CHAPTER-III
ENVIRONMENTAL PROBLEMS IN INDIA

3.1. Introduction

Environmental pollution now constitutes the biggest hazards not only to human existence but also the existence of all the gifts that nature has so kindly bestowed to man. Environmental problems have attracted the attention of wide cross-section of the people all over the world during the last two decades. ¹ Today, the environmental pollution is a growing threat to our country and has become a common phenomenon being observed both in towns and villages all over India. The heavy rush of population from villages to urban areas has resulted in over-crowding of cities. Rapid industrialization and urbanization have led to an increase in pollution particularly in metropolitan cities. About 72 per cent of the air pollution is due to vehicular emissions which is responsible for 12 time’s high risk for respiratory problems.² The problem of environmental degradation is a social problem.³ Since the industrial development started in India, the environment issues also grew with it which took an ugly turn at the end of 20th century. Environmental pollution has become a serious problem in the country, community/domestic wastes, industrial affluent and chemical fertilizers and pesticides have polluted our surface, water and affecting quality of our rivers and other water bodies like lakes is an important challenge⁴. Some of the environmental problems which are critical at the present time are fairly widely known because of the growing awareness of all levels of society, including governments, general public and the scientific community. Current environmental problems include global warming, air pollution, carbon-dioxide emissions from the burning of the fossils, fuels, water pollution from runoff pesticides and other fertilizers

limited fresh water and desertification\textsuperscript{5}. All of these problems have global consequences \textit{viz.} acid rain, depletion of the ozone layer, global warming and eventual ocean level rising from burning of coal and oil and the proliferation of green gases; ugly landscape, loss of diversity of species; tropical deforestation and the pollution of worlds the oceans.\textsuperscript{6}

In the 21\textsuperscript{st} century, irregular climate changes have been a big challenge for the entire human race therefore the international organizations are working together continuously to save the world form the effects of climate change and global warming\textsuperscript{7}. In an effort to cut down the pollution rate, the 195 countries had signed an agreement at the 21\textsuperscript{st} Conference of the Parties of the UNFCCC in Paris and adopted by consensus on 12 December 2015. As of November 2016, 193 UNFCCC members have signed the treaty, 114 of which have ratified it. After several European Union states ratified the agreement in October 2016, there were enough countries that had ratified the agreement that produce enough of the world's greenhouse gases for the agreement to enter into force. The agreement went into effect on 4 November 2016\textsuperscript{8}. This agreement amongst the nations is known as Paris Agreement. The objective of the Paris Agreement is to achieve the environmental justice by way of reduction in the emission rate of green house gases.

The recent "record-high" air pollution in New Delhi is a "wake-up call" for the world that unless decisive actions are taken to reduce air pollution, the smog in India's capital and its adverse impact on the daily lives of its citizens will become a commonplace phenomenon, the United Nations children's agency has said. According to estimates, air pollution levels hit 999 micrograms of particulate matter per cubic meter in some areas of the national capital, more than 15-16 times the limit considered safe.\textsuperscript{9} Researcher is going to study the major problems of environment degradation and its impact on flora-fauna in this chapter wherein researcher will study the environment and its associated problems. As in the previous chapters we have been studied the different means and methods

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\textsuperscript{7} AK Thakur and Dalip Kumar, \textsc{Dimensions of Climate Change in India-A Development Perspective}, Regal Publications New Delhi (2013) p.163.
\textsuperscript{9} Delhi a wake-up call for world on air pollution: UNICEF, The Times of India (November 12, 2016).
\end{flushleft}
adopted to cure and tackle the environment hazards by way specific legislations, PILs, Supreme Court and High Court’s decisions, directions and the steps taken by the state and central government to implement their policies but we see the problems still persist in spite of this. The environment problems are inherently associated right from the inception with the invention and advancement of new techniques evolved by the modern science and we see that science and technology give birth to a new research every day and night but giving way to a new environment problem simultaneously as well. Therefore there is always an environmental threat from one end and solution from the other.

3.2. Current Environment Problems

The environmental imbalance gives rise to various environmental problems. Undoubtedly, the environmental problem is a global issue, however, developed countries are observing, controlled environmental pollution but the addition of other countries is pathetic. India's rapid urbanization and industrialization have resulted in heavy exploitation of natural resources, which has led to environmental pollution. Water is contaminated by noxious and toxic substances. Sulphur dioxide, oxides of nitrogen, and suspended particulate matter are serious air pollutants in industrial regions and cities. The other great problem is noise pollution, which occurs mainly in commercial and residential areas as a result of traffic, industrial activities, and religious festivals. These three major problems water, air and noise pollution are constantly discussed in various forums.

Some of the environmental problems are pollution, soil erosion leading to floods, salt deserts and sea recedes, desertification, landslides, change of river directions, extinction of species, and vulnerable ecosystem in place of more complex and stable ecosystems, depletion of natural resources, waste accumulation, deforestation, thinning of ozone layer and global warming. The environmental problems are visualized in terms of pollution, growth in population, development, industrialization, unplanned urbanization etc. Recently, as per the survey conducted by the Asian environmental protection society in India, Bombay, Delhi, and Calcutta are the most polluted cities in the world .this is

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certainly an alarming features and need immediate protective measures. \(^ \text{12} \) Though the source of environmental pollution rather degradation are multidimensional. But, the present environment problems which the planet earth is facing today can be understood and classified in the following ways:

**3.2.1. Climate Change-** Climate change is no more an environmental concern. It has emerged as the biggest developmental challenge for the planet. Its economic impacts, particularly on the poor, make it a major governance issue as well. \(^ \text{13} \) Climate change is one of the complex problems facing mankind today. This is evident from observations of increases in the global average air and ocean temperatures, widespread melting of snow and ice, and the rising global average sea level. It poses a variety of challenges with wide-ranging effects. It is projected to have significant impacts on conditions affecting agriculture, including temperature, precipitation and glacial run-off. \(^ \text{14} \) Agriculture is the mainstay of the Indian economy and provides food and livelihood security to a substantial section of our population. Agriculture will be adversely affected not only by an increase or decrease in the overall amounts of rainfall but also by shifts in the timing of the rainfall. Any change in rainfall patterns poses a serious threat to agriculture, and therefore to the economy and food security. The rise in temperatures caused by increasing green house gases is likely to affect crops differently from region to region. Erosion, submergence of shorelines, and salinity of the water-table due to the increased sea levels are the factors that mainly affect agriculture through inundation of low-lying areas. Increased frequencies of drought, floods, storms and cyclones are likely to increase the variability of agricultural production. \(^ \text{15} \) Climate change is a change in the usual weather found in Earth’s climate \( \text{as we know weather can change in few hours, but climate change takes place in hundreds or even millions of years.} \( \text{16} \)

\(^ \text{14} \) Sharat Poornima, “*Climate Change in India: Challenges and Solutions*”, Mainstream Weekly, 50 (December. 5, 2015), available on http://www.mainstreamweekly.net/article6130.html(accessed on 6\textsuperscript{th} June 2016).  
\(^ \text{15} \) Ibid.  
\(^ \text{16} \) Rahul Singh ,”*Climate change and concept of environmental justice*”, Completion in focus , Arihant publication India Ltd.UP (February ,2016) p. 93.
Earth’s climate is dynamic and always changes through a natural cycle. But the changes occurring today are speeded up because of human activities. Climate change refers to significant variation either in the mean of climate or in its variability persisting for an extended period. These changes have created too many problems at every level. In 21st century, irregular climate changes have been a big challenge for the human race.  

3.2.1.1. Definitions of Climate Change - Modern climate prediction started back in the late 1700s with Thomas Jefferson and continues to be studied around the world today.

According to Article 1 of UNFCCC Climate change means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

"Climate change" in British English “changes in the world's weather, in particular the fact that it is believed to be getting warmer as a result of human activity increasing the level of carbon dioxide in the atmosphere”

“A longterm change in the earth's climate, especially a change due to an increase in the average atmospheric temperature”

Melting glaciers imply that life in the Arctic is affected by climate change. There is broad-based agreement within the scientific community that climate change is real. The U.S. Environmental Protection Agency, the National Aeronautics and Space

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Administration, and the National Oceanic and Atmospheric Administration concur that climate change is indeed occurring and is almost certainly due to human activity.\textsuperscript{22}

In broader sense, climate may be perceived as a part of larger system that includes not only the atmosphere but also hydrosphere (all liquid and frozen surface water), the lithosphere (all solids land surfaces), the biosphere (all living beings) and even extra-terrestrial factors as the sun.\textsuperscript{23} Increased burning of fossil fuels contributes to climate change.

3.2.1.2. Causes of Climate Change - Environmentalists consider climate change a major problem of the century. The main cause of climate change is concentration of carbon dioxide (burning of fossil fuels, such as oil and coal, which emits greenhouse gases) in the atmosphere.\textsuperscript{24} Other human activities, such as agriculture and deforestation, also contribute to the proliferation of greenhouse gases that cause climate change.

While some quantities of these gases are a naturally occurring and critical part of Earth’s temperature control system, the atmospheric concentration of CO$_2$ did not rise above 300 parts per million between the advent of human civilization roughly 10,000 years ago and 1900. Today it is at about 400 ppm, a level not reached in more than 400,000 years.

The main causes of climate change can be categorized into two - Natural causes of climate change and Man-made causes of climate change

3.2.1.3. Natural Causes of Climate Change -

3.2.1.3.1. The Milankovitch Theory –This explains the 3 cyclical changes in Earth’s orbit and tilt that cause the climate fluctuations that occur over tens of thousands of years to hundreds of thousands of years.\textsuperscript{25}

\textsuperscript{22} What is Climate Change, Take Part available on http://www.takepart.com/flashcards/what-is-climate-change/ (accessed on 29\textsuperscript{th} November 2016 ).
\textsuperscript{24} Rahul Singh, “Climate Change and Concept of Environmental Justice”, Completion in focus, Arihant publication India Ltd.UP (February, 2016) p. 93.
\textsuperscript{25} Ibid. at p.94.
3.2.1.3.2. **Volcanic activity**- Volcanic eruptions discharge carbon dioxide, but they may also emit aerosols, such as volcanic ash or dust, and sulfur dioxide. Aerosols are liquids and solids that float around in the air. They may also include soot, dust, salt crystals, bacteria, and viruses. Aerosols scatter incoming solar radiation, causing a slight cooling effect. Volcanic aerosols can block a percentage of sunlight and cause a cooling that may last for 1-2 years.\(^\text{26}\)

3.2.1.3.3. **Sunspots**- The increase in sunspot activity and a run-up of global temperature on earth are happening convergent and view regulation of carbon emissions as folly with negative ramifications for over economy and tried and tree energy infrastructure.\(^\text{27}\)

3.2.1.4. **Manmade Causes of Climate Change**

3.2.1.4.1. **Burning Fossil Fuels**: Burning coal to generate electricity, burning oil to power vehicles and aircraft (vehicle emissions), or burning wood in fires used for cooking or to provide heat, etc. changes the state of stored organic carbon from a liquid (e.g. oil) or solid (e.g. coal/wood) into a gas (carbon dioxide) which is released into the atmosphere.\(^\text{28}\)

3.2.1.4.2. **Deforestation**: Vegetation absorbs carbon dioxide from the atmosphere during the process of photosynthesis, converting this to carbon which is stored within all plants (i.e. it is a carbon sink). When vegetation is burned, this organic carbon is released into the atmosphere in the form of carbon dioxide, and in so doing becomes a carbon source rather than a carbon sink.\(^\text{29}\)

3.2.1.4.3. **Urbanization and Industrialization**: The excessive exploitation of resources and nature due to rapid urbanization and industrialization let to climate change.\(^\text{30}\)

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27 Rajan Kumar, ENVIRONMENT AND ECOLOGY, Arihant Publications India Ltd. UP (2016) p.120.
28 *Ibid*.
29 *Ibid*.
30 Rajan Kumar, ENVIRONMENT AND ECOLOGY, Arihant Publications India Ltd. UP (2016) p.120.
3.2.1.5. **Impacts of Climate Change** - Climate change is one of the inexorable physical phenomena happening on the earth. The change induced by the humans is leading towards adverse effects, which is now being recognized as an immediate threat to the environment and ecological systems. Many manifestations of the climate induced changes have been reported by the scientific community all across the Globe.\(^{31}\) Climate change impacts also spans over spatial and temporal scales. These changes will have an adverse impact on the development of the nations and human well-being\(^{32}\). Even small increases in Earth’s temperature caused by climate change can have severe effects. The earth’s average temperature has gone up 1.4° F over the past century and is expected to rise as much as 11.5° F over the next. That might not seem like a lot, but the average temperature during the last Ice Age was about 4° Flower than it is today.

3.2.1.6. **Impacts of Climate Change in India** - India is the 13\(^{th}\) most vulnerable country to climate change. Since more than 60% of Indian agriculture is rain fed and it hosts 33% of the world’s poor, climate change will have significant impacts on the food and nutritional security of the country.\(^{33}\)

IPCC in its fourth assessment report has highlighted the possible adverse effects due to climate change. It has been reported that ambient air temperature and precipitation will increase in certain parts of the world, while these will decrease in some other parts. It is imperative to assess in detail the various environmental changes and their subsequent consequences on our ecosystem. While most of the climate change studies focus on the climate modeling, impacts on various resources as well as mitigation and adaptation, little attention has been made to understand environmental consequences climate change.\(^{34}\)

3.2.1.6.1. **Effects on Himalayan Glaciers** - Climate change, which is a result of global warming, is causing the glacier melt. It is now clear that global warming is occurring due

\(^{32}\) J. Sundaresan, et.al., CLIMATE CHANGE AND ENVIRONMENT, 1\(^{st}\) edn. Scientific Publishers (India) (2013) p.iii.
\(^{34}\) J. Sundaresan, et.al., CLIMATE CHANGE AND ENVIRONMENT, 1\(^{st}\) edn. Scientific Publishers (India) (2013) p.iii.
to human activities, primarily the excessive burning of fossil fuels like oil and coal. Himalayan glaciers are a source of fresh water for perennial rivers in India. The meltdown of the glaciers (called glacial retreat) is a complex phenomenon and scientists are still trying to understand the process. Excessive meltdown may cause floods initially, but in the long run glacial retreat will reduce the water reaching the rivers. Also, the water from the meltdown is creating large lakes and there is a big risk of these lakes bursting out and causing enormous floods. Each summer, the melt water feeds the rivers and streams of the region. If the glacial retreat continues, at some stage normal glacier melt will not be able to contribute to the region’s water supply each year. The glacial retreat is adding to the irreparable ecological damage already suffered by the Himalayas. Human activities like forest clearing, road construction, and mountaineering have taken a heavy toll. These in turn have led to soil erosion, landslides, and floods. In addition, there are natural calamities like avalanches and earthquakes. In spite of their scale and grandeur, the Himalayas constitute a fragile ecosystem in delicate balance. That balance may have already been upset, with unpredictable consequences for the entire subcontinent.

Recent climate changes have had significant impact on high-mountain glacial environment. Rapid melting of snow/ice and heavy rainfall has resulted in the formation and expansion of moraine-dammed lakes, creating a potential danger from dammed lake outburst floods. On 16 and 17 June 2013, heavy rains together with moraine dammed lake (Chorabari Lake) burst caused flooding of Saraswati and Mandakini rivers in Rudraprayag district of Uttarakhand. The bursting of this lake led to its complete draining within 5–10min as reported by the watch and ward staff of the Wadia Institute of Himalayan Geology (WIHG), which were present in WIHG camp at Chorabari Glacier on 16 June and early morning of 17 June 2013. The heavy rainfall together with melting

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35 AK Thakur and Dalip Kumar, DIMENSIONS OF CLIMATE CHANGE IN INDIA- A DEVELOPMENT PERSPECTIVE, Regal Publications New Delhi, (2013) p.163.
of snow in the surrounding Chorabari Lake washed off both the banks of the Mandakini River causing massive devastation to the Kedarnath town.\textsuperscript{37}

### 3.2.1.6.2 Effect on Indian Monsoon

Human interference have certainly made the Indian monsoon fickle. There is a reason to believe that the tipping point for the Indian monsoon may have already crossed or is imminent. In 2006, there were unprecedented floods in Barmer district of western Rajasthan, where the average annual rain fall is hardly 120 mm.\textsuperscript{38}

### 3.2.1.6.3 Effect on Agriculture

The climate change could cause irresistible damage to land and water ecosystems and lead to loss of production potential.\textsuperscript{39}

### 3.2.1.6.4 Effect on Sea Level

The next effect of climate change is rise of sea levels. Though a sea level rise in some Indian coastal cities has been quite mild so far, less than a centimeter a decade, it did not specify its rise in recent years.\textsuperscript{40}

### 3.2.1.6.5 Effects on Human Health

It is being reported that at global level, climate change affects human health directly. The Inter-governmental Panel on Climate Change (IPCC) has forecasted and observed various diseases which are caused due to climate change. Climate change, also called global warming, refers to the rise in average surface temperatures on Earth. Climate change affects human health in many ways.\textsuperscript{41} An overwhelming scientific consensus maintains that climate change is due primarily to the human use of fossil fuels, which releases carbon dioxide and other greenhouse gases into the air. The gases trap heat within the atmosphere, which can have a range of effects on ecosystems, including rising sea levels, severe weather events, and droughts that render

\textsuperscript{37} Scientific Correspondence, Kedarnath Disaster; Facts and Plausible Causes, available on http://chimalaya.org/2013/07/30/kedarnath-disaster-facts-and-plausible-causes/ (accessed on 28\textsuperscript{th} March 2016).

\textsuperscript{38} D. Vijalakshmi, CLIMATE CHANGE AND ENVIRONMENT IMPACT ON INDIAN ECONOMY, Regal publication New Delhi (2013) p. 42.


\textsuperscript{40} Anubha Kaushik and CP Kaushik, PERSPECTIVE IN ENVIRONMENTAL STUDIES, 2\textsuperscript{nd} edn. New Age International Publishers Bangalore, p.183.

landscapes more susceptible to wildfires.\textsuperscript{42} These diseases affect the human health in various ways which is shown in tabular form as follows:

<table>
<thead>
<tr>
<th>Disease</th>
<th>Affected Population (In Crores)</th>
<th>Number of Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaria</td>
<td>320</td>
<td>97</td>
</tr>
<tr>
<td>Leishmaniasis/KalaAzar</td>
<td>0.9</td>
<td>98</td>
</tr>
<tr>
<td>Lymphatic Filariasis</td>
<td>123</td>
<td>73</td>
</tr>
<tr>
<td>Schistosomiasis</td>
<td>26.2</td>
<td>78</td>
</tr>
<tr>
<td>Leprosy</td>
<td>0.2</td>
<td>102</td>
</tr>
</tbody>
</table>

*Diseases Caused due to Climate Change*\textsuperscript{43}

### 3.2.2. Problem of Pollution

Pollution of air, water and soil require millions of years to recoup. Industry and motor vehicle exhaust are the number one pollutants. Heavy metals, nitrates and plastic are toxins responsible for pollution. While water pollution is caused by oil spill, acid rain, urban runoff; air pollution is caused by various gases and toxins released by industries and factories and combustion of fossil fuels; soil pollution is majorly caused by industrial waste that deprives soil from essential nutrients. No improvement in water quality after 22 years of ‘incoherent’ spending. The city has spent over Rs.2, 000 Crore on Yamuna clean–up in the last 22 years.\textsuperscript{44} Death due to toxic air. *Recent global reports:*

1. State global air 2017:
   - Globally air pollution caused more than 4.2 million premature death in 2015
   - India is the second highest in the world in terms of premature deaths due to air pollution-10, 90,400 deaths.

\textsuperscript{42} Ibid.
\textsuperscript{43} Rahul Singh, “Climate change and concept of environmental justice”, Completion in focus, Arihant publication India Ltd.UP (February, 2016) p.95.
\textsuperscript{44} Jayshree Nandi and Neha Lalchandani, Rs.2000 cr. down Yamuna drain, The Times of India, 5, Feb. 23, 2017.
• China tops the list -11, 08,100 deaths air pollution is the fifth highest cause of death.\textsuperscript{45}

2. The Lancet countdown: tracking progress on health and climate change

• Air pollution is killing two people in India every minute.
• Globally 2.7-3.4 million pre-term births may be associated with exposure to PM2.5.
• South Asia, with 1.6 million preterm births, is the worst hit.\textsuperscript{46}

3.2.2.1. Water Pollution: - Water pollution can be defined in many ways. Usually, it means one or more substances have built up in water to such an extent that they cause problems for animals or people. Oceans, lakes, rivers, and other inland waters can naturally clean up a certain amount of pollution by dispersing it harmlessly. If you poured a cup of black ink into a river, the ink would quickly disappear into the river's much larger volume of clean water. The ink would still be there in the river, but in such a low concentration that you would not be able to see it. At such low levels, the chemicals in the ink probably would not present any real problem. However, if you poured gallons of ink into a river every few seconds through a pipe, the river would quickly turn black. The chemicals in the ink could very quickly have an effect on the quality of the water. This, in turn, could affect the health of all the plants, animals, and humans whose lives depend on the river.

Water pollution almost always means that some damage has been done to an ocean, river, lake, or other water source. A 1969 United Nations report defined ocean pollution as:

"The introduction by man, directly or indirectly, of substances or energy into the marine environment (including estuaries) resulting in such deleterious effects as harm to living

\textsuperscript{45} Report is prepared by the health effects institute in cooperation with the institute of health metrics and evaluation at the university of Washington and university of British Columbia
\textsuperscript{46} Vishwa Mohan, Won’t just go by foreign data, will do study on air pollution: centre, Times of India Chandigarh,8,feb.23,2017
resources, hazards to human health, hindrance to marine activities, including fishing, impairment of quality for use of sea water and reduction of amenities.”

**Causes of Water Pollution in India**

The single biggest reason for water pollution in India is urbanization at an uncontrolled rate. The rate of urbanization has only gone up at a fast pace in the last decade or so, but even then it has left an indelible mark on India’s aquatic resources. This has led to several environmental issues in the long term like paucity in water supply, generation and collection of wastewater to name a few.

The treatment and disposal of wastewater has also been a major issue in this regard. The areas near rivers have seen plenty of towns and cities come up and this has also contributed to the growing intensity of problems.

Uncontrolled urbanization in these areas has also led to generation of sewage water. In the urban areas water is used for both industrial and domestic purposes from water bodies such as rivers, lakes, streams, wells, and ponds. Worst still, 80% of the water that we use for our domestic purposes is passed out in the form of wastewater. In most of the cases, this water is not treated properly and as such it leads to tremendous pollution of surface-level freshwater.

This polluted water also seeps through the surface and poisons groundwater. It is estimated that cities with populations of more than one lakh people generate around 16,662 million liters of wastewater in a day. Strangely enough, 70% of the people in these cities have access to sewerage facilities. Cities and towns located on the banks of Ganga generate around 33% of wastewater generated in the country. Some of the important reasons of increasing levels of water pollution in India are industrial waste, improper practices in agricultural sector, reduction in water quantity in rivers in plains, social and religious practices like dumping dead bodies in water, bathing, throwing

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47 The original definition appeared in UN Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection, Report of the First Session, March 1969, p.5. It omitted the word "energy," which was added at the Stockholm Conference (the UN Conference on Human Development) in 1972.
waste in water, oil leaks from ships, acid rain, global warming, eutrophication, inadequate industrial treatment of wastes, denitrification.\footnote{Ibid.}

**Effects of Water Pollution in India**

Water pollution can have some tremendously-adverse effect on the health of any and every life form living in the vicinity of the polluted water body or using water that has been polluted to some extent. At a certain level polluted water can be detrimental to crops and reduce the fertility of soil thus harming the overall agricultural sector and the country as well. When sea water is polluted it can also impact oceanic life in a bad way. The most fundamental effect of water pollution is however on the quality of the water, consuming which can lead to several ailments.

In fact as far as India is concerned polluted water is one of the major factors behind the general low levels of health in India, especially in the rural areas. Polluted water can lead to diseases such as cholera, tuberculosis, dysentery, jaundice, diarrhea, etc. In fact, around 80% stomach ailments in India happen because of consuming polluted water.

- **Decreasing Freshwater Resources**

  The availability to man of freshwater of high quality is becoming an acute problem in many countries. Water requirements continue to increase with the growth of populations and living standards and the expansion of agriculture and industry. Water is needed for power generation, irrigation, navigation and community water supply. Often it is drawn from international rivers or lakes and in many instances international co-operation is needed in the allocation of water and the financing and technical aspects of water resource development projects. The availability of ground water is most often a local problem but it has international implications in relation to the general effects which a depletion of ground water may have within a larger region.\footnote{M. Rajakumar, and A. Selvaraj, ENVIRONMENTAL EDUCATION ISSUES AND CHALLENGES, Laxmi Book Publication, Sholapur (2017)16.}
• **Fluoride Contamination of Groundwater**

Ingestion of low levels of fluoride compounds is beneficial to the body and prevents dental caries. Some of us can perhaps still remember advertisements of fluoridated toothpastes. But long term ingestion of excess fluoride can be harmful to the body and cause a condition known as fluorosis that affects teeth and bones.\(^{50}\)

• **The story of Cherrapunji; Buying Water in Cherrapunji**

The reason for the water shortage is that the town is so hilly that the downpour just drains off. Owing to heavy rains villagers cannot grow crops because five minutes after it rains, there isn’t any water to be seen. Plants rot and the soil needed to sow food is washed away. IT’S hard to believe but even Cherrapunji suffers from water shortage. For nearly 150 years now, all schoolboys in the world have learnt that the 4,000 feet-high Cherrapunji in modern Meghalaya in India is the wettest place in the world, having as much as 14,000 mm (40 feet) of rain every year. But what is not known is that today there is such a shortage of water in this "wet desert" that its 10,000 inhabitants have to buy water, carted from the nearby plains at a cost of Rs 8 per bucket. It remains to be seen whether Cherrapunji will have the wisdom be able to sort out their water problems.\(^{51}\)

### 3.2.2.2. Air Pollution

Today, air pollution has emerged as a global public health problem and is identified as a major environmental health hazard by agencies such as the World Health Organization (WHO) and governments around the world.\(^{52}\) The major sources of air pollution in India are fuel wood and biomass burning, fuel adulteration, vehicle emission and traffic congestion.\(^{53}\) Pollution is now a common place term that our ears are attuned to. We hear about the various forms of pollution and read about it through the mass media. Air pollution is one such form that refers to the contamination of

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\(^{50}\) Fluoride contamination of groundwater available on http://schools.indiawaterportal.org/wq-test/fluoride-factsheet (accessed on 5th March 2016).

\(^{51}\) Dhananjay Bhatt; *Buying Water In Cherrapunji Spectrum*, The Tribune; June 10, 2007.


\(^{53}\) "Urban Air Pollution, Catching gasoline ad diesel adulteration" (PDF). The World Bank. 2002.
the air, irrespective of indoors or outside. A physical, biological or chemical alteration to the air in the atmosphere can be termed as pollution. It occurs when any harmful gases, dust, smoke enters into the atmosphere and makes it difficult for plants, animals and humans to survive as the air becomes dirty.\textsuperscript{54} An increase in concentration of pollutants - both gaseous and solid - is among the largest health risk in the world and according to the latest data released by WHO, indoor and outdoor air pollution were responsible for 3.7 million deaths of people aged under 60 in 2012. Most tourism-related air pollution comes from automobiles. Automobiles emit by far the most carbon monoxide of all transportation modes. In recent years, air pollution has acquired critical dimensions and the air quality in most Indian cities that monitor outdoor air pollution fail to meet WHO guidelines for safe levels. The levels of PM2.5 and PM10 (Air-borne particles smaller than 2.5 micrometers in diameter and 10 micrometers in diameter) as well as concentration of dangerous carcinogenic substances such as Sulphur Dioxide (SO2) and Nitrogen Dioxide (NO2) have reached alarming proportions in most Indian cities, putting people at additional risk of respiratory diseases and other health problems. Furthermore, the issue of indoor air pollution has put women and children at high risk.\textsuperscript{55} Air pollution can further be classified into two sections- Visible air pollution and invisible air pollution. Another way of looking at Air pollution could be any substance that holds the potential to hinder the atmosphere or the well being of the living beings surviving in it. The sustainment of all things living is due to a combination of gases that collectively form the atmosphere; the imbalance caused by the increase or decrease of the percentage of these gases can be harmful for survival. The Air (Prevention and Control of Pollution) Act was passed in 1981 to regulate air pollution and some of the measures for the prevention of air pollution. However, the 2016 Environmental Performance Index ranked India 141 out of 180 countries. In 2015, Government of India, together with IIT Kanpur launched the National Air Quality Index.\textsuperscript{56}

\textsuperscript{54} Rajni Johar Chhatwal, ENVIRONMENTAL SCIENCES A SYSTEMATIC APPROACH, 1\textsuperscript{st} edn., UDH Publishers and Distributors New Delhi (2009) p.66.
\textsuperscript{55} Ibid.
\textsuperscript{56} Vishwa Mohan, Choking India gets Air Quality Index, The Economics Times, 8th April 2015.
Effects of Air Pollution

Over the past 30 years, researchers have unearthed a wide array of health effects which are believed to be associated with air pollution exposure. Among them are respiratory diseases (including asthma and changes in lung function), cardiovascular diseases, adverse (such as preterm birth), and even death.57

In 2013, the World Health Organization concluded that outdoor air pollution is carcinogenic to humans. While climate change is a global process, it has very local impacts that can profoundly affect communities, not the least of which is air pollution. Increasing temperatures are directly linked to poor air quality which, in turn, can affect the heart and exacerbate cardiovascular disease. Examples of this may include a rise in pollen, due to increased plant growth, or a rise in molds, due to severe storms -both of which can worsen allergies and other lung diseases, such as asthma.

In recent days Delhi facing more problems of these pollution. Delhi was affected by smog. SMOG means SMOKE +FOG=SMOG. Literally smog means due to the air pollution and by burning of waste and agriculture waste. The smoke create by this waste is mixed with the fog in the society that leads smog. Because of this smog the people faces lot of problems. The people were affected by some diseases. The smog in Delhi is at worst level in two decades, the air quality of Delhi is rated at ‘severe’. Burning crackers, cigarette smoke, vehicular pollution and burning of crops over the last few days let to an increase of particular matter in Delhi air. And also the Delhi is located similarly middle part of our country. The pollution created by the neighbouring country also affect the Delhi state peoples. But other say that it is responsible for only 20% of the air pollution and 80% of the sources of pollutants in the lower atmosphere of the state.58

3.2.2.3. Soil / Land Pollution- Soil pollution is defined as, “contamination of soil by human and natural activities which may cause harmful effect on living organisms”. Uncontrolled deforestation, intensive irrigation and mining activities are the major cause of land degradation. Deforestation on a massive scale has resulted in an

unmanageable fast flow of water from upstream areas. The eroded soil has led to siltation of rivers which naturally have over flown their banks with roaring speed. It has been estimated that about 23 billion tonnes of soil are lost every year. The Thar-desert is expanding at the rate of one km per year. Drought-prone areas have been ever expanding, as a result, some of the districts in U.P. like Tehri and Uttarkashi, Bankura in West Bengal and large areas of Rajasthan fell to acute scarcity of water. Lakes, rivers and streams are drying day by day. The water area of Chilka (Orissa) has been reduced from 1165 sq km to 900 sq km. Loktak lake, the largest freshwater inland lake, has been reduced from 495 sq km to 390 sq km in ten years causing a serious ecological problem in Kashmir valley. The defective drainage system and encroachment on Dal Lake and the closure of the Nallah are hindering the flood channel linking the Dal with the Jhelum. Soil erosion is a natural process and is as old as the earth. In March 2009, the issue of Uranium Poisoning in Punjab attracted press coverage. It was alleged to be caused by fly ash ponds of thermal power stations, which reportedly lead to severe birth defects in children in the Faridkot and Bhatinda districts of Punjab. The news reports claimed the uranium levels were more than 60 times the maximum safe limit. In 2012, the Government of India confirmed that the ground water in Malwa belt of Punjab has uranium metal that is 50% above the trace limits set by the United Nations' World Health Organization. Scientific studies, based on over 1000 samples from various sampling points, could not trace the source to fly ash and any sources from thermal power plants or industry as originally alleged. The study also revealed that the uranium concentration in ground water of Malwa district is not 60 times the WHO limits, but only 50% above the WHO limit in 3 locations. This highest concentration found in samples was less than those found naturally in ground waters currently used for human purposes elsewhere, such as Finland. Research is underway to identify natural or other sources for the uranium. In March 2009, the issue of Uranium Poisoning in Punjab attracted press coverage. It was alleged to be caused by fly ash ponds of thermal power stations, which reportedly lead to severe birth defects in children in the Faridkot and Bhatinda districts of Punjab. The news reports claimed the uranium levels were more than 60 times the maximum safe limit. In 2012, the Government of India confirmed that the ground water in Malwa belt of Punjab has uranium metal that is 50% above the trace limits set by the
United Nations' World Health Organization. Scientific studies, based on over 1000 samples from various sampling points, could not trace the source to fly ash and any sources from thermal power plants or industry as originally alleged. The study also revealed that the uranium concentration in ground water of Malwa district is not 60 times the WHO limits, but only 50% above the WHO limit in 3 locations. This highest concentration found in samples was less than those found naturally in ground waters currently used for human purposes elsewhere, such as Finland. Research is underway to identify natural or other sources for the uranium. But today it has increased to the point where it far exceeds the natural formation of new soil. In the face of continuously expanding the demand for agricultural products and increase in pressure on land, soil erosion is accelerating. Indeed the agricultural land is losing its productive top soil 20 to 40 times faster than soil naturally can reform in thousands of years.

Use of Pesticides is Harmful: Pesticides are toxic chemicals or harmful substances which are released into the environment to kill or destroy pests. Although each pesticide is meant to kill a certain pest, a very large percentage of pesticides reach a destination other than their target. It does not only kill but also affect the living organisms in an immense level of danger. They enter the air, water, sediments, and even end up in our food. Pesticides can easily contaminate the air, ground and water when they run off from fields, escape storage tanks, are not discarded properly and especially when they are sprayed aerially. There are many factors where pollution is caused due to this usage of pesticides with motive to destroy the pests but the main fact is left unaware that it causes harmful effects on to living things including human, birds, animals, and insects. It also causes a great pessimistic barrier to the other factors like air, soil and etc. A study conducted by Baba Farid Centre for Special Children (Jan 2009 – Jan 2018) across Punjab shows the level of toxicity in the urine samples of 200 children shows a drastic increase of heavy metals in blood. For example the dangerous metals like lead, Nickel, Arsenic, Aluminum, Mercury and Cadmium have been found present in the blood of such

children up to 94% more than the prescribed limits which resulted in a massive increase in the prevalence of autism, mental retardation and learning disabilities.\textsuperscript{62}

**Effects of Soil Pollution:**

- The story The Green Revolution might have enriched Punjab. Today, many farmers living in one of India's richest granaries are in danger of losing their livelihood as agricultural lands are slowly turning barren due to farming practices aimed at increasing yields to meet demand. Forty years ago, the state embarked on an agrarian revolution, popularly known as the Green Revolution (GR), designed to improve harvests. It was born out of a dire necessity to provide food security for the country and reduce dependence on imports from the West, which reached 10 million tons in 1967. As a result of the GR, agricultural productivity in Punjab grew by around six percent annually for the next two decades. By the mid-1980s, wheat and rice yields had trebled. Rising costs as farmers step up reliance on chemical fertilizers. Undoubtedly, the GR made Punjab where 70 percent of the labour force works in agriculture and related activities one of the richest states in India. Yearly per capita income (at current prices) rose from $60 in 1980-81 to $440 in 1997-98, well above the national $240 average. But there is a flip side to this prosperity. Always seeking to boost production, farmers made excessive use of chemical fertilizers and pesticides, altered crop patterns and overexploited groundwater resources. "It was more a grain revolution than a green revolution. Its unsustainable policies have led to the poverty of soil and the people.\textsuperscript{63}

3.2.2.4. **Noise pollution** -Noise is an unwanted or undesired and unpleasant sound.\textsuperscript{64} Noise disturbance is the disturbing or excessive noise that may harm the activity or balance of human or animal life. Noise pollution is any loud sounds that are either harmful or annoying to humans and animals. Some examples of noise pollution;

- Airplanes, helicopters and motor vehicles

\textsuperscript{62} Jasmine Singh, Heavy Metals, Deep Impact; Indepth, The Sunday Tribune, 28\textsuperscript{th} January 2018.


Problem of noise pollution is increasing day by day especially in urban and industrial areas. Poor urban planning may give rise to noise pollution, since side-by-side industrial and residential buildings can result in noise pollution in the residential areas. Documented problems associated with urban noise go back as far as Ancient Rome.

Outdoor noise can be caused by machines, construction activities, and music performances, especially in some workplaces. Noise-induced hearing loss can be caused by outside (e.g. trains) or inside (e.g. music) noise.

**Effects of Noise Pollution**

- High noise levels can contribute to cardiovascular effects in humans and an increased incidence of coronary artery disease. In animals, noise can increase the risk of death by altering predator or prey detection and avoidance, interfere with reproduction and navigation, and contribute to permanent hearing loss.
- Noise pollution can be disruptive to human stress levels, may be harmful to unborn babies and drives animals away by causing nervousness and decreasing their ability to hear prey or predators.
- There has been a great concern over the noise level generated during Diwali festival. According to the recent test report on firecrackers National Physical Laboratory, New Delhi most of the firecrackers available in the market produce noise beyond permission limits of 125 decibels as per the environment protection (second amendment) rules 1999, some of them have been observed to produce noise near the threshold of pain.

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Noise Pollution May Be Harming the World’s Most Endangered Killer Whales\textsuperscript{70}, Undersea noise from container ships, oil tankers, and cargo ships may be drowning out communications among the endangered orcas of the Pacific Northwest, making it harder for these rare whales to find the fish they need to survive.

The supreme court of India which is in New Delhi gave a significant verdict on noise pollution in 2005. Unnecessary honking of vehicles makes for a high decibel level of noise in cities. The use of loudspeakers for political purposes and for sermons by temples and mosques makes noise pollution in residential areas worse. In January 2010, Government of India published norms of permissible noise levels in urban and rural areas.\textsuperscript{71}In Church of God (FULL GOSPEL) In India v K.K.R.Majestic Colony Welfare Association and Others\textsuperscript{72}, the apex court in this held that nobody has right to affect others by the noise pollution in the name of even religion.

3.2.3. Global Warming

A climate change like global warming is the result of human practices like emission of Greenhouse gases. Global warming leads to rising temperatures of the oceans and the earth’ surface causing melting of polar ice caps, rise in sea levels and also unnatural patterns of precipitation such as flash floods, excessive snow or desertification. An island, which contributes minimally to climate change with a few thousand people and not even a single motorized vehicle, is going under water due to the phenomenon. in India eight out of ten warmest years occurred during the decade of 2001-2010.in 2013 the very sever cyclone Phailin made land fall on the Odisha coast, affecting 12 million people. weather pattern have changed drastically in many parts of the country.\textsuperscript{73}

\textsuperscript{70} Emily J. Gertz , Noise Pollution May Be Harming the World’s Most Endangered Killer Whales, available on http://www.takepart.com/article/2016/02/02/ship-noise-may-harm- worlds- most- endangered- orcas (accessed on 2nd May 2016).

\textsuperscript{71} Vanaja Danthuluri, “Environmental Problems And Sustainable Development: With Special Reference To India Issues And Challenges”.15,International Conference on Recent Research Development In Environment ,Social Sciences And Humanities(September2015) p.10.

\textsuperscript{72} AIR 2000 SC 2773.

\textsuperscript{73} R. Rajagopalan, ENVIRONMENTAL STUDIES: FROM CRISES TO CURE, 3\textsuperscript{rd} edn. Oxford University Press New Delhi (2016) p. 3.
Effect of Global Warming

- **The Story of Ghoramara:** Ghoramara located about 150 km south of Calcutta and immediately north of Sagar Island—close to where the Hooghly meets the sea—is about 4.8 sq km in area. It has lost land roughly half that size in the last three decades to the Hooghly. Though a few argue that the submergence is caused by the dynamics of the river’s flow, most experts feel that the rising sea triggered by global warming and melting glaciers is the dominant factor behind the disappearance of islands in the Sunderbans. A study by the oceanographic department of Jadavpur University found that roughly 80 sq km in the Sunderbans have vanished under water in three decades.74

- **The Asian Haze or Asian Brown Cloud**

  In the beginning of the 21st century, INDOEX (Indian Ocean Experiment) scientists have identified a new threat to the world climate. An UN study, commissioned by UNEP conducted by about 200 scientists, including Indians, have discovered a 3km thick blanket of brownish layer of pollution spread over South Asia and most tropical Indian ocean. To this they have named as “Asian Haze” or “Asian Brown Cloud”. This is a major environmental hazard for the region. This haze consist of deadly cocktail of ash, acids, sulphates, nitrates, black carbon, and suspended particles in the air called aerosols and several other damaging air borne pollutants. The burning of wood and fossil fuels cause a large part of aerosols. It can also results from natural causes like desert sand and sea salts.75 One major impact is on health i.e. a study of 2002 indicated nearly two million people die each year, in India alone, from conditions related to the brown cloud.76 The discovery of “Asian Haze” has sent a shock wave in the sub

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76 Khabir Ahmad, Pollution cloud over south Asia is increasing ill health available on http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(02)09762-3/fulltext (accessed on 11th November 2015).
continent and the countries likely to be affected from this are India, Pakistan, Afghanistan, Bhutan, Nepal Sri Lanka and Maldives.  

### 3.2.4. Over Population

There is a long history of study and debate about the interactions between population growth and the environment. According to a British thinker Malthus, for example, a growing population exerts pressure on agricultural land, causing environmental degradation, and forcing the cultivation of land of poorer as well as poorer quality. This environmental degradation ultimately reduces agricultural yields and food availability, causes famines and diseases and death, thereby reducing the rate of population growth. Population growth, because it can place increased pressure on the assimilative capacity of the environment, is also seen as a major cause of air, water, and solid-waste pollution.  

About 34 million people in 1947 the time of independence have swelled up to 86 million in 1991 and are likely to cross 100 million marks by the turn of this century and more than 200 crore by 2035. An unbelievable bitter truth is that Indian population explosion adds an Australia to the country every year. Concentration of people in the urban areas which are already polluted is becoming heavier. The hard pressed economic necessities have overlooked environmental aspect altogether. The population of the planet is reaching unsustainable levels as it faces shortage of resources like water, fuel and food. Population explosion in less developed and developing countries is straining the already scarce resources. Intensive agriculture practiced to produce food damages the environment through use of chemical fertilizer, pesticides and insecticides. Overpopulation is one of the crucial current environmental problems.

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78 Vanaja Danthuluri, “Environmental Problems And Sustainable Development: With Special Reference To India Issues And Challenges”, 15, International Conference on Recent Research Development In Environment, Social Sciences And Humanities (September 2015) p.10.  
Effect of Over Population

The Story of Dharavi—Spread over 175 hectares and swarming with one million people, Dharavi is often called 'Asia's largest slum'. But it is much more than cold statistic. What makes it special are the people who live there, many of whom have defied fate and an unhelpful state to prosper through a mix of hard work, luck and ingenuity.  

3.2.5. Natural Resource Depletion

Natural resource depletion is another crucial current environmental problem. There are so many legislation to protect the environment but still these problems are in existence. Fossil fuel consumption results in emission of Greenhouse gases, which is responsible for global warming and climate change. Globally, people are taking efforts to shift to renewable sources of energy like solar, wind, biogas and geothermal energy. The cost of installing the infrastructure and maintaining these sources has plummeted in the recent years.

3.2.6. Waste Disposal

Waste disposal is one of urgent current environmental problem. The over consumption of resources and creation of plastics are creating a global crisis of waste disposal. Developed countries are notorious for producing an excessive amount of waste or garbage and dumping their waste in the oceans and, less developed countries. Nuclear waste disposal has tremendous health hazards associated with it. Plastic, fast food, packaging and cheap electronic wastes threaten the well being of humans.

(i) E-waste Electronic waste or e-waste describes discarded electrical or electronic devices. Used electronics which are destined for reuse, resale, salvage, recycling or disposal are also considered e-waste. Informal processing of e-waste in developing countries can lead to adverse human health effects and environmental pollution.  

Composition of E-waste

E-waste consists of all waste from electronic and electrical appliances which have reached their end-of-life period or are no longer fit for their original intended use and

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81 Rediscovering Dharavi, The Hindu; September 17, 2000.
are destined for recovery, recycling or disposal. It includes computer and its accessories monitors, printers, keyboards, central processing units; typewriters, mobile phones and chargers, remotes, compact discs, headphones, batteries, LCD/Plasma TVs, air conditioners, refrigerators and other household appliances. The composition of e-waste is diverse and falls under ‘hazardous’ and ‘non-hazardous’ categories. It contains over 1000 different substances, many of which are toxic, and creates serious pollution upon disposal. Obsolete computers pose the most significant environmental and health hazard among the e-wastes.83

**Effects of e-waste**

- Lead is toxic to the kidneys, accumulating in the body and eventually affecting the nervous and reproductive systems. Children’s mental development can be impaired by low-level exposure to lead.
- When burned, PVC produces dioxins, some of the most hazardous carcinogens known.
- Brominates flame retardants have been linked to fetal damage and thyroid problems.
- Barium produces brain swelling after a short exposure. It may cause weakness in muscles as well as heart, liver, and spleen damage.
- Hexavalent chromium damages kidneys, the liver, and DNA. Asthmatic bronchitis has been linked to this substance.
- Mercury is known to harm developing fetuses and is passed through the mother’s milk to newborns. In adults it can cause brain and kidney damage.
- Beryllium causes acute or chronic beryllium disease, a deadly ailment affecting the lungs.

**E-Waste: – Legal Position in India**

Although there are legislations to regulate the disposal and management of E-waste in India, there is no proper implementation of these legislations. The various legislations enacted by the Government of India are:-

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• The Hazardous Wastes (Management and Handling) Amendment Rules, 2003;
• Guidelines for Environmentally Sound Management of E-waste, 2008; and
• The e-waste (Management and Handling) Rules, 2011.

Following Supreme Court directions, the states have notified a set of hazardous waste
laws and built a number of hazardous waste disposal facilities in the last ten years.
However, the CAG report found that over 75 percent of state bodies were not
implementing these laws.84

(ii) Pollution by Plastics:

This kind of pollution involves the accumulation of plastic products in
the environment that adversely affects wildlife, wildlife habitat, or humans.85 Plastics that
act as pollutants are categorized into micro-, meso-, or macrodebris, based on size. The
prominence of plastic pollution is correlated with plastics being inexpensive and durable,
which lends to high levels of plastics used by humans. However, it is slow to
degrade. Plastic pollution can unfavorably affect lands, waterways and oceans. Living
organisms, particularly marine animals, can also be affected through entanglement, direct
ingestion of plastic waste, or through exposure to chemicals within plastics that cause
interruptions in biological functions. Humans are also affected by plastic pollution, such
as through the disruption of the thyroid hormone axis or hormone levels. In the UK alone,
more than 5 million tonnes of plastic are consumed each year, of which an estimated
mere 24% makes it into recycling systems. That leaves a remaining 3.8 million tonnes of
waste, destined for landfills. Plastic reduction efforts have occurred in some areas in
attempts to reduce plastic consumption and pollution and promote plastic recycling.86 A
plastic bottle can survive an estimated 450 years in the ocean and plastic fishing line can
last up to 600 years.87

84 Ibid. at p.189.
86 Pollution By Plastic In India available on https://en.wikipedia.org/wiki/Plastic_pollution (accessed on
10th December 2016).
87 AS Gayathri and Satwika, “A Critical Study On Environment Pollution And Environmental Laws”,4 (1)
Effects of Plastic Pollution

• Today, in an extraordinary move, the World Health Organization (WHO) declared the Zika virus and its suspected link to birth defects as an international public emergency. The link between the Zika virus and plastic pollution may not be immediately apparent but plastic has become a harmful element of the environment which fosters a breeding ground for the virus carrier: the mosquito. Mosquitoes thrive and lay their eggs in pools of stagnant water, which are often full of organic matter that they require to survive. They and tubal ectopic pregnancy: a cross-sectional analysis of historical data from the Women’s Health Initiative.  

• In landscapes that are heavily polluted with plastic, these manmade pools are commonly found where plastic waste clogs, natural drainage and prevents water from flowing. Roadside drainage ditches, mangrove swamps and other spots filled with plastic become full of stagnant water, and as such provide to opportune breeding grounds for mosquito larva.

• Plastic Pollution Is Killing India's Sacred Cows.

(iii) Radioactive waste

People view radioactive waste with great alarm—and for good reason. At high enough concentrations it can kill; in lower concentrations it can cause cancers and other illnesses. The biggest sources of radioactive pollution are radium, uranium, etc. which emit invisible effects known as radiations. Due to enormous use of atomic energy in the world to generate power, our environment is exposed to greater atomic pollution and ultimately living beings will its dangerous effect.

(iv) Solid Waste Management

Trash and garbage is a common sight in urban and rural areas of India. It is a major source of pollution. Indian cities alone generate more than 100 million tons of solid waste a year. Street corners are piled with trash. Public places and sidewalks are despoiled with

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89 Ibid.
filth and litter, rivers and canals act as garbage dumps. In part, India's garbage crisis is from rising consumption. India's waste problem also points to a stunning failure of governance. In 2000, India's Supreme Court directed all Indian cities to implement a comprehensive waste-management programme that would include household collection of segregated waste, recycling and composting. These directions have simply been ignored. No major city runs a comprehensive programme of the kind envisioned by the Supreme Court.  

Indeed, forget waste segregation and recycling directive of the India's Supreme Court, the Organisation for Economic Cooperation and Development estimates that up to 40 percent of municipal waste in India remains simply uncollected. Even medical waste, theoretically controlled by stringent rules that require hospitals to operate incinerators, is routinely dumped with regular municipal garbage. A recent study found that about half of India's medical waste is improperly disposed of. Municipalities in Indian cities and towns have waste collection employees. However, these are unionized government workers and their work performance is neither measured nor monitored. Some of the few solid waste landfills India has, near its major cities, are overflowing and poorly managed. They have become significant sources of greenhouse emissions and breeding sites for disease vectors such as flies, mosquitoes, cockroaches, rats, and other pests. In 2011, several Indian cities embarked on waste-to-energy projects of the type in use in Germany, Switzerland and Japan.

For example, New Delhi is implementing two incinerator projects aimed at turning the city's trash problem into electricity resource. These plants are being welcomed for addressing the city's chronic problems of excess untreated waste and a shortage of electric power. They are also being welcomed by those who seek to prevent water pollution, hygiene problems, and eliminate rotting trash that produces potent greenhouse gas methane. The projects are being opposed by waste collection workers and local unions who fear changing technology may deprive them of their livelihood and way of life. Along with waste-to-energy projects, some cities and towns such as Pune,

92 Ibid.p.13.
Maharashtra are introducing competition and the privatization of solid waste collection, street cleaning operations and bio-mining to dispose the waste. A scientific study suggests public private partnership is, in Indian context, more useful in solid waste management. The outbreak of the Surat plague, 1994 is the example of this. Chandigarh has done a reasonably well managed MSW disposal programme.93

3.2.7. Problem of Wild Animals Trafficking

Wildlife trade is always a problem because of illegal trafficking of large number of wild animals. Animal trafficking means animal poaching is an activities of hunting, killing or capturing of protected animals illegally to gain profits amounts. The most peculiar and notable one in affecting the biodiversity conservation is the crimes which are committed in the environment and wild life trafficking is the one which is prevailing the most now a days. It is the second illegal trade in the world. This is now a days a very big business in the networking world which may reach up millions of dollars. In this the most preferable wild life trades are poaching of wild elephants for ivory and tigers for skin and bones and materials like fur etc.94 and the most important objective for the capture of animals is for;

- Obtain food
- Domestication (company, food, help at workplace protection, etc.)
- Religion(rituals, offering, divination, superstition)
- Fun(spectacles)
- Social status( symbol, heraldic, luxury )
- Zoo, museums
- Sciences( research, experiment

**Effects of wildlife life trafficking**: Wildlife poaching has negative side-effects that affect local communities, populations in wildlife, and the environment. The animal parts are sold as novelty items and are sold for their “medicinal” uses. US is second to China in its desire for illegal wildlife uses. The extinction of a species can have a negative economic effect on a local community’s tourism industry also. A community that relies

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on its wildlife to attract tourists is at great risk for economic hardship if the prevalence of poaching is increasing in this rate. But also, extinction is the greatest threat to animals which are victims of wildlife poaching. In 2011, the International Union for the Conservation of Nature (IUNC) declared the Western Black Rhinoceros extinct. This subspecies of the critically endangered species Black Rhino was poached because of the belief in the healing proportion of its horns. The Sumatran Tiger is a critically endangered species right now. It is sold for its parts (skin, teeth, claws and bones) which sell for up to $5,000. Poaching is more lucrative than other jobs which are available in the region; a harsh reality faced by many individuals (one green planet). Wildlife trade can also cause indirect harm through introducing invasive species which then compete with native species, invasive species are in threat to balance of nature as the direct overexploitation by humans of particularly some species. Many invasive species have been purposely introduced by wildlife traders; examples include the American Mink, and Red-eared Terrapin. As if the rate goes in this manner the ecosystem will be in the imbalance stage. In order to prevent this exploitation of wild animals and to prevent the hunting and killing of wild animals an act was passed by the Indian government called as Wildlife protection Act, 1972.\textsuperscript{95}

3.2.8. Natural Disasters in India

The many of natural disasters related to the climate of India, cause massive losses of Indian life and property. Droughts, flash floods, cyclones, avalanches, landslides brought on by torrential rains, and snowstorms pose the greatest threats. A natural disaster might be caused by earthquakes, flooding, volcanic eruption, landslides, hurricanes etc. In order to be classified as a disaster it will have profound environmental effect and/or human loss and frequently incurs financial loss.\textsuperscript{96} Other dangers include frequent summer dust storms, which usually track from north to south; they cause extensive property damage in North India and deposit large amounts of dust from arid regions. Hail is also common in parts of India, causing severe damage to standing crops such as rice and wheat.

\textsuperscript{95} Ibid.

(a) Landslides are very common indeed in the Lower Himalayas. The young age of the region's hills result in labile rock formations, which are susceptible to slippages. Rising population and development pressures, particularly from logging and tourism, cause deforestation. The result is denuded hillsides which exacerbate the severity of landslides; since tree cover impedes the downhill flow of water. Parts of the Western Ghats also suffer from low-intensity landslides. Avalanches occurrences are common in Kashmir, Himachal Pradesh, and Sikkim.97

For example, Himachal Pradesh’s Mandi district witnessed one of the worst landslides in August 2017. The mangled remains of the bus and car buried under the debris after major landslide at Kotrupi near Joginder Nagar on Mandi-Pathankot national highway on Sunday morning (13th August 2017). More than 150 meters of the road caved in. Several houses, two buses, and other cars were buried in the debris. A total of 46 people were reportedly killed in this massive landslide.98

(b) Floods are the most common natural disaster in India. The heavy southwest monsoon rains cause the Brahmaputra and other rivers to distend their banks, often flooding surrounding areas. Though they provide rice paddy farmers with a largely dependable source of natural irrigation and fertilisation, the floods can kill thousands and displace millions. Excess, erratic, or untimely monsoon rainfall may also wash away or otherwise ruin crops. Almost all of India is flood-prone, and extreme precipitation events, such as flash floods and torrential rains, have become increasingly common in central India over the past several decades, coinciding with rising temperatures. Human activities have been the main causes for increasing the severity and frequency of floods. Construction of roads, parking space and buildings that over the earth’s surface hardly allows infiltration of water into the soil and speed up the runoff. Clearing of forests for agriculture has also increased the severity of floods.99 For example, Floods in Bihar, UP, West Bengal, Assam. Here are the numbers from the flood damage this year:

- 1.5 crore people have been affected in 19 districts of Bihar.

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98 Massive landslide in Mandi kills 46, rescue operation on; Himachal CM announces Rs 5 lakh relief, The Indian Express, 14th August 2017.
99 Ibid. at p.156.
- 27 lakh people affected in eastern Uttar Pradesh, 103 lives lost so far.
- 152 people die in 11 districts in West Bengal.

The unprecedented rainfall on 29 August put life in the maximum city in disarray. At least 10 people died in Mumbai and the neighboring districts of Thane and Palghar, as the city flooded and people found themselves stranded for hours. A few fell into open manholes, one man died when a wall caved in.100

(c) Earthquakes: An earthquake is caused by the movement of rocks called ‘tectonic plates’ under the Earth’s surface. The ‘fault line’ which marks the gap between each plate is affected by the movement causing pressure to build and a ‘shock wave’ to be sent out. Earthquakes are measured on a ‘Richter scale’ with zero being a minor tremor (shake) and nine being a large vibration. On the 11th March 2011, an earthquake measuring nine on the Richter scale occurred off the coast of Japan. The devasting earthquake which hit the Bhuj town in Gujarat had caused massive damage, killing 20,000- 30,000 people and leaving many injured . It had an energy equivalent to a 5.3megaton hydrogen bomb.101

(d) Tsunami (Tidal Wave): A tsunami (from the Japanese word meaning ‘harbour-wave’) is caused by underwater movements such as earthquakes, landslides and submarine (underwater) volcanoes. These cause large waves of water to form on the surface travelling vast distances across the ocean before eventually dissipating (losing momentum and coming to an end). The waves slow down once they hit land but the wave height increases which causes more destruction, whereas in deep water the waves are very small. Japan has a number of tsunami prevention measures such as large walls surrounding coastal towns; however there is evidence suggesting trees form a much better, natural barrier to tsunamis. Asian tsunami (2004) on the 26th December 2004, an earthquake measuring nine on the Richter scale (and triggering quakes across the world) occurred underwater in the Indian Ocean causing a tsunami in Asia. The wave that hit the Indian Ocean coast was over 30 foot high devastating coastal areas of Indonesia, Sri-
Lanka, India and Thailand. It is the deadliest tsunami ever known with over 300,000 killed and the effects felt as far away as Somalia in Africa.

(e) Cyclones in India Intertropical Convergence Zone, may affect thousands of Indians living in the coastal regions. Tropical cyclogenesis is particularly common in the northern reaches of the Indian Ocean in and around the Bay of Bengal. Cyclones bring with them heavy rains, storm surges, and winds that often cut affected areas off from relief and supplies. In the North Indian Ocean Basin, the cyclone season runs from April to December, with peak activity between May and November. Each year, an average of eight storms with sustained wind speeds greater than 63 kilometers per hour (39 mph) form; of these, two strengthen into true tropical cyclones, which have sustained gusts greater than 117 kilometers per hour (73 mph). On average, a major (Category 3 or higher) cyclone develops every other year.102

During summer, the Bay of Bengal is subject to intense heating, giving rise to humid and unstable air masses that produce cyclones. Many powerful cyclones, including the 1737 Calcutta cyclone, the 1970 Bhola cyclone, the 1991 Bangladesh cyclone and the 1999 Odisha cyclone have led to widespread devastation along parts of the eastern coast of India and neighboring Bangladesh. Widespread death and property destruction are reported every year in exposed coastal states such as Andhra Pradesh, Orissa, Tamil Nadu, and West Bengal. India's western coast, bordering the more placid Arabian Sea, experiences cyclones only rarely; these mainly strike Gujarat and, less frequently, Kerala.103 For example, on December 12, 2016 a “very severe” cyclonic storm hit Tamil Nadu shores, causing death and destruction in its capital city, Chennai, besides other areas. The cyclone named Vardah made landfall north of Chennai at around 3pm. The weather department had initially forecast that the cyclone would weaken before making landfall but that did not happen and the city was lashed by winds blowing at up to 140 kmph. Nearly 20,000 evacuated.104

103 Ibid.
104 Cyclone Vardah brings Chennai to a standstill, The Hindu, 14th December, 2016.
(f) **Hurricane** - A hurricane is a severe tropical thunderstorm with strong winds reaching 74 mph or more. They form when a storm travels over warm water (80°F/26.6°C or more) causing the surface temperature of the ocean to begin to rise creating what is called ‘low pressure’ on the surface of the water. The winds blowing in different directions cause the storm to start spinning. *Hurricane Katrina was one of the worst natural disasters to hit the United States of America.* It struck New Orleans in the summer of 2005, killing more than 1,800 people.  

(g) **Volcanic Eruption** - During volcanism, materials from the earth’s core and mantle are brought to the surface as a result of the heat and pressure generated within. Volcanic eruptions and geysers release particles into the earth’s atmosphere which affect the climate. The most dangerous of these gases is the carbon dioxide gas which reacts with water vapour commonly found in the stratosphere to form a dense optically bright haze layer that reduces the atmosphere transmission of some of the sun’s incoming reception. Climatologists for a long time have noticed that there is a link between very explosive volcanic eruptions and short term climate change. For instance, a year after the Tambora volcanic eruption in 1815, there came very cold years. As such there has been very cold weather in regions across the planet.

### 3.2.9. Loss of Biodiversity

Human activity is leading to the extinction of species and habitats and loss of biodiversity. Eco systems, which took millions of years to perfect, are in danger when any species population is decimating. Balance of natural processes like pollination is crucial to the survival of the eco-system and human activity threatens the same. Another example is the destruction of coral reefs in the various oceans, which support the rich marine life.

### 3.2.10. Deforestation

Our forests are natural sinks of carbon dioxide and produce fresh oxygen as well as helps in regulating temperature and rainfall. At present forests cover 30% of the land but every

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year tree cover is lost amounting to the country of Panama due to growing population demand for more food, shelter and cloth. Deforestation simply means clearing of green cover and makes that land available for residential, industrial or commercial purpose. During the last four decades of freedom, the greatest denudation of forests has been experienced. As the human and cattle population grew, forest areas have been cleared for agricultural and other household purposes. Again, railways, roadways etc., have expanded their network. Dams, projects, bridges and several other institutions have been constructed thereby decreasing the forest areas. At the rate of deforestation of 2.5 hectare of forest per minute, India will become a Sahara desert within 50-100 years.\textsuperscript{107}

\textbf{Effects of deforestation}

The Andaman and Nicobar Islands have seen widespread deforestation in the years since independence, endangering the habitat, the inhabitants and the wildlife. Only a concerted effort by the government and its agencies, the mill owners, the labour in timber felling and the NGOs can preserve the pristine biodiversity of these islands and protect the rights of the inhabitants.\textsuperscript{108}

\textbf{3.2.11. Ocean Acidification}

It is a direct impact of excessive production of CO2. 25% of CO2 produced by humans. The ocean acidity has increased by the last 250 years but by 2100, it may shoot up by 150%. The main impact is on shellfish and plankton in the same way as human osteoporosis.

\textbf{3.2.12. Ozone Layer Depletion}

The ozone layer is an invisible layer of protection around the planet that protects us from the sun’s harmful rays. Depletion of the crucial Ozone layer of the atmosphere is attributed to pollution caused by Chlorine and Bromide found in Chloro-floro carbons (CFC’s). Once these toxic gases reach the upper atmosphere, they cause a hole in the ozone layer, the biggest of which is above the Antarctic. The CFC’s are banned in many


industries and consumer products.\textsuperscript{109} The presence of ozone layer in the stratosphere forms a protective umbrella around the earth. Ozone layer is valuable because it prevents harmful UV radiation from reaching the earth. \textsuperscript{110} This is one of the most important current environmental problems.

3.2.13. Acid Rain

Acid rain occurs due to the presence of certain pollutants in the atmosphere. Acid rain can be caused due to combustion of fossil fuels or erupting volcanoes or rotting vegetation which release sulfur dioxide and nitrogen oxides into the atmosphere. Acid rain is a known environmental problem that can have serious effect on human health, wildlife and aquatic species. Acid rain was always a serious problem. It causes lots of damage every time. It has become a serious topic around the globe in the 21st century. \textsuperscript{111}

Effects of Acid Rain

- Taj Mahal is situated in Agra. The air in this place contains serious levels of sulphur and nitrogen oxides. This is due to the large number of power plants and industries set up around this area. All these led to acid rain. Acid rain reacted with the marble (calcium carbonate) of Taj Mahal. This caused damage to this wonderful structure, which had attracted many people from different parts of the world. Acid rain is a serious threat to the environment. To protect Taj Mahal, the Government of India announced an action plan in 1995. The plan aims at clearing the air in 'Taj Trapezium'. Taj Trapezium refers to an area that includes towns of Agra, Mathura, Bharatpur and Firozabad. As a result of this plan, over 2000 industries situated inside the trapezium had switched over to the use of liquefied petroleum gas or natural gas in the place of coal or oil. It is the duty of each and every citizen of India to protect the historic monument, the Taj Mahal, India's pride.\textsuperscript{112}

\textsuperscript{109} SC Tripathi, ENVIRONMENTAL LAWS, 6\textsuperscript{th} edn., Central Law Publication Allahabad, (2017)p.591.  
\textsuperscript{110} PS Jaswal and Nishtha Jaswal, ENVIRONMENTAL LAW, 3\textsuperscript{rd} edn. ALLAHABAD LAW AGENCY, Reprint, (2011)p.9.  
\textsuperscript{111} SC Tripathi, ENVIRONMENTAL LAWS, 6\textsuperscript{th} edn. Central Law Publication Allahabad (2017) p.590.  
\textsuperscript{112} Anubha Kaushik and CP Kaushik, PERSPECTIVE IN ENVIRONMENTAL STUDIES, 2\textsuperscript{nd} edn. New Age International Publishers Bangalore, p.183.  

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• Aquatic species are damaged by the acid rain. Certain metal and their salts become soluble in ponds, lakes since it has toxic effect on aquatic life.

• It has adverse effect on plants by causing damage to plant membrane, chlorophyll. 113

• It affects human health since heavy metals are released by acid rain. 114

• The Gulf of Mannar Biosphere Reserve, the biologically richest coastal region in India, is under tremendous pressure, and the legal measures that are in place to protect it have not been quite effective. 115

3.2.14. Urban Sprawl

Urban sprawl refers to migration of population from high density urban areas to low density rural areas which results in spreading of city over more and more rural land. Urban sprawl results in land degradation, increased traffic, environmental issues and health issues. The ever growing demand of land displaces natural environment consisting of flora and fauna instead of being replaced. The first large flow of migration from rural to urban areas was during the “depression” of late 1930s when people migrated in search of jobs. Later, during the decade 1941-51, another a million persons moved to urban places in response to wartime industrialization and partition of the country in 1947. During 1991-2001, well over 20 million people migrated to cities. The greatest pressure of the immigrating population has been felt in the central districts of the city (the old city) where the immigrants flock to their relatives and friends before they search for housing. Population densities beyond the “old city” decline sharply. The projections made in the UN's recent publication, State of The World's Cities 2012-13, suggests that the Delhi urban agglomeration will have a population of 28.6 million by 2025, still well behind Tokyo's 37.1 million. Mumbai will, in the meantime, have reached a population of 25.8 million. While the report does not indicate exactly which areas are included in these urban agglomerations, comparison of the numbers given for 2010 with 2011 census

114 Ibid.
figures indicates that the relevant area is Greater Mumbai and Delhi plus Gurgaon, Ghaziabad, Noida and Faridabad. Delhi and Mumbai are both projected to see populations increasing by 29% over the same period, but even this is a significant drop from the rates at which they have grown since 1990. Dhaka, however, is likely to see its population grow by 43% over the 15-year period, a rate that will be matched by Karachi while Lagos in Nigeria will see a 49% jump in population by 2025, if the projections come true. "There is a need to address the ribbon development happening around big cities in developing countries, particularly in India. A city or urban area has to have adequate infrastructure to make them cities of prosperity," said Eduardo Lopez Moreno, head of City Monitoring Branch of UN Human Settlements Programme.  

3.2.15. Environment and Health Issues

The environmental pollution causes lot of health problems. They include communicable disease problems, nutritional problems, environmental sanitation problems, medical care problems and miscellaneous problems. Communicable Disease continues to be a major problem in India. The important communicable disease problems are smallpox, malaria, cholera, plague, tuberculosis, leprosy, filarial, venereal disease, trachoma, diarrhoea and dysentery, helminthes infestations, skin diseases, enteric fever and viral hepatitis. The tragedy is that most of the diseases can be either easily prevented or treated with minimum input of resources. In fact, most of the developed countries of the world have overcome many of these problems by such measures as manipulation of environment, practice of preventive medicine and improvement of standards of living. Surveys indicate that the major bottleneck in Indian diets is shortage of calories, not proteins. Against a recommended allowance of 2, 400 calories for an average male adult engaged in sedentary occupation, the typical Indian diet hardly supplies 2,000 calories. The specific nutritional problems in the country are Protein-Calorie Malnutrition, Anemia, Vitamin Deficiencies and Goiter. The twin problems of environmental sanitation are: lack of safe drinking water in many areas of the country, and Primitive methods of excreta disposal, especially in the rural areas where 80 per cent of population lives. The opinion is held that 80 per cent of India’s health problems are associated with lack of protected water

supply, and hygienic means of excreta disposal. Medical care in India is mostly based on Western medicine.¹¹⁷

- Pollutants cause respiratory disease like Asthma and cardiac-vascular problems. High temperatures encourage the spread of infectious diseases like Dengue.

- Thirty years ago, on the night of December 2, 1984, an accident at the Union Carbide pesticide plant in Bhopal, India, released at least 30 tons of a highly toxic gas called methyl isocyanate, as well as a number of other poisonous gases. The pesticide plant was surrounded by shanty towns, leading to more than 600,000 people being exposed to the deadly gas cloud that night. The gases stayed low to the ground, causing victims throats and eyes to burn, inducing nausea, and many deaths. Estimates of the death toll vary from as few as 3,800 to as many as 16,000, but government figures now refer to an estimate of 15,000 killed over the years. Toxic material remains, and 30 years later, many of those who were exposed to the gas have given birth to physically and mentally disabled children. For decades, survivors have been fighting to have the site cleaned up, but they say the efforts were slowed when Michigan-based Dow Chemical took over Union Carbide in 2001. Human rights groups say that thousands of tons of hazardous waste remain buried underground, and the government has conceded the area is contaminated. There has, however, been no long-term epidemiological research which conclusively proves that birth defects are directly related to the drinking of the contaminated water.

- Many parts of the world have fallen prey to this pesticide, that has affected a lot of humans, animals and the environment. The Supreme Court of India had passed an interim order on May 13, 2011, as a major number of victims were reported to be affected in Kasargode (Kerala), and banned the production, distribution and use of endosulfan.¹¹⁸

- For years, residents of Minamata, a town located on Kyushu (Japan's most southwesterly island), had observed odd behavior among animals, particularly

household cats. The felines would suddenly convulse and sometimes leap into the sea to their deaths — townspeople referred to the behavior as "cat dancing disease". In 1956, the first human patient of what soon became known as Minamata disease was identified.\(^{119}\) Symptoms included convulsions, slurred speech, loss of motor functions and uncontrollable limb movements. Three years later, an investigation concluded that the affliction was a result of industrial poisoning of Minamata Bay by the Chisso Corp., which had long been one of the port town's biggest employers. As a result of wastewater pollution by the plastic manufacturer, large amounts of mercury and other heavy metals found their way into the fish and shellfish that comprised a large part of the local diet. Thousands of residents have slowly suffered over the decades and died from the disease. It has taken as long for some to receive their due compensation from the corporation.\(^{120}\)

### 3.2.16. Genetic Engineering

Genetic modification of food using biotechnology is called genetic engineering. Genetic modification of food results in increased toxins and diseases as genes from an allergic plant can transfer to target plant.\(^{121}\) Genetically modified crops can cause serious environmental problems as an engineered gene may prove toxic to wildlife. Another drawback is that increased use of toxins to make insect resistant plant can cause resultant organisms to become resistant to antibiotics.

Environmental risks perceived from large-scale cultivation of GE crops are:

- Increased invasiveness.
- Development of new, more virulent strains of viruses on transgenic virus resistant plants.
- Effect of toxic, transgenic products from insect and pathogen resistant plants on non-target organisms.

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\(^{120}\) Gilbert Cruz, Minamata Disease available on http://content.time.com/time/specials/packages/article/0,28804,1986457_1986501_1986450,00.htm (accessed on 2\(^{nd}\) January 2016).

- Overcoming the resistance mechanism of the transgenes by insect pests leading to more virulent insect biotypes.
- Transfer of antibiotic resistance genes, used as selectable markers in the process of developing transgenic, to other organisms.
- Safety of food items obtained from transgenic crops – allergic reactions.
- Gene flow to other crop cultivars, traditional varieties, land races, wild, weedy related species leading to the loss of biodiversity.
- Long term effects.
- Non-foreseeable effects on ecosystems.

GE crops though grown in 18 countries over an area of 67.7 million hectare in 2003 is one of the most controversial and hotly debated issues. People opposing globalization, privatization, multinational companies and new technologies view GE crops as a symbol of all the above, and a means of exploiting the farmers in poor countries.122

3.2.17. Crop Burning

Crop burning is the one of the major problem of air pollution in northern states of India in the month of October November. Each year, crop burning in the region is the start of the annual escalation of pollutant concentrations in the air, leading to massive winter pollution in the region. The states of India with the largest areas under rice-wheat cropping systems are Uttar Pradesh, Punjab, Haryana, Bihar, Madhya Pradesh, and Himachal Pradesh.123 Every year around this time, farmers in Haryana and Punjab set paddy stubble ablaze to prepare ground for the next crop. In the process, they damage soil quality and cause heavy pollution but they say they have no alternative. Plumes of smoke are rising from the fields on National Highway 1. By the end of October or sooner, the smoke will be a thick blanket in the air over Haryana, extending all the way to the national capital. It’s the season for paddy stubble burning. In this district of Kurukshetra,

harvested paddy fields are now black with ash. In between the wheat-paddy cycle, some farmers grow potatoes or mustard. The sowing of these crops has already started at some places.124 "Hazy weather was witnessed recently which could have been due to the pollution levels caused post-Diwali and smoke generated from burning of stubble," stubble burning not only affects the soil fertility resulting from loss of essential nutrients but also causes serious threat to human health including breathing problems, allergies and asthma attacks.125 In a December 2015 order, the National Green Tribunal had called for a curb on straw burning, and had recommended that satellite-based monitoring mechanisms be adopted and local government officers engaged to take action against stubble burning.126

3.2.17.1. Meaning of Crop Burning- “A crop residue is the practice of using fire to reduce or dispose of vegetative debris from an agricultural activity. Some common practices include field burning, large areas of crop residues after harvest to reduce excess plant material, to control crop diseases, weeds or pests, or to maintain crop yields; disposing of piles of agricultural debris, such as orchard trees, limbs, or hay stacks; and clearing vegetation out of irrigation ditches and canals”.127 The burning of stubble, contrasted with alternatives such as ploughing the stubble back into the ground has a number of consequences and effects on the environment 128.Stubble burning is the deliberate setting fire of the straw stubble that remains after wheat and other grains have been harvested.

3.2.17.2. Causes of Crop Residue Burning- The main causes of crop residue burning are two-fold. Firstly, there is a very short window of time between harvesting of paddy and cultivation of wheat, at the end of the Kharif season. Paddy, or rice, is a water-intensive crop. The high usage of water in its cultivation has resulted in the central and various

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state governments restricting the cultivation of paddy in the summer months. In order to prevent diversion of scarce water resources in the summer, paddy cultivation can legally begin only around mid-June, when the monsoons typically arrive over North India. This further delays the cut short to the root with a knife, the large units of harvesters leave 6-10 cm of paddy stalk on the field. The rise in incomes and the subsequent availability of mechanical implements in Punjab and Haryana lead to increased mechanization of agriculture over the past 10-15 years.

Traditionally, farm labour in these states was in the form of seasonal, migrant workers from the states of Uttar Pradesh and Bihar. Since 2005, the demand for these workers saw a reduction, and accordingly, the availability of assured income from farm labour has declined. The launch of an assured rural income scheme in the form of the NREGA further led to income opportunities in their home states. As a result, agricultural labour has become a scarce commodity in parts of Punjab and Haryana.

The removal of the paddy stalk that remains on the field is a labour-intensive process. With labour being unavailable and the time window for preparing the field for wheat cultivation being limited, the options that the farmer has are either investing in expensive and rarely used agricultural implements, or burning the residue right on the field. Of the two, the latter is both cheaper and requires less effort.129

3.2.17.3. Data Vise Information—During the 2015 harvest, the Haryana State Pollution Control Board did a survey in 10 paddy growing districts in the state with the help of Haryana Space Application Centre (HARSAC), an agency of Department of Science and Technology. The districts surveyed were Ambala, Fatehabad, Jind, Kaithal, Karnal, Kurukshetra, Panipat, Sirsa Sonipat and Yamunanagar.

The survey showed a decline of around 21 per cent in crop burning practice in the past three years. In the year 2015, stubble burning took place in 163 thousand hectares, which was 14.4 per cent of the total rice cropped area. A year earlier, in 2014, stubble burning was witnessed in 168.9 thousand hectares or 15.7 percent of the rice cropped area. The figure was 208.3 thousand hectares or 20.3 per cent of the rice cropped area in 2013.

The survey said the total paddy stubble burning area in the 10 districts had come down by 3.5 percentage points as compared to 2014 and 21.8 percentage points as compared to 2013. In eight districts, there was a marked reduction in stubble burning. In Kurukshetra and Yamunanagar alone, there was an increase. The decline appears to have not made a significant impact on the air quality in those two years. The report also indicated that early rice stubble burning in major area takes place during second to fourth week of October in Karnal, Kaithal, Kurukshetra, Ambala and Panipat. While late burning in major areas takes place during first week to third week of November in rest of the districts.\textsuperscript{130}

\textbf{3.2.17.4. Effects of Crop Burning} - The burning of stubble, contrasted with alternatives such as ploughing the stubble back into the ground has a number of consequences and effects on the environment.

- Quickly clears the field and is cheap.
- Kills weeds, including those resistant to herbicide.
- Kills slugs and other pests.
- Can reduce nitrogen tie-up

\textbf{3.2.17.5. Impact on Environment} - The problem of pollution caused by rice and wheat crop stubble burning has not received much attention by the policymakers and the various pollution authorities till recently. This could be partially due to the fact that the rice burning (the major source agri waste burning pollution) takes place only during selected months of October, November and December. The pollution is restricted only during these months. However even during these months there is considerable loss to human health and environment degradation.\textsuperscript{131} Air pollution contributes to the respiratory diseases like eye irritation, bronchitis, emphysema, asthma etc., which not only increases individuals’ diseases mitigation expense but also affect their productivity at work. Though health consequences from burning of agricultural residues are not fully

\textsuperscript{130} Khushboo Sandhu, Fields on fire: Burning paddy straw, The Indian Express, Kurukshetra, October 10, 2016.

\textsuperscript{131} Parmod Kumar, et.al., SOCIO ECONOMIC AND ENVIRONMENTAL IMPLICATIONS OF AGRICULTURAL RESIDUE BURNING A CASE STUDY OF PUNJAB ,INDIA, Springer open (2015)p.137.
understood, relative short exposure may be more of a nuisance rather than a real health hazard. Many of the components of agricultural smoke cause health problem because of crop residues burning. The crop residues also contain some percentage of organic pesticides and which adversely affect the environment. The environmental impact of pesticides is often greater than what is intended by those who use them. Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their target species, including non target species, air, water, bottom sediments, and food. Though there can be benefits using pesticides, inappropriate use can counterproductively increase pest resistance and kill the natural enemies of pests. Many users are inadequately informed about potential short and long-term risks, and the necessary precautions in the correct application of such toxic chemicals are not always made. Pesticides can contaminate unintended land and water when they are sprayed aerially or allowed to run off fields, or when they escape from production sites and storage tanks or are inappropriately discarded. Pesticides can contribute to air pollution. Pesticide drift occurs when pesticides suspended in the air as particles are carried by wind to other areas, potentially contaminating them. Some farmers prefer the inexpensive approach of setting the stubble ablaze, but repeated burning is not good for the soil, and the resulting smoke is a health hazard. Although many studies have measured the particles released into the air by crop burning, fewer have isolated the effect of the smoke on lung function. New research now shows the smoke produced by crop burning could have a lasting effect on children’s lung function.\textsuperscript{132}

\textbf{3.2.17.6. Role of States for Ban on Crop Residue Burning-} There is no specific law in Punjab to ban straw stubble burning, but every Deputy Commissioner (DC) in Punjab has the power to ban this under section 144 of the CrPC. The practice, however, continues right under their nose. The DC also has the power under 188 of the IPC to punish violators but that rarely happens. Under the law, a violator may be punished for up to six months jail and imposed a fine of Rs 1,000. Like Punjab Preservation of Subsoil Act of 2009, which was enacted to save depleting groundwater and under which no farmer can sow paddy before June 10 or June 15, a similar law is needed to ban paddy straw burning.

\textsuperscript{132} Tina Adler, Respiratory Health: Measuring the Health Effects of Crop Burning available on https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2974718/ (accessed on 22\textsuperscript{nd} June 2017).
Meanwhile in Haryana, the environment department had banned the burning of agriculture waste in the open fields under the Air (Prevention and Control of Pollution) Act 1981. Till date, prosecution action has been filed against 32 farmers in the special environment courts in Kurukshetra and Faridabad by the Haryana Pollution Control Board for burning paddy in the open fields. In terms of efforts being made to reduce crop residue burning, the following approaches have been used by various state and central administrations and regulatory bodies so far: The Haryana State Pollution Control Board has prepared a strategy to tackle the problem. All Deputy Commissioners have been advised to issue necessary directions to all the revenue field officials like BDPOs, tehsildars and patwaris to instruct the sarpanchs and panchs in the villages for persuading and educating the farmers on the ban and on the harmful effects of such acts.

All DCs have also been advised to direct the gram sachivs and patwaris to bring all the incidents of burning of wheat stubble or paddy straw and other agricultural waste in the open fields to his notice within 30 minutes of the occurrence of such incidents. In case they fail to do so, it shall be treated as dereliction of duty and disciplinary action would be initiated against them.

Apart from HARSAC being asked to monitor stubble burning in the 10 districts, Central Pollution Control Board has also been requested to share the satellite imagery reports / data obtained from ISRO on a daily basis. The government has decided to launch a pilot project for paddy straw based biomass power project. An official said government or Panchyat land would be explored for setting up of the project and storage of biomass. Further, power utilities will buy power from the biomass power projects on the HERC tariff or better tariff. The agriculture department will support the setting up of bio-fertilizer plants using biomass and would devise a scheme to provide subsidy and to buy the fertilizer from such plants.

133 Plash Mittal, Stubble Burning-A threat to the environment? available on https://thelawblog.in/2016/10/31/stubble-burning-a-threat-to-the-environment/(accessed on 22nd June 2017).
Haryana Agriculture Minister OP Dhankar said awareness is being created among the farmers. He added once a biomass power project is set up, the farmers will have an incentive not to burn the stubble.\textsuperscript{135}

The High Court of Punjab and Haryana in a civil writ petition \textit{Captain Sarbjeet Singh v. State of Punjab and others} directed the State Government to take immediate remedial measures to stop burning of wheat/paddy stubble in the field.\textsuperscript{136}

\textit{Punjab Government, its various Departments and other institutions like Punjab Agricultural University}, \textit{Punjab Farmers Commission} are all making efforts to devise some alternate economic uses of rice stubble. These include the stubble treated with urea as a fodder for animals, its use in bio-thermal energy production, paper manufacturing, mushroom cultivation, bedding for animals, etc. \textit{Punjab government} is also providing subsidy to the farmers to promote the use of equipments which help in checking the burning of crop residues, like rotavators, happy seeders, zero–till-drills and straw reapers. While on the one hand, there is an urgent need to revitalize the research in agriculture and related activities, on the other hand, to tackle the problem of soil degradation and water depletion, a dedicated programme for promoting resource conservation technologies, such as zero tillage, deep ploughing, raised bed planting, laser land leveling etc., should be promoted. An eco friendly technology will be beneficial to the farmer community and the state by providing them a tool for improving soil health and environment for sustainable agriculture.\textsuperscript{137} An example, the District Magistrate Amritsar banned the burning of crop stubble (the Tribune dated 19th May 2009). However the practice still continues in the rural belt of Amritsar district, including Attari, Ajnala and Majitha. Thus the problem of agri waste burning still remains unresolved. While on the one hand, there is an urgent need to revitalize the research in agriculture and related activities, on the other hand, to tackle the problem of soil degradation and water depletion, a dedicated programme for promoting resource conservation technologies, such as zero tillage, deep ploughing, raised bed planting, laser land leveling etc., should

\textsuperscript{135} \textit{Ibid}.
\textsuperscript{137} Parmod Kumar and Laxmi Joshi , \textit{Pollution Caused by Agricultural Waste Burning and Possible Alternate Uses of Crop Stubble: A Case Study of Punjab}, available on https://link.springer.com/chapter/10.1007%2F978-3-642-36143-2_22 (accessed on 22\textsuperscript{nd} June 2017).
be undertaken. Heavy investments are required to be made for rejuvenation of these resources.\textsuperscript{138}

The Rashtriya Krishi Vikas Yojana (RKVY) is a welcome initiative in that direction. There is a requirement for an eco-friendly technology that will be beneficial to the farmer community and the State by providing them a tool for improving soil health and environment for sustainable agriculture.\textsuperscript{139}

3.2.18. Environmental Governance

This is the major drawback of our legal system that there is lack of environmental governance. We can say that the Environmental laws are easier to draft but difficult to implement due to conflicts between genuine need and unwanted greed.\textsuperscript{140} India still follows inadequate and outdated environmental laws. Further, various factors that contribute towards poor implementation of environmental laws in India, are:

- Lack of appropriate skills amongst the law enforcement agencies.
- Inadequate infrastructural facilities.
- Lack of proper understanding of environmental laws.
- Lack of coordination among the law enforcement authorities and officers.
- Jurisdictional Conflicts-No initiatives are being taken to recruit law officers who possess knowledge, skills and understanding of environmental issues and laws.\textsuperscript{141}

3.3. Conclusion

From the above discussion researcher come to this conclusion that there is a dire need of protection of ecology, otherwise coming generation will going suffer a lot. India is the second most populated country in the world. So protection of environment should be given significance in our country. If the nature is healthy then it will give rise to healthy

\textsuperscript{139} Ibid.
\textsuperscript{140} PD Sharma, ECOLOGY AND ENVIRONMENT, 13\textsuperscript{th} edn., Rastogi publication, Meerut (2017)p.10.
generation. Because a healthy Environment helps in giving birth to a healthy baby, if environment pollution is caused it will lead to cause miscarriage or abortion and even in causing disabilities to the born infant. Many studies have revealed that there is a strong relationship between the women’s exposure to radioactivity, abortions, birth of a child, and other environment pollutions. Every human being has to safeguard the environment and help the procreation of the child in a healthy manner, which will in turn help to save the future generation. Most serious type of pollution in India is water pollution. The waste disposal and Sewage from these Industries are the main cause of water pollution. These wastes are drained into the water resources. All the rivers in India became nasty including Ganga and Yamuna. People who are in connection of these rivers are suffering from contagious diseases. Air pollution is another biggest problem in India. Air quality of Delhi, the capital of India is the worst of any major city in the world. India has the world's highest death rate from chronic respiratory diseases and asthma, according to the WHO. In Delhi, poor quality air damages irreversibly the lungs of 2.2 million or 50 percent of all children. Climate change is yet another environmental problem that has surfaced in last couple of decades. Climate change has various harmful effects but not limited to melting of polar ice, change in seasons, occurrence of new diseases, frequent occurrence of floods and change in overall weather scenario. So, there are numerous methods to reduce the pollution or tackle with this problem of environment pollution, but in reality most of them are not practical.