</td>
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<td>Ringing in the ears, Headache, Dizziness, Nausea, Drowsiness</td>
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<td>Reduced work capacity, Comatose state (can lead to death)</td>
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<td>Lead (Pb)</td>
<td>Kidney Damage, Reproductive system damage</td>
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<td>Nervous system damage (including brain dysfunction and altered neurophysical behaviours)</td>
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<td>Oxides of Nitrogen</td>
<td>Increased risk of viral infections, Higher respiratory illness rates</td>
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<td>(NO\textsubscript{2})</td>
<td>Lung irritation (including pulmonary fibrosis and emphysema)</td>
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<td>Airway resistance, Eye burning, Chest tightness and discomfort</td>
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<tr>
<td></td>
<td>Headache</td>
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<td>Ozone (O\textsubscript{3})</td>
<td>Respiratory system damage (lung damage from free radicals)</td>
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<td></td>
<td>Reduces mental activity, Eye irritation, Chest discomfort</td>
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<td>Damage to cell lining (especially in nasal passage), Headache</td>
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<td></td>
<td>Reduces effectiveness of the immune system, Breathing difficulties</td>
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<td></td>
<td>Chronic lung diseases (including asthma and emphysema), Nausea</td>
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<tr>
<td>Sulphur dioxide (SO\textsubscript{2})</td>
<td>Aggravates heart and lung diseases</td>
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<td></td>
<td>Increases the risk for respiratory illness (including chronic bronchitis, asthma, pulmonary emphysema)</td>
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<td></td>
<td>Cancer (may not show for decades after exposure)</td>
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<tr>
<td>Respirable Particulate Matter (PM\textsubscript{10})</td>
<td>Respiratory illness (including chronic bronchitis, increased asthma attacks, pulmonary emphysema)</td>
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<tr>
<td></td>
<td>Aggravates heart disease</td>
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#### 2.10 NOISE AND HEALTH HAZARDS

The type of severity depends on the particular chemicals involved, their concentration in the air, and exposure time. Groups particularly sensitive to air pollution include the elderly, especially those with lungs and heart disorders; infants, those respiratory system are not fully developed; active
children, who breathe more than most adults; and people with frequent colds or chronic nasal congestion, who breathe through the mouth and thus bypass the filtering mechanism of the nose.

Although ten of thousands of statistical studies provide massive evidence that air pollution harms and sometimes kills people, it is difficult to establish that a specific pollution causes a particular disease or death. Reasons for this include the large number and variety of air pollutants people are exposed to over decades, synergistic interaction between various pollution that can lead to more harm of one acting alone, and the multiple causes and lengthy incubation times of diseases such as emphysema, chronic bronchitis, lung cancer, and heart disease.
REFERENCES


6. (6. Ibid. pp. 1-5.)


