

ENVIRONMENTAL POLLUTION OF BANGLADESH – IT’S EFFECT AND CONTROL

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ABSTRACT

Environmental pollution is as old as the civilization itself. It has become a major concern in the last few decades. It is the by product of the development of civilization and in fact a price for the progress. It is more prone in case of Bangladesh. Air pollution of Bangladesh is mainly caused by the vehicle emission, industrial discharge and burning of fossil fuel. The water resource of Bangladesh becomes a major health hazard due to arsenic contamination, inadequate solid waste and industrial effluent management. Necessary steps are to be taken to protect the environment for our own existence. This paper provides an overview of different environmental problems of Bangladesh and discusses the ways to improve it

Keywords: Environmental Pollution, Air Pollution, Water Pollution, Noise Pollution

1. INTRODUCTION

1.1 Pollution has become the first enemy of the mankind. Industrial revolution of 19th century led to environmental disaster. The whole world is now more afraid of pollution rather than nuclear blast. Technological advancement has brought revolutionary changes in life style and national economy with overwhelming power over nature. The protection of environment has become a major issue around the global for the well being of the people and economic development.

1.2 The present environmental condition of Bangladesh is not at all equilibrium. Severe air, water and noise pollution are threatening human health, ecosystems and economic growth of Bangladesh. Air pollution caused due to increasing population, burning fossil fuels, industrialization and associated motorization. The water pollution caused due to industrialization. The under ground water of Bangladesh has been polluted due to arsenic. The inhabitants of major cities of Bangladesh are also exposed to high level of noise pollution. Environmental degradation of Bangladesh is also caused due to poverty, over-population and lack of awareness on the subject. It is manifested by deforestation, destruction of wetlands, soil erosion and natural calamities. Few steps have been taken by the government to improve the environmental degradation and pollution control. This paper analyzes the different types of environmental pollution and associated health hazard in Bangladesh. It also discusses the different governmental steps as well as some suggested steps to improve the pollution control.

2. DIFFERENT ASPECTS OF ENVIRONMENTAL POLLUTION

2.1 Air Pollution.

Air pollution is a serious environmental health hazard affecting the populations of Bangladesh. Air pollution of Bangladesh is caused due to increasing population and associated motorization. Indoor air pollution is mainly associated with the use of biomass fuels during cooking with poor ventilation. Industrial emissions and automobiles are the principle sources of outdoor air pollution. The national ambient air quality standards of Bangladesh and amount of pollutants in the air of Dhaka city is shown below:

Table – 1: Bangladesh National Ambient Air Quality Standards

Land use Category	8-hour average concentration in $\mu\text{g}/\text{m}^3$			
	CO	NO ₂	SPM	SO ₂
Industrial/mixed use	5,000	100	500	120
Commercial/mixed use	5,000	100	400	100
Residential/rural use	2,000	80	200	80
Sensitive use *	1,000	30	100	30

*Sensitive areas include national monuments, health resorts, hospitals, archeological spots, and educational institutions. *Source:* Department of Environment (DOE), 1997.

Table – 2A: Pollutants in the Air of Dhaka City

Location at Dhaka City	Sulfur Dioxide (SO ₂)		Nitrogen Dioxide (NO ₂)	
	Concentration (µg/m ³)	Permissible (µg/m ³)	Concentration (µg/m ³)	Permissible (µg/m ³)
Gulistan	800	100	500	100
Jatrabari	1300		500	
Pantho-Path	900		500	
Mohakhali	1200		500	

Table – 2B: Pollutants in the Air of Dhaka City

Location at Dhaka City	Carbon Monoxide (CO)		Suspended Particulate Matter (SPM)	
	Concentration (µg/m ³)	Permissible (µg/m ³)	Concentration (µg/m ³)	Permissible (µg/m ³)
Gulistan	33200	5000	1332	400
Jatrabari	67000		4667	
Pantho-Path	85100		2666	
Mohakhali	69300		2111	

2.2 Main Sources of Air Pollution.

2.2a. Burning of Fossil Fuel.

Air pollution mainly occurs due to burning of fossil fuels like coal, petroleum etc and associated black smoke. Over 99% of the brick kilns use fossil fuel but don't comply with the "Brick Kiln Ordinance" and pollute enormous air.

2.2b. Industrial Discharge.

Industries cause air pollution through smoke emission. Agro based industries like sugar, pulp, paper, tanneries and value added industries like textile, garments, pharmaceuticals, oil refineries, fertilizer and chemical industries are the major contributors for air pollution. The air pollution percentage of most five industrial sectors of Bangladesh in the year 2001 is shown below:

Table-3: Air Pollution Percentage of most Five Industrial Sectors of Bangladesh in the Year 2001

Industry	Emission (Tons/yr)	Pollution (%)
Food Industry	1,46,356.06	38.7
Cement/Clay	62,725.88	16.6
Pulp and Paper	51,963.92	13.7
Textile	39,831.01	10.5
Tobacco	16,992.22	4.5

Source: Research Work by Islam Faisal on "Industrial Pollution in Bangladesh" in the year 2002.

2.2c. Emission from Vehicles.

One of the major sources of air pollution in urban areas of Bangladesh is due to the unburned fuel from two stroke engine vehicles. Dhaka has been rated as one of

the most polluted cities of the world. Bangladesh Atomic Energy Commission reports that automobiles in Dhaka emit 100 kg lead, 3.5 tons SPM, 1.5 tons SO₂, 14 tons HC and 60 tons CO in every day. The contribution of air pollution by different types of vehicle and the amount of pollutants emitted from vehicles in Dhaka city is as follows:

Table-4: Contribution of Air Pollution by Vehicle Type

Type of Vehicle	CO (%)	HC (%)	NO _x (%)	PM (%)	Annual Growth
Truck	13.4	8.6	59.7	47.5	7.8
Bus	10.3	9.7	18.5	29.4	2.5
Mini bus	7.3	3.9	6.5	19.1	6.8
Utility	6.3	4.4	2.8	0.7	10.2
Car	38.2	18.2	6.5	1.2	9.4
Three wheeler	10.6	26.9	6.0	1.2	31.0
Motor cycle	14.0	28.3	0.3	1.0	8.1

Source: Country Profile on Environment of Bangladesh by Japan International Cooperation Agency in the Year 1999.

2.3 Water Pollution.

Water pollution creates serious health hazard for Bangladesh. The dumping of municipal wastes, hospital wastes and toxic environmental discharges from mostly industries pollute both surface and ground water sources. The most dangerous threat emanating from environmental degradation is the arsenic contamination of ground water.

2.4 Main Sources of Water Pollution.

2.4a. Industrial Waste and Effluent.

The main industrial areas of Bangladesh are at Dhaka, Chittagong, Khulna, and Bogra districts. The mostly contributing industries for water pollution are pulp and paper, pharmaceuticals, metal processing, food industry, fertilizer, pesticides, dyeing and painting, textile, tannery etc. More than 200 rivers of Bangladesh directly or indirectly receive a large quantity of untreated industrial wastes and effluent. Everyday approximately 700 tanneries of Dhaka city are discharging about 16,000 cubic meters of toxic wastes. The Department of Environment (DOE) has listed 1,176 factories that cause pollution throughout the country. Water pollution percentage of most five industrial sectors of Bangladesh in the year 2001 is shown below:

Table-5: Water Pollution Percentage of most Five Industrial Sectors of Bangladesh in the Year 2001

Industry	Emission (Tons/yr)	Pollution (%)
Pulp and Paper	91,768.10	47.4
Pharmaceuticals	30,866.72	15.9
Metal	27,174.61	14.0
Food Industry	23,403.39	12.1
Fertilizers/Pesticides	12,715.00	6.6

Source: Research Work by Islam Faisal on "Industrial Pollution in Bangladesh" in the year 2002.

2.4b. Solid Waste and Sewage Disposal.

The indiscriminate discharge of solid waste, domestic and hospital sewage are the major source of water pollution in Bangladesh. About 4,000 to 4,500 tons of solid wastes are generated daily and only half of the generated wastes are disposed of in low lying areas or into river water. These solid wastes are associated with the problems of littering on roads, spilling around the bins, clogging of drains, indiscriminate dumping on vacant plots and cause serious environmental pollution. More than 500 hospitals and clinics of Dhaka city generate and release hazardous and toxic wastes without any treatment. The generated solid waste of six famous hospitals / clinics of Dhaka city is shown below:

Table-6: Solid Waste Generation from Six Famous Hospitals/Clinics of Dhaka City

Name of Hospital / Clinic	Generated waste (Kg/bed / day)	Non hazardous waste		Hazardous waste	
		Qty	% of Total waste	Qty	% of Total waste
DMCH	1.19	1.07	90	0.12	10
SSMCH	1.23	1.09	89	0.14	11
RIHD	1.20	0.91	76	0.29	24
HFRCH	1.59	1.29	81	0.30	19
DNMCH	0.80	0.70	88	0.10	12
SAHL	0.83	0.72	87	0.11	13

Source: M Shehab Ullah on “A study of hospital waste management in Dhaka city” in the year 1999.

2.4c. Inadequate Sanitary Facilities.

Inadequate sanitation facilities pose a serious environmental threat in Bangladesh. Dhaka Water and Sewerage Authority (DWASA) can serve only for 15 to 20% of city population. In absence of the sanitation and infrastructural services, 40% having septic tank and soak pit, 15% using pit latrines and 30% using open latrines. The sewage is mostly released into low-lying areas and river water in untreated manner causing great environmental hazards.

2.4d. Arsenic Contamination of Ground Water.

Arsenic in ground water poses a serious environmental hazard for Bangladesh. About ninety-seven percentages (97%) of Bangladesh people have been using ground water as the main source of drinking water but the water has been threatened by arsenic contamination. More than half (52%) of the studied population drink well-water containing >50ug/L of arsenic and more than two-thirds (70%) drink well-water containing >10ug/L of arsenic. The acceptable level of arsenic in drinking water is 0.05 mg/L for Bangladesh but some places it is found more than 70 times higher than that standard. About 80 million people are at a risk of arsenic contamination. The arsenic level of ground water over 0.05 mg/L surveyed in 1998 by the British Geological Survey team is as follows.

Table-7: Percentage of Ground Waters Surveyed in 1998 by the British Geological Survey Team with Arsenic Levels over the Limit

District	% of ground water surveyed	District	% of ground water surveyed
Bagerhat	66	Madaripur	93
Barisal	63	Magura	19
Brahmanbaria	38	Manikganj	15
Chandpur	96	Meherpur	60
Chittagong	20	Moulvibazar	12
Chuadanga	44	Munshiganj	83
Comilla	65	Narail	43
Cox's Bazar	3	Narayanganj	24
Dhaka	37	Nawabganj	4
Faridpur	66	Noakhali	75
Feni	39	Pabna	17
Gopalganj	94	Pirojpur	24
Jessore	51	Rajbari	24
Jhalakati	14	Rajshahi	6
Jhenaidah	26	Satkhira	73
Khulna	32	Shariatpur	80
Kushtia	28	Sylhet	19
Lakshmipur	68		

Source: Allan H Smith, Elena O Lingas & Mahfuzar Rahman on “Contamination of drinking-water by arsenic in Bangladesh: a public health emergency” in 1998.

2.5 Noise Pollution.

The noise pollution is also a major health hazard in Bangladesh. According to World Health Organization (WHO), 60 decibel (DB) sound can make a man deaf temporarily and 100 DB sound can cause complete deafness. According to the Department of Environment (DOE), the perfect sound condition for Bangladesh is 45 dB for the daytime and 35 dB for the night in peaceful areas and 50 dB for the daytime and 40 dB for the night in residential areas. The main sources of noise pollution are industries, motorized vehicles, construction works and indiscriminate use of loudspeaker. At present noise level in Dhaka city are estimated ranging from 60 to 100 decibel. If present situation continues then by the year 2017, 50% people of Dhaka city will loss 30 decibel of hearing power. The daily variation of noise level near the road at some of the key locations of Dhaka city is shown below:

Table – 8A: Pollutants in the Air of Dhaka City.

Time Interval	Location		
	Gulistan Commercial	Science Lab Mixed	Saydabad Commercial
7am -11am	80.08	76.24	83.27
11am -3pm	79.34	75.19	83.89
3pm -7pm	81.13	77.23	84.37
7pm -1pm	78.52	75.32	82.08

Source: Nazmul Chowdhury research on noise pollution in Dhaka city on Feb 2002.

Table – 8B: Pollutants in the Air of Dhaka City.

Time Interval	Location			
	Farmgate	Dhan- mondi	Gulshan	Uttara
	Commer- cial	Residen- tial	Residen- tial	Residen- tial
7am - 11am	80.07	75.87	76.16	76.25
11am - 3pm	78.86	74.38	74.83	74.81
3pm - 7pm	81.96	75.21	76.11	76.81
7pm - 1pm	80.28	76.30	74.31	73.36

Source: Nazmul Chowdhury research on noise pollution in Dhaka city on Feb 2002.

3. EFFECT OF ENVIRONMENTAL POLLUTION

3.1 Severe environmental pollution is threatening human health and economic growth of Bangladesh. Air pollution mostly affects the urban children. Indoor air pollution is a greater threat to health than outdoor air pollution. Bangladesh could avoid 10,000 deaths and save between 200 and 500 million dollars a year if indoor air pollution in four major cities can be reduced to acceptable limits.

3.2 Immediate effect of smoke inhalation causes headache, vertigo, burning sensation of the eyes, sneezing, nausea, tiredness, cough etc. It's long term effect may cause asthma and bronchitis. Lead affects the circulatory, nervous and reproductive systems as well as affects kidney and liver including liver cancer or cirrhosis. Carbon monoxide hampers the growth and mental development of an expected baby. Nitrogen oxides cause bronchitis and pneumonia.

3.3 Industrial emissions cause different waterborne disease and damage to health. Arsenic poisoning is slow and cumulative. It causes melanosis, kurtosis and conjunctivitis. Subsequently respiratory problem, gangrene, skin, kidney and lung cancer would arise. The Arsenic effect not only causes serious health hazards but also creates a widespread social problem. The inadequate sanitation facilities also pose a serious health threat in Bangladesh.

3.4 Noise pollution causes mental and physical illness among the people. Sound pollution causes deafness to heart attack. Any sort of noise pollution seriously affects expecting mothers. It also causes high blood pressure, tachycardia, headache, indigestion, and peptic ulcer.

3.5 Many people died every year in many diseases due to environmental pollution. The death rate in the year 1996 mainly due to environmental pollution is as follows.

Table-9: The death rate in the year 1996 due to environmental pollution

Causes of Death	National Level	Dhaka City
Death: All Ages (%)		
Cardiovascular	7.87	17.5
Asthma	5.2	4.3
Diarrhea	1.66	7.8
Cancer	4.05	5.3
Dysentery	4.05	5.5
Viral Hepatitis	2.14	3.4
Death: Less than One Year Infant (%)		
Anemia	4.77	6.5
Breathing problem	1.87	2.8
Diarrhea	18.96	17.5
Cancer	4.05	5.0
Dysentery	1.66	3.9
Viral Hepatitis	2.14	3.4

Source: Bangladesh Bureau of Statistics (BBS), Statistical Yearbook of Bangladesh 2001, Ministry of Planning, Dhaka 2002.

4. GOVERNMENTAL STEPS FOR POLLUTION CONTROL IN BANGLADESH

4.1 The 'Ministry of Environment and Forest (MOEF)' of Bangladesh is primarily responsible for environmental protection. It was created in 1989. The MOEF has taken some steps to control the environmental pollution of Bangladesh.

4.2a. National Environmental Management Action Plan (NEMAP).

The government has taken a project named NEMAP to integrate environment with the development in a policy framework. It provides a guideline for promoting effective management of resources, raising awareness among the people and improvement of environmental degradation.

4.2b. Environmental Acts, Rules and Laws.

The government of Bangladesh has modified environmental acts, rules and laws to improve environmental condition. Environment court has already been established to take prompt legal action against environmental pollution. The DOE has been empowered to punish the offenders of environmental rules.

4.2c. Control of Air Pollution.

Recently the DOE has taken some measures to carry out surveys on identification and control of polluting industries, protecting habitats, examining the use of compressed natural gas in industries, setting environmental standards and controlling river and automobile pollution on environmental management. It also conducts vehicular emission measurements at Dhaka city.

4.2d. Banning of Polyethylene Bags.

Most of the sewage lines of Dhaka city have been blocked by indiscriminate dumping of polyethylene bags over the years. As such, the government has banned the production, marketing and use of polyethylene bags up to 20 microns thick or less from 01 March 2002.

4.2e. Urban Transport Project.

An Urban Transport Project has been launched by the Government to improve traffic system, envisage good bus services, improve road networks by constructing over-bridges, fly-overs, underpasses and envisage a positive role for non-motorized transport.

4.2f. Embargo on Import of Items.

The government has banned the import of leaded petrol, high sulfur diesel and high sulfur coal. The government has also encouraged to use Compressed Natural Gas (CNG) to the automobiles. Bangladesh Road Transport Authority (BRTA) has restricted the registration on two stroke three wheelers.

4.2g. Control of Arsenic Pollution.

The Government has taken four Strategies to mitigate the arsenic problem. These are as follows:

- (1). Immediate detection of the arsenic effected patients and ensure their proper treatment.
- (2). Identify the arsenic contaminated tube wells, labeled them with red colour for danger ones and green with safe ones.
- (3). Detect the reasons for arsenic contamination in soil water and find out the sources of safe drinking water.
- (4). Conduct health education campaigns and grow awareness among the people.

4.2h. Knowledge Enrichment Programme.

Environmental education program has been incorporated in primary and higher education. Many universities have introduced various curriculum and projects on environmental issue. Government organizations as well as NGOs present meetings and seminars to arise public awareness on the environmental issue.

4.2j. Rural Sanitation Programme.

The Bangladesh Government has taken a rural sanitation programme from October 2003 to implement the facilitation, construction and installation of twin pit latrine. It improves rural sanitation coverage and reduces infectious diseases in rural areas.

5. AIR POLLUTION IN MEGA-CITIES

5.1 Environment problems differ from country to country. Cities in the South East Asia such as Delhi, Bangkok and Manila suffer from high levels of lead, particulate matter, and oxides of sulfur. Central and

South American cities such as Mexico City and Santiago experience frequent ozone problems. A comparison of air pollution in mega cities of the world is as follows:

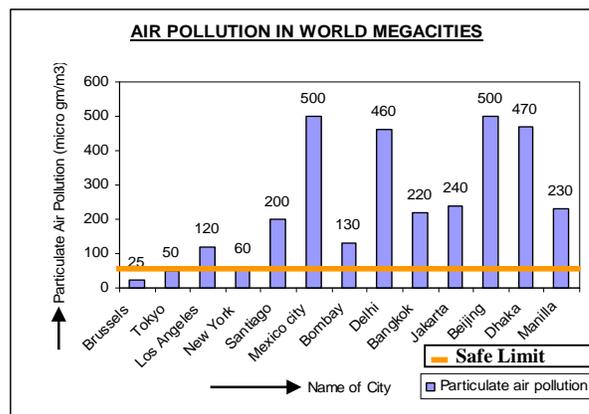


Fig 1. Comparison of Air Pollution in World Mega cities

6. SUGGESTED STEPS FOR POLLUTION CONTROL

6.1 The government has taken some steps to improve the pollution control of Bangladesh. But the steps are not adequate. As such, few more steps may also be taken to improve the environmental degradation:

6.2 Use of Environmental Technologies and Methods.

Environmental technologies and methods such as Geographic Information Systems (GIS), remote sensing and environmental impact assessment might be used for integrated policy formulation, decision-making, evaluation and monitoring of environment.

6.3 Development of Environmental Database.

A comprehensive environmental database may be made and the environmental planners might have the access for environmental up-gradation, planning and management. The database is to be updated regularly.

6.4 Environmental Education and Awareness.

Formal and informal methods of education might be adopted through local media, seminars, celebrations, workshops, walks and student competitions to aware the people regarding the process of environmental degradation.

6.5 Industrial and Solid Waste Management.

The government might take appropriate measures to monitor emission limits and Market Based Incentives (MBI) for reducing pollution control. The industries might be given both technical and financial support for introducing mitigation measures, promoting green technologies, using less pollution technologies and recycling the waste.

6.6 Enforcement of Rules and Regulation.

Environmental Conservation Rules of 1997, traffic rules and other relevant environmental laws might be

enforced further to punish the violation of the emission limits.

6.7 Urban Transport Management.

Government must strengthen vehicle emission standards, complete the emission inventory and conduct an investigation on the emission control measures. Auto-rickshaw must be restricted in Dhaka city. Government must replace old vehicles, two-stroke engine vehicles, improve traffic conditions and promote an equivalent and efficient alternative public transportation services to improve urban transport management.

6.8 Reduce Sulfur in Diesel.

Government must take necessary steps to remove sulfur content from diesel through hydro-desulphurization (HDS) process. The government must also enforce the vehicle manufacturers to install catalytic converters in every vehicle to reduce the vehicular emissions.

7. CONCLUSION

7.1 Environmental issues have become a major concerns due to impact on public health and development of Bangladesh. Air and water pollution, groundwater contamination, nuisance from solid wastes and noise pollution are the main environmental pollutions of Bangladesh. Dhaka City is one of the most polluted cities in the world. Environmental problems occur mainly due to population growth, urbanization, industrialization, rapid rise in transportation, inadequate and improper traffic management, poor sanitation systems and inefficient solid waste management.

7.2 Air pollution from transportation systems in urban areas mainly occurs due to smoke emission from automobiles, burning of fossil fuel, use of low lead gasoline, high sulfur in diesel, increasing number of two stroke engine and overall poor traffic management. Industries cause air and water pollution through smoke emission, inadequate solid waste management and dumping of untreated effluent to lakes, rivers and ground water. The arsenic pollution of groundwater has become a major disaster for Bangladesh. The noise pollution is a major health hazards in the country. It is a serious but neglected issue throughout Bangladesh. Government as well as other organizations must take adequate steps to reduce the environmental pollution of Bangladesh.

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9. ABBREVIATION

Abbreviated Form	Full Form
SO ₂	Sulfur Dioxide
NO _x	Nitrogen Dioxide
CO	Carbon Monoxide
HC	Hydro Carbon
SPM	Suspended Particulate Matter
DOE	Department of Environment
DWASA	Dhaka Water and Sewerage Authority
WHO	World Health Organization
DB	Decibel
BBS	Bangladesh Bureau of Statistics
MOEF	Ministry of Environment and Forest
NEMAP	National Environmental Management Action Plan
CNG	Compressed Natural Gas
BRTA	Bangladesh Road Transport Authority
GIS	Geographic Information Systems
MBIs	Market Based Incentives
HDS	Hydro-desulfurization
DMCH	Dhaka Medical College Hospital
SSMCH	Sir Salimullah Medical College Hospital
RIHD	Rehabilitation Institute & Hospital for Disabled
HFRCH	Holly Family Red Cresent Hospital
DNMCH	Dhaka National Medical College Hospital
SAHL	South Asia Hospital Limited

