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## Industrial Development and Climate Change: A Case Study of Bangladesh

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### ABSTRACT

This study attempts to examine the climate change in Bangladesh as a cause of industrialization. Over the last few decades, pollution of the environment has become a significant concern in the case of Bangladesh. Both qualitative and quantitative data were utilized to write this article. Primary and secondary data on the environment, national policy, and technology have been gathered. Research results show that rapid and unplanned industrialization has turned into the main cause of the endangered environment. The toxic waste materials of industries are dumped into water and ground, causing air pollution, water pollution, and soil pollution. As a result, the people of the riverbank are suffering a lot. Though industrial development is very much required for a country's development, it is also undermining the environment which will destroy the natural balance and impose a long-term effect on climate in near future. In Bangladesh, industries are developed in an unplanned and centralized way without following any particular guidelines. The poor waste management system of industries are polluting rivers and toxic emission is polluting the air as well. Natural resources are used by the industries, causing an imbalance in nature. Forests are cut down massively, which increases the chance of various natural disasters. Industrialization has a long-term effect on climate change which also increases the average temperature of the earth known as global warming. Climate change also increases the chance of various natural disasters, unemployment, food scarcity, diseases, and extinction of wildlife.

### INTRODUCTION

Industrialization is considered a very momentous policy of economic development in a country. In developing as well as in developed countries, industrialization is the primary sector for their development. The process of industrialization has started in the 18th century through the European Industrial revolution. The industrialization process has brought major development in the world. The Least Developing Countries (LDC) are developing at a faster pace in this industrialization era. But like everything also, industrialization has both positive and negative impacts on the world. And like other developing countries, Bangladesh is also facing severe environmental pollution. The slow depletion of natural resources such as soil, air, and water is referred to as environmental degradation. In another way, environmental degradation causes climate

change. It degrades biological variety and the overall health of the ecosystem, whether as a result of natural causes or as a result of human activity. It is one of the major threats that the world is facing since human civilization.

Before the independence of Bangladesh, the jute industry was at the forefront of its development. After independence, the pace of development was stagnant. At that time, the ready-made garment sector has started developing gradually. Today it has been considered as one of the most successful industries in Bangladesh. During the 1980s many other industries got importance in the economy of Bangladesh, such as the leather industry, tea manufacturing factories, and food processing factories. In the period of 1990s, sectors like shipwrecking, steel, and cement factories have developed. At the beginning of the

21st century, different industries like ceramics, glass, plastic, aluminum, and electronics have developed. All these industries play a significant role in Bangladesh's economy. Bangladesh is gradually shifting its sole dependence from agriculture to industrialization. According to Bangladesh Economy Profile 2018, the contribution of agriculture and industry to the economy is 14.2% and 29.2% respectively. The industrial growth rate in 2018 is 8.2% than the previous year.

Bangladesh is a populous country. Though it is developing through industrialization but in an unplanned way. Bangladesh's economy is mostly dependent on industrial development rather than agriculture. And this continuity of unplanned industrialization is causing climate change. Various types of pollution including soil pollution, air pollution, sound pollution, water pollution, etc. are causing disaster in the daily human life of Bangladeshi people. These industries are mostly undermining the environment as well as exploiting the natural resources of Bangladesh. Besides, industrialization is a hindrance to sustainable development.

Industrialization is the process of developing the world. At the same time, the environment is also our concern to live in a better world. But industrialization process is hampering the natural balance of the environment. The environment is degrading continuously by the process of industrialization and thus causing climate change. This drawback of industrialization is deteriorating the quality and life expectancy of human beings as well as various animals. The unplanned rise of various factories in urban areas is not concerned about the environment. Climate change increases the chances of various natural disasters, global warming, climate change, ecological imbalance, etc. The chances will be getting higher if we undermine this problem.

Many works have been done previously on climate change for various causes. But industrialization as a cause is far from being exhausted as a research area. New studies in this area can bring sustainable development and growth of the environment along with industrial development in the world. This study aims to project how the industrialization process is hampering the environment. And how to protect the environment during this industrial development

process, as in the perspective of Bangladesh. This study also recommends the possibilities that how Bangladesh can protect its environment and prevent climate change during industrial development. The fact is that as a result of industrial development, we have seen the development, but it also pollutes the environment. The people are not concerned about that. So we worked on this topic to increase the awareness of the people about industrial development and its impacts.

The objectives of the paper are to see the connectivity between climate change and industrial development; to find out the negative impacts of industrialization on climate; to find the broader dimensions of environmental pollution in Bangladesh; to raise social awareness regarding the importance of the environment on human life, and to develop possible guidelines and suggestions for the government as well as industries to apply.

## **METHODS**

Both qualitative and quantitative data were utilized to write this article. Primary and secondary data on the environment, national policy, and technology have been gathered. So, to get primary information, it needs interaction with local people and working people who are directly involved with the industries as well as environmental pollution. It has taken several interviews of local people of Shadarghat as well as Savar Upazila who are victimized by climate change as a result of industrialization. It has tried to emphasize the causal effect of climate change, the environment, and industrialization. It has followed step-by-step policy, were discussed the causes and consequences of climate change. It has also gone through different online documentaries, journal articles, newspapers, TV reports, etc. All the things have been done for sake of getting information on the environment, national policy support, management of industries, environmental degradation as well as climate change as a result of industrialization, and so on.

Purposive sampling was done for the study. This sampling method was used to make sure the representation of a different category of people lived in the study area. Study areas were also purposively selected. The study is focused on the Shadarghat area and Savar Upazila. A sample refers to a subset of a population selected to participate in the research.

## **RESULTS AND DISCUSSION**

Industrialization is the key pillar of the economic development of a country. But industrialization is so much connected with our environment that at first, it does not come to our realization until it is polluted. As getting efficiency through industrialization, we are also losing many things. Industrialization including vehicle exhaust causing massive air pollution in the world, which is causing global warming (Magsi, 2014).

Habibullah Magsi has brought examples of Pakistan to prove the relation between industrial expansion and environmental hazard. He has also connected the weak governance system to this. This industrial pollution is also against human health, causing early death and less life expectancy. He has also brought some daylight on this issue specifically in the Asian region that it is capable of producing 90% of industrial power using green power projects. But this region is also in grave danger if not taken necessary measures to protect the environment. The government of the country has to play a prominent role to protect Mother Nature. Awareness Campaigns can bring change to our environment. The author also said that all the economic units of the country should unite together for solving environmental issues (Magsi, 2014; Rozalinna & Azmi, 2020).

Industrialization always brings opportunities in society as well as challenges. Industrialization not only brings betterment in human life but also affects our environment, ultimately causing climate change. Extreme weather and high temperatures challenge human living standards. Industrialization has shifted human civilization from rural to industrial in both social and economic terms. The technological development and manufacturing process requires the usage of natural resources and energy, which causes environmental pollution on a big scale, gradually turning into global warming and climate change. Author Chigbo A. Mgbemene's paper looked at the linkages between industrialization and climate change and tried to answer some concerns about how climate change is causing devastating human lives (Mgbbemene, 2011).

Several works of literature have emerged on the theory of the geographical clustering of industries and their assessment of economic contribution as well as negative impact on society.

Author Adejomo in his article has shown how the clustering of industries in regions is causing climate change. Climate change has become one of the important issues for the world, often called global warming. Regional agglomeration of similar types of industries in proximity implies enhanced productivity and reduced cost. Despite various advantages, it also causes overcrowding, various types of pollution, traffic congestion, and a high cost of land. Air pollution is the most important contribution to climate change among all the effects of the industrial complex. The author has also shown that this continuation of conglomerating industries on a regional basis can ultimately affect the climate, which will increase the earth's average temperature. And the consequences of global warming could lead to large-scale food and water shortages, having catastrophic effects on human life (A. Fagbohunka).

### **Climate Change**

The environment is consists of various compounds like air, water, soil, forest, atmosphere, etc. The slow depletion of natural resources such as soil, air, and water is referred to as environmental degradation. In another way, environmental degradation is the leads to climate change. It diminishes biological variety and environmental health, either naturally or as a result of human actions. Various types of environmental pollution that cause climate change are:

#### **1. Industrial Development and Air Pollution**

Air pollution in Bangladesh became a prime concern nowadays. Dhaka, the capital city, now has the worst level of air pollution of any city on the planet. According to the Department of Environment (DoE), the density of Airborne particulate Patter (PM) in the city reaches 463 micrograms per cubic meter throughout December and March, which is the highest level in the world. At the same time, Mumbai and Mexico have 383 and 360 micrograms per cubic meter (Rahman, 2016). So it is easily understood how dangerous air is polluted here in Bangladesh. Air pollution is a big environmental threat for the upcoming generation, which is mainly done by industries. Industries are gradually developed in urban areas without taking into consideration the environment and human safety. Poor air pollution is blamed for 15000 premature deaths, as well as millions of pulmonary, respiratory, and neurological issues, as per the Air

Quality Management Project (AQMP), particularly in Dhaka.

Excessive pollution might cause the premature death of a newborn if it is encountered by pregnant mothers. According to the National Institute of Diseases of the Chest and Hospital (NIDCH), almost 7 million individuals in Bangladesh suffer from asthma, with children accounting for roughly half of the cases. According to WHO air quality recommendations 2005, a maximum allowable PM level of 20 micrograms per cubic meter is acceptable, whereas cities with more than 70mc/m are deemed severely polluted. Bangladesh has already exceeded the standard and has reached high levels of air pollution. Air pollution causes neurological and renal illness that is irreversible. Bangladesh's industrialization is still in its early stages. However, this does not imply that air pollution is lower here. Currently, the country has 30000 industrial units, which may be classified into two groups depending on renewable and non-renewable local resources. Renewable local resources are used in the production of jute, paper, tobacco, leather, salt, and other agro-based products. Natural gas-based businesses, ceramic industries, brickfields, and other sectors rely on non-renewable local resources (Rahman, 2016).

Many businesses in Bangladesh are located in unsuitable areas. Many dangerous and polluting sites are in proximity to residential areas. Toxic gases and dust emitted by manufacturers damage the air near them. All the industries emitted a huge amount of toxic gas, for which the workers of the industries suffered from the different respiratory problems due to long hours' presence in polluted air. In almost every town in Bangladesh, oil mills, textile factories, chemical factories are located close to the residential area. Old Dhaka is a densely populated area of Dhaka city, hundreds of legal and illegal factories growing in this area link an umbrella. These factories emitted different toxic gas like carbon mono oxide, sulfur dioxide, nitrous oxide which pollute the city air very much. Many small industries have been developed in residential areas such as Sutrapur, Gandaria, Dholaikhal, Narinda, Hazaribagh, and Rokonpur, among others. Residents have found it difficult to live because of the smoke and stench created by these factories. In Chittagong, there are 144 polluting businesses scattered throughout several industrial zones. 19

tanneries, 26 textile manufacturers, oil refinery industries, and chemical companies are among those steadily damaging the city's air (Rahman, 2016).

## **2. Industrial Development and River Pollution**

Bangladesh has around 230 small and major rivers, and a substantial portion of the country's 140 million people rely on them for their livelihood and transportation. But unfortunately, many of them are dying because of pollution and encroachment. Water pollution is exceeding the limit in most of the rivers and has become a great threat to the survival of aquatic species. The rivers of Bangladesh are the worst victim of industrialization, especially in Dhaka city. Rapid and unplanned industrialization in the urban areas is the main reason for river pollution. Industries are growing on the bank of the rivers for easy access to water. The used and untreated wastes are dumped in river water as an extraction process. The government of Bangladesh has passed a law of using Effluent Treatment Plant (ETP) on industries, but most of the industries are overlooking this technology.

In a survey of the Bangladesh Center for Advanced Studies (BCAS), it is found that only 40% of industries use ETP and more than 50% of industries do not have ETP technology, causing serious damage to river water. The Dissolved Oxygen level has gone down to a lethal state for toxic wastage industries dumped in river water. A scientific research team of BUET found that the Oxygen level of the River Buriganga has come down to 0%, which means impossible to survive for any aquatic life in the river. Pollution is so severe that few hydro-organisms can endure it, and many kinds of fish are finally found dead in rivers. Industrial pollutants including lead, cadmium, iron, copper, and organic wastage accumulate in the river, causing health issues and destroying the river's food chain. It also destroys the water aeration system, which means the self-purifying process of rivers is destroyed.

The continuous emission of carbon dioxide, sulfur dioxide, nitrous oxide in the atmosphere and river water make which make water more acidic. River water acidification may cause acid rain in the future. Ship wrecking activities nearby the river bank also worsen the condition of river water. The dumping of industrial solid waste like plastic, polythene, fabric into river water causes ecological

damage to the river water. When industrial wastes are discharged into the river, water can negatively affect the biodiversity, food, and human health of the nearby area.

### **3. Industrial Development and Soil Pollution**

Human civilization started through agriculture and the cultivation of various foods and grains. But industrialization process has reduced agriculture by containing cultivable lands as well as polluting them. Many lands have lost their fertility for toxic wastage of industries, and they are no longer able to use them for cultivation. Soil pollution is the damage of soil for various toxic materials, which poses an adverse impact on the growth of plants and animal health. The salinity of soil has increased rapidly for various use of pesticides and chemicals. The usage of polluted water for irrigation also causes soil pollution. Industries are the biggest contributor to soil pollution in Bangladesh. Industrial toxic materials, polythene, plastics are damaging soil fertility very rapidly.

Industrialization growth is inversely proportional to agriculture. As industries are increasing cultivable lands are decreasing. People are heading more towards industrial jobs rather than working in the field. Agricultural production is failing to reach its minimum target for overall climate change. Chemical utilization has gone up tremendously in technological and industrial development. Farmers nowadays use a huge amount of fertilizers and pesticides, which negatively affect the structure of the soil (Alfonso, 2021). The continuous use of chemicals in soil reduces the fertility of soil slowly. Most of the industries dump their wastes into the soil. Soil gradually absorbs this waste and becomes unproductive. Oil spills from oil stations also pollute the soil. Brickfield, tanneries, garments industries, chemical, gas, electronics factory greatly polluted the soil. Industrial products like polythene, plastic, aluminum became much popular among Bangladeshi people. Excessive use of these products is very harmful to soil because the soil can't absorb this product. Plants hardly survive in polluted soil. The agricultural production day by day reducing because of soil pollution. Humans, plants, and animals all suffer from soil pollution. The extensive pollution of soil has an impact on any system's ecological equilibrium.

### **4. Industrial Development and Deforestation**

The forest of Bangladesh has been experiencing a cumbersome degradation of natural resources, which is causing climate change. For sake of industrial development, forests are cut down vigorously. The clearing of woodlands for Industries has been the leading cause of deforestation. Food, shelter, water, air, and other needs are required for living organisms to survive. These components are required for life to exist. Forests provide a home for wild animals and birds. The most serious environmental problem is deforestation, it harms the environment. Deforestation is the process of systematically destroying forests to use the land or the trees. Deforestation is typically characterized as the destruction of a substantial number of trees with no plans to replace them. Harvesting, forest fires, and insect infestations are not considered deforestation because the affected areas will regrow.

All around the world, industrialization is a never-ending addiction. Our ecology and human health have both suffered greatly as a result of industrialization. In the name of development, every country is increasing greenhouse gas emissions, exposing hazardous waste to the environment, polluting streams, causing climate change, and destroying wilderness. Clearing forest trees harm human health as well as animals. Carbon emissions are the most serious environmental concern, and the primary reason is widespread deforestation. A survey showed that over 90% of respondents believe that fast industrial expansion in Sal forest regions has a significant detrimental influence on forest cover and degradation. They also said that it posed a severe danger to their ability to continue living in the woods. This conclusion is backed up by research, which points to the industry as one of the key causes of Sal forest degradation (Ahmed 2008).

Since Dhaka and Gazipur are near the Sal forest, many companies are constructing plants there, and influential elites have taken land. New road construction, for example, exacerbates the degradation of forest land (GOB, 2008). Most of the industries are not environment friendly, causing deforestation. The toxic materials as wastage are extracted openly in the forest, causing an imbalance in the ecosystem. This prevents forests to live. Nuclear power plants radiate harmful radiation,

causing forest death. Poor wastage extraction of industries is against the living of forests, causing tremendous damage to the environment.

### **Case Study**

#### **1. Rampal Power Plant Project**

Rampal Power Plant is a proposed coal-based power plant in Bangladesh's Khulna district, located in Rampal Upazila. It is a joint venture power plant of India and Bangladesh which is known as "Bangladesh-India Friendship Power Company Limited" (Kumar & Chaytannya, 2013). The Joint Venture Agreement was signed between Bangladesh Power Development Board (BPDB) and National Thermal Power Corporation (NTPC) on 29th January 2012 (Sharda, 2016). The total equity of the proposed Joint Venture is 30% and there is 50/50 ownership of the equity. The proposed power plant is located on the Poshur River and the area of the plant is 1834 acres. It is situated in a high-risk area of the Sundarbans, the world's biggest mangrove forest and a UNESCO World Heritage Site.

It is very much controversial because of its critical location. It may hamper the biodiversity of Shundarban as it is based on coal. Electricity is highly needed for our industrial development. For the sake of demand for rapid industrial development, the Bangladesh government has taken many initiatives to develop its national power grid. Among them, Rampal Power Plant is one of them. But this may harm our environment as well as our mangrove forest.

#### **a. National Policy**

This power plant is probably a controversial project which is undertaken by the present government. From the beginning, the environmentalists are opposing to launch of the plant. The government of Bangladesh, on the other hand, denies that the coal-based power station would have an unfavorable impact on the world's biggest mangrove forest, the Sundarban. According to the energy adviser of the Bangladeshi prime minister Tawfiq-e-Elahi Chowdhury, the debate over the power plant and its impact on the Sundarbans was "not based on facts". He further stated that the plant will have no detrimental impact on the mangrove forest since greenhouse gas emissions will be kept to a minimum. The government has also said that there is no possibility of the flow of smoke and harmful gases to the

Sundarban because the height of the chimney is 900ft. And the flow of wind remains opposite of Sundarban for nine months. Only for three months (November-February) wind flows over Sundarban but will affect a high chimney. Ujjal Kanti Bhattacharya, MD of the Rampal Power Plant ensured that the advanced Fuel Gas Desulfurization (FGD) technology will be used to control all produced toxic gas from coal-burning that is NO<sub>x</sub> and SO<sub>x</sub>. He also ensured high-quality exported vessels for coal transportation through River Poshur so that coal does not pollute river water. The government will be using high technology for controlling Fly Ash and Bottom Ash.

#### **b. Civil society/ NGOs Depiction**

The Rampal Power Plant is planned on 1834 acre area of Rampal. Considering the densely populated area of Bangladesh, it is quite fancy to cover such a big area. In 2014, UNESCO has published a report on coal transportation through the river Poshur which will damage the biodiversity of Sundarban. A team of UNESCO in 2016 has visited Rampal Power Plant for a survey and projected a report to the government highlighting the negative impact over the area for that power plant. Some environmentalists like, Dr. Abdullah Harun Chowdhury said that it will be very difficult to monitor all vessels containing coal through the river Poshur. Coal contains a huge amount of Sulfuric acid. There is a high probability of mixing those Sulfuric acids with river water.

Coal is anti-environmental fuel energy and very harmful to nature for which many European countries like Malta, Cyprus, Baltic nations came out from coal-based power plants. Recently, Germany has stopped 30 of its coal-based power plant because of protests by environmentalists. Professor Badrul Imam of Dhaka University has said that this Power Plant will destroy the Food Chain of Sundarban. The Power Plant is planned for 30 years, which will gradually damage the Biodiversity of Sundarban. Fly ash and bottom ash are also prime concerns for saving the environment of Sundarban because no such developed technology is there to control them. This Ash contains 15 different harmful chemicals like Mercury, Arsenic, Lead, etc. which are not fully controllable to refrain from damaging the environment. In Rampal Power Plant it is estimated that almost 1300 metric tons of coal will be burnt per day which will be producing 8

million metric tons of Carbon-di Oxide. And it is equal to the damage of trimming 38 cr. trees altogether.

Table 1. Rampal Power Plant

1320 megawatt Rampal Power Plant	
Sulfur-di Oxide/SOx	52,000 ton
Carbon-di Oxide/NOx	8,00,000 ton
Carbon monoxide	2,000 ton
Mercury	440 pound

Though Government ensures the use of highly advanced technology in the Rampal Power Plant to save nature in all possible ways, it is not that much convincing to environmentalists. For example, in the USA a coal-based Power plant has recently collapsed even using high technology and devastated around environment completely.

**c. Case Analysis of Rampal Power Plant**

A large amount of electricity is produced from coal-based power plants around the world. It might be the best source of electricity if it would not have been producing toxic ash while burning. It produces polluted ashes in two ways. Firstly, when it is ground and secondly while burning. In the 1320 megawatt power plant, yearly 7.5 lacs ton fly ash and 2 lacs ton bottom ashes are produced. This ash contains around 15 toxic materials. Among them mercury, lead and arsenic are the most harmful. In the Rampal power plant project, this ash management is the biggest challenge. There are two rivers beside Rampal, one is Posur and another is Moidara River and there are also some small water bodies beside the Rampal Power Plant project. If the ash of the power plant mixes with the river water and land, it will cause great damage to the Sundarban. There was a failure of management while the Oil vessel sunk into the River Posur. So environmentalist says that it will be challenging for the Rampal Power Plant project to prevent such type of incidents. They also say that manpower is not that efficient in Bangladesh that they can manage everything while transporting coal through the river. So overall it is very risky for Sundarban. Though they said that they will use advanced technology, but an accumulation of minimum pollution can destroy the world’s largest Mangrove Forest.

Environmental experts offer the Burishwar River, which is 2.5 times larger than the Posur River, as an alternate proposal for the Rampal

power plant. So ships can easily transport coal. As well as this place is 30 km far from Sundarban. The river is very close to the sea, so it will decrease the transportation cost. Most importantly, coal transportation vessels do not need to go through Sundarban. Apart from that, some expert suggests that there is a huge opportunity for a solar power plant in Bangladesh. Through this solar power plant, we can easily produce electricity at a low price, and it is very environmentally friendly.

**2. Pollution of Buriganga River**

The Buriganga River is one of Dhaka’s most significant waterways. After losing its connection with the main Ganges River, the Dhaleswari River, a tributary of the Ganges River, spilled into the Bay of Bengal and was renamed Buriganga (Majumdar, 1971). Unlike many other rivers, the Buringanga River serves a variety of uses, including drinking water, transportation, and flood control. Dhaka’s economy depends on Buriganga. When the Mughals declared Dhaka their capital in 1610, the Buriganga bank was an important commerce hub. The Buriganga River is now dealing with a significant pollution problem. Mill and factory’s chemical waste, medical waste, home garbage, plastic, and oil-polluted Buriganga. Thousands of tons of solid trash are discharged daily in Dhaka, with most of it ending up in the Buriganga. Every day, tanneries emit 22000 cubic liters of hazardous waste into the river, according to the Department of the Environment (DoE). Waste material from different sources falls into the Buriganga River and destroys the biodiversity of the Buriganga River and also increases the possibility of aid rain, health hazard, etc.

**a. River VS Industry**

The river plays a vital role in domestic agriculture, industrial development, and the development of human civilization. Bangladesh’s river systems have become contaminated as a result of fast population increase, unregulated construction along river banks, urbanization, and unplanned industrialization. Industries are major pollutants because they consume a great deal of water and discharge dirty water into rivers. Tanneries, shipwrecking, electronics, textiles, oil, and gas, as well as other newly developing processing businesses, contribute significantly to river pollution (Islam, 1997). The discharge of untreated

wastewater and solid debris into the water system has a substantial impact on the river's water quality.

In Dhaka, the tanneries, chemical, oil, and textile industries are the biggest pollutants of surface water. Dhaka, Bangladesh's capital, is one of the world's most densely populated cities. The Buriganga River runs through the city, which is also bordered by the Turag, Dhaleshwari, Tongi Canal, Balu, and Shitalakkhya rivers. The majority of enterprises and factories are located along the banks of these rivers or near the river system. Along these rivers, there are around 7000 industries, especially in the Hazaribagh, Tejgon, and Dhaka-Narayanganj-Demra dam districts of Dhaka metropolis (Roy, 2009). The Burignaga and its connected river absorb around 60000 cubic meters of hazardous waste per day, primarily from businesses in Tongi, Hazaribagh, Tejgoan, Narayanganj, Savar, Gazipur, and DEPZ (RPMC report, 2008). According to another study, the tanneries in Hazaribagh produce 7.7 million liters of liquid waste and 88 million tons of solid garbage every day (The Daily Star, 2010). Although the tanneries have already been relocated to Savar, they have mostly destroyed the water supply of the river Buriganga. According to Bangladesh Poribesh Andolon (BAPA), 6000 tons of liquid trash are thrown into the Buriganga River every day. It is also estimated 70% of the Buriganga and other linking rivers of Dhaka city are polluted by industrial waste and toxic material.

#### **b. Case Analysis of Buriganga River**

Encroachment and excessive pollution have rendered Buriganga's water unsuitable and unsustainable for aquatic life during the previous few decades. The environment expert expresses that, still we have time to protect the Buriganga River from further pollution. First and foremost, we must halt the constant release of hundreds of tons of industrial trash and junk into the environment. Second, any enterprises that are next to the river should establish a water purifying facility. In the past, attempts to clean up waterways failed to owe to polluters' impunity. We must take stronger action against these pollutants. Above all, polluters must be held accountable for their actions. The industries should follow environment-friendly technology to protect the Buriganga River.

### **3. Agricultural land degradation of Savar Upazila**

Bangladesh is mostly an agricultural nation with a dense population and slow economic progress. The increase in population and growth of reckless industrialization is creating high pressure on the lands of Bangladesh, especially on agricultural land. Savar Upazila is a vast agricultural land of Bangladesh. Most of the people live in agriculture in this area. But in recent years, the excess growth of industries of different types are contained over agricultural land. Almost 600 industries are present in Savar Upazila. As the agricultural land is decreasing side by side, the rest lands are also being polluted by waste materials of those industries. These solid toxic materials are dumped over the open land, causing both air pollution and land pollution. The salinity of soil increased such that it is no longer cultivable. Different pesticides are also responsible for that. Savar contains a big EPZ that is containing vast agricultural land.

The tannery industry has been shifted to Savar which is causing massive land pollution. Waste materials have become clogged in Zam city's drains, sand, and soil, causing the area to stink and creating an environmental threat. The untreated waters also flow over agricultural land and wetlands, causing an environmental hazard. The brickfields in Ashulia are discharging waste material that is polluting nearby wetlands and agricultural lands. It is also covering a big area, which is reducing cultivable lands in Savar. Almost 300 textile factories in Ashulia is covering huge cultivable lands. Various cultivable lands are bought from poor farmers to build industries, which on one side decreases cultivable lands, and on the other side, the waste materials of those industries are affecting the rest of cultivable lands.

In Savar Upozilla industries are grown up in an unplanned way. Industrial toxic materials are polluting the land of Savar very much as well as water and air also. The local villagers said that they cannot take bath in water because industrial waste materials are dumped on land, which causes water pollution. Lands are no longer arable and the domestic animals also dying because of heavy toxic chemicals in the soil. The huge land pollution of Savar is also destroying the nearby Shal forest. Deforestation is also causing infertile land.

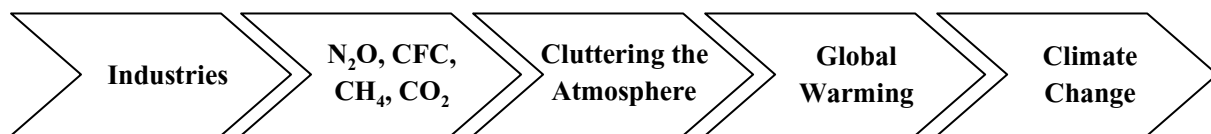


Environmental exploitation is dangerously happening in this area. Here, marginalized communities are struggling to survive. It is very much hard to grow crops from this infertile land, which is causing unemployment in that particular area. Expert says that all the heavy industries are growing up in Savar region in an unplanned way. Decentralization is needed to save the area from pollution. The industries must be aware of their waste management. If the industry uses highly advanced technology in their plant, it can reduce the pollution of land.

**Effect of Climate Change**

Industrialization is always a key instrument for development, again it is the vital reason for climate change. This climate change process has started since the beginning of the industrial revolution when industries started burning fossil fuels. When fossil fuels are burned, they release a variety of

greenhouse gases such as carbon dioxide, methane, nitrogen oxide, chlorofluorocarbon, and others. Most of the industries of Bangladesh use coal, gas, and natural petroleum to run. When these toxic gasses are released into the atmosphere, it depletes the ozone layer, causing the entrance of harmful rays from the sun. It also causes the greenhouse effect on the earth. When these gasses are accumulated in the atmosphere from industries, it increases the average temperature of the earth by trapping it. If the greenhouse effect intensifies, more heat is trapped than is required. And the world will eventually grow more populated. In the 21st century, it is the most significant driver of climate change. The natural process of carbon emission and absorption is controlled by trees. But due to rapid industrialization, forests are cut down vigorously, which destroys this cycle. And thus more Carbon-dioxide is present in the earth's atmosphere.



Scientists have predicted that, if this continues and remains unaware, the southern part of Bangladesh will sink under the Bay of Bengal by 2050. The toxic chemicals of industries like Sulphur-dioxide, Nitrous-Oxide are drained in river water which intoxicates the water. When this water evaporates, it mixes with atmospheric Carbon-Dioxide and becomes acidic. This increases the chance of acid rain.

Recently, in Bangladesh, people face difficult weather patterns for this ecological imbalance. During summer, excessive temperature, and in winter, extreme cold is felt. The rise of average temperature has increased significantly in past years, which affected the socio-economical life. The inconsistency in rainfall causes serious damage to agriculture. Due to rapid industrialization, deforestation is occurring in a massive way, which is also responsible for landslides in hilly areas of Bangladesh. These accumulative reasons are causing climate change in Bangladesh. Climate change has a serious impact on human life. The following are some of the effects:-

**1. Unemployment**

Unemployment is the lack of job facilities for an abled person, both for an educated and illiterate

person. Every country faces this problem and Bangladesh is no exception to it. The people of Bangladesh have a mainly agriculture-based earning system. Most of the general people used to cultivate their land or fish in the river. But as industries started raising, cultivable land started decreasing and farmers lost their earnings. Even they are not skillful to work in the industries. Advanced technologies started replacing humans in the industries, causing massive unemployment. In the Rampal Power Plant project, 1834 acres of land were taken from poor people. Almost 400 houses and their cultivable land has been taken by the government. This situation made massive unemployment of people and also made forced migration to a new place, especially in cities. And this coal-based power plant will damage the in around cultivable lands, which will create more unemployment. Buriganga River was the heart of many people's earnings.

But nowadays, the river is so polluted that no more aquatic life is present there. Many fishermen have lost their earnings for that. River pollution is also causing the death of rivers and polluting the other connecting rivers. Industrialization on one side is a source of employment, but for skilled

labor. But most people are unskilled for industrial work. As well as in many industries, advanced technologies are used for accelerated production rather than human labor. Industrialization is causing a significant number of unemployed people in Bangladesh. This unemployment in the rural area is creating force migration towards cities, causing excessive land pressure and a cluttered population. Ecological balance is damaged for an unequal number of population in the cities, making ineligible to live. This causes more environmental degradation in society.

## **2. Health Hazard**

Climate change is the prime reason for health hazards in human life as well as various animals. In developing countries, five children die every minute from malaria or diarrhea. Every hour, 100 children die as a result of indoor exposure to solid fuel smoke. Nearly 1,800 people die every day in emerging cities as a result of urban air pollution. Nearly 19,000 individuals die each month in poor nations as a result of accidental poisoning. (Remonduo, 2009). For industrialization, various types of pollution like air pollution, soil pollution, and water pollution is creating hundreds of diseases in human life. According to World Health Organization (WHO), 24% of total global death is responsible for various types of diseases caused by environmental pollution. Arsenic poisoning, insufficient solid waste management, and industrial effluent management have all made Bangladesh's water a severe health threat. Even workers of various industries are affecting themselves while working with toxic materials, harmful chemicals, and excessive sound pollution. Most old-aged persons and infants are the main victim of environmental pollution. Groundwater contamination for various harmful chemicals like Arsenic and Iron creates deadly diseases like Cancer. And water bodies of Bangladesh are polluted through various industrial waste materials and weak effluent management systems. Air and noise pollution in cities is at an alarming level, causing various mental and physical disabilities of humans. This climate change costs human life more.

## **3. Food and Resource scarcity**

Food and resource are very important for human life. As climate change started in Bangladesh, food and resource scarcity raised to a

higher level. Industrialization is replacing the agriculture business from Bangladesh by containing arable lands and intoxicating the soil. The quality of food has decreased because of various pesticides and chemicals. Food production has decreased enormously due to huge losses by the farmers as the food production rate decreased because a large number of lands are contained by more than 30,000 industries. As the population is increasing, food production is not increasing at that rate, causing food scarcity. For various pollution in nature, food chain damaged in the society, causing less food production. Various rivers are polluted by industrial toxic wastage, causing fewer fish in the water. Foodgrains contain harmful toxic materials through air pollution, causing less harvest even in the seasons. Many industries use non-renewable resources like gas, oil, coal, etc. As these natural resources are used enormously by the industries, resource scarcity is prevalent in Bangladesh. Population and industries are increasing tremendously, but the resources are not increasing because it is fixed in a particular geographical location. Many resources are used uncontrollably by the industries, so very soon the resource scarcity will target the alarming stage.

## **4. Global warming**

The rise in global temperature is referred to as global warming. As a result of the melting ice in the poles caused by global warming, the delta countries will be submerged. In a survey, it is found that, if the global warming for climate change rises at this rate, 70% of the total area of Bangladesh will be under the Bay of Bengal within the next 50 years. According to the Global Climate Risk Index 2018, Bangladesh is the 6th most vulnerable country to global warming and climate change. It is very alarming for such a developing country as Bangladesh. The main reason for rising temperature in the global area is environmental degradation. Industrial emissions and Green House Gas in the open-air cause the breakdown of the ozone layer in the atmosphere. As a result, direct harmful rays from the Sun like UV rays are melting the polar ice and increasing harmful diseases in human life. The natural features of coastal soil and water will be destroyed when the sea level rises. It would shift the river's estuary's position, resulting in significant changes in fish habitat and breeding grounds. And it has a greater tendency of forced environmental

migration. Climate change is a continuous process; changes gradually. But the effect of environmental pollution has increased the rate much higher. It affects agriculture and the production of various grains. It also affects the natural ecosystem of a country.

### **5. Natural Disaster**

Natural catastrophes have a long history in Bangladesh. From 1997 to 2016, it experienced around 187 natural disasters and around 859 people died in that. The financial loss of 2, 31,000 cr. USD has been estimated during this period of disaster. Bangladesh is very vulnerable to natural disasters due to its geographic position, land features, abundance of rivers, and changing monsoon climate. Bangladesh is very vulnerable to natural disasters. And the effect of climate change increases the rate of natural disasters. Scientists found that in comparison to 2016 to 2017, the rate of natural disasters was more and a possible cause of this is environmental pollution for rapid industrialization. Rapid industrialization increases the chance of an earthquake. From 2017 to 2018, Bangladesh has faced several mild earthquakes (Kuddus, 2017). As ecological imbalance is caused by rapid industrialization, the environment is losing its capacity to prevent a natural disaster. It is seen that floods are a very common phenomenon in Bangladesh because of ecological imbalance. It is an alarming threat for Bangladesh that her environment is largely affected by industrialization; Bangladesh has lost its balance, for which natural disaster occurs frequently. Natural disasters like cyclones, floods, earthquakes, drought, unusual rainfall, landslides, etc. are frequently happening in Bangladesh. Because of climate change, the temperature of the sea is increasing which causes cyclones. Water in the rivers is rising because of ice melting. The inconsistency increases in nature because of climate change.

### **6. Ecological imbalance**

As industrial development is increasing day by day throughout the country, especially by the riverside, environmental sustainability is declining. Most of the unplanned tannery industries and oil industries are achieving their goals and interest by deteriorating the environment. Industries are not following any specific guidelines for waste management. They just dispose of their industrial waste in the river water. In the tannery industry,

many types of poisonous chemicals are being used for the processing of leather. All these chemicals come out from the industries as solid and liquid waste and get mixed with the river water. Then the water of the river is being polluted by the wastage of the industries. In the polluted water, there are no species of fish; the natural color of water and the smell of water has been changed because of industrial development. Without the tannery's waste, the dumping of oil of ship and launch is also responsible for the ecological imbalance of the Buriganga River.

Industrial development has been considered the main culprit of climate change. Throughout the world, most of the developed countries are emitting the largest amount of carbon dioxide. Because of carbon dioxide, the temperature of the world is increasing gradually. So, the developing countries are suffering from many problems, especially the countries of the coastal area like Bangladesh. Bangladeshi industries are also accountable for that. As a result, it has been facing many natural disasters like earthquakes, floods, cyclone drought, ozone layer depletion, and so on.

### **CONCLUSION**

Industrialization is needed for a country's economic development, at the same time we have to preserve the environment. From Bangladesh's perspective, though industrialization is in the initial stage, it is degrading our environment. During the last two decades, Bangladesh has faced more natural disasters than before. The unplanned industries and this industry's unplanned solid waste management are accountable for climate change such as water pollution, air pollution, soil pollution, and deforestation. Owing to climate change, people have been suffering from various economic difficulties as well as deadly diseases. So, the government of Bangladesh should have taken possible measures for sustainable development, in which industrial development and the environment would get the same importance.

The governmental organizations, as well as non-governmental organizations, should increase social awareness so that a decentralized policy of industrialization will have taken instead of a centralized policy of industrialization. The government must have taken strict policy guidelines and must have implemented those during the

establishment of an industrial park. The government also must have ensured the use of high industrial technology to protect the environment as well as bolster the environment-friendly industries.

## REFERENCES

1. Ahmed, A.I.M.U. (2008). *Underlying causes of deforestation and forest degradation in Bangladesh, A report submitted to the Global Forest Coalition (GFC)*, The Netherlands. University of Dhaka, Bangladesh.
2. Alfonso, G. P. (2021). Assessing the Climate Change Adaptations of Upland Farmers: A Case of La Trinidad, Benguet, Philippines. *Indonesian Journal of Social and Environmental Issues (IJSEI)*, 2(2), 129-142.
3. GOB. (2008). *Bangladesh Road Network Improvement and Maintenance Project*, Ministry of Communication Roads and Highways Department, Dhaka, Bangladesh [Accessed on 15<sup>th</sup> November 2018]
4. Goodess, C.M. Palutikof, J.P. and Davies, T.D. (1992). *The nature and causes of climate change: assessing the long-term future*, Belhaven Press.
5. Islam, K. and Sato, N. (2012). Deforestation, land conversion and illegal logging in Bangladesh: the case of the Sal (*Shorea robusta*) forests, *iForest-Biogeosciences, and Forestry*, 5(3), 171.
6. Islam, M.S. et al. (2015). Alteration of water pollution level with the seasonal changes in mean daily discharge in three main rivers around Dhaka City, Bangladesh. *Environments*, 2(3), 280-294.
7. Khan, M.A.I., et al. (2007). Physico-chemical and biological aspects of monsoon waters of Ashulia for economic and aesthetic applications: Preliminary studies. *Bangladesh Journal of Scientific and Industrial Research*, 42(4), 377-396.
8. Kumar, C. (2017). *Bangladesh Power Plant Struggle Calls for International Solidarity*, Huff Post. [Accessed 19<sup>th</sup> December 2018].
9. Magsi, H. (2014). *Industrialization, Environment and Pollution*, The Diplomatic Insight [Accessed on 10<sup>th</sup> November 2018].
10. Mgbemene, C.A.. (2016). Industrialization, and its backlash: focus on climate change and its consequences, *J. Environ. Sci. Technol*, (9), 301-316.
11. Rahman, M. (2016). *Air pollution by Chemical Industries in Dhaka city*, The Daily Observer, <http://www.observerbd.com/2016/01/23/132448.php>. [Accessed on 19 December 2018].
12. Roy, M. (2009). Planning for sustainable urbanization in fast-growing cities: Mitigation and adaptation issues addressed in Dhaka, Bangladesh, *Habitat International*, 33(3), 276-286.
13. Rozalinna, G. M., & Aulia Izzah Azmi. (2020). Evaluation of Boundary-Spanning on Climate Change ENGO International Greenpeace in Asia. *Indonesian Journal of Social and Environmental Issues (IJSEI)*, 1(2), 108-121.
14. The Daily Star. (2018). *Polluters must pay* The Daily Star. [ONLINE] Available at: <http://archive.thedailystar.net/newDesign/news-details.php?nid=155050>. [Accessed on 19<sup>th</sup> December 2018].
15. Woodwell, G.M. (1989). The warming of the industrialized middle latitudes 1985–2050: causes and consequences, *Climatic Change*, 15(1-2), 31-50.