

3 GOOD HEALTH
AND WELL-BEING



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Impact of Air Pollution on Human Health and Way Forward

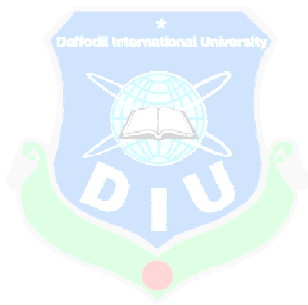
2019



Report
On
Impact of Air Pollution on Human Health and Way
Forward

(Under the Category of SDG-3: Good Health and Well-Being)

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Executive Summary

The scoping study was carried out with the objectives to assess and analysis of current state of the evidence of air pollution in Bangladesh, identify research gaps and mapping of institutes, networks and bi lateral agencies involved in Air Pollution Management. To achieve the objectives we carried out literature review, conducted in depth interview of respondents and arranged consultation meeting among stakeholders.

Major natural sources of air pollution (AP) in Bangladesh are windblown dust and sea spray while anthropogenic sources are motor vehicle, power stations, oil refinery, industrial pollution, (e.g. brick kilns, cement factory, construction work, stone crush, rice par boiler), trans-boundary air pollution and open burning of agricultural/industrial residue.

Trans-boundary traveling has a significant effect on air quality and the pollutants traveled beyond the boundary line of Bangladesh North-western Indian regions, Nepal and its neighboring areas, and Indian state of West Bengal were identified as the most probable zones that might have contributed to PM pollution in Gazipur, Dhaka. Trans-boundary transport of pollutants from agricultural burning in upwind regions of India

may be the reason of higher PM and BC concentrations in air of Rajshahi then other cities.

Biomass fuel is the primary source of household energy for cooking in Bangladesh. Some rural women in Bangladesh are exposed to fine air particle (i.e., $PM_{2.5}$), from 32-5007 $\mu\text{g}/\text{m}^3$ from biomass, which is 70 times higher than the country's outdoor, health-based standard. Women and children are disproportionately affected by health effects from Household Air Pollution (HAP). Exposure to air pollutants results in adverse pregnancy outcomes such as stillbirth, low birth weight, miscarriage, and retarded fetal growth.

Major sources of air pollutants in Bangladesh:

<i>Pollutant</i>	<i>Sources</i>
<i>Carbon Monoxide (CO)</i>	Motor vehicle exhaust, kerosene, power plants with internal combustion engines or wood/biomass burning stoves.
<i>Sulphur Dioxide (SO₂)</i>	Coal-fired power plants, brick kilns, petroleum refineries, sulphuric acid manufacture, and smelting sulphur containing ores.
<i>Nitrogen Dioxide (NO₂)</i>	Motor vehicles, power plants, and other industrial, commercial, and residential sources that burn fuels (e.g. diesel generators).
<i>Ozone (O₃)</i>	Vehicle exhaust and certain other fumes (hydrocarbons). Formed from other air pollutants in the presence of sunlight.
<i>Lead (Pb)</i>	Metal refineries, lead smelters, battery manufacturers, iron and steel producers.
<i>Particulate Matter (PM)</i>	Diesel engines, motor vehicles, power plants, brick kilns, industries, windblown and road dust, wood/ biomass stoves, open burning.

Health and Economic Cost of Air Pollution:

Globally air pollution were responsible for 16 percent of all deaths in 2015. In Bangladesh this proportion was nearly 28 percent and ambient and indoor fine particulate matter pollution is causing about 21 percent of all deaths. There is increasing international evidence that air pollution reduces the productivity of healthy workers, including in the RMG industry, which in Bangladesh is significant for continued competitiveness and high GDP growth.

High air pollution can cause immediate aggravated cardiovascular and respiratory illness and damage cells in the respiratory system. Chronic exposure of polluted air has permanent health effect such as accelerated aging of the lungs, loss of lung capacity and decreased lung function and development of asthma, bronchitis, emphysema, and possibly cancer etc. The most vulnerable people are persons with heart disease, coronary artery disease or congestive heart failure, lung diseases such as asthma, emphysema or chronic obstructive pulmonary disease (COPD), pregnant women, outdoor workers, older adults and the elderly, Children under age 14, athletes who exercise vigorously outdoors.

AQ Standard: The first set of ambient air quality standards for Bangladesh was defined in the Environment Conservation Rules of 1997. The new standards for Particulate Matter (PM_{10} , $PM_{2.5}$), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), and ozone (O_3) are almost the same as the ambient air quality standards set by US EPA and by WHO. Bangladesh is the only country in South Asia which set a $PM_{2.5}$ standard in its National Ambient Air Quality Standards (NAAQS).

Emissions standard: The impact on population does not depend only on the quantity of emissions but also where the pollutants are emitted. Comprehensive air quality modeling requires the input from emissions sources as well as spatial and temporal distribution of emissions and meteorological information. Development of a reliable

emissions inventory for large cities and the whole country must be a priority for proper evidence-based policy making in future. The emissions standards of industries are not stringent enough and there is significant scope to review these standards and ensure enforcement. It should be mentioned that DOE has not sufficient manpower for enforcement of laws.

Related policy and regulations. Government of Bangladesh has adopted a number of sector-specific policies and rules that impact on air pollution e.g. the National Environmental Policy 1992, amendment 2013, Environmental Conservation Act 1995. Motor Vehicles Ordinance, 1983. Brick Manufacturing and Brick Kiln Establishment (Control) Act 2013. Environment Conservation Rules 1997 (Amended 2017), Environmental Conservation Rules 1997 (Amended in 2002 and 2005). National Industrial Policy 2005. Environment Court Act 2000, 2010. Environment Conservation Act (Amended in 2000, 2002, 2010), National policy on Air Quality 2018 and Clean air Act 2018.

Air pollution reduction strategy in Bangladesh

	Strategy	Area of application
A	Improve public transport	Large cities
B	Strengthen vehicle inspection and maintenance	All, especially large cities
C	Ban vehicles older than 20 years	Commercial vehicles, large cities
D	Encourage Diesel to CNG switch through incentives	All diesel vehicles, truck & buses in large cities
E	Emissions (age) based annual registration fees	All vehicles

F	Stringent emissions standards	All new vehicles
G	Emissions based import tariff	All new vehicles
H	Comprehensive land use plan for industry locations	All industries, especially new ones
I	Cluster management	Cluster of highly polluting industries
J	Emissions (technology and fuel) based license fee	All kilns
K	Technology standards	All kilns
L	Alternate construction material	All country, especially large cities
M	Ensure adequate power supply	All country
N	Emissions standards	All new plants
O	Emissions standard for diesel generators	All new generators
P	Inspection & maintenance of diesel generators	All existing generators
Q	Technology specification	Existing steel mills, cement and glass factories
R	Inspection and maintenance	Existing steel mills, cement and glass factories
S	Emissions standards	All new and existing plants
T	Import control for quality of coal	Whole country, brick and power industries
U	Better construction practices on site	All construction sites
V	Air pollution mitigation plan and its enforcement	Large construction projects
W	Timely road maintenance	All roads
X	Landscaping and gardening	All exposed soil in urban areas
Y	Encourage fuel switch	Urban slums and rural areas
Z	Improved cooking stoves	Rural areas

Air Quality monitoring experiences in Bangladesh:

Policy/Strategy	Policy	Year	Result	Lessons learnt
Lead phase out from Petrol	CAC	1999	Success	Media and public support allow easy implementation, implementation quick and easy if few, government run bodies are targeted
Vehicle emissions Standard	CAC	1997, Update 2005	Failure	There is no testing facilities for monitoring vehicle emissions during certification, poor institutional capacity and enforcement hinder implementation
Brick kiln stack height	CAC		Success	Benefit to the owners (more efficient burning, better quality bricks) is good for policy implementation, ease of monitoring is also important
Ban on older vehicle import	CAC		Success	Small number of vehicle importers, no significant losses to businesses (increased cost of vehicles passed on to buyers) allow easier implementation, somewhat covers vehicle emissions standard initially
Differentiated vehicle import tariff	MBI		Success	Although not a perfect MBI, strong public support, smaller points of regulation means easier implementation
Ban on driving older vehicles in Dhaka	CAC	2010	Repeated failure	CAC did not work when many polluters are financially affected, especially when they have a strong lobby. MBI instruments with active stakeholder engagement during policymaking can be useful

Ban two stroke three wheelers	CAC	2002	Success	Extensive public support allows easy implementation, unforeseen practices (smaller diesel vehicles) can erase the benefits, monopoly in new CNG three wheeler supply can make a good policy costlier than necessary, multiple benefits
Promotion of CNG vehicles	MBI	2002	Success	Extensive public support, good pricing policy, good incentive to private sector, multiple benefits - all are important for a functioning MBI
Compulsory use of catalytic converter	CAC	Not enacted	--	Proper technical evaluation of a proposed strategy is needed, before implementation
Ban on use of wood in brick kilns	CAC		Success - qualified	Fuel choice primarily governed by economics - high sulphur coal is generally cheaper than wood currently (unless in remote areas), monitoring and enforcement lax in rural areas
Lane based traffic	CAC	2010	Failure	Trying to impose a policy very quickly, without education and advertisement campaigns does not work, not enforced
Carpooling	CAC	2010	Failure	Unrealistic proposals certainly do not work!
Colored kerosene	CAC		Unclear	Price is an important issue, monitoring difficult
Ban on import of high Sulphur coal	CAC		Failure	CAC did not work when many polluters are financially affected (fuel choice governed by economics), especially

				when they have a strong lobby to overturn the ban
ICS Programs	--	--	Success - qualifie d	There is lack of awareness regarding IAP. Involvement of community, especially women, and innovative financing (e.g., microcredit) are important for success of program.

Government initiative to reduce air pollution: In 2002, rules were proposed to ban buses older than 20 years or trucks older than 25 years from Dhaka city. Bangladesh government has banned the import of vehicles older than 5 years, and also reduced import duties on newer vehicles. Vehicle emissions standard was tightened in 2005 to correspond to Euro 2. Since withdrawal of two stroke engines the air quality of Dhaka has been stable over the past decade even though economic activity and the number of sources including passenger cars, number of registered vehicles and brick kilns are increasing. This might be the impact of government policy implementation. Government has been preparing a roadmap to cut the use of high sulfur content energy. According to the draft roadmap, import of diesel containing over 500ppm sulfur content will not be allowed anymore. The ceiling of 50ppm sulfur content for imported diesel will go into effect by 2023.

Findings of stakeholder's interview and consultative meeting: We identified more than 26 individuals and 10 different institutes/organizations those are involved in research and air pollution control activities. It was unanimously agreed that there is research gap on air pollution and its health effect.

Research Gap: The participants opined that there is need to do source apportionment study particularly in industrial zones and big cities. They also underscored to carry out such studies in regional concept and carry out source apportionment studies on air pollutants those enters into Bangladesh from neighboring countries.

Research on health effect of Ambient Air Pollution (AAP) should be done to have evidence based data in Bangladesh.

Research on understanding of emission sources, spatial and temporal variation of pollution, population exposure and health effects in major urban centers and other pollution hot-spots.

Promoting research on development of options for control/ reduction of air pollution from major sources along with their health benefits and costs;

Promoting research on indoor air pollution, including improved cook stove and alternative/ less polluting fuel for domestic use

RECOMMENDATION

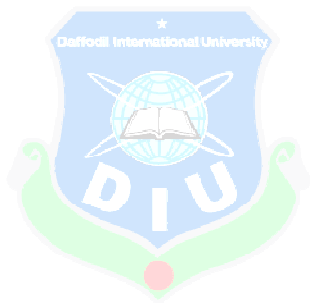
Priority areas of research may be as follows:

- Identification of priority areas of research involving all stakeholders;
- Encouraging and supporting research initiatives for better understanding of emission sources, spatial and temporal variation of pollution, population exposure and health effects in major urban centers and other pollution hot-spots (e.g., industrial areas);
- Promoting research on development of options for control/ reduction of air pollution from major sources along with their health benefits and costs;
- Promoting research on indoor air pollution, including improved cook stove and alternative/ less polluting fuel for domestic use;
- Disseminating research findings and background research data widely in order to enhance cooperation among researchers.
- Technical coordination and cooperation among institutes those are working in Air Pollution and Air Quality Management areas.

- Development of a reliable emissions inventory for large cities and the whole country must be a priority for proper evidence-based policy making in future.
- Develop capacity of DOE to carry out research on ambient

CONCLUSION:

Government's policy and regulation to control air pollution is good; but lacks stringency in application due to lack of manpower and logistics. Capacity of DOE must be strengthened. DOE should take the leadership to strengthen coordination among research institutes and share of experiences. Source apportionment study and health effect of air pollution is emergent need.



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