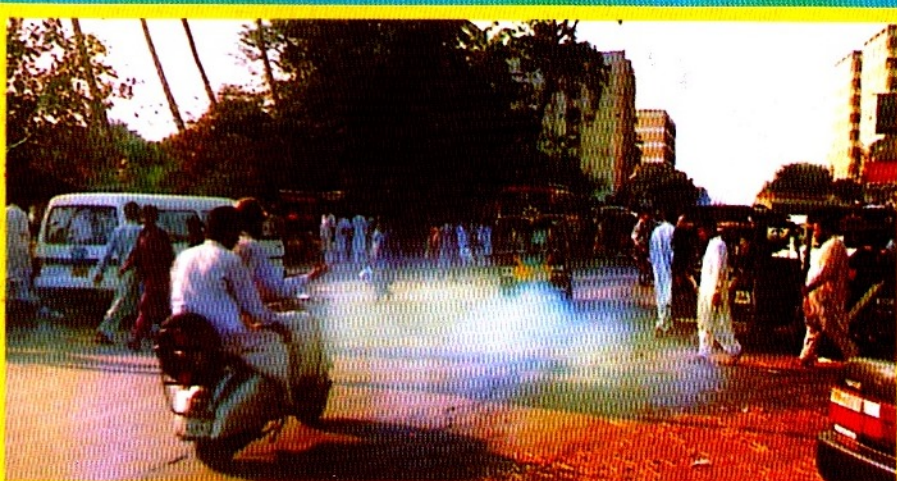


# Air Pollution in Asian Cities



Edited by  
Quamrul Islam Chowdhury

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Editor  
**Quamrul Islam Chowdhury**

A publication of  
**Forum of Environmental Journalists  
of Bangladesh (FEJB)**



# **Air pollution in Asian cities**

a study report on the state of regional air quality

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# Preface

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We have chosen air pollution as the theme of our first Asian Study for obvious reasons. Those of us living in these Asian cities -- and others from different continents who have been in these cities on short visits - must have already realised how direly air pollution is poisoning life and degrading the environment of urban Asia. Today, people living in most cities of the world experience the problem of air pollution in varied degrees. We had dispatched a number of teams to some selected Asian capitals to take a look at the problem of air pollution in those cities and see how they are trying to tackle it. We then organised a two-day Global Workshop of Environmental Journalists on "Curbing Air Pollution : Role of the Media" in Dhaka on March 5-6, 2000. The member of Forum of Environmental Journalists of Bangladesh (FEJB) in collaboration with Commonwealth Environmental Journalists Association (CEJA) and Asia-Pacific Forum of Environmental Journalists (APFEJ) accomplished the task.

This publication is the outcome of both the field trips and the Global Workshop -- an humble attempt to provided some insights into the problem of urban air pollution in Asia. The study team members, especially the visiting delegates and resource persons from abroad, contributed valuable inputs that helped us to come up with this report.

The global workshop, though it was a short one, gave us an opportunity to share experiences with the participants and resource persons who discussed the problem as well as remedial measures being taken in their respective countries to curb air pollution. Indeed, the workshop gave us another occasion to cross-fertilise our knowledge and swap experiences. We, as journalist, have this particular responsibility of creating awareness and drumming up support for action-oriented policies to curb the deadly air pollution.

We believe that humankind has a natural right to clean fresh air, which is the most precious of all natural resources. And we have to renew our pledge to protect that right as well as our environment. cursory field trips and a two-day workshop are really not enough for delving deeper into a serious environmental problem like air pollution. We wish that both the workshop and the field visits could have been of longer duration to enable us to address more detailed aspects of the hazards of air pollution which is adversely affecting the lives of the teeming millions in the Asian cities. But these efforts are not the last -- we will have many more of such studies in the days ahead.

Indeed, air pollution today is virtually slow-poisoning humankind all over the world, particularly in the urban centres. But this is the fall-out of our own consumeristic civilisation, which has encouraged rampant industrialisation, the swiftly increasing use of automobiles and rapid urbanisation. We know this one study report will certainly not result in any tangible outcome overnight; but let us say that this is just the beginning -- we will have many more of this kind of report to sensitise the people about the environmental issue and mainstream it in our respective national media.

But there has been at least one immediate benefit from this study. Visiting various cities gave us an opportunity to realise the magnitude of the problem that is bedevilling life in those burgeoning urban centres which are growing both horizontally and vertically by the day. Let me quote Frederick Temple, the World Bank Country Director in Dhaka. He began his address at our workshop by saying: "Dhaka's air pollution problem is very serious. The air we breathe is world-class dirty". These two sentences summed up the magnitude of the problem of air pollution in Dhaka city. Mr. Temple had related the economic value of the health costs of urban air pollution in Bangladesh, estimated to be between US \$ 60 to US \$ 240 million per year. The man on the street, particularly the down-and-outs who work outdoors -- and many of those who live in the open air - - have been the most exposed and are most vulnerable to the hazards of air pollution.

Industrialisation and mechanised vehicles are the major sources of air pollution. But again those are the inevitable



accompaniments of increased economic activity. The number of automobiles is increasing dramatically in Dhaka city at the rate of 10 per cent annually. This is creating traffic congestion and severe air pollution.

But air pollution is really a governance problem. During our field trips to other cities, we came to know how good administration helped curb air pollution in places like Bangkok, Calcutta, Kathmandu and Lahore. On the other hand, we have seen how weak governance caused the rise of air pollution in cities like Dhaka and Karachi. Then again, it is also a fiscal and monetary problem -- curbing air pollution costs money and can involve fiscal measures -- which makes it difficult for poor countries like Bangladesh to combat environmental pollution effectively. The problem should be on the agenda of the government as well as of the political parties.

Lastly, as we present this report, we want to say that though we have started to "think globally", we will now have to act locally, at our respective national levels, to ensure our right to clean, fresh air. That is the main message of this publication.

**Quamrul Islam Chowdhury**  
Chairman, FEJB and CEJA  
and Secretary General, APFEJ





Photo: Abu Taher Khokon and Azizur Rahim Peu, FEJB

Traffic police on duty on the streets of Dhaka, Bangladesh's capital, putting on masks against black smoke emitted by three-wheeler autorickshaws.

## AIR POLLUTION IN ASIAN CITIES





Rising number of automobiles in Dhaka  
making the city's air world-class dirty.

Photo: Bulbul Ahmed, FEJB

# Smoke and haze over Dhaka's sky line

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By Quamrul Islam Chowdhury  
with Gaziur Rahman, Mostafa Kamal Majumder  
and Bakhtiar Rana

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**T**he long queue of the victims of the pall of yellow-orange haze that blankets Dhaka city, the capital of Bangladesh, gets longer everyday, and the number of patients suffering from respiratory diseases continues to rise unabatedly. Smoke and dust are ubiquitous throughout the city. Trees and ponds and empty spaces continue to disappear at an alarming rate. The once green, tree-filled town is now a horrific jungle of concrete and bricks, with the dirtiest air and water in the whole world. It is becoming more and more unliveable, and is heading for disaster unless drastic steps are taken to protect its environment.

Dhaka, which is both the nation's administrative capital and business hub, has a total estimated population of more than nine million, which is an unbearable burden for the city's limited facilities. The population is expected to swell to 16 million by the year 2015, making Dhaka the seventh most populous city in the world. This overcrowded city is already considered to be one of the world's most polluted urban centres, so what will happen when the population reaches the above figure boggles the imagination.

**Nowadays, on any working day, a filthy grey haze, composed of vehicular emissions and dangerous chemicals from the smoke of factories, blankets the city.**

Nowadays, on any working day, a filthy grey haze, composed of vehicular emissions and dangerous chemicals from the smoke of factories, blankets the city. The smog causes the eyes to water, and coats the lungs with layers of microscopic, noxious soot, which is composed of dangerous particulate matter.

Emissions from all types of motor vehicles like cars, jeeps, buses, trucks, mini-buses, micro-buses, two-stroke engine-powered vehicles (auto-rickshaws, tempos, mini-trucks) and



**According to an assessment made by the DoE, 80 per cent of the 200,000-plus automobiles that ply Dhaka's streets are faulty and emit black smoke in excess of the prescribed limit. Black smoke is primarily unburned carbon that is agglomerated into small particles caused by over-loading and faulty condition of the vehicles' engines.**

motor cycles have been unabatedly polluting the city's air. Aircraft, railway engines, industrial plants, power plants, brickfields, open incineration, solid waste disposal sites and dust particles are also contributing to the air pollution. Dust pollution due to road diggings, construction and other development activities further aggravates the city's air pollution problem.

The principal pollutants from gasoline-powered internal combustion engines are carbon monoxide, hydrocarbons, nitrogen oxides, sulphur dioxide, particulates of lead compound and unburned carbon particles (soot).

Emissions from diesel engines are smoke, carbon monoxide, unburned carbon, nitrogen oxides and sulphur dioxide.

The Department of Environment (DoE) has procured sophisticated equipment to detect air polluters in the city, particularly the automobiles that belch out black smoke. DoE has also set up modern laboratories to determine the nature and quantum of air pollution. But the fact is that the pollution level of air in Dhaka city has reached such a peak that no equipment is necessary to detect it. Anybody whose sense organs are working normally will, after a few breaths, realise how polluted the air is.

According to an assessment made by the DoE, 80 per cent of the 200,000-plus automobiles that ply Dhaka's streets are faulty and emit black smoke in excess of the prescribed limit. Black smoke is primarily unburned carbon that is agglomerated into small particles caused by over-loading and faulty condition of the vehicles' engines.

With growing urbanisation and affluence, the number of vehicles is also rising rapidly, causing more and more air pollution. Narrow roads, traffic congestion, poor quality of fuel and improper traffic management are further aggravating the air pollution problem.

The DoE and other concerned agencies and organisations have identified the two-stroke engines used in auto-rickshaws, tempos, mini-trucks and motor cycles, and leaded petrol, as the main culprits responsible for polluting Dhaka's air. Besides, many dilapidated vehicles, including 40-year-old trucks, are still plying in the city streets, emitting toxic gases at a dangerous rate. Among the polluting vehicles, the 2-stroke engine-powered auto-rickshaws (also called baby taxis) have been identified as the worst polluters. At present, there are about 35,000 baby taxis in Dhaka city, according to a Bangladesh Road Transport Authority (BRTA) source. (If unregistered vehicles were counted the number would have been much higher). The official revealed that the two-stroke engine of a baby taxi emits 13 times more smoke than a four-stroke engine of the same size. This is because the fuel combustion is not efficient in a two-stroke engine as lubricant is mixed with its fuel. As a result, unburned hydrocarbon is emitted in excessive quantities. Thus a baby taxi is sometimes found to emit more smoke than a bus of normal size.

The two-stroke petrol engines are less fuel-efficient and release about 30-100 times more unburned hydrocarbons and more carbon monoxide than the four-stroke or diesel engines, experts say. Two-stroke petrol engines do not have a proper lubrication system, and in most cases, the lubricant is poured into the fuel tank along with gasoline. This aggravates the situation by producing more hydrocarbon and soot in the exhaust.

Because of their excessive pollution, the use of two-stroke engines is now being discouraged in India, from where most of the three wheelers are imported, informed sources said. In view of the serious air pollution in the metropolis, an initiative was taken with World Bank support to introduce big buses in the city and discourage the plying of small automobiles, including baby taxis. The introduction of the premium bus service is an outcome of that initiative.

**About 50 tons of lead are emitted into Dhaka's air annually, so lead concentration is almost ten times the acceptable level... Lead content in the blood of drivers and office-goers was found to be as high as 120 ppm!**

**A recent monitoring of the air quality of the city shows that the concentration of suspended particles in the ambient air is many times higher than normal. This air, which the city dwellers and the road-users breathe regularly, contains lead in concentrations almost ten times above the government safety standard set by the Department of Environment, according to a survey conducted by the scientists of the Bangladesh Atomic Energy Commission (BAEC).**

According to available government statistics, the numerical growth of auto-rickshaws and tempos in Dhaka city in 1997 was 29 per cent, cars and jeeps 20 per cent, minibuses 6 per cent and buses only 0.6 per cent. It is estimated that the current demand for buses in Dhaka city is more than 5,000 against an existing fleet of 1,500. Then again, only 1,300 of the existing number actually ply in the streets, of which 1,100 are old and dilapidated. There are fewer than 200 buses of improved quality.

The International Development Association (IDA), the World Bank's concessionary lending arm, has recently announced the approval of a US\$ 177 million credit to help solve Dhaka's air pollution and traffic crisis under the Dhaka Urban Transport Project. The total project will exceed US\$ 234 million. Air quality management and control is a significant part of the project.

**Slow-poisoning of Dhaka city dwellers:** The citizens of metropolitan Dhaka are being slow-poisoned by air pollution. But the city dwellers are not aware that they are being slowly poisoned by lead particles dispersed in petrol, which is used as fuel. The fuel, when burnt, releases invisible lead particles into the air.

A recent monitoring of the air quality of the city shows that the concentration of suspended particles in the ambient air is many times higher than normal. This air, which the city dwellers and the road-users breathe regularly, contains lead in concentrations almost ten times above the government safety standard set by the Department of Environment, according to a survey conducted by the scientists of the Bangladesh Atomic Energy Commission (BAEC). According to an estimate made by BAEC, 50 tons of lead are emitted into Dhaka city's air annually and the emission reaches its highest level in the dry season,

from November to January. Earlier reports from scientific studies say the density of lead in the air of Dhaka city in the dry season reaches 463 nanograms (one nanogram is one billionth of a gram) per cubic metre, the highest in the world. The lead concentration in the polluted air of Mexico City is 383 nanograms and in Mumbai, India, it is 360 nanograms per cubic metre.

According to another survey, the concentration of lead in the blood of most people in Dhaka city is higher than the tolerable limit of eight parts per million (ppm). Lead concentration in the blood of automobile drivers and office-goers was found to be as high as 120 ppm!

**Effects of air pollution:** Air pollution adversely affects the respiratory tract, and causes irritation, headache, fatigue, asthma, high blood pressure, heart disease and even cancer.

Experts say that if this trend continues unabated, most residents of the metropolis will become exposed to the risk of these ailments and other complications. The mental faculties of the children will be impaired by lead pollution, which can also affect the central nervous system, and cause renal damage and hypertension. Excessive lead in the blood of children can damage their brains and kidneys. Scientific studies have revealed that children are three times more vulnerable than adults to lead poisoning. Dust pollution is causing many respiratory diseases, including asthma, according to concerned physicians and experts.

According to experts and physicians, children are the worst victims of air pollution as their breathing rate per minute is much higher than that of adults. Public exposure to air pollution in Dhaka city is estimated to cause 15,000 premature deaths and several million cases of sickness every year, said a recent World Bank report.

In Bangladesh, no survey has yet been made on the impact of air pollution on health. However, surveys on the quality

According to experts and physicians, children are the worst victims of air pollution as their breathing rate per minute is much higher than that of adults. Public exposure to air pollution in Dhaka city is estimated to cause 15,000 premature deaths and several million cases of sickness every year, said a recent World Bank report.

**The concentration of suspended particles at Farm Gate goes up to as high as 2,465 micrograms per cubic metre as against the allowable limit of 400 micrograms per cubic metre. The concentration of sulphur dioxide and nitrous oxide at this spot, however, was still below the permissible limit of 100 micrograms per cubic metre.**

of air in Dhaka city, made during the second half of the decade, show that pollution has attained alarming proportions. Automobile exhausts fill the air in Dhaka city with volatile organic compounds (VOCs) beyond tolerable limits; some of these compounds cause cancer.

Recently, Prof. Abul Hussam of the George Mason University, Virginia, USA, detected 200 organic compounds and identified 35 of them by analysing four air samples collected from the Shewrapara area of the city. It was the first such advanced analysis of air quality ever done in Bangladesh. The air samples were analysed at the time of installing ultramodern equipment at a

privately set-up research, development and technology centre in the area on August 18 and 19, 1998. The tests showed that exhausts of auto-rickshaws contain VOCs, the amount of which is four to (more than) seven times beyond the allowable limit. The presence of these compounds in the ambient air in Shewrapara is close to the threshold limits, the tests revealed.

The air quality analyses have been carried out on behalf of the Intronic Technology Centre being set up with financial support from Prof. Mohammad Alaiddin of Wagner College and City University of New York, USA. The centre -- having the capacity to test water and air quality, detect toxic trace constituents in them, and carry out trace element analysis of blood, urine, hair, skin lesions and other tissues - will be formally launched soon. Prof. Amir Hussain Khan, pioneer of trace analysis in Bangladesh, is the academic adviser of the centre.

Prof. Hussam said the analyses of the exhausts of auto-rickshaws showed the presence of toluene, a cancer-causing agent, at a rate of up to 200,000 micrograms per cubic metre as against the threshold limit of 2000 micrograms per cubic metre. The 35 volatile organic compounds identified included carcinogenics: benzene, toluene, octane, ethylbenzene, 1-



isocyanato- 3-methoxybenzene, propylbenzene, trimethylbenzene and butylbenzene. The tests, however, were conducted at a relatively less traffic-congested area in the metropolis. Prof. Alauddin said that a much higher concentration of air pollutants would have been found if tests were carried out at heavily congested areas like Hatkhola, Shapla crossing, Sonargaon crossing and Farm Gate. Prof. Hussam said that apart from automobile exhausts, chemical processing plants and biogenic sources contribute to the extremely bad VOC pollution of Dhaka's air. He shared the results of the air quality tests with the scientists of the Dhaka Centre of Bangladesh Atomic Energy Commission (BAEC).

**Areas worst affected:** The worst-affected areas in Dhaka city include Hatkhola, Manik Mian Avenue, Tejgaon, Farm Gate, Motijheel, Lalmatia, and the inter-district bus terminals. Surveys conducted between December, 1996 and June, 1997 showed that the concentration of suspended particles at Farm Gate goes up to as high as 2,465 micrograms per cubic metre as against the allowable limit of 400 micrograms per cubic metre. The concentration of sulphur dioxide and nitrous oxide at this spot, however, was still below the permissible limit of 100 micrograms per cubic metre.

**Prof. Alauddin said that a much higher concentration of air pollutants would have been found if tests were carried out at heavily congested areas like Hatkhola, Shapla crossing, Sonargaon crossing and Farm Gate.**

In the Tejgaon Industrial Area, on the other hand, the maximum concentration of suspended particles was 630 micrograms as against the allowable limit of 500 micrograms per cubic metre. However, the presence of sulphur dioxide in the air over Tejgaon I.A. was found to be higher than the maximum permissible limit of 120 micrograms per cubic metre. The tolerable limits of pollutants in the air are different for residential areas, industrial areas and commercial areas. The concentration of pollutants in Dhaka's air was the maximum during the dry months of December to March, according to surveys conducted by the DoE.

### **Fuel quality**

Sulphur and lead content of different fuels available in

Bangladesh are shown in Table-1 and 2.

Table-1: Sulphur content of different fuels available in Bangladesh.

Motor Gasoline-Premium	Max. 0.1 mass%
Motor Gasoline-Regular	Max. 0.1 mass%
High Speed Diesel (HSD)	Max. 0.1 mass%
Low Sulphur HSD	Max. 0.5 mass%
Light Diesel Oil	Max. 1.8 mass%
High Sulphur Furnace Oil	Max. 3.5 mass%
Kerosene	Max. 1.0 mass%

Table-2 : Lead content (as Pb) in Motor Gasoline available in Bangladesh.

Motor Gasoline- Premium	Max 0.84 g/l
Motor Gasoline- Regular	Max 0.5 g/l

## **Air pollution in several industries in Bangladesh**

### **Textile and dyeing**

Gaseous emissions adversely affect the health of workers due to inadequate ventilation and noxious vapours from the printing and dyeing operations of textile industries. These mills often burn their solid wastes in the open air or pay contractors to collect and dispose of the wastes. This is often done in an irregular and unscientific manner, characterised by dumping of wastes here and there. Nobody is using incinerators for burning solid wastes.

### **Tanneries**

Air pollution in tannery area is mainly caused by the emission of foul odour from putrefying raw hides and solid wastes. Foul odours also rise from open drainage channels, sedimentation pits and wastes dumped inside the tannery premises.

### **Pulp and Paper**

The most dangerous emissions from the Kraft pulp mills are sulphur dioxide, total reduced sulphur compounds and particulate matter, hydrogen sulphide and methyl. These are highly malodorous. This group originates mainly from the sulphate cooking process in the digester system, the brown stock washes, the multiple effect evaporators, the black liquor

oxidation, the recovery furnace, the smelt dissolving tank, the lime kiln and the condensate stripper system. The principal sources of particulate matter are the recovery furnaces, the smelt dissolving tank, and the lime kiln. Fly ash particles consist mainly of carbonates and sulphates. Chlorine emissions can occur but these are mostly of the diffused type and originate from tank vents, wash filters, sewers and other similar sources. The gases are mainly chlorine or chlorine dioxide. Generally, concentrations are not significant. Hydrogen sulphides can collect in the stock chests.

## **Cement**

Air pollution can originate from several operations:

Sl. No.	Source	Emission
1.	Raw materials grinding, handling	Particulate dust
2.	Kiln operation and clinker cooling	Particulate dust
	CO, HC, SO <sub>2</sub> , NO <sub>2</sub>	
3.	Product grinding, handling, packaging, shipping	Particulate (dust)

## **Metal industries**

A number of metals and surface treatment operations generate acid mists, particulates and solvent fumes. Toxic pollutants such as nitrous vapour, chromic acids and chlorides are emitted and may cause health hazards to workers and the residents of adjoining areas.

## **Fertilisers**

Severe air pollution may result from ammonia leakage during the production of nitrogen fertilisers. Phosphate fertiliser plants generate a considerable amount of dust while phosphate rock is being ground. Fluorine may be produced by the acidulation process. Specific air pollution problems are caused by Triple Super Phosphate (TSP) production.

## **Environmental legislation**

The Environment Conservation Act, 1995 and the Environment Conservation Rules, 1997 have been enacted by the Parliament. Under the Rules of 1997, the following standards have been set:

- Ambient Air Quality Standards.
- Vehicular Exhaust Emission Standards.
- River Transport (Mechanised) Emission Standards.

- Standards for Gaseous Emission for Industries or Projects.

Ambient Air Quality Standards are shown in Table-3:

Table-3: Ambient Air Quality Standards.

Concentration in micrograms per cubic metre

Area Category	SPM	SO <sub>2</sub>	CO	NO <sub>2</sub>
Industrial and mixed use	500	120	5000	100
Commercial and mixed use	400	100	5000	100
Residential and Rural	200	80	2000	80
Sensitive	100	30	1000	30

Vehicular emission standards are shown in Table-4:

Table-4 : Vehicular Emission Standards

Parameters	Unit	Standard Value
Black Smoke*	Hartridge Smoke Unit (HSU)	65
CO	g/km	24
	Per cent volume	4
Hydrocarbon	g/km	2
	ppm	180
Oxides of Nitrogen	g/km	2
	ppm	600

*\*Measuring at two thirds of maximum rotating speed.*

One of the primary objectives of the National Environment Policy 1992 is to identify and regulate activities which pollute and degrade environment. The primary purpose of enforcement measures is to stop or prevent polluting activities by making offenders accountable.

The Environmental Conservation Act 1995 also contains laws on the protection of environmental health and control of environmental pollution.

Articles 31 and 32 of the Constitution of Bangladesh guarantee the "right to life" of a citizen. In two recent cases, the Supreme Court has held that the "right to life", which is enshrined as a fundamental right, includes the "right to a healthy environment".

Effective cooperation of the public in general and the

concerned agencies in particular was lacking in the implementation of all laws and regulations for reducing air pollution. There was almost no cooperation by the transport owners, drivers and other transport workers in this regard.

**Steps taken so far:** Against this backdrop, the daily monitoring of automobiles at certain points in Dhaka city, recently initiated by the Department of Environment (DoE), did not work out due to non-availability of the members of the law-enforcing agencies. DoE has not succeeded in continuing the checking of vehicles even at one single point near the Parliament building.

**Against this backdrop, the daily monitoring of automobiles at certain points in Dhaka city, recently initiated by the Department of Environment (DoE), did not work out due to non-availability of the members of the law-enforcing agencies. DoE has not succeeded in continuing the checking of vehicles even at one single point near the Parliament building.**

DoE officials initially faced resistance from auto-rickshaw drivers who were suspicious of the initiative and even tried to attack them. They, however, succeeded in making them understand that monitoring the state of the air is in the interest of public health. DoE requires the cooperation of the Bangladesh Road Transport Authority (BRTA) and Dhaka Metropolitan Police (DMP) to monitor the extent and quality of automobile exhausts. It also needs the services of the Dhaka Metropolitan Magistracy to penalise owners and drivers for not maintaining smoke emission standards.

Preventive measures like publicity campaigns against the dangers of excessive emission of black smoke have so far been inadequate. The curative measures like the daily checking of automobiles for penalising the offenders are also not being pursued vigorously.

The DoE had a programme of organising mobile courts every month in cooperation with the BRTA, DMP and Dhaka Metropolitan Magistracy for some time. The owners and operators of faulty and polluting vehicles were penalised. But on many occasions, the mobile courts actually did not function due to lack of coordination among the four agencies involved.



**Preventive measures like publicity campaigns against the dangers of excessive emission of black smoke have so far been inadequate. The curative measures like the daily checking of automobiles for penalising the offenders are also not being pursued vigorously.**

The measure, thus, did not produce any tangible results in controlling air pollution in the city.

An assessment made by DoE suggests that about 80 per cent of the over 200,000 automobiles that ply in the streets of the metropolis emit smoke in excess of the prescribed limits. By late 1996, BRTA had taken a decision not to allow more than 35,000 imported three-wheelers in Dhaka city. To achieve the objective, it had decided to give registration to not more than 35,000 three-wheelers per year. BRTA had also decided to

restrict the registration of 'Mishuks', a locally-manufactured auto-rickshaw, to 500 a year in the city. (BRTA officials believe that Mishuks, with their 4-stroke engines, emit less smoke. But then, they add to the problem of traffic congestion).

An attempt was made not only to control automobile pollution but also to reduce traffic jams by implementing the above decision. But the decision was challenged in the High Court Division of the Supreme Court by one Ali Murad Habib, and the learned court imposed an injunction. Meanwhile, the baby taxi manufacturers are said to be lobbying hard with the authorities concerned to soften their attitude towards the 2-stroke three-wheelers. Representatives of manufacturing companies are claiming that they have evolved a special lubricant for use with fuel to reduce emission of black smoke.

**Way ahead (policy and planning issues):** A consultative meeting was recently organised by the World Bank in association with the DoE and the Bangladesh government. The Atomic Energy Commission reportedly came up with some important recommendations on an integrated approach to vehicular air pollution control in Dhaka. They deserve the attention of the government for implementation. The meeting called for the creation of public awareness about the magnitude of the problem as well as on the need to use unadulterated fuel and lubricants in motor vehicles.

The meeting suggested the phasing out the use of leaded petrol as soon as possible, stopping the issuance of new licences and route permits to three-wheelers with 2-stroke engines and phasing out the existing 2-stroke engine-powered three-wheelers. It was further suggested that the sale of loose lubricants should be stopped to prevent adulteration and the use of compressed natural gas (CNG) in vehicles should be promoted. The meeting also suggested that the big gaps in the prices of gasoline, diesel and kerosene should be removed to prevent adulteration.

The participants at the meeting called for increasing fines for repeated violation of motor vehicles regulations and for establishing emission standards for all types of vehicles. Daily inspection of motor vehicles was emphasised. They further recommended effective transportation planning to promote mass transit in the city through building a route network for big buses. The need for improving traffic planning was also underlined. The meeting called for ensuring the effectiveness of air pollution control programmes through regular air monitoring.

**An attempt was made not only to control automobile pollution but also to reduce traffic jams by implementing the above decision. But the decision was challenged in the High Court Division of the Supreme Court by one Ali Murad Habib, and the learned court imposed an injunction.**

The government and the relevant agencies are well aware of these recommendations. What is needed is their implementation through participation of all the stakeholders. Organisations of Dhaka-dwellers should be promoted to build up pressure to establish their right of access to clean air in the metropolis. The owners and operators of motor vehicles should be made aware of the need to stop excessive vehicular emission, not only in the interest of the residents of the city, but also in their own interest. A package of incentives should be given through policy measures that should also financially benefit the owners and operators of environment-friendly vehicles.

Meanwhile, the government has recently decided to ban the import of motor vehicles powered by two-stroke engines in order to curb air pollution. News reports say that under the

**The government and the relevant agencies are well aware of these recommendations. What is needed is their implementation through participation of all the stakeholders. Organisations of Dhaka-dwellers should be promoted to build up pressure to establish their right of access to clean air in the metropolis.**

decision taken at a high level meeting, the movement of vehicles like baby taxis and auto-rickshaws will be prohibited, in phases, in the four metropolitan cities of Dhaka, Chittagong, Khulna and Rajshahi within five years. The government has also decided to offer financial incentives for converting four-stroke automobiles using petrol and diesel to compressed natural gas (CNG) that is low in sulphur content and has no lead. Registration and renewal fees of such vehicles will be reduced.

These are the decisions taken in the light of the long debate among the environment journalists and their

environmental campaign over the years. One should, however, take note of the fact that the decisions are also subject to changes and modifications. In our government's case, most often, decisions are taken only to flout them subsequently. Implementation of decisions is very important. We should make sure that phasing out the most polluting vehicles does not take a long time. What today is a soluble problem may become insoluble tomorrow. We just cannot afford to waste any time at all in protecting our environment.

## Cash incentive for CNG conversion

**Kazi Shahnaz**

The government is likely to provide financial incentive to auto-rickshaw owners for converting their petrol-fuelled two-stroke engine vehicles into engines using Compressed Natural Gas (CNG) to help reduce air pollution level in capital Dhaka.

Environment and Forest Secretary Syed Marghub Murshed said this at a press briefing on April 19, 2000, while announcing a plan for 'CNG conversion' of the city's worst polluters -- about 50,000 auto-rickshaws.

The Department of Environment (DoE) has taken up Bangladesh Environmental Management Project (BEMP) under which some auto-rickshaws using CNG will be run on an experimental basis in the city in the coming months. The project, supported by Canadian International Development Agency (CIDA), targets conversion of the existing fleet before a ban on auto-rickshaws is imposed in phases over the next few years. CIDA is providing a grant of 10 million Canadian dollars for the project.

Tests have already been conducted on Bajaj auto-rickshaws in Toronto, Canada, as part of a CNG conversion programme in Pakistan, acting head of CIDA Monique Angers told the press briefing held at the DOE. BEMP engineer Rory Wong estimated the conversion cost to be about Tk. 20,000 for an auto-rickshaw. But the cost could be reduced, he added. Wong said a gas cylinder similar to a scuba diver's oxygen cylinder would be fitted under the seat of an auto-rickshaw. It would not only reduce air pollution level but also provide financial incentive to the drivers, facilitating a 200-250 km run with a full cylinder.

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Murshed assured that CNG would be made easily available, ending the current hassles. The state-owned Rupantarita

Prakritik Gas Company, set up in the early eighties, has been providing CNG to all converted vehicles. The Environment Secretary said that along with the CNG conversion programme for auto-rickshaws, the government plans to phase out auto-rickshaws in 12 years, ban further import and discourage their use by imposing 300 per cent duties.

Solutions are being sought for controlling the city's pollution without entailing drastic and painful action that might cost jobs and transport disruption. Autorickshaws with two-stroke engines that cause incomplete combustion have been listed as the principal cause of air pollution in the city. Concentration of lead in the city's air rose to such a high level that the government is now contemplating to impose a ban on the import of auto-rickshaws.

The environment-friendly CNG holds great promise in this regard. Conversion of two-stroke engines into CNG-powered vehicles is considered to be feasible from environmental, economic and technological points of view. CNG-powered autorickshaws are non-pollutant and entail lower maintenance cost. It is important to note that bad maintenance of vehicles is one of the causes of air pollution.

To carry out mandatory conversion of autorickshaws speedily, logistics and management will have to be improved. The initial cost of conversion may prove forbidding for many. Here local technology and technocrats can do their bit to bring down the cost. Also, fiscal and other incentives may be provided for conversion of the vehicles.

It should be realised that while conversion will limit the level of pollution, it will not ease traffic jam. If the mileage cost of CNG-run autorickshaws falls, which one would reasonably expect, the fare may also decrease, which means that more people will want to hire autorickshaws and greater demand will lead to larger supply and more of such vehicles will ply on the city roads. The present number of autorickshaws is estimated to be about 50,000. Switchover to CNG as fuel is no doubt a sound option to improve the environment, but at the same time it should be ensured that dependence on autorickshaws -- which have already become a major mode of urban transport - is not allowed to increase.

# Media can make a difference

Frederick T. Temple

Dhaka's air pollution problem is very serious. The air we breathe is world-class dirty. The measured range for ambient particulate matter in Dhaka is from a low of 300 to an extreme high of 2,400 micro grams per cubic metre, which on an average is more than three times higher than the 1998 World Health Organisation guidelines and the Bangladesh limit. The economic value of the health costs of urban air pollution in Bangladesh is estimated to be between 60 and 240 million dollars per year.

The poor are particularly affected by air pollution. They are more exposed, because they work in the streets for long hours and at times live and die by the side of the road. Their poor nutrition and general health means they have less resistance to disease, which problem is compounded by their limited access to health care. With little or no savings, a day lost to ill health can mean a day without meeting basic needs, further contributing to a vicious circle of sickness, reduced productivity and lower income. In more general terms, the health costs associated with air pollution slow the economic growth that is essential if Bangladesh has to significantly reduce poverty.

Vehicular pollution and measures to curb it : Motor vehicles are a major source of air pollution. As we all know, the air is especially foul along the main traffic corridors, and breathing has become very difficult. The number of vehicles is increasing dramatically at more than 10 per cent per year, adding to the already congested traffic and affecting the health of children and elderly people, especially the poor.

Priority actions to reduce air pollution must include efforts to improve the quality of fuel and lubricants used by motor vehicles. If an engine burns low quality fuel and oil, it will emit a lot of pollutants, no matter how well maintained the engine is.

**Priority actions to reduce air pollution must include efforts to improve the quality of fuel and lubricants used by motor vehicles. If an engine burns low quality fuel and oil, it will emit a lot of pollutants, no matter how well maintained the engine is.**

**The sale of loose oil at petrol stations should be stopped. Baby taxi drivers could purchase high quality two-stroke lubricating oil either in small sachets or pre-mixed with petrol. This will not necessarily cost them more money. Because of misconceptions and pressure from petrol pump operators, baby taxi drivers currently mix about 10 per cent lubricating oil with their petrol.**

Leaded petrol was phased out overnight last year, which is an important achievement of which Bangladesh can be proud. This was an important step that alone will reduce neurological damage to children and may reduce annual health costs by up to US\$ 40 million. But a number of further steps need to be taken urgently to improve fuel and lubricant quality, if any improvement in air quality is to be achieved in the near future.

First, two-stroke vehicles, particularly baby taxis (auto-rickshaws), should use lubricating oil designed for two-stroke engines. Most baby taxi drivers use straight-run mineral oil, sold to them in open containers with no quality control. Straight-run mineral oil, particularly

when contaminated by uncontrolled recycling, is more difficult to burn and causes higher emission of pollutants. The sale of loose oil at petrol stations should be stopped. Baby taxi drivers could purchase high quality two-stroke lubricating oil either in small sachets or pre-mixed with petrol. This will not necessarily cost them more money. Because of misconceptions and pressure from petrol pump operators, baby taxi drivers currently mix about 10 per cent lubricating oil with their petrol. This is more than the amount recommended by the manufacturer, Bajaj, and further increases air pollution. If they switch to the recommended 3-4 per cent of two-stroke oil, emissions will be reduced at no additional cost to the driver.

Secondly, the fuel and oil sold at the petrol pumps must meet the relevant specifications. Independent tests of the petrol sold in Dhaka show that about half the fuel is adulterated, causing higher emission of pollutants. Controlling such adulteration is partly an issue of governance and partly one of economics. Government action is required to ensure that fuel and lubricants meet appropriate standards at all stages -- from production, through distribution, to retail sales. This will require a clear definition of regulatory responsibility, separated from any commercial interest, with transparent reporting.

But there would be far less incentive for unscrupulous elements to contaminate petrol with kerosene if the current difference in the price of the two fuels was reduced. When the government increased the price of petrol in August, 1998 by almost 60 per cent, the Bangladesh Petroleum Corporation (BPC) -- the state-owned petroleum marketing agency -- saw a decrease in demand for petrol and a corresponding increase in demand for kerosene. One doesn't need to be an investigative reporter to conclude that the adulteration of petrol increased with the increase in price.

Thirdly, the octane level of standard petrol should be raised. The current octane level of standard petrol in Bangladesh does not meet the minimum requirement of modern vehicles. The present standard of 80 RON is below the 87 RON minimum required for baby taxis, motorcycles and scooters, and for passenger cars a minimum 91-92 RON is required. Running on low octane increases the emission of pollutants, and also causes damage to engines.

**But there would be far less incentive for unscrupulous elements to contaminate petrol with kerosene if the current difference in the price of the two fuels was reduced.**

Fourthly, the level of sulphur in diesel must be reduced. The current limit of 1 per cent sulphur by weight ranks among the highest in the world. At this level, sulphur makes a serious contribution to the formation of fine particulates, which are the most serious air pollution problem in Dhaka. Urgent measures are needed to reduce the level of sulphur, initially to 0.5 per cent by weight and then in stages down to 0.05 per cent in the long run.

Finally, the unlicensed sale of fuel and low quality lubricant must be stopped. It has been estimated that more than 10 per cent of the fuel sold in Dhaka is purchased from unlicensed dealers, who mix petrol, diesel, and kerosene with no concern for the resulting air pollution. The police, who suffer more than most from bad air quality, are in the best position to prevent these illegal sales.

**Introducing vehicles with cleaner burning engines : The**



above-mentioned five steps to improve the quality of the fuel and lubricants used by motor vehicles are priority actions to improve urban air quality in the short term. Beyond these priority actions, a range of medium to long term measures should also be considered.

**Even with good quality fuel and oil, two-stroke engines pollute more than four-stroke engines. Two-stroke engine-powered vehicles, especially baby taxis, contribute about one-third of vehicular particulate emissions in Dhaka, although they represent only a small fraction of the total fleet.**

Even with good quality fuel and oil, two-stroke engines pollute more than four-stroke engines. Two-stroke engine-powered vehicles, especially baby taxis, contribute about one-third of vehicular particulate emissions in Dhaka, although they represent only a small fraction of the total fleet. Each year, two-stroke engine-powered vehicles alone may be responsible for over 400 premature deaths. A second success of which Bangladesh can be proud is that the 50 per cent supplementary duty imposed on two-stroke baby taxis has effectively halted their import. Uttara Motors, the sole licensed importer of Bajaj baby taxis, reports that after

clearing stocks, no new two-stroke three-wheelers have been sold since November, 1999.

The challenge now is to phase out the existing two-stroke fleet and to replace it with cleaner transport alternatives. In fact, the government has already made a number of commitments to this effect. In April 1998, the Department of Environment and The World Bank sponsored a workshop on vehicular air pollution control in Dhaka. The recommendations arising from this workshop included a ban on new licenses for two-stroke three-wheelers in Dhaka and an action plan to phase out the existing two-stroke three-wheelers within five years. While preparing the Dhaka Urban Transport Project, supported by The World Bank, the government made a commitment to stop registration of additional two-stroke three-wheelers in Dhaka after July 1, 1999, and to phase out from Dhaka all existing two-stroke engine three-wheelers by January 1, 2003.

In fact, these commitments are a minor extension of a pre-existing agreement signed in 1997, between the Dhaka City

Auto-rickshaw Business Owners Association, the Bangladesh Road Transport Authority (BRTA) and the Ministry of Communications. This agreement states that three-wheelers older than nine years cannot ply within Dhaka and will not be sold into the metropolitan areas of Rajshahi, Chittagong or Khulna. All that is required now is an effective mechanism to implement these commitments.

**Closing the price gap between petrol and kerosene, stopping the unlicensed sale of poor quality fuel and the introduction of vehicles with engines that burn more cleanly will lower pollution from well-maintained vehicles.**

While phasing out two-stroke three-wheelers, cleaner transport alternatives must be promoted. Access to transport is important for the economic growth necessary to raise the incomes of the poor. It is expected that later in the year 2000, four-stroke petrol engine three-wheelers will become available. Eliminating the supplementary duty on them, while taking swift measures to remove old two-stroke baby taxis, will help accelerate the replacement of the existing three-wheeler fleet with cleaner vehicles.

Given the abundance of natural gas in Bangladesh, Compressed Natural Gas, or CNG, is a potential option as a much cleaner alternative fuel for urban transport. Switching to CNG would dramatically reduce the emissions of fine particulates, responsible for many respiratory symptoms and premature deaths. The city has five CNG stations and many people and quarters, including The World Bank, converted their cars to be able to use this fuel. Due to lack of spare parts, however, stations are often closed, and those that are open have long queues. Many of these difficulties could be overcome if the government deregulated the sector and allowed private operators to compete. The World Bank would like to encourage privatisation of these ventures and the introduction of greater competition, which will bring higher efficiency and more foreign investment to Bangladesh.

Closing the price gap between petrol and kerosene, stopping the unlicensed sale of poor quality fuel and the introduction of vehicles with engines that burn more cleanly will lower pollution from well-maintained vehicles. When this happens, it will become more important to enforce existing regulations on vehicle emissions, to increase the incentive for improved

**Pollution is also a governance problem.**

**Even if Bangladesh gets its fuel prices right, enforcement of fuel quality and vehicle emission standards will still be necessary to encourage improved engine maintenance and to get the wrong types of vehicles off the streets. This is where journalists and other elements of civil society have critical roles to play.**

maintenance. Now there is essentially no enforcement, so this will be a major challenge.

**The air quality management project:**

The World Bank is currently assisting the Department of Environment to formulate a project to improve the air quality in Dhaka. The activities under this project include : staff and equipment for improved enforcement to eliminate gross polluters; the identification of control options for three-wheelers and buses; air monitoring and modelling; health assessment; awareness raising of drivers and people in general; and the assessment of sources of pollution for better policy decisions. The success of this project will depend on the

collaboration of stakeholders and policymakers from the environment, transport and energy sectors, and dynamic partnerships among the government, private sector and the general public. As the Department of Environment executes this project, we hope that such partnerships can be nurtured to ensure the long-term sustainability of the air quality management programme in Dhaka.

**Improving air quality requires good economics and good governance :**

Let me summarise much of what I have said by saying that the solutions to Dhaka's air quality problem have to be partly economic and partly governance. The economic solution lies mainly in closing the gap between petrol and kerosene prices. This gap provides an incentive all down the supply chain for people to make money by adulterating petrol with kerosene, with disastrously polluting consequences. The solution is either to close the price gap or improve enforcement of fuel quality. We should recognise the fact that effective enforcement is likely to be very difficult, and since there will be many other economic benefits from equalising the economic prices of petrol and kerosene, this is not only the preferred solution, but also the more feasible one.

Pollution is also a governance problem. Even if Bangladesh gets its fuel prices right, enforcement of fuel quality and vehicle emission standards will still be necessary to encourage improved engine maintenance and to get the wrong types of vehicles off the streets. This is where journalists and other elements of civil society have critical roles to play. As we have seen in many countries, regulations often provide opportunities for the enforcers and those being regulated to strike corrupt deals. This kind of corruption will only disappear when there are pressures on the regulators to perform honestly. Journalists can play very important roles both in improving public awareness and in being vigilant about lax enforcement and reporting it.

There seems to be a consensus that the quality of life in Dhaka is declining, and the rise in air pollution is a major contributing factor. The success of efforts to curb air pollution will depend on collaboration among policy-makers and stakeholders from the environment, transport and energy sectors, and dynamic partnerships among the government, private sector and general public. The media have a vital role in building the consensus necessary for such partnerships to develop. Good investigative reporting of the technical issues involved can build the understanding and political support that will be necessary for decisive action to be taken and, perhaps most importantly, can be a significant force to reduce the corruption that can prevent even the best policies from achieving their objectives.

# Automotive pollution control in earnest

Md. Reazuddin

The atmosphere is a highly complex medium. When it is used as a receptor for anthropogenic emissions of various waste materials, the complexity of the situation deepens considerably. Primary pollutants are directly emitted into the atmosphere from sources on the earth's surface, and secondary pollutants are created through chemical interactions between primary pollutants and various atmospheric components, such as moisture. Over the past two decades there has been a growing realisation that the complexities of the pollutants' interaction with the atmosphere are not confined to a local or regional scale. Movement of pollutants several thousand kilometres away from source regions due to atmospheric circulation systems has expanded air quality problems to continental and global scales.

The potential impacts from expanded air pollution problems on the biosphere and the quality of life have not escaped public attention. There have been protests in Canada concerning acid rain, because its major sources are located in the United States; concern among island nations in the Pacific Ocean over potential increase of the sea level due to the greenhouse effect; warnings of increased skin cancer in Australia for which the depletion of the stratospheric ozone layer is blamed; and a variety of other environmental problems. Consideration of air pollution problems on a global scale requires a revision in thinking -- the narrow, local viewpoint must be discarded in favour of the global viewpoint. The use of the word "global" in this case does not necessarily mean that the pollutants in question encompass the entire world. The importance of global thinking regarding air quality can be emphasised by the following the interlines between air

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pollutants and their host medium, the atmosphere:

- Air pollutants are inseparably associated with changes in the earth's chemical climate.
- The various air pollution problems involve many of the same pollutants emitted from the burning of fossil fuel. Changes to solve one problem will affect others.
- Secondary pollutant formation of various species occurs under similar photo-chemical or aqueous transformation processes during both short and long range transport.
- Pollutants act both alone and synergistically to increase natural stresses on ecosystems. Processes are either known or suspected.
- As an overall group, air pollutants create increased risk, either directly or indirectly, to human health, cultural resources, and atmospheric visibility. Risks to the structure of society, through the workplace, home environment, recreational environment, and lifestyle have also been documented.

Estimates of global problems created by anthropogenic emissions are often based on incomplete data sets and computer models that have limited accuracy. However, there is a growing consensus in the scientific community that such problems as acid rain, the greenhouse effect, and stratospheric ozone depletion are serious and that governmental and economic actions are required to limit their impacts. There are indications that some governments are beginning to respond, both politically and economically.

**Estimates of global problems created by anthropogenic emissions are often based on incomplete data sets and computer models that have limited accuracy.**

### **Air pollution characteristics :**

Air pollution characteristics of a particular region are determined by:

- the type and amount of pollutants in the air and their sources of emission, both mobile and stationary;
- the topographical and meteorological conditions affecting dispersion, concentration, and trans-boundary transport of pollutants;

- the mix of factor inputs and technology applied in economic activities, and their impact on types and levels of emissions;
- the scale of economic activity and population density to assess exposure to pollutants; and
- estimated dose-response functions for various pollutants to assess health and welfare impacts.

### **Types and sources of air pollutants :**

Air pollutants are classified in two categories : primary, if emitted directly into the atmosphere by a stationary or mobile

**There are natural as well as anthropogenic sources of air pollutant emissions.**

**Among the natural sources are forest fires and volcanoes, as well as swamps, oceans, lakes, vegetative matters and insects.**

**Anthropogenic sources include industrial processes, power generation, commercial and domestic fuel use such as wood or coal , solid waste disposal (for example, incineration), slash and burn cultivation practices and motorised transport.**

source; and secondary, if formed in the atmosphere as a result of physical and chemical processes such as hydrolysis, oxidation, and photochemistry. Among the primary pollutants are carbon monoxide (CO), hydrocarbons (HC) and other volatile organic compounds (VOCs), oxides of sulphur (SO<sub>x</sub>), oxides of nitrogen (NO<sub>x</sub>), particulate matter including dust and soot and compounds of lead. Secondary pollutants include nitrogen dioxide, the entire class of photochemical oxidants (including ozone), and acidic depositions. Carbon dioxide has no direct adverse effect on human health but its build-up contributes to the greenhouse effect. Other greenhouse gases, such as nitrous oxides, methane, chlorofluorocarbons (CFC) and ozone also trap heat and thus contribute to global warming and potential climatic changes. It is estimated that different greenhouse gases presently contribute to overall global warming roughly in the

following proportions :

Carbon dioxide	49 to 55%
Chlorofluorocarbons	14 to 25%
Methane	12 to 18%
Nitrous oxides and other gases	13 to 19%

There are natural as well as anthropogenic sources of air pollutant emissions. Among the natural sources are forest fires and volcanoes, as well as swamps, oceans, lakes, vegetative matters and insects. Anthropogenic sources include industrial processes, power generation, commercial and domestic fuel use such as wood or coal, solid waste disposal (for example, incineration), slash and burn cultivation practices and motorised transport. Automobiles are by far the predominant contributors to air pollution among mobile sources.

### **Factors affecting emission and concentration of pollutants:**

The emission rate refers to the amount of a particular type of pollutant discharged in the air. The magnitude of emissions depends on the number of emission sources, the diversity of source types, the nature and scale of activities at the polluting source, and the emission characteristics. The emission characteristics of motor vehicles, for example, pollute the air because of inefficient combustion.

**The emitted pollutant gets dispersed, diluted or transformed in the atmosphere. The resultant amount of a pollutant in terms of its mass or volume per cubic metre of air is the concentration of the pollutant in the air.**

The emitted pollutant gets dispersed, diluted or transformed in the atmosphere. The resultant amount of a pollutant in terms of its mass or volume per cubic metre of air is the concentration of the pollutant in the air. The atmospheric concentration of a pollutant is dependent on the magnitude of emissions, topographical features and altitude, meteorological conditions, and physical and chemical mixing in the atmosphere. Concentration levels are normally associated with harmful effects of air pollution.

### **Trends in emissions and ambient concentration of pollutants:**

Table 1 shows trends in the overall emissions of SO<sub>x</sub>, particulate matter, NO<sub>x</sub>, CO, and lead in selected countries. Based on this sample of countries, there has been a decreasing trend in overall emissions of air pollutants in industrialised countries during the period from 1973 to 1984, whereas in the developing countries there has been an increasing trend.



**The reason for the higher concentration of sulphur oxides in the air is the higher sulphur content in our imported oil.**

Air quality in the major urban areas around the world has been monitored by the Global Environmental Monitoring System (GEMS/Air), which operates a worldwide network to monitor air quality under the auspices of the World Health Organisation (WHO) and United Nations Environment Programme (UNEP).

The concentration levels in 1985 and trends from 1973 to 1988 in selected cities are shown in Table 2. There has been a decreasing trend in the concentration of sulphur oxides and particulate matter in many cities in industrialised countries, but urban areas in developing countries have experienced sharp increases in these contaminants. For example, New Delhi experienced a 20 per cent increase in the concentration level of sulphur oxides from 1973 to 1985. Except for Singapore, concentration levels of NO<sub>x</sub> increased in all cities (shown in Table 2) in both industrialised and developing countries.

The concentration levels of SO<sub>x</sub> in many cities such as Beijing, Sao Paulo, Rio de Janeiro and Seoul exceeded the WHO guidelines of 40 to 60 ug/cu. m, in 1985. The particulate level in almost all the developing cities shown in Table 2 exceeded the WHO guideline of 60 to 90 ug/cu. m. The average levels of NO<sub>x</sub>, however, in most cities in developing countries were below the US national air quality standard of 100 ug/eu. m.

Data on emissions of SO<sub>x</sub>, particulate matter, NO<sub>x</sub>, CO and lead in the countries mentioned above from (GEMS/Air) for the period 1985-1999 also reveals the same trend, which is more acute in the developing countries. The number of cities, which increased exponentially in the developing countries, have exceeded allowable limits and the city dwellers are exposed to dangerous air pollution. They include Mexico City, Shanghai, Bombay, Bangkok, Jakarta and Manila. Dhaka, the capital of Bangladesh, is also one of these cities.

### **The state of air pollution in Dhaka**

Current DoE data on the ambient air quality of Dhaka city provided in Table-1 amply demonstrate that its air quality is really bad and is deteriorating every day. In terms of the

presence of Suspended Particulate Matter (SPM), it is rather worse than other heavily polluted cities. It is as high as 4 to 5 times of the allowable limit. In terms of certain gases, though, the concentration of nitrogen oxides (NO<sub>x</sub>) is still within the allowable limit (without counting occasional highs) but concentration of sulphur oxides (SO<sub>x</sub>) has exceeded the allowable limit quite a long time ago. The reason for the higher concentration of sulphur oxides in the air is the higher sulphur content in our imported oil.

The other burning issue is the dangerously high lead content in Dhaka's ambient air. The DOE conducted a series of tests after collecting ambient air samples from different residential, commercial and industrial areas of Dhaka city during 1996-1997. At 1 metre height from ground level, the highest concentration in commercial spots was observed to be 251.84 nanogram/cubic metre and the lowest concentration was 1 nanogram/cubic metre in a residential spot. Majority data were in the range of 20 to 60 nanogram/cubic metre. Current DOE data, however, reveals a decreasing trend when compared to the previous years. Vehicular exhaust is the major cause of air pollution, especially in Dhaka, where the concentration of vehicles is higher than that any other part of the country. It has been estimated vehicular exhaust causes 50-60 per cent of the total air pollution load in the city. Auto-exhaust can be classified into the following categories:

- I) Petrol exhaust from vehicles such as cars, three-wheelers, two-wheelers.
- II) Diesel exhaust from trucks, buses, minibuses, etc.

Dhaka city's air is also polluted with carbon monoxide (CO) and hydrocarbon from vehicular sources, because of the incomplete combustion of fuels in most of our vehicles due to improper maintenance of the engines and use of adulterated fuel and lubricants. Two-stroke engine-driven vehicles are the worst among the vehicles in terms of emitting these obnoxious gases.

**Dhaka city's air is also polluted with carbon monoxide (CO) and hydrocarbon from vehicular sources, because of the incomplete combustion of fuels in most of our vehicles due to improper maintenance of the engines and use of adulterated fuel and lubricants.**

**An emission control policy should include an emissions inventory to assess the relative contribution of motor vehicles to overall pollution; emission standards based on a realistic evaluation of costs and expected compliance; identification of specific problems and appropriate countermeasures based on their cost-effectiveness; design of a policy and appropriate monitoring and evaluation.**

It has been identified that two-stroke engines are also a major contributor to ambient HC and PM concentrations. There are about 35,000 two-stroke three-wheelers (per year increase 3,500), 2,000 two-stroke large tempos (per year increase 200) and 3,000 four-stroke three-wheelers (per year increase 300) in Dhaka city. The drivers generally take lease of the three-wheelers from their owners on a daily basis. So the owners do not have much control and initiative in maintaining their vehicles to maximise fuel economy or minimise pollution. The drivers are also not properly trained. They are usually uneducated and do not know how to maintain the vehicles. The vehicles are often overloaded with as many as six passengers instead of three and the drivers often use cheaper or recycled lubricating oil. Emission estimates and percentage of pollutants of different categories of vehicles in Dhaka city are provided in Table - 4.

**Conclusions :** Automotive air pollution, once largely a problem of the developed countries, will spread to the developing countries in the next decade because of the rapid pace of urbanisation and motorisation there. Rising income, combined with greater desire for travel and personal mobility, will increase the number of automobiles and buses in Asia, the Middle East, Eastern Europe, and parts of Africa. The need for fast, reliable distribution of goods, the increasing pace of containerisation, and the selection of transport options on the basis of service rather than price alone will increase reliance on trucks and lorries for freight transport. As motor vehicle ownership approaches saturation levels in North America, Western Europe, and Japan, most of the future growth will be in the developing countries.

Automotive air pollution will be the worst in big cities,

particularly in Latin America, Asia, Eastern Europe and the Middle East. The growth in road transport is unlikely to be curbed in the developing countries. Possible actions and countermeasures to control automotive air pollution encompass energy efficient and environmentally clean vehicles, clean fuel, better traffic management, and a policy framework including regulatory, pricing, and taxation measures. The most promising approach in developing countries, however, is through clean fuel, sound traffic management, and administratively simple policy measures. Owners of buses and taxi fleets could be given incentives to run vehicles on alternative fuels, such as LPG, CNG, etc., and vehicle taxes and license fees could be designed to discourage the ownership and use of polluting vehicles.

An emission control policy should include an emissions inventory to assess the relative contribution of motor vehicles to overall pollution; emission standards based on a realistic evaluation of costs and expected compliance; identification of specific problems and appropriate countermeasures based on their cost-effectiveness; design of a policy and appropriate monitoring and evaluation. Although there is a consensus on the need to reduce lead in gasoline and sulphur in diesel fuels, knowledge of the cost and effectiveness of various control measures is inadequate. More research and action programmes are needed in the following areas:

- The characteristics and amount of automotive air pollution in urban areas in developing countries.
- The environmental characteristics of reformulated and substitute transportation fuels.
- The cost-effectiveness of various measures to control motor vehicle emissions.
- An evaluation of vehicle inspection and maintenance programmes;
- The environmental management of urban buses and para-transit vehicles.

Many cities in the developing world have only limited resources available for management of urban air quality. It is the responsibility of the international community to assist such cities in reducing present and potential risks for human health and the environment.

Table - 1

## Trends in emissions in selected countries

(1000 tons per year)

Pollutant	Country	1973-75	1976-78	1970-81	1982-84
SO <sub>x</sub>	USA	25600	25670	23330	21100
	UK	5430	4990	4740	3750
	Japan	2620	1680	1640	1610
	China	..	..	14210	12920
	Hong Kong	160	200	220	240
	India	1610	1890	..	..
	Poland	2080	..	2600	3700
	Thailand	..	..	120	310 (a)
	Turkey	..	710	..	..
Particulate Matter	USA	10400	9330	8470	6900
	UK	450	360	300	230
	China (b)	..	..	16200	13740
	Honk Kong	15	20	20	15
	Poland	2230	..	2120	3350
	Portugal	75	90	120	..
	Thailand	..	..	40	130 (a)
	Turkey	..	..	..	..
NO <sub>x</sub>	USA	19200	20870	20670	19500
	UK	1870	1890	1900	1770
	Japan	1800	1550	1340	1420
	China	..	..	4400	4130
	Honk Kong	40	45	50	80
	Portugal	105	170	210	190
	Poland	90	..	..	1770
	Thailand	..	..	30	230 (a)
	Turkey	..	380	..	..

CO	USA	81200	83100	76030	69230
	UK	4820	4920	5090	5180
	Honk Kong	110	120	165	180
	Poland	590	..	..	3300
	Portugal	460	490	525	..
	Thailand	..	..	120	.. (a)
	Turkey	..	..	3710	..
Lead	USA	147	141	78	47
	UK	7.9	7.4	7.2	7.0
	Mexico	..	..	19.6	8.4
	Thailand	..	..	..	1 to 5

Source: [UNDP & WHO 1984, UNEP & WHO 1988]

- a) for Bangkok only
- a) fossil fuel combustion only
- b) gasoline fueled road vehicles only

**Table - 2**

**Ambient pollution levels in selected cities**

Pollutant	Cities	Trend in 1978-1985 in %	Concentration level 1985
SO <sub>x</sub> (a)	New York London	-6	50
	Tokyo	-7	55
	Bangkok	-6	35
	Kuala Lumpur	..	18
	Lisbon	..	22
	Bombay	..	25
	New Delhi	..	30
	Hong Kong	+20	40
	Shanghai	+8	45
	Santiago	..	50
	Manila	0	60
	Beijing	..	65
	Sao Paulo	..	75
	Rio de Janeiro	-10	90
	Seoul	..	100
		..	105

Particulate Matter (a)	New York	-3	61
	Tokyo	-1	60
	Accra	..	100
	Rio de Janeiro	..	101
	Kuala Lumpur	..	105
	Bombay	..	110
	Bangkok	+13	110
	Shanghai	..	111
	Jakarta	-3	115
	Calcutta	0	130
	Beijing	..	130
	New Delhi	-3	131
NO <sub>2</sub> (a)	New York	+2.5	65
	London	+7	61
	Bombay	+3	20
	Bogota	..	25
	New Delhi	+2	32
	Hong Kong	..	43
	Singapore	-4	46
	Lisbon	+4	47
	Sao Paulo	+1	75
CO (d)	New York	..	12
	Los Angeles	..	13
	Sao Paulo	..	19
	Bangkok	..	5
Lead (a)	Stockholm	..	1.1
	Amsterdam	..	0.3
	Frankfurt	..	0.4
	Hong Kong	..	0.14
	Sao Paulo	..	0.22
	Bangkok	..	0.3
	Singapore	..	0.9

Source: [UNEP & WHO 1984, UNEP & WHO 1988]

**Table - 3**

**Analysis Sheet of Ambient Air Sample of Dhaka City for the Month of December 1999 in Farmgate location**

Location	Date	Ambient Air Pollutant Concentration in micro gram/cubic meter		
		SEM	NO <sub>x</sub>	SO <sub>2</sub>
Farm gate, Near Police box	02-12-99	2367.34	38	119.79
Farm gate, Near Police box	03-12-99	2371.59	44	116.35
Farm gate, Near Police box	06-12-99	2256.42	47	104.27
Farm gate, Near Police box	07-12-99	2285.93	51	97.96
Farm gate, Near Police box	08-12-99	2317.14	57	123.48
Farm gate, Near Police box	09-12-99	2335.68	67.48	136.54
Farm gate, Near Police box	10-12-99	2465.25	79	139.32
Standard Value for Commercial and Mixed Area		400	100	100

*Source: Department of Environment*

Note:

1. SPM - Suspended Particulate Matter
2. NO<sub>x</sub> - Oxides of Nitrogen
3. SO<sub>2</sub> - Sulphur di-Oxide

**Table - 4**

**Emission Estimates (Metric tons/year)**

Vehicle Type	TSP	NO <sub>x</sub>	CO	HC	SO <sub>x</sub>
Emissions, (Metric Tons/Yr.)					
2-Wheeler 2-Stroke	58.6	55.1	7785.7	1156.7	17.2
2-Wheeler 4-Stroke	5.2	2.2	3348.0	885.6	27.0
3-Wheeler 2-Stroke (Baby taxis)	567.0	18.9	21243.6	5874.1	21.9



Large Tempus, 2 Stroke	64.8	2.2	2427.6	671.3	2.5
3-Wheeler 4 stroke	2.4	1.0	1562.4	413.3	2.5
4-Wheeler 4-Stroke (cars)	136.8	128.5	18166.7	2698.9	40.1
Buses	19.6	590.2	312.3	94.6	102.7
Trucks	24.3	3497.4	185	71.7	60.9
Total	878.8	1147.4	55031.5	11866.2	284.8
Pct. Pollutant by Vehicle Type (%)	TSP	NO <sub>x</sub>	CO	HC	SO <sub>x</sub>
Emissions, (Metric Tons/Yr.)					
2-Wheeler 2-Stroke	6.7%	4.8%	14.1%	9.7%	6.0%
2-Wheeler 4-Stroke	0.6	0.2	6.1	7.5	905
3-Wheeler 2-Stroke (Baby taxis)	64.5	1.6	38.6	49.5	707
Large Tempus, 2 Stroke	7.4	0.2	4.4	5.7	0.9
3-Wheeler 4 stroke	0.3	0.1	2.8	3.5	4.4
4-Wheeler 4-Stroke (cars)	15.6	11.2	33	22.7	14.1
Buses	2.2	51.4	0.6	0.8	36.4
Trucks	2.8	30.4	0.3	0.6	21.4
Total	100%	100%	100%	100%	100%

*(Core J. 1998, Draft Mission Report-Air Quality Management, Policy and Vehicle Emission Control World Bank, Dhaka)*

The above table reveals that the 3-wheeler (Baby Taxis) stands number one as polluter in the vehicle category in terms of SPM, CO and Hydrocarbon, whereas the buses and trucks are the major contributor for SO<sub>x</sub> and NO<sub>x</sub>.

# The Metagame and Bangladesh's press: are newspapers a strategic dead end in the battle?

By Cameron Kennedy

In the game of chess, the ultimate goal is to checkmate your opponent's king. However, if you're teaching someone how to play chess, simply telling him or her to "checkmate the king" is not enough.

Not only do players need to learn the specific capabilities and limitations of the pieces at their disposal, they also need to be prepared for the opponents they're likely to face in any given area or tournament.

In short, the player must learn to respect the metagame -- the game behind the game -- if he or she wants to achieve any long-term success.

The same can be said about the crusade to curb air pollution. I think everyone here will agree that the quality of Dhaka's air, smothered as it is by layers of carbon dioxide, sulphur, lead and other toxic substances emitted daily by poorly tuned vehicles and baby-taxis, is deteriorating rapidly.

The general public, politicians and journalists who attend seminars like this one will also agree that something must be done to stop the damage to the city and the people who live in it.

**I think everyone here will agree that the quality of Dhaka's air, smothered as it is by layers of carbon dioxide, sulphur, lead and other toxic substances emitted daily by poorly tuned vehicles and baby-taxis, is deteriorating rapidly.**

The objective is clear, that much is certain. However, this does not explain why the government has done very little to crackdown on air pollution, despite the efforts of dozens of Bangla and English newspapers currently operating in Bangladesh. It would seem they don't have the skills they need to checkmate the king.

- Where did the campaign go wrong?

- Are newspapers really the useful strategic tools we believe them to be?
- Or do they overshadow more appropriate tools, such as radio, television, the Internet or even simple billboards?

What is lacking is an understanding of :

- a) the game played by newspapers, government officials and polluters in Bangladesh,
- b) the characteristics that set this game apart from similar games in North America, Europe or South Asia, and
- c) their effects on the development of an effective campaign against air pollution. Stated in another way:

- What are the characteristics of the metagame in Bangladesh?
- What are their effects on strategic development?
- What can be done to strengthen the newspapers' role in the campaign against air pollution?

Once these issues are clear, we will be in a better position to decide whether newspapers are a liability or a tool we can use to deal with the issue of air pollution.

In the pages that follow, I will identify three aspects of the metagame in Bangladesh that impose severe limitations on the development of an effective strategy based on newspapers. These include:

- A shortage of well-trained reporters capable of tackling complex issues, such as air pollution.
- The focus on "eminent personalities" and "canned" events rather than ordinary people and the issues that affect them.
- Political bias and a tendency towards self-censorship.

After discussing these three problems, I will offer some solutions:

- Training programmes that provide reporters with the professional skills they need to produce hard-hitting news stories.
- A concerted effort by journalists and newspapers to focus on "ordinary" people and issues rather than politicians and

the events they attend.

- A concerted effort by journalists to encourage politicians and other officials to go on record and take responsibility for their decisions and actions.

Before continuing, I would like to make it clear that what follows is not hard scientific data. It is simply a collection of observations of the print media and print journalists, especially those belonging to English language dailies, that I have made during my time in Bangladesh.

### Competition or cooperation?

One of the most common complaints I hear from reporters and newspapers alike is that they've been waging campaigns on important environmental issues, such as air pollution, for years, but the government hasn't done anything about the problem.

While the newspapers' tenacity is admirable, their inability to step back and ask why stories brimming with statistics on Dhaka's intolerable air and countless photos of horrific traffic jams haven't encouraged the government to take immediate action is questionable.

**While the newspapers' tenacity is admirable, their inability to step back and ask why stories brimming with statistics on Dhaka's intolerable air and countless photos of horrific traffic jams haven't encouraged the government to take immediate action is questionable.**

Bangladesh's newspapers must consider the possibility that the strategy they've adopted in their game of cat-and-mouse with the government might be wrong.

For example, the word "campaign" itself implies a confrontational, competitive approach to the exchange of information. This immediately places the government and other officials on the defensive, making them less likely to provide the information that reporters need.

Presentations by Mr. Martin and Mr. Choung during yesterday's session suggested that environmentalists in the United States and Indonesia were having some success with cooperative

approaches that de-emphasised conflict in order to build more progressive partnerships.

Perhaps a more cooperative stance would improve the relationship between newspapers and their sources, generate a heated public debate and expedite action on the air pollution problem.

However, before we can assess the merits of competition versus cooperation, we must examine the elements that make up Bangladesh's metagame. Unless we account for the pitfalls in this country's media environment, any strategy we eventually adopt will fail.

## **The Metagame**

### ***1) Training***

The quality of the writing in the English dailies varies considerably between the papers and even between the pages themselves. While the quality of the reporters' English can lead to some rather interesting interpretations of an event, it is not the main problem since it can be fixed by judicious editing.

**Bangladesh's newspapers must consider the possibility that the strategy they've adopted in their game of cat-and-mouse with the government might be wrong.**

Most journalists in the capital enter the profession from other disciplines without receiving any formal or informal training in journalism.

Many don't know how to develop story ideas, conduct research or write intelligent articles that are accessible to all readers. Others have embraced jargon and psychobabble with a passion matched only by the bureaucrats who do nothing but sit around in offices and

think up baffling words like "particulate matter".

This places newspapers and other media at a disadvantage, since there is a shortage of trained staff capable of producing stories that grab the audience's attention.

The situation is more problematic in the rural districts. Newspapers rely heavily on stringers to provide news content.

Unfortunately, the quality of the stringers' articles is extremely low.

Many of the "stories" they produce are nothing more than rumour, gossip or opinion. They lack the skills needed to develop informative, hard-hitting articles and features that can provoke a free, democratic debate, which means potential stories fall through the cracks. Here is a typical example of a report from the districts:

"Unauthorised factories threaten environment"

Shariatpur, Mar. 3: Unauthorised establishment of factories at roadside and residential areas in all six thana headquarters and in the town have posed a serious threat to the environment, reports UNB.

Local people complained that a number of factories were set up in residential areas and the roadside, violating relevant laws.

Taking advantage of the negligence of the authorities concerned, some unscrupulous people have established engineering workshops, welding shops, steel factories, flour mills and spice crushers near schools, public places and residential areas.

**Many don't know how to develop story ideas, conduct research or write intelligent articles that are accessible to all readers. Others have embraced jargon and psychobabble with a passion matched only by the bureaucrats who do nothing but sit around in offices and think up baffling words like "particulate matter".**

It is learnt that owners of the establishment did not take permission from the authorities concerned to set up these enterprises.

Heavy noise and other types of pollution have been causing health problems and the welding shops are damaging the eyesight of people.

## ***2) Canned events and eminent personalities***

Another tendency of Bangladesh's media is to focus on "eminent personalities" and staged events, such as seminars,

workshops and trade-fairs, rather than use those events as a springboard to discuss substantive issues and the people affected by them.

Unfortunately, I'm afraid this very workshop could fall victim to that tendency. I won't need to pick up tomorrow's paper to read about this workshop, since I already know what the reporters covering it for United News of Bangladesh or BSS will write. Here, briefly, is a summary of the three main points:

- There was a workshop on air pollution and the role of the media in Dhaka yesterday.
- (Insert name here) chaired the workshop, while (insert minister's name here) gave the keynote address.
- The following people attended the conference (insert long list of names).

Throw in a quote or two about the dangers of air pollution, a couple of statistics and you are done. A perfect "paint-by-numbers" story.

One of the most important things to notice about this formula is that it has absolutely no news value whatsoever. It makes no difference whether it was written last year, last month or last night.

**In fact, most seem to have a morbid fear of taking responsibility for anything in Bangladesh's press, good or bad, which is a daunting limitation that must be accounted for by any strategy to curb air pollution.**

This "timelessness" suggests that the issue isn't pressing and is probably unimportant, which certainly doesn't encourage readers, especially picky ones like myself, to read to the end of the story.

If I have picked up on this trend after only a few months here I'm certain most residents have picked up on it as well and no longer pay attention to formulaic stories. This leads to a valid question:

- How are you going to convince people to pick up the newspaper when the articles about air pollution don't contain any news?

Events, such as a global workshop on air pollution and the role of the media, can be newsworthy. However, they must be covered in a way that encourages people, including those who attended the event the day before, to pick up a newspaper the next day and learn something new, not just when and where the event was held.

The same is true of eminent personalities. Comments from ministers and other government officials are often necessary to help round out an article. However, politicians aren't very good at telling stories, since they have too much at stake.

In fact, most seem to have a morbid fear of taking responsibility for anything in Bangladesh's press, good or bad, which is a daunting limitation that must be accounted for by any strategy to curb air pollution.

People, on the other hand, excel at telling stories, which is what the newspaper business is all about. They are also more likely to go on record, an important component of creating a free, open, democratic society, the only type of society capable of dealing with a complex issue like air pollution.

To summarise, a news story is not a transcript of a speech made at an inauguration or a list of the names of the people who attended an event. It is a narrative, woven together from the lives of interesting, though perhaps not eminent, personalities, which grabs the public's attention, luring them to explore an issue in more detail.

### ***3) Political bias and self-censorship***

Most papers in North America and Europe implicitly or explicitly support political parties. For example, everyone in Canada knows that the National Post and the Globe and Mail's editorial policies are geared towards conservative and liberal agenda respectively. However, most people would also agree their coverage is balanced and fair.

**Many of the "stories" they produce are nothing more than rumour, gossip or opinion. They lack the skills needed to develop informative, hard-hitting articles and features that can provoke a free, democratic debate, which means potential stories fall through the cracks.**



The same cannot be said about the newspapers in Bangladesh. There are at least ten prominent newspapers in Bangla and at least six English language dailies published in Bangladesh.

Most are considered to be "party" papers that adhere strictly to the party line. For example, Bhorer Kagoj, Ajker Kagoj and Janakantha are considered to be proponents of the ruling Awami League, while the Financial Express, Morning Sun, and Holiday support the opposition, the Bangladesh Nationalist Party. The Islamic parties are represented directly by Dainik Sangram, which is owned by the Jamaat-e-Islami Party, and indirectly by the Inquilab.

I don't want to spend a great deal of time on this issue, since everyone here knows about the country's volatile political

**Reporters must place their integrity as journalists ahead of their political allegiance. Otherwise, they are nothing more than propagandists. Needless to say, this country's polarised political environment imposes serious limitations on reporting about the natural environment.**

situation. Reporters must place their integrity as journalists ahead of their political allegiance. Otherwise, they are nothing more than propagandists. Needless to say, this country's polarised political environment imposes serious limitations on reporting about the natural environment.

Another disturbing facet of journalism in Bangladesh is a tendency among reporters to resort to unnecessary self-censorship. Anonymous sources are a fact of life in this country due to official and unofficial gags placed on bureaucrats by the government or party

faithfuls who don't take kindly to criticism.

However, I often come across quotations attributed to "high ranking officials" or "a leading doctor in the field" that resemble "the sun will rise in Dhaka tomorrow" or "Dhaka is polluted." These are not particularly revolutionary statements that will jeopardise a government's hold on power or a bureaucrat's career, and so I've asked the reporter whether the source told him not to use his name. More often than not the answer is no. This might not seem very important at first, but what it means is that officials have achieved a small victory in the meta-arena.

The politician's consistent refusal to take responsibility for their portfolios on the record, coupled with the journalist's fear of losing an important source of information, has created pliable reporters who don't even bother to print their sources' names even when they could do so with impunity.

- The voluntary decision not to print a name not only plays into the politicians' hands, but also has a deleterious effect on the impact of an article.

### Solutions

The metagame that governs the newspaper industry's dealings with the government, public and polluters in Bangladesh creates daunting technical and professional barriers. Those must be overcome before the print media can become an effective tool in competitive or cooperative efforts to curb air pollution.

This conclusion seems to suggest that we should ignore newspapers and reporters altogether and focus on using radio, television, the Internet, billboards, songs, poetry or folk media to tackle Dhaka's air pollution, as some speakers at yesterday's session suggested.

**The metagame that governs the newspaper industry's dealings with the government, public and polluters in Bangladesh creates daunting technical and professional barriers. Those must be overcome before the print media can become an effective tool in competitive or cooperative efforts to curb air pollution.**

Problems like political bias or self-censorship would seem to back up this claim. There is very little a workshop like this can do on those fronts. The impetus for change must come from the journalists themselves. They must decide if they want to promote free speech or promote their party's agenda. It's as simple as that.

- Journalism is a profession that entails certain professional responsibilities. If these responsibilities are ignored, then nobody will take seriously the articles that reporters produce, and the strategy will fail.

However, I think it would be premature to write off the print

media as a tool despite its daunting limitations. There are things that we can do to improve the situation.

Journalists working in the rural districts and major urban centres must acquire the technical and professional skills they need to deal with the complex issues that are affecting their community. I have already seen notices about training sessions circulating through my newsroom and such efforts should be expanded and monitored.

Meanwhile, journalists must focus on people and issues rather than on politicians and canned events. Workshops such as this one aren't particularly newsworthy in themselves, but they can serve as useful springboards for a campaign on air pollution.

For example, if the papers really wanted to focus on air pollution, they could have published a series of articles leading up to the workshop to generate interest in the event and the issues. After the workshop, the newspapers could have published a second series of articles dealing with the issues that were raised, encouraging the debate to continue. Unfortunately, this kind of long-term planning does not occur, which means a timely opportunity to focus on an issue and encourage public debate is lost.

Finally, journalists must embrace a policy of zero-tolerance with their sources. Cooperation does not mean submission.

There are circumstances where an anonymous is a necessary evil. However, if politicians and other officials refuse to discuss an issue in their portfolio on the record then journalists must make sure that their readers know who failed to perform their public duty.

Hundreds of articles on air pollution will do little good unless the people who go to the polls know which officials or politicians are responsible for the decisions that have ruined the cities' air and the people's lungs.

# BEIJING

CHINA 



Photo: FEJB / CEJA

A crowded street in Beijing

## AIR POLLUTION IN ASIAN CITIES

[www.pathagar.com](http://www.pathagar.com)





Rising number of automobiles in Beijing

Photo: FEJB / CEJA

# Chinese cities choke on air

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By Sharif Shahabuddin

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**W**hile over the years bicycles slowly gave way to increasing number of automobiles in Beijing, the air quality in the Chinese capital started to deteriorate. But air pollution problem in Beijing as well as other Chinese cities is mainly caused by smoke from burning coal. The major pollutants are sulphur dioxide and soot. While the discharge amount of the latter is coming down on an annual basis, that of the former is going up gradually. Last year, 23.46 million tons of sulphur dioxide were discharged, exceeding the discharge of 1995 by 1.14 million tons. The total amount of soot discharged was 18.73 million tons, a drop of 1.11 million tons from that of 1995. Pollution by acid rain is relatively serious in central, south and southwest China. Acid rain has also occurred in some northern cities, such as Tumen and Qingdao. Areas affected by acid rain now account for 30 per cent of the country's total land area.

Air pollution in China is not easy to understand. It is not a composite index but reflects the concentration of one of the three reported pollutants -- total suspended particles (TSP), sulphur dioxide (SO<sub>2</sub>) and nitrous oxides (NO<sub>x</sub>). In Beijing the API (air pollution index) of the pollutant with the highest API for the week is reported for all of Beijing and for each of the seven air quality monitoring stations. In this report, a method for converting the API for each of the three reported pollutants to an internationally-used format is described. Once this conversion has been made, the concentrations of these pollutants in Chinese cities can be compared with concentrations in foreign cities.

**Air pollution in China is not easy to understand. It is not a composite index but reflects the concentration of one of the three reported pollutants -- total suspended particles (TSP), sulphur dioxide (SO<sub>2</sub>) and nitrous oxides (NO<sub>x</sub>).**

**The WHO 24-hour TSP standard is 125 micrograms per cubic metre for a 24-hour exposure and an annual average of 50 micrograms per cubic metre. In North China, TSP arises from the burning of soft coal (95 per cent of the 28 million tons of coal burned in Beijing each year is soft coal), dust from construction sites, and desert sand and loess soil blown eastwards from the arid regions of western and northern China.**

Total suspended particulates (TSP) is a measure of the concentration of suspended particulate matter (aerosols) in a cubic metre of air. In China this concentration is sometimes specified in a fraction of a milligram per cubic metre as, for example, 0.150 mg per cubic metre, while in most other countries this same concentration would be written as 150 micrograms per cubic metre. Exposure to pollutants can be reported by hourly or eight hour occupational exposure standards, twenty-four hour residential standards or annual averages. According to the PRC Ambient Air Quality Standard [GB 3095-1966] promulgated on October 1, 1996 (summarised in "Severe Beijing Air Pollution Information Emerges", appendix 1), there are three 24-hour PRC TSP standards corresponding to

three categories: Class I parks and specially protected areas (120 micrograms per cubic metre); Class II residential areas (300 micrograms per cubic metre); and Class III designated industrial zones (500 micrograms per cubic metre).

The WHO 24-hour TSP standard is 125 micrograms per cubic metre for a 24-hour exposure and an annual average of 50 micrograms per cubic metre. These exposures are for TSP in the presence of sulphur dioxide since the two pollutants have more serious effects in combination than individually because sulphur dioxide coatings on respirable fine particles increase the amount of sulphur dioxide entering the body. In the United States, the concentration of respirable particles ten microns or less in diameter (PM-10 particles) rather than TSP is reported.

In North China, TSP arises from the burning of soft coal (95 per cent of the 28 million tons of coal burned in Beijing each year is soft coal), dust from construction sites, and desert sand and loess soil blown eastwards from the arid regions of western and northern China. Over the past two decades the northern forest belts and trees in urban peripheries have sharply reduced

the amount of desert sand and loess soil blowing into northern Chinese cities. TSPs from burning coal indoors for cooking typically doubles the indoor TSP levels in north China urban homes compared with homes with cooking gas. Many indoor stoves and water heaters do not comply with Chinese safety standards, which require venting of pollutants outdoors. Some Chinese and foreign experts attribute most of the respiratory diseases among rural Chinese women, who smoke far less than men, to indoor air pollution from cooking stoves. Several Chinese epidemiological studies conclude that most of the 1.4 million deaths due to chronic obstructive pulmonary disease in China each year are due to outdoor and indoor air pollution.

Emissions controls and energy efficiency prevent TSP growth [Comment: Judging from the annual averages of north China urban TSP levels released for 1980 - 1993 by the then National Environmental Protection Agency (NEPA), the TSP level has remained almost unchanged despite a sharp drop in coarse sand and soil particles and higher coal consumption and rapid economic growth. The answer to this paradox appears to be important energy efficiency gains and reduced emissions from industrial coal users. A senior Chinese environmental official told a visiting American official in spring, 1997 that over the past five years Chinese energy consumption has grown at only half the rate of GDP growth.

Another probable factor is that the pollution from town and village enterprises, which now produce half of GDP, is not covered by Chinese urban air pollution statistics. End comment]

China has achieved significant progress in protecting the environment in most of its cities and urban areas despite the tremendous industrial development in the country. Over the past decade China had undertaken quite a number of programmes to mitigate the sufferings of the people from the degradation of air and water. In this regard the foreign

**Many indoor stoves and water heaters do not comply with Chinese safety standards, which require venting of pollutants outdoors. Some Chinese and foreign experts attribute most of the respiratory diseases among rural Chinese women, who smoke far less than men, to indoor air pollution from cooking stoves.**



**In addition to the formulation of new environmental legislation and enforcement of existing laws, the Chinese government has promoted the development of clean production and environmental technology in China. It has heavily invested in pollution treatment facilities and eco-agricultural projects as well as established more nature reserves all over China.**

NGOs are also playing an important role to create awareness about the adverse impact of environmental degradation.

At present the Chinese government is carrying out the National Action Guidelines for Environmental Protection Publicity and Education. Environmental training programmes for officials at various levels, elementary school students, and the public at large are conducted regularly.

China is a coal-rich country and its industrialisation programme was mostly based on coal and iron. Air pollution is mainly caused by smoke from burning coal. According to a report the Capital Iron Industry in Beijing was the central source of air

pollution in Beijing and the adjoining areas. Over the past years the government has taken a number of measures to reduce air pollution by the coal and iron industries.

In addition to the formulation of new environmental legislation and enforcement of existing laws, the Chinese government has promoted the development of clean production and environmental technology in China. It has heavily invested in pollution treatment facilities and eco-agricultural projects as well as established more nature reserves all over China. Beijing's city fathers have taken the help of trees in their battle against air pollution. Beijing is now a green city with hundreds of parks and thousands of roadside trees.

The Chinese government, in its effort to spread environmental education, has already included environmental protection in the syllabus of the nation's nine-year compulsory education system, as well as that of 140 institutes of higher education, more than 100 secondary vocational and technical schools, and central and provincial party schools and administrative colleges.

*(Taken from "Trans-Century Environmental Protection in China").*



Photo: Abu Taher Khokon, FEJB

A street scene in Kolkata where air pollution  
is a major urban problem

## AIR POLLUTION IN ASIAN CITIES





Even trees in Kolkata bear the brunt of black smoke

Photo: Abu Taher Khokon, FEJB

# Kolkata concentrates on efficient management

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By Anisur Rahman

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**T**he Britons founded Kolkata city more than 300 years ago and made it the centre of their empire in the vast Indian subcontinent. Kolkata was once called the city of gardens. But with the passage of time and change of political perspective, particularly after the shifting of the British Indian capital to Delhi in 1911, it lost its status and gradually turned into one of the region's worst polluted cities.

Several years ago Nobel laureate Guenter Grass felt it suffocating to live in Kolkata, where he could not see stars in the night sky. Many people, both Indians from other areas and foreigners who visited the West Bengal capital two or three years ago, expressed the same feeling, mainly due to its notorious traffic jams and emission of black smoke from vehicles and factories.

According to a 1995 World Bank study, Kolkata witnessed more than 5,500 premature deaths and hospitalisation of more than 30 lakh people due to ambient air pollution in the years 1991 and 1992. The death figure went up to 10,647 and that of the cases of hospitalisation rose to 55 lakh in 1995.

But those who visited Kolkata recently have reported an apparent improvement in the situation, particularly in its traffic system, which has made life there a little more comfortable and healthy.

"There has been a perceptible improvement in the chaotic traffic situation and some mitigation of the air and sound pollution that prevailed even two years ago, thanks to the steps taken by the law enforcing agencies and also the directives being issued by the courts," said a Kolkata resident.

**Guenter Grass, the Nobel laureate German author, once said that he felt suffocated to live in Kolkata where he could not see the stars in the night sky. That referred to the magnitude of the city's air pollution problem.**

**According to a study, the day population of the city is about seven million, but the population is reduced to 4.3 million at night as many people return to their homes in the countryside or suburbs after their days' work. Nearly 50 per cent of the night population are slum dwellers while some 56,000 people spend nights on roadside pavements or footpaths.**

The officials and experts, however, would not agree with the above observation. Some concerned people say that despite some improvements, the pollution level has remained static due to the increasing population, which now stands at more than seven million in the 1300 square kilometre area of Kolkata.

"We have just achieved some success in containing the degradation of the environment so far as air pollution is concerned," said one official of the West Bengal Pollution Control Board.

Added a researcher in the School of Environment Study at Jadavpur University: "It is a difficult job to check environmental degradation as the

population is increasing rapidly."

According to a study, the day population of the city is about seven million, but the population is reduced to 4.3 million at night as many people return to their homes in the countryside or suburbs after their days' work. Nearly 50 per cent of the night population are slum dwellers while some 56,000 people spend nights on roadside pavements or footpaths.

"Air pollution is still one of our major problems but we have been trying to reduce the emission of toxic gases from vehicles and factories," said Proshanta Chatterjee, the Mayor of Kolkata. But he added that it was a difficult problem and positive public response and cooperation was a major precondition for its solution as it was linked with socio-economic conditions.

"Fortunately people are very responsive. Particularly their initiatives and cooperation in our tree plantation drive is very encouraging," he said.

Most experts and officials in Kolkata, however, are of the opinion that the management and technology factors are crucially important to deal effectively with the air pollution problem which is acute in the 104 square kilometre core area of the city.

But unlike the city of Dhaka, the smoke emitted by factories, mostly the small ones, is the culprit mainly responsible for air pollution in the West Bengal capital, think many Kolkata experts, although not much data is available. Some, however, believe that vehicles are equally polluting the city air along with the 11,516 registered and hundreds of small home-based factories.

"Air pollution is virtually an integral part of modern life but technology and efficient management can help minimise the problem," said Dr. T.K Ghatak of the Kolkata Metropolitan Development Authority (CMDA).

It was not always possible for cities like Kolkata, unlike the cities of developed countries, to adopt modern technologies to minimise the pollution, he added.

"We have put more emphasis on management than technological aspects, considering our social and economic condition, and it worked in our city," Mr. Ghatak claimed.

He said that introduction of systems like no vehicle zone, one-way traffic, more rational traffic networking and sharing of taxis and auto-rickshaws by several passengers have proved to be more effective in the city of Kolkata.

The authorities, however, have decided to ban leaded fuel, a major culprit in air pollution. Currently both leaded and unleaded fuels are available in the market.

Citing examples, Mr. Ghatak said the one-way traffic system has been introduced even in a busy area like Howra. "We also encourage the sharing of one auto-rickshaw by four passengers to reduce the number of such vehicles in order to minimise traffic jams."

"One of the major reasons of air pollution is the congestion when vehicles are forced to remain stranded at one point and emit toxic gases. We want to ensure normal speed of vehicles by reducing their numbers," he said.

**He said that introduction of systems like no vehicle zone, one-way traffic, more rational traffic networking and sharing of taxis and auto-rickshaws by several passengers have proved to be more effective in the city of Kolkata.**

The Additional Police Commissioner of Kolkata, Mr. Thambi, echoed the opinion, saying it was difficult for a city like Kolkata to afford modern technologies for mitigating air pollution.

"On the question of adopting environment-friendly technologies and discarding the old ones," he said, "Kolkata can't afford it due to its economic cost."

But Mr. Thambi, who hails from Kerala, thinks that despite the initial cost, "the investment on technology works eventually in terms of cost effectiveness."

He said one of the major problems of traffic management was that all kinds of transport operate in the city, causing congestion and emitting toxic gases.

**"On the question of adopting environment-friendly technologies and discarding the old ones," he said, "Kolkata can't afford it due to its economic cost."**

"But we have achieved some success in minimising the problem by taking some measures. Auto-rickshaws and cycle-rickshaws are now allowed to operate only in the periphery of the city, hand pulled ones are allowed only in certain parts and push carts are prohibited in the core areas of Kolkata," he said.

Moreover, tram lines, once regarded as a major contributor to traffic jams in

Kolkata, were realigned under a new networking system. "We also encourage the sharing of one auto-rickshaw by several passengers to check traffic jam and smoke emission on the outskirts of the city."

Mr. Thambi said they were also contemplating the introduction of trolley buses to replace trams in some areas. This mode of transport operates in the Nepalese capital of Kathmandu. "But we still have a number of problems, the major one being the fitness of vehicles."

He said since 1996, police and the transport departments were jointly entrusted with the responsibility to ensure vehicle fitness, and since then "we are checking the fitness at different city points. Shortage of manpower is the main problem in this regard".

In Kolkata, the private sector is authorised to issue fitness certificates of vehicles and the petrol pumps are entrusted with

this responsibility. But, according to Mr. Thambi, they don't seem to be sincere enough in doing this job and, therefore, "we are trying to strengthen our monitoring system."

Mr. S.K. Bhattacharya of the Kolkata Pollution Control Board said that although auto- rickshaws were restricted to the main city areas, a ban on the operation of auto-rickshaws and taxis aged above 15 years could not be implemented due to vehement protests from the owners and the operators.

Dr. Gautam Samanta of Jadavpur University, however, identified the lack of space for roads as one of the most crucial problems for vehicle-related air pollution. Against the international standard of at least 25 per cent Kolkata has only 6 percent road space.

Moreover, he said, the road space was further shrinking as some 56,000 people who sleep on pavements were encroaching on the roads, disrupting normal traffic speed and causing congestion.

"There is an extreme scarcity of open space or greenery in Kolkata. The total area of open space in Kolkata is little more than one-twelfth of that of London and one twenty -fifth of that of Moscow," Dr. Samanta said.

"We have severe scarcity of open space in our city. We need some open space for breathing," added Rathin Roy, a Kolkata taxi driver.

A 1996 study by the Environment Department termed the transport sector as the biggest contributor to air pollution. It identified outdated and dilapidated vehicles, poor fuel quality, lack of maintenance of vehicles, poor maintenance of roads, the lack of more scientific traffic planning as the main reasons of transport-related pollution.

"Latest estimates in 1996 indicate that pollution load from this sector [Suspended Particulate Matter (SPM), Sulphur Dioxide, Nitrogen Oxide and Carbon Monoxide] has increased from 206 tons per day in 1987 to 417 tons

Moreover, he said, the road space was further shrinking as some 56,000 people who sleep on pavements were encroaching on the roads, disrupting normal traffic speed and causing congestion.



per day in 1996. (SPM - 6 tons; Sulphur Dioxide - 25 tons; Nitrogen Oxide - 140 tons, Carbon Monoxide - 266 tons). To this we must add the load of hydrocarbons."

"This sector's contribution will rise in proportion as the number of vehicles in the city is increasing very rapidly," the study said. According to the police department, the number of currently registered vehicles is around 10 lakh. This figure was 6.32 lakh

**The highest polluting group is the taxis of which more than 50 per cent violate emission norms.**

**Trucks as a group occupy the second place with about 40 per cent violation.**

**Violations by private cars are about 33 per cent while violations by mini-buses, auto-rickshaws and government vehicles are about 20 per cent, according to the study.**

in 1997, 3.37 lakh in '87-'88, 2.19 lakh in '82-'83 and less than two lakh in 1980. Nearly 50 per-cent of the vehicles are two-wheelers, which is followed by motor cars, trucks or delivery vans, taxis, auto-rickshaws, buses and about 1000 mini-buses.

Environment Department officials said some 56 per cent of the motor cars, 55 per cent of the trucks, 56 per cent of the buses, 46 per cent of the taxis and 25 per cent of the two-wheelers are more than 15 years old.

A study by the Department on the movement of traffic found that of 22,000 taxis, 18,000 were seen on nine specific street points on a particular day, 7,500 buses were seen 38,000 times at the same points on the day and 1,000 minibuses were seen 15,000 times. It

also found that 56 per cent of the cars, 54 per cent of which were old models, were seen 90,000 times, indicating that old cars are quite common on the road.

The highest polluting group is the taxis of which more than 50 per cent violate emission norms. Trucks as a group occupy the second place with about 40 per cent violation. Violations by private cars are about 33 per cent while violations by mini-buses, auto-rickshaws and government vehicles are about 20 per cent, according to the study.

Officials and experts agree that compressed natural gas (CNG) is a good solution to the transport-related pollution but they cannot encourage it due to economic reasons. There is not enough gas in Kolkata.

With a little success in some initiatives in the transport sector, experts and officials are now concentrating on industries, particularly the "unrestricted, small, home-based units which deal with materials like plastic and scrap batteries". Many of them opine that these units are now the major culprits in respect of air pollution, especially 'localised air pollution'.

"Though awareness about the need for a pollution-free environment is increasing, most entrepreneurs try to set up industries without adequate pollution control measures," admitted Achintya Ray, Minister for Departments of Environment and Forests.

Dr. Gautam said that in Goriahata, one of the worst industrially polluted areas, a street hawker is at risk of becoming the victim of cancer in less than 15 years due to the toxic gas he inhales everyday, emitted by the factories and vehicles.

Officials said they were trying to relocate these units in suitable places. These factories are generally owned by families who themselves hawk their products in the city.

"We have talked to them with the aim of relocating these units on a collective basis and, thanks to the participatory approach, we are getting good responses," Mr. Ghatak said.

According to the Environment Department officials, industrial and power plants at Garden Reach, Behula, Cossipore, Mujore, Bandel, Titagarh and at Budge Budge are the principal contributors to air pollution.

They identified small and medium iron foundries, mostly situated in Howrah area, as one of the major air polluting industries. They are being operated without pollution control devices because of the use of obsolete technology. These small and unorganised units, including the lead smelting units, are becoming the prime concern of the concerned officials. Concentration of lead is very high in areas like Damdam and Tiljala.

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Dr. Samanta Chatterjee said that although lead emission is negligible from vehicles in Kolkata, the industries are supplying it to the air of the city.

"They mostly use battery scrap and lead dross as raw materials. The pollution caused by these units has led to serious objection from the public as well as the regulatory authorities," said a senior official of West Bengal Pollution Control Board.

He said the major problem of these small-scale units was the non-availability of low-cost or cost-effective pollution control devices. The board officials, however, said they have recently developed some suitable technological solutions which were yielding good results.

Experts identified the acid making units, gold smelting and galvanising units as other major contributors to air pollution as far as industrial pollution is concerned.

Officials are not very clear about the domestic or indoor air pollution in Kolkata. But independent researchers are of the view that it is a severe problem as more than half of Kolkata's 4.3 million permanent (night) population, particularly the women and children who stay indoors in slums, are the worst victims of coal or kerosene burning for cooking.

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In 1995-96, the Environment Department of the State Government launched a study to find out the direct health effects due to air pollution in the city using the method of Alveolar Macrophage (AM) count in sputum which reveals the lung tissue reaction to the inhaled pollution.

The control group was chosen from non-polluted areas like Sundarban. It was found that Kolkata citizens had about 10 times the number of AM in their sputum compared to their control counterpart.

It was also found that even housewives had increased levels of AM compared to the control group, indicating the presence and effect of indoor pollution. The study also indicated a strong

association between high PAH levels and increased AM levels. Environment Department officials admitted that a number of cases indicated pathological change in lung tissues.

A doctor at the Kolkata Municipality said an increasing number of people, mostly old men and children, were coming to hospitals with bronchial and throat problems, and respiratory disorders like asthma, which he blamed on air pollution.

All experts are of the opinion that Suspended Particulate Matter (SPM) is a major problem for Kolkata air with its average concentration of nearly 1,100 ppm in winter against the permissible level of 200 to 400 ppm. The concentration of SPM is very high at Howrah Bridge approach, Taltala, Shyambazar, Hazra, Moulali, BBD Bagh and College Street areas.

"But what concerns us more is the elements of the SPM, particularly those that are respirable or inhalable . . . it is the most problematic component of SPM," said Dr. Samanto Chatterjee of Jadavpur University, adding that they had identified 10 heavy metals in the air.

Experts estimated that respirable SPM or RSPM accounts for 30 to 40 per cent of the total SPM. They fear that maximum RSPM values in winter exceed the WHO permissible values by more than 10 times.

A recent report by the School of Environment Studies of Jadavpur University shows that 15 to 30 per cent of Kolkata's SPM contains benzene soluble organic matter (BSOM) and 37.5 per cent of this BSOM consists of poly-nuclear aromatic hydrocarbons (PAH), which are very toxic. Benzo (a) pyrene, a suspected carcinogen, was also found present in the PAH in a very high concentration.

"It is alarming that BSOM concentration in the city air has

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**All the concerned people, however, highly lauded the role of the High Court in mitigating the pollution problems. A bench of the Kolkata High Court, which is known as the "green bench", sits every Wednesday to deal with the cases related to environment.**

increased by 30 per cent since 1987," it said.

Normally automobile emissions and coal burning contribute to BSOM. When a coal oven burns, Benzene concentration near the oven may exceed 5000ug/m<sup>3</sup>.

The environment department recently carried out another study to find the relations between increasing traffic volumes and increasing pollution level.

"It roughly indicated that the introduction of every new batch of 1,000 vehicles will lead to an increase in Nitrogen Oxide level by 12.5 microgram/m, Carbon Monoxide by 30.125 ppm, SPM by 150 microgramme per cu.mt," one official said.

The study, which for the first time measured the ground level Ozone in Kolkata, found that the level was much higher than the USEPA standard of 160 microgram/m<sup>3</sup> (hourly average).

According to experts, even if one tonne of SPM remains in circulation in the 187 square kilometre core area of the city, it will be enough to generate an average SPM concentration of 500ug/m<sup>3</sup> for an ambient level height of 10m.

All the concerned people, however, highly lauded the role of the High Court in mitigating the pollution problems. A bench of the Kolkata High Court, which is known as the "green bench", sits every Wednesday to deal with the cases related to environment.

"The public litigation process is working very effectively in Kolkata since several years . . . the court accepts any complaint even if it is lodged without maintaining the due formalities," said Mohith Chowdhury, a researcher and environmental activist.

He added that in the past several years, the court had issued several landmark verdicts or directives which have cautioned the officials and factory owners, encouraged the activists and developed awareness among the common people.

Several officials, however, feel that many of the existing laws related to environment are either outdated or not suitable for a city like Kolkata. Some others think the provisions for punishment are too soft for violators of pollution related laws.

Under the Motor Vehicles Act 1988, the violators of road safety and of air or noise pollution laws "shall be punishable for the first offence with a fine of one thousand rupees and for any second or subsequent offence with a fine of two thousand rupees."

Officials and independent researchers are unanimous that lack of data and co-ordination between different government departments and NGOs is a major obstacle to the management of the air pollution problem. Several officials, independent researchers, environmental activists and NGOs have suggested ensuring the involvement of the central government and taking immediate- term, medium-term, and long-term action plans to deal with the air pollution problems.

"It has to be clearly understood that unless people who bear the brunt of this problem are taken into confidence and their participation is ensured, it will not be possible to take up and implement hard and effective decisions. And without a number of such decisions now, things will become much worse in the course of the next five years or so," one environment official said.

Added another official: "It must be realised that the state of air quality has reached such a stage that no single measure will give us any result -- there has to be a concerted effort on all fronts. At the same time, it is very important to set targets, measure, quantify, and see what we are doing."

# Kolkata experience and imperatives

By Delwar Hossain

Noted German novelist and poet Guenter Grass visited Dhaka, the capital of Bangladesh, in 1986 and said, "Here one can see the sky and start counting the stars. But in Kolkata, the sky is always overcast by dark smoke."

Praising the city environment in Dhaka, Guenter Grass said here you can heave a sigh of relief but it is very difficult to do so in Kolkata. The air in Kolkata streets is polluted by vehicular emissions, mainly by dilapidated auto-rickshaws and tempos with two-stroke engines. Besides, there are towering chimneys all around the city and suburbs releasing black smoke, industrial wastes and burned chemicals. Kolkata, which also served as the capital of British India, was once regarded as the 'city of palaces and gardens.' Apart from its political importance, Kolkata rendered invaluable service in terms of port facilities and as an industrial growth centre. When the British rulers shifted the capital to Delhi, the glamour of Kolkata began to dwindle. But the city grew fast in terms of population and area and in no time was called the 'dirtiest city in India.'

**Environmental issues received high priority, as public awareness grew through campaigns by the civil societies and voluntary professional groups and NGOs. The judiciary in India has played a pioneering role in checking air-pollution by chemical industries which have no safe systems of disposal of the burned chemicals which are dangerous to human health.**

Guenter Grass spent a few months in Kolkata for study and research. He also came on a visit to Dhaka at the invitation of German Cultural Centre. If Guenter Grass, who won the Nobel prize for literature last year, revisits the two Asian mega-cities -- Kolkata and Dhaka -- his comment this time will be just the reverse: "Dhaka air is eye-burning and difficult to breathe." Inhaling polluted air in the city streets is dangerous to the children and heart and asthma patients. On the other hand, drastic changes have taken place in Kolkata city over the last few years.

Environmental issues received high priority, as public awareness grew through campaigns by the civil societies and voluntary professional groups and

NGOs. The judiciary in India has played a pioneering role in checking air-pollution by chemical industries which have no safe systems of disposal of the burned chemicals which are dangerous to human health.

Any person affected by pollution can get a decree and a remedy by writing a postcard to the Chief Justice of the Indian Supreme Court. The Supreme Court has set up a separate Bench, popularly known as the Green Bench, for disposal of environment-related cases.

**Although apparently the city has achieved a remarkable success in combating the curse of air pollution, the team members did not find anyone complacent about it. The Kolkata residents want to plug Kolkatalaws for mitigating air pollution.**

An FEJB study team on air pollution visited Kolkata from October 1 to Oct. 8, 1999. The team comprised Anisur Rahman (Deputy Leader), Chinmoy Mutsuddi, Shafiq Mahmud, Shafiq Chowdhury, Ali Mahmud, Mahbubur Rahman, Mahmud Hasan, Abu Taher Khokan, Rosy Ferdous and Delwar Hossain (Team Leader). The team members, during their stay in Kolkata, studied the state of air pollution in the West Bengali capital, one of the most densely populated cities of India.

The members, at times all together or in small groups, scrutinised the sources of air pollution and made a comparative study with the state of air-pollution in other Asian mega-cities. The laws, rules and regulations in respect of automobiles, generally the main culprits of the city's air pollution, are being strictly enforced. Hardly any visitor will find a vehicle emitting black smoke in the core city areas. The team visited several parts of the city as well as kitchen garbage composting plants, and examined the mitigation measures.

The team members interviewed city's Mayor, Prasanta Chatterjee, and held meetings with the top officials and experts of the Kolkata Municipal Corporation (CMC). They also talked to officers of the West Bengal Pollution Control Board, Environment Department, NGOs, experts, traffic managers, taxi drivers, pedestrians and a cross-section of people and heard their opinions about the problem of air pollution.

Although apparently the city has achieved a remarkable success



in combating the curse of air pollution, the team members did not find anyone complacent about it. The Kolkata residents want to plug the loopholes in the laws for mitigating air pollution.

Despite his heavy preoccupation on the eve of the Lok Sabha elections, Mayor Prasanta Chatterjee welcomed the FEJB team cordially at his office and explained the measures taken by the Municipal Corporation. He identified the sources of air pollution in the Burning Ghats and said the Municipal Authority has been introducing pollution-free devices in that area.

**A programme has been taken up to clear the garbage, yet another major source of air pollution. Special attention is being given to the disposal of garbage, as well as unclaimed bodies, from the hospitals and clinics.**

While the problems of emissions from the automobiles are being looked after by the police, Transport Department, Kolkata Metropolitan Development Authority (CMDA) and Pollution Control Board, the CMC concentrates on dealing with the problems of city garbage and waterlogging. Mr. Chatterjee said, "The West Bengal Government, under a Central Government Programme, has been implementing a Ganges Action Plan (GAP) for the city's trans-sewerage

management. The main channel of sewerage goes to the Bay of Bengal. Besides, the historic Tally's Nala canal is being renovated to save the city from water-logging, which happens even after a slight rainfall". The Mayor said 60 per cent of the total city area of 187.33 square kilometres has so far been given sewerage coverage. Ward-wise, 81 out of the total of 141 wards have sewerage facilities. Appropriate measures have been taken to give coverage to the remaining 60 wards.

In addition to the guarantee of minimum amenities to the city dwellers, the Municipal Authority has made a remarkable success in clearing up the city garbage under a slogan 'No garbage in the streets by the year 2,000.'

A programme has been taken up to clear the garbage, yet another major source of air pollution. Special attention is being given to the disposal of garbage, as well as unclaimed bodies, from the hospitals and clinics.

Besides hearing the details of the government programme to combat air pollution, the FEJB team also learned some interesting things from the academics, research workers, experts and NGO representatives. Dr. Gautam Samanta of the School of Environment Studies of Jadavpur University, Environmental Engineer Dr. Mohit Ray, Mr. Nava Dutt, General Secretary of Nagarik Mancha, and other NGO experts narrated separately their own experiences in creating public awareness against the menace of air pollution.

The officials of the West Bengal Pollution Control Board, Kolkata Development Authority and even the police department discussed their programmes for addressing the air pollution problem.

It was perhaps the Jadavpur University which shook the Kolkata dwellers and the authority by unearthing some alarming effects of air pollution on human health during the three- years study programme on air pollution in winter season.

Nine scholars and researchers of the School of Environment Studies of Jadavpur University chose winter for carrying out their study, because during this season air pollution becomes acute as pollutants cannot disperse easily due to inversion, low wind pressure and high congestion. The particles and suspended particulate matter (SPM) and other parameters like CO, benzene soluble organic matter (BSOM), heavy metals, poly-nuclear aromatic hydrocarbon (PAH), benzene-toluence-xylene (BTX), organolead, heavy metals in inhalable particulate matter (IPM) and acidity of moisture are also found in the air. High SPM is associated with high BSOM. According to the findings of the study, the average SPM concentration in 1992, 1993 and 1994 was 982 ug/m, 1007 ug/m and 1181 ug/m respectively.

**The study blamed various factors like the use of kerosene and coal as cooking fuel by a large member of the city dwellers, large number of registered and unregistered factories, poorly-maintained cars, poor quality of fuel, bad condition of the city streets, small road area compared to the total city area, high density of population, miserable slum conditions, and above all, the poor socio-economic status of city dwellers for the serious air pollution in Kolkata.**

High SPM in the air also showed high BSOM. High BSOM was associated with a high degree of PAH. The study identified 12 PAH compounds in the city's air.

Among the ten heavy metals identified, lead concentration in SMP during winter in Kolkata was high in comparison to that of other cities of the world. The total organolead concentration in ambient air was measured which indicated a high value of organolead in the city's air. The average organolead concentration for 1992, 1993 and 1994 was 303 ng/m, 299 ng/m and 296 ng/m respectively.

Concentration of benzene, toluence and xylene in Kolkata was found to be much higher than elsewhere in the world. The average benzene concentration during the same periods was recorded at 1004 ug/m, 7082 ug/m and 491 ug/m respectively.

The study blamed various factors like the use of kerosene and coal as cooking fuel by a large member of the city dwellers, large number of registered and unregistered factories, poorly-maintained cars, poor quality of fuel, bad condition of the city streets, small road area compared to the total city area, high density of population, miserable slum conditions, and above all, the poor socio-economic status of city dwellers for the serious air pollution in Kolkata.

The study concluded that air pollution is no doubt a serious threat for Kolkata residents and pointed at the poor socio-economic condition of the state and development without proper planning as the main causes of all environmental problems.

Dr. Mohit Ray, an environmental engineer by profession, has rendered invaluable service to the civil society and the victims of air pollution by chemical industrial units in and around Kolkata and its suburbs. He has provided technical evidences of air pollution by chemical industries before the court and helped to secure decrees in favour of the victims on many occasions. A visit to the working place of Dr. Roy at Santoshpur near Johra Bridge provided the FEJB members with an opportunity to see for themselves the effects of air pollution by chemical emission from a large number of registered and unregistered industrial units. The acid-burnt croplands around the chemical industries showed how the unscientific disposal of untreated

chemical waste can ruin the land, apart from poisoning the air.

The Joint Police Commissioner of Kolkata Metropolitan Police (CMP), Mr. V.V. Thambi, explained how the vast and diversified modes of city transport and traffic systems are managed.

He said: "We have restricted the movement of two-stroke engine-powered three-wheelers in the city's core areas and strictly enforced the traffic rules, including the issuing of fitness certificate to the vehicles."

**In addition to enforcing traffic rules, the CMP is carrying out random examination and inspection of the vehicles in the street for recording the level and quality of emissions to check the honesty of the fitness certificate agencies, both in the public and private sectors.**

In addition to enforcing traffic rules, the CMP is carrying out random examination and inspection of the vehicles in the street for recording the level and quality of emissions to check the honesty of the fitness certificate agencies, both in the public and private sectors.

Mr. Thambi said, "Yes, we have, to some extent, contained the air pollution by faulty and out-dated vehicles. But we are yet to cope with the dust, and air pollution by industrial units. We are planning to procure vehicles for watering the city streets to dampen the dust to prevent it from flying around"

Mr. Nava Dutta, the General Secretary of Nagorik Mancha, a leading non-government voluntary organisation, explained the difficulties of combating air pollution by industrial units and tanneries. At times, it was found that the workers of air polluting units, the major victims of the pollution, themselves stood by the side of the management in order to protect their jobs. The Nagorik Mancha, however, has been successful in preserving the wet land by preventing it from becoming the site of polluting industries by carrying out a dedicated campaign.

One strange trait of the Nagorik Mancha is that it does not take any assistance or donation from anybody. It manages its expenditures from the sales proceeds of its publications on pollution and health hazards.

# **The vehicle variety**

**By Ali Mahmud**

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The air pollution situation in the densely populated South Asian city of Kolkata still remains grave, despite increased public awareness and government initiatives. Because of the slow pace of the enforcement of environmental laws, dangerous emissions from motor vehicles are not being reduced. Despite its availability, the sale of lead-free fuel is not high, as the engines of most vehicles are not compatible with unleaded fuel. However, the price of leaded and unleaded petrol is the same.

According to government estimates, the number of vehicles in Kolkata is one fourth compared to that of the number of vehicles in New Delhi. But there is a great variety of vehicles--tube trains (metro rail), electrically-powered trams, rickshaws pulled by men, three-wheelers, buses and cars. Some two lakh people use the metro rail on the 16-mile underground track linking Taliganj in the south to Darndam in the north. The number of electrically-powered trams is about three hundred.

# NGOs do their bits

By Mahbubul Alam

All development projects implemented till the 1970s in the megacity of Kolkata did not face any resistance from ordinary citizens. But the wave of environmental awareness, created worldwide after the Stockholm Declaration on Environment in 1972, influenced the upper-class citizens of Kolkata. They started giving advertisements in the newspapers containing messages about the need for protecting the environment and the eco-system. But those elite action groups were not really environmental activists. They did not perform the function of a watchdog, and also never bothered to gauge the response to their campaign, launched in 1990, and get the feedback. Victims from grassroots level got involved in action to protect the local environment and their own health and wellbeing from the hazards of development activities. The first environment-related case was filed in Kolkata in 1985.

All this information was given by Mr. Naba Dutt, General Secretary of Nagarik Mancha, one of Kolkata's 81 NGOs, now working in the fields of science, environment and citizens' rights. Nagarik Mancha was launched in 1989 and, in 1992, its activities were linked with labour support and movement on industrial pollution issues.

## Characteristics of NGOs

From the mid-seventies, the affected people of Kolkata and its suburbs organised themselves in protesting and resisting the government's development initiatives, as rapid earth-filling of wetlands, water and air pollution due to urbanisation and industrialisation made them jobless and homeless. Factory workers and residents of industrial belts started acquiring occupational diseases.

The NGOs belonging to the elite class had no contact with

**From the mid-seventies, the affected people of Kolkata and its suburbs organised themselves in protesting and resisting the government's development initiatives, as rapid earth-filling of wetlands, water and air pollution due to urbanisation and industrialisation made them jobless and homeless.**

**None of 81 NGOs working in Kolkata is solely engaged in preventing pollution in any particular sector. Those NGOs mobilise affected people against polluters on specific issues. They extend support to other unions and organise campaigns collectively to materialise the demand of victims. Any member of these NGOs, individually or collectively, can file cases against the government or the management on behalf of the victims.**

them. Against this backdrop several NGOs, including professional cooperative bodies, were formed -- their membership comprising common citizens, including fisherman and industrial labourers -- to mount pressure on the government and the factory management to rehabilitate the victims. That was the first organised environment-related movement in Kolkata. But Mr. Naba Dutt opined that the action could not be termed as a green movement because of its nature and objectives, which were to ensure the rights of the affected citizens only. He said the NGOs and the labour unions worked together on a common platform. But when the Court ordered the closure of mills and factories on charge of pollution without ensuring the regular wages of workers, the latter left the platform. When the NGOs ensured wages during the closure period, the workers returned to that platform.

The south-western part of Kolkata city and the eastern areas from Bidhannagar to Canning Street were developed on wetlands and water bodies. As a result, thousands of fishermen lost their livelihood. In 1962 the government developed Salt Lake, evicting a good number of local people of various professions. Thirty-six NGOs unitedly came forward to protecting the interest of the fishermen's community. The West Bengal government also played a supplementary role in rehabilitating them. This event is known as the 'Kolkata 36 Movement.'

None of 81 NGOs working in Kolkata is solely engaged in preventing pollution in any particular sector. Those NGOs mobilise affected people against polluters on specific issues. They extend support to other unions and organise campaigns collectively to materialise the demand of victims. Any member of these NGOs, individually or collectively, can file cases

against the government or the management on behalf of the victims.

In Kolkata there is no environmental lawyers' association or environmental journalists' forum, as in Bangladesh, to fight for green issues. Even then India's first green bench was set up in 1986 at the Kolkata High Court to dispose of the environment-related cases. This remarkable development forged the unity of the environmental NGOs and enabled the general people to get legal address.

### **Who pollutes Kolkata's air?**

According to the NGOs of Kolkata, the central government, the West Bengal Government and the Kolkata

Municipal Corporation are responsible for polluting the city of Kolkata. After the UN-sponsored Stockholm Summit, the central government enacted the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981. These were revised and updated later. After the Bhopal tragedy of 1984 the central government enacted the Environment (Protection) Act, 1986 and the Sound (Prevention and Control of Pollution) Act, 1996. These legal steps could not make any significant headway in curbing industrial pollution because, as the Nagarik Mancha General Secretary alleged, the government was patronising the industrialists and not applying these rules and regulations properly. Thus, he said, the government itself has become the major polluter.

While discussing the state of air pollution in Kolkata, the NGOs expressed their clear conviction that the government agencies, the Municipal Corporation and the public sector are mainly responsible for polluting the air of Kolkata. Mr. Dutt informed us that automobiles are responsible for 60% of the city's air pollution. The percentage of air pollution from industrial and domestic resources is 20 each. The responsibility for controlling this pollution lies on the West Bengal Pollution Control Board and the Kolkata Municipal Corporation. The

**None of the political parties have taken up any programme to protect the endangered environment of the city although each party talks a lot about the people's welfare. Not a single party has moved forward to prevent or mitigate Kolkata's air pollution, which is a serious threat to public health.**



**The NGOs of Kolkata do not have any primary data on air pollution as they have not yet conducted any survey. There is only some secondary data on the issue, gathered so far by them directly and indirectly.**

NGOs, which are determined to the ensure the enforcement of environmental rules and regulations by these organisations, consider their performance to be not up to the mark. The Nagarik Mancha official said that sometimes even the verdicts of the courts on environmental issues are not enforced properly, since there is no watchdog body in Kolkata to ensure their enforcement. He said that inter-personal communication, public demonstrations and campaigns in the

press are gradually increasing the environmental awareness of the city-dwellers. The campaign could be more effective if the leading dailies of Kolkata spare a minimum amount of space on green issues regularly. The air pollution from domestic sources, amounting to 20% of the total, cannot be checked until alternative fuels are made available. The low-income group, who comprises about 70% of the city's population, use kerosene and low-quality coal for cooking and other purposes.

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### **Information gap**

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However, the statistical data and information on Kolkata's air pollution released by the government had to face questions from private support groups, including the NGOs. Neither the West Bengal Pollution Control Board nor the Kolkata Municipal Corporation have published a pollution map of the city till today. The volume of activities of the West Bengal Pollution Control Board, in its reports, gives a false picture of the actual progress in controlling pollution. The Accountant General's office raised audit objections to its huge spending on

pollution control though, the NGOs alleged, even the city's daily garbage of 2,000 metric tons is not effectively disposed of by Kolkata Municipal Corporation.

It was stated that a pollution map of Kolkata was being prepared. But the primary data released by the government, the Municipal Corporation and other sources are not the same. The mayor of Kolkata, Mr. Prasanta Banerjee, said the average day-time population of Kolkata's 141 wards is 8 million. The following day, Dr. Goutam Samanta, a research-scholar of the School of Environmental Studies, Jadavpur University, said that the day-time population of core-Kolkata is 6 million. He said the average density of population is 43,000 per square kilometre, road area is about 6% of the city's total area, per capita green space is 20 square feet, the number of registered factories is 11,516 and there are about half a million registered motor vehicles. The NGOs put the density of population and area space in north Kolkata at 1,75,000 per square kilometre and 8 square feet per capita respectively.

**It was stated that a pollution map of Kolkata was being prepared. But the primary data released by the government, the Municipal Corporation and other sources are not the same.**

The NGOs used data released by the West Bengal Pollution Control Board and other national and international bodies in their publications. In 1996, per cubic metre of Kolkata's air had 460 micro-grammes of Suspended Particulate Matter (SPM), the highest in any of the cities of India. Quoting this figure, the NGOs said Kolkata was not

developed as a planned city with standard road space of 25-30 % of the total area. Fuel or petrol consumption is increasing day by day as the number of motor vehicles is doubling every decade. Unplanned industrialisation and newly-built high rise complexes in Kolkata are posing a serious threat to city life. Besides various heart and lung diseases, dwellers of Kolkata nowadays are sufferings from critical ailments as 238.8 metric tons of SPM, 64.7 MT of sulphur dioxide, 176.7 MT of carbon dioxide, 47.3 MT of nitrogen oxide and 59.1 MT of hydrocarbon are being released into the city's air daily from power generators, mills and factories, automobiles and domestic sources.

Colootola, Gariahat, Beckbagan, BBD Bagh and Shyambazaar have been identified as the most polluted areas of Kolkata. Lead pollution in Ballygange, Belgachia, Bagmari and Maniktala has increased to an alarming level. The court has already ordered the closure of all jewellery workshops of those areas to check lead pollution. It has also ordered 540 tanneries to relocate themselves outside Kolkata. But NGO campaigners complained that after relocation, these tanneries will pollute the air of a new area. As a result, workers employed there have withdrawn their support to the NGOs in their own interest.

### **Encouraging successes**

Although Kolkata-based NGOs do not work exclusively on green issues, their campaign, advocacy and support programme for the pollution victims is changing the attitude and vision of all concerned gradually. Most of the people suffering from asthma and other bronchial diseases are victims of air pollution. At night pollutant concentration increases due to low speed of wind. As a result, old people and children become sick and many of them die every year.

Some NGOs, including Nagarik Mancha, regularly publish newsletters and booklets to inform the people about the threat of diseases. The green bench of Kolkata High Court plays a supplementary role in protecting the endangered environment. Such actions should encourage the dwellers of other South Asian megacities to do the same.

# DELHI

INDIA 



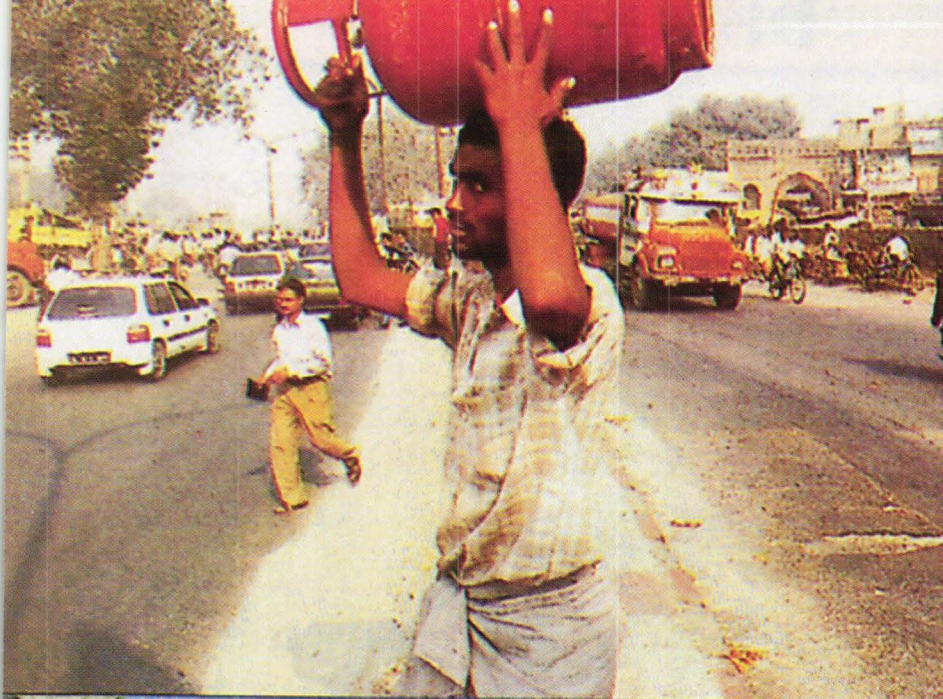
Photo: FEJB / CEJA

A shopping mall in old Delhi.

## AIR POLLUTION IN ASIAN CITIES

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Delhi street scene

Photo: FEJB / CEJA

# Delhi's legal war against auto emission

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By Anwar Hossain Manju and  
Geasuddin Ahmed

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**N**ew Delhi is one of the Indian cities severely affected by air pollution, much of which is emitted by the ever-increasing number of motor vehicles on its streets. It is estimated that some 70 per cent of the city's air pollution is caused by vehicular exhausts. Of late though, at the directive of the Supreme Court of India regarding compliance of emission norms for new cars that are sold in the city, different aspects of vehicular pollution were brought to the limelight. These include engine technologies, fuel quality, public transport inspection and certification system for vehicles and traffic management.

For containing vehicular pollution, the government has taken some important initiatives in recent years. These relate to progressive tightening of auto emission norms and fuel quality specifications as recommended by the Central Pollution Control Board (CPCB) of India. CPCB also drew up a series of Action Points (1995) and a Strategy for Vehicular Pollution Control (1997) with estimates of possible reduction in the pollution load through different measures, including phasing out of grossly polluting old vehicles and introduction of systematic inspection and certification for on-road vehicles.

The Supreme Court of India also approved some proposed measures and directed for their immediate implementation. Officials said some of those measures had already been implemented, while others were at different stages of implementation. Steps have been taken to reduce lead content in petrol. Since April 1995, the authorities also introduced

**The two-stroke three-wheelers and scooters require 2T oil for lubrication of engines. This increases visible smoke. To prevent the use of 2T oil in excess of the required quantity, pre-mixed 2T oil dispensers have been installed in all the petrol filling stations in New Delhi. Sale of loose 2T oil has also been banned from December 1998.**

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compulsory use of unleaded petrol for all new passenger cars. And from September 1998, it has been ensured that only unleaded petrol will be supplied for all vehicles Delhi. Besides, the Indian government made target to phase out gasoline lead from the whole country by April 2000. The Supreme Court had also directed that passenger cars -- both petrol and diesel -- should meet at least EURO 1 norms by June 1999 and EURO II norms by April 2000. The Supreme Court further directed that only vehicles meeting EURO II norms will be registered in New Delhi. Besides, the authorities have been asked to encourage CNG-operated vehicles in the city.

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To begin with, 20-year-old vehicles were first prohibited from plying on the city streets. Then, from November 1998, they started to phase out all 17-year-old vehicles, followed by the elimination of all 15-year-old vehicles that started in 1999. Registration of new auto-rickshaws with front engine was banned from May 1996 and registration of old defence service and government-auctioned vehicles was banned from April 1998.

All these steps taken so far left some favourable impacts by reducing vehicular pollution load and improving the air quality. Following the above-mentioned actions, the ambient air quality in different parts of Delhi improved to the level that existed in 1995, CPCB sources claimed. It has been estimated that the pollutants in the ambient air of Delhi decreased by 4-40 per cent in case of  $\text{SO}_2$ , 4-13 per cent in case of  $\text{NO}_2$ , 6-17 per cent in case of particulate matter, 3 per cent in case of Carbon

Monoxide and 11-60 per cent in case of lead during 1998.

And while in recent past, the concentration of lead in the New Delhi's air was 370, now it has been reduced to 340, thanks to the initiatives of Delhi administration, the environmental protection departments and the municipal authorities. Nowadays, vehicles in New Delhi are hardly seen emitting black smoke even when those are waiting at the traffic signals, said a CPCB official. But there are some coal-fired and diesel-run old power plants in and around New Delhi that were allegedly causing air pollution. The authorities were reportedly trying to relocate or modernise those polluting power plants.

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# Air pollution: the silent killer

By Nurul Huda

Each year, air pollution-related diseases claim some 52,000 lives in 36 Indian cities, including capital New Delhi where the toll is 10,000, said Ms Anumita Roy Chowdhury, a researcher at the Delhi-based Centre for Science and Environment (CSE). She said that in recent years, the levels of small particulate matter (SPM), nitrogen oxide and sulphur dioxide increased significantly in Delhi, resulting in widespread cancer and cardiovascular diseases.

Describing emissions caused by automobiles, thermal power plants and industries as the major sources of air pollution, Ms Chowdhury said, "Delhi's air has become so polluted that one life is lost every hour as a result of ailment caused by air pollution." A recent World Bank study reported that the average annual deaths from air pollution-related diseases increased to 10,000 from the level of about 7,500 in 1991-92. Ms Chowdhury pointed out that the level of small particles less than 10 micron present in the air was very high - which could cause severe lung cancer.

Asked to comment on role of the government in combating the air pollution problem, the CSE official said, "They have been focusing only on users' side of responsibility. At times, the Indian automobile manufacturers were enjoying protection ...

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as a result they were apparently under no obligation to improve their engine designs for bringing down the level of emissions to an acceptable level." However, an emission control regulation was introduced in India in 1991 and it was only in 1997 when a notification on engine specification was issued, she added.

Giving a comparative picture of automobile emissions, she described diesel engines as more dangerous than the petrol engines. Ms Chowdhury cited a recent study conducted by CSE that revealed that the diesel engines

create 10-100 times more particles than the petrol engines and over 90 per cent of those particles were dangerously fine. Delhi transport uses 2.5 times more diesel than petrol and there is no technology that can prevent the diesel engines from exhausting the harmful particles.

Strongly pleading for drastic reduction in the use of diesel to check deterioration of air quality, Ms Chowdhury favoured switching over to compressed natural gas (CNG) to reduce particle emissions by 30-35 per cent. In this context, she referred to the order of the Indian Supreme Court for conversion of diesel buses into CNG in capital Delhi by March, 2001. But she argued in favour of reducing the level of particles by 90 per cent so that people of Delhi could breathe clean air.

"It's a pity that our urge for fresh and clean air is frustrated when we find the transnational car makers -- who must have been aware of the severe pollution load in Indian cities -- are promoting diesel cars in our country," the CSE official lamented. Quoting a recent study by the Swedish Environmental Protection Agency, Ms Chowdhury said, "While diesel cars use 20-25 per cent less fuel per km, they emit 15 per cent more carbon per litre than the petrol cars. As a result the overall effect on carbon dioxide emission is very little." Bitterly criticising the cars makers for trying to mislead people about diesel cars, she said, "The car manufacturers were releasing advertisements in the media, describing diesel as an environment-friendly fuel." She praised the role of the Indian Supreme Court for a suo moto action on control of vehicular pollution. The Indian Supreme Court's suo motu order on control of vehicular pollution in the capital Delhi region, given on July 23, 1998, called for the following steps to be taken with respect to automotive fuels.

**"It's a pity that our urge for fresh and clean air is frustrated when we find the transnational car makers -- who must have been aware of the severe pollution load in Indian cities -- are promoting diesel cars in our country," the CSE official lamented.**

- Elimination of leaded petrol from national capital Delhi as proposed by the Environment Pollution (Prevention and Control) Authority and agreed by the Ministry of Petroleum and Natural Gas, by

September 1, 1998.

- Supply of only pre-mix petrol in all petrol filling stations to two-stroke engine vehicles by December 31, 1998.
- Replacement of all pre-1990 autos and taxis with new vehicles on clean fuel by March 31, 2000.
- Financial incentives for replacement of all post-1990 autos and taxis with new vehicles on clean fuels by March 31, 2000.
- No eight-year old buses should be allowed to ply except on CNG or other clean fuel by April 1, 2000.
- The entire city fleet of vehicles to be steadily converted to single fuel mode on CNG by March 31, 2000.
- The Supreme Court-appointed Environment pollution (Prevention and Control) Authority for the National Capital Region has also asked Delhi Government not to register any diesel taxi in Delhi;
- Several of these directions relate to substitution of diesel by cleaner fuels. These orders will force a large part of commercial vehicular fleet to move from diesel to cleaner fuels;

Responding to the Supreme Court directives, the Delhi administration had to submit an action plan for curbing air pollution to the court in December, 1996.

Meanwhile, eminent doctors, scientists and toxicologists in a joint statement on World Environment Day (June 5) last year expressed grave concern over the harmful effects of air pollution in New Delhi. They stressed the need for "comprehensive epidemiological studies to show how ambient air pollution is affecting people's health and also to measure this information and provide policy tools for air quality planning."

According to available figures, New Delhi had over 30 lakh vehicles registered on March 31, 1998 and the number was growing at a rate of two lakh annually.

Dilip K. Biswas, Chairman of Central Pollution Control Board (CPCB) - the government's environmental watchdog - in an interview with a visiting FEJB team said, "Pollution caused by various sectors of industry is disproportionate to their contribution to the total industrial output." Asked about the role of his organisation, Biswas said they had identified 17 categories

of polluting industries and more than 1000 such industries had been forced to close down for their failure to comply with remedial measures in time.

Besides, the CPCB Chairman said, hazardous industries were being shifted to isolated, designated places. The government and also the financial institutions were extending financial assistance to meet the costs of such relocation. Biswas pointed out that the Small Industries Development Bank of India (SIDB) and the Industrial Finance Corporation of India (IFCI) were giving extending support for modernisation of smaller industries. Biswas said the government had undertaken a scheme of promoting common effluent treatment plants in clusters of small scale industries. Meanwhile, the Ministry of Environment and Forest also set up a cell to promote clean technology efforts.

**Strongly pleading for drastic reduction in the use of diesel to check deterioration of air quality, Ms Chowdhury favoured switching over to compressed natural gas (CNG) to reduce particle emissions by 30-35 per cent.**

About the problem of using 'leaded' petrol, Biswas said the Indian government had taken steps for introduction of unleaded petrol which should be made available throughout the country by the year 2000. He dismissed such apprehension that unleaded petrol would cause harm to engines. Expressing his concern over the deadly effects of vehicles emissions, the CPCB chief said, "The Indian government is going to introduce stringent emission rules." He further said that in order to encourage greater use of CNG, there will be as many as 200 CNG conversion stations in New Delhi by the end of the year 2000. Until late 1999, there were only nine such stations in Delhi. Biswas appreciated the role of some NGOs, including the CSE, for creating awareness about the harmful effects of air pollution.



# TEHRAN

# IRAN



Photo: FEJB / CEJA

Cars on a Tehran avenue

## AIR POLLUTION IN ASIAN CITIES

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Downtown Tehran

Photo: FEJB / CEJA

# Planning for air pollution abatement in Tehran

By Dr. O. Yokoyama and K. Takahashi

**T**he Greater Tehran Area (GTA), with a current population of over eight million and an area of approximately 2300 square kilometres is suffering heavily from life-threatening atmospheric pollution, arising from the rapid urbanisation and industrialisation during the last few decades. Presently, there are more than 1.4 million vehicles and some 300 thousand industrial factories and offices in Tehran. Although there is little data available in Tehran, some of the observation data revealed that concentration of SO<sub>x</sub> and TSP in the ambient air in Tehran is very often well beyond the WHO standard.

Against such a background, the government of Japan, in response to the request of the Government of the Islamic Republic of Iran, decided to carry out a study on an integrated master plan for air pollution control in the GTA. Accordingly, a Study Team was dispatched through the Japan International Cooperation Agency (JICA). The team visited Iran several times from March 30, 1995 to February 12, 1997 and conducted investigations into the environmental situation of the city.

During the survey, the team exchanged views and had a series of discussions with the Municipality of Tehran and relevant organisations in the central government and other authorities concerned. It conducted observations, measurement and investigation of the ambient air, emissions from stationary sources and indicative parameters on mobile vehicle sectors, prepared an inventory of stationary sources and developed a simulation model during the study period.

**Among these pollutants, CO concentration is most severely high, sometimes exceeding 80 ppm. SO<sub>2</sub> shows next high concentration and sometimes exceeds 300 ppb. Also, PM<sub>10</sub> shows high concentration over 500 g/m<sup>3</sup> sometimes. These concentrations have exceeded the WHO standards.**



Overview of present status of air pollution : Air pollution concentration of SO<sub>2</sub>, NO, NO<sub>2</sub>, CO, THC, PM<sub>10</sub> as well as O<sub>3</sub> is measured at 5 monitoring stations belonging to the Department of Environment and at 3 stations belonging to the AQCC (Air Quality Control Co.). Among these pollutants, CO concentration is most severely high, sometimes exceeding 80 ppm. SO<sub>2</sub> shows next high concentration and sometimes exceeds 300 ppb. Also, PM<sub>10</sub> shows high concentration over 500 g/m<sup>3</sup> sometimes. These concentrations have exceeded the WHO standards.

Emission estimate : The contribution to air pollution varies according to the nature of the pollutants, but the main polluter in GTA is the automobile. Estimation of contribution has been done by several methods in this project, and results are summarised in Table 1.

Table 1: Emission Quantity of Air Pollutants in GTA (1994)

	SOX	NOX	CO	HC	SPM	(Total)
Stationary	96.8	70.7	5.9	15.5	12.1	28.8
Mobile		3.2	29.3	94.1	70.2	87.9 71.2
(Sub-total)	100.0	100.0	100.0	100.0	100.0	100.0

Simulation of future condition in the year 2005/2010 : The meteorological condition is assumed to be the same as the present situation. For future conditions of stationary sources, the following three scenarios are considered. 'Do nothing' assumes amount of pollutants extend proportionally to the economic growth rate. 'Best' is based on the schedule of pollution reduction plan and 'common' is the average of 'do nothing' and the 'best'. All those are adopted for year 2005 to 2010. Future emission from vehicles is calculated by predicted traffic volume and assumed future emission factor. Traffic volume predictions are based on two scenarios; one is 'do nothing' (1994 network + 2001 demand) and the other is 'existing + funded' (existing and funded network + 2001 demand). Three scenarios are considered for emission factor changes in the future according to several plans. The results are shown in Table 2.

**Table 2: Future emission amount from mobile and stationary sources**

Year	Source	Pollutants		
		CO	SOx	NOx
2010 do nothing	Mobile T/year	1,378,748	11,017	53,931
2010 best	Mobile T/year	336,158	5,084	33,143
2010 do nothing	Stationary T/year	5,1421	524,585	188,220
2010 best	Stationary T/year	5,1421	83,902	109,304

Definite methods of countermeasure for air pollution include use of oxygenated gasoline (e.g. MTBE), structural improvement of car manufacturing, introduction of car scrapping programmes, enhancement of the public transport system and so on.



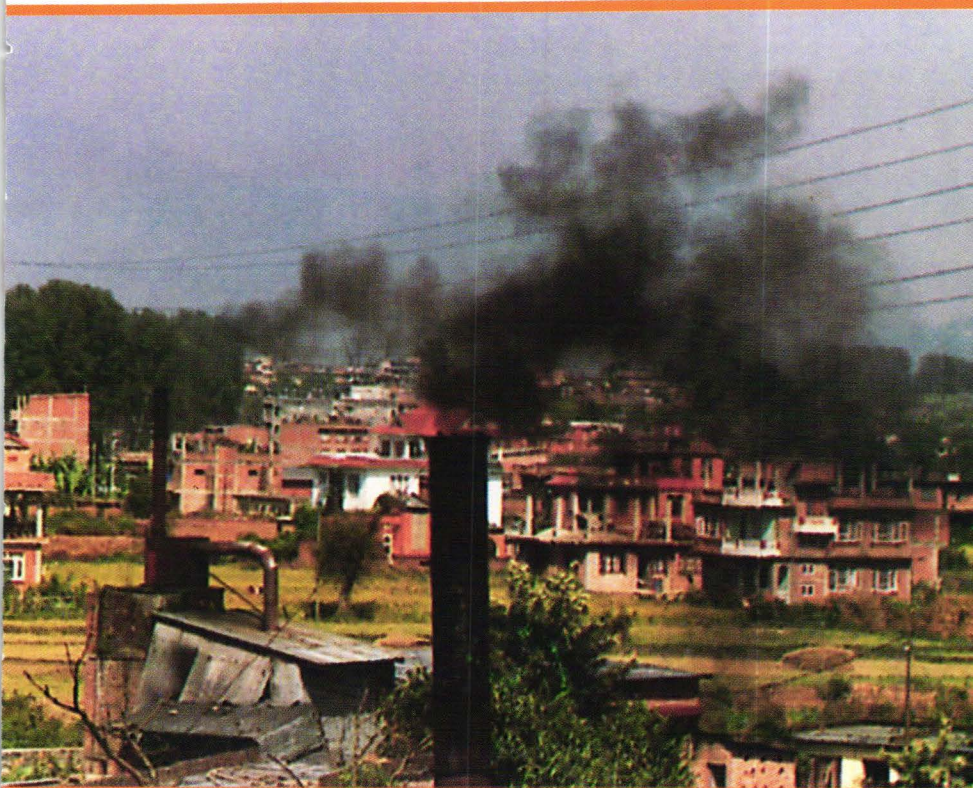
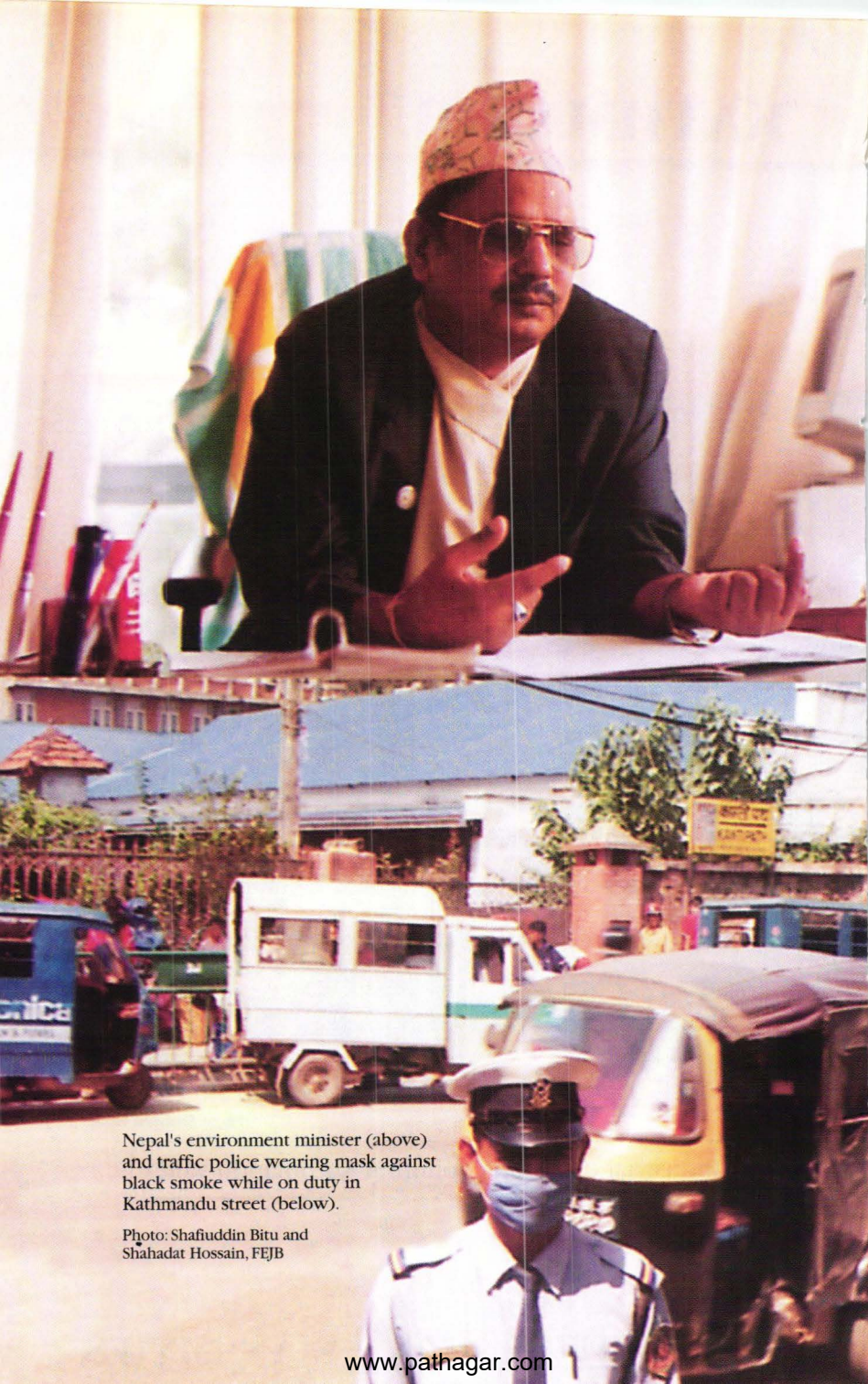


Photo: Shahadat Hossain, FEJB

Industrial emissions polluting Kathmandu valley

## AIR POLLUTION IN ASIAN CITIES





Nepal's environment minister (above) and traffic police wearing mask against black smoke while on duty in Kathmandu street (below).

Photo: Shafiuddin Bitu and Shahadat Hossain, FEJB

# Kathmandu curbs air pollution

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By Kamaluddin Sabuj

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**W**hile Kathmandu -- the capital of the Himalayan Kingdom of Nepal -- is expanding fast, the valley in which the metropolis is situated is losing all its charm. Today, the bowl-shaped city within Kathmandu valley is often ranked as one of the most polluted cities in the region. Walled in by mountains, the city's bowl-like topography and lack of wind during the dry season cause poor dispersion of polluted air, resulting in serious air pollution problems.

The vehicles and industrial establishments within the valley are generally considered to be the major sources of air pollution. The swelling urban population and increasing concentration of industry and automobile traffic in the city have resulted in severe air pollution. Emissions from automobiles and factories, domestic heating, cooking and refuse burning are constantly degrading the city's air quality. Acute air pollution is not only taking a toll of human life and health, but is also threatening the future livability of the city.

The consumption of automobile fuel and coal has increased with the numerical growth of vehicles and industries in the city. Studies have shown that particulate pollution is the major problem in Kathmandu valley, which is made up of three districts -- Kathmandu, Lalitpur and Bhaktapur. The total TSP (Total Suspended Particles) emission per year amounts to 16,500 tons, and particulate matter (PM10) emission to 4700 tons per year. The main sources of particulate pollution are the brickfields, domestic fuel combustion, some cement plants,

**The total TSP emission per year amounts to 16,500 tons, and particulate matter (PM 10) emission to 4,700 tons, annually... According to WHO, the level of Kathmandu's air pollution exceeds the acceptable standard by four times!**

vehicle exhaust and the stirring up and consequent re-suspension of the road dust.

Among the vehicles, buses, trucks and tempos and motorcycles with two-stroke engines are probably the most significant contributors to air pollution. (Concerned officials said that approximately 600 new two-wheelers are registered in Kathmandu every week). It is estimated that around 56 tons of carbon monoxide, 18 tons of hydrocarbons, 7 tons of nitrogen, 0.4 tons of sulphur dioxide and 0.69 tons of particulate matter are discharged daily through the exhaust-pipes of these vehicles in Kathmandu.

Industrial emissions also increase the ambient load of air pollutants. An industrial pollution inventory carried out by the Industrial Pollution Control Management Project indicated that altogether 3156 air polluting industries emit about 76,400 tons of total suspended particulate matter annually. In general, the TSP load in the Kathmandu valley atmosphere contributed by medium- and large-sized industries is estimated to be 104 tons per day. The questionable quality of the petrol and diesel that are generally available in the market has also contributed to air pollution because of the low octane level and the high content of lead and carbon.

**There are several hundred brick production facilities, mostly situated in the southern and eastern parts of Kathmandu -- within 5 to 10 kilometres of the city-centre. Coal and other forms of fuel are used to burn the bricks, giving rise to significant air polluting emissions.**

There are several hundred brick production facilities, mostly situated in the southern and eastern parts of Kathmandu -- within 5 to 10 kilometres of the city-centre. Coal and other forms of fuel are used to burn the bricks, giving rise to significant air polluting emissions. Sporadic research findings have indicated that the winter days are more vulnerable than the summer days in terms of the ambient level of particulate matter.

According to the Kathmandu Valley Traffic Police Office, there are some 200,000 vehicles in Kathmandu. The figure includes the three-wheeler auto-

rickshaws and tempos. Pawan Prasad Kharel, Deputy Superintendent of Police, said a vehicular colour rationing system, with respect to exhaust emission standards, was introduced in 1995. Under the system, they give green stickers to the pollution-free vehicles and the red ones to the polluting vehicles. Vehicles emitting black smoke are given 15 days' time to overhaul their engines.

**"We have limitations which we are trying to overcome. It will need new laws and their strict enforcement to curb air pollution. And in reality it's very difficult to enforce the laws," said one of the officials at the Traffic Department, which has manpower of only 591 personnel.**

The authorities had at first set a 3 per cent limit of carbon monoxide emission by the vehicles. But the limit was recently extended to 4.5 per cent. Some 40,000 vehicles were tested and on an average 50 per cent of the heavy duty diesel vehicles and 25 per cent of the light duty petrol vehicles failed to comply with the prescribed standards (3 per cent CO and 65 per cent HSU). The vehicles with red stickers cannot ply in some restricted areas of the city and there is a provision of fine for violation of this rule. There are only five to six restricted areas in the metropolis where the vehicles with red stickers are banned. "We have limitations which we are trying to overcome. It will need new laws and their strict enforcement to curb air pollution. And in reality it's very difficult to enforce the laws," said one of the officials at the Traffic Department, which has manpower of only 591 personnel. "This is too meagre a figure for overseeing nearly 1,000 kilometres of roads across the Kathmandu Valley," he complained.

**Health hazard:** Doctors and medical experts believe that some of the key health problems faced by those living in Kathmandu valley are directly related to the high level of air pollution. Problems like eyesores, asthma, common cold and slow growth in children are due to overexposure to polluted air. According to the World Health Organisation (WHO), the level of Kahtmandu's air pollution exceeds the acceptable standard by four times. Nearly half of some 200,000 vehicles in the city do not meet the emission standard. When solid particles containing



**Problems like eyesores, asthma, common cold and slow growth in children are due to overexposure to polluted air. According to the World Health Organisation (WHO), the level of Kahtmandu's air pollution exceeds the acceptable standard by four times.**

lead are inhaled, they are trapped in the lung and soon enter the blood system. Higher level of lead in the blood due to long exposure to polluted air can have deadly effects on blood formation, vitamin metabolism and the neurological process.

**Electric vehicles:** Kathmandu's burgeoning population is ill-served by the mass transport system, mainly made up of dilapidated buses and some 4000 noxious fume-spewing tempos. To improve the situation, the

authorities are now encouraging Electric Vehicles (EVs), run on batteries charged by clean hydro-electricity. They have already introduced new battery-operated three-wheelers, popularly known as SAFA tempos. The 15-seater SAFA tempo with reduced noise and vibration offers a smooth and comfortable ride. These EVs are more economical than vehicles run on gasoline and most cost-effective in terms of maintenance. Asok Raj Panna, Managing Director of the Nepal Electric Vehicles Industries (Pte) Limited, said that about 200 SAFA tempos are being manufactured yearly. He said that the EVs are ideal for the valley because the distances travelled are comparatively short.

**Legislation:** The Nepalese government has enunciated environmental policies and integrated environmental aspects in the development projects and programmes since the mid-1970s. An Environment Protection Act 1966 (EPA) and the Environment Protection Rules 1997 have also been introduced since July, 1997. The EPA contains several provisions to internationalise the environmental assessment system and public consultation and pollution control. The country's Ninth Plan (1997-2002) emphasises environmental management to improve environmental conditions. The Plan seeks to implement progressive vehicular taxation to control urban pollution. The EPA 1996 aims at maintaining a clean and healthy environment and contributing to sustainable

development. The Vehicle and Transport Management Act 1992 is intended to regulate vehicular exhaust emissions while the Industrial Enterprises Act 1992 promotes the adoption of industrial pollution control measures, including incentive and disincentive provisions.

A number of non-government organisations (NGO) are also involved in the campaign for making the city environment-friendly as well as for protecting its cultural heritage sites. A writ petition was filed in the Supreme Court in December, 1998 seeking a ban on the movement of air polluting vehicles. The case is still pending in the Supreme Court.

## **SAFA Tempo**

**By Shamima Chowdhury**

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The Nepalese authorities are recently encouraging a new kind of vehicle called the SAFA Tempo - a three-wheeler run by rechargeable batteries - to reduce air pollution in Kathmandu city. There are nearly 300 of these vehicles now plying the streets of Nepal's capital. Officials as well as users of the SAFA tempos say that because of their pollution-free and noise-free features, the vehicles are getting more popular by the day. On top of that, the vehicles are relatively cheap to operate.

In the Nepalese language, SAFA means clean. These vehicles virtually emit no fumes since they are powered by batteries. They are also cheap to maintain and operate as it costs only Nepali Rupee 200 for charging a set of batteries. Each tempo, able to carry 12 passengers, requires two batteries to run 60 kilometres before recharging.

The Nepal Electric Vehicles Industry Ltd. (NEVI) is a local company that has taken the lead in constructing the SAFA Tempo. "We know it's a big challenge to compete with the petrol- and diesel-run automobiles ... but we ventured to produce these battery-operated electric vehicles because of their emission-free technology. But SAFA is now becoming popular." said Ashok Raj Pandey, Managing Director of NEVI. So far the company has assembled more than 100 SAFA tempos. They build the body of SAFA locally, but import the chassis from India and engines and batteries from USA. Apart from NEVI, there are a number of other companies like the Electrical Vehicle Company (EVCO) and Green Electrical Vehicle Company (GEVCO) which are producing SAFA tempos.

The Electric Vehicle (EV) movement in Nepal got off the ground in 1989 when India imposed a trade embargo on Nepal that caused a fuel scarcity in the country. The Indian embargo then prompted a group of Nepalese engineers to find out alternatives for running the transport sector. Being a country rich in hydropower, the Electric Vehicle Development Group (EVDG) came up with the idea of making and operating electric vehicles. The EVs have now become a popular mode of transport in Nepal's quest for curbing air pollution.

# **Worsening air pollution scenario**

**By Abdul Hai Siddiqui**

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Kathmandu, the Nepalese capital with a population of about one million, is often ranked as one of the most polluted cities of South Asia. Some environmental observers even tend to equate Kathmandu with Mexico City, which became notorious for dangerously high levels of air pollution.

Although the size of Kathmandu is relatively not that big and the number of vehicles and industries in the city is far less compared to most of the large cities in South Asia, the level of its air pollution has been on the higher side. The reason is topographical. The city is situated in Kathmandu valley, a patch of 30 square kilometres of land. It is surrounded by hills and mountains that rise 500 to 1000 metres above the valley floor and 1300 metres above the sea level. The city is thus virtually walled in by the mountains, except for just one narrow outlet in the south-west through which the Basmati river flows out of the valley. This bowl-like topography and generally low wind speed during the dry (winter) season create poor dispersion conditions, making Kathmandu Valley vulnerable to serious air pollution problems.

**Although the size of Kathmandu is relatively not that big and the number of vehicles and industries in the city is far less compared to most of the large cities in South Asia, the level of its air pollution has been on the higher side.**

Environmentalists, government officials and residents of Kathmandu city generally identify two major sources of air pollution: vehicles plying on the city roads and the industries in and around the city.

There are about 200,000 registered vehicles that ply on the city streets. Buses, trucks, and especially the three-wheeler auto-rickshaws, tempos and the motor-cycles which are all powered by two-stroke engines, are the main contributors to air pollution. It has been estimated that some 56 tons of carbon monoxide, 18 tons of hydrocarbon, 7 tons of nitrogen oxide,

**The traffic police in Kathmandu have introduced the Green Card and Red Card system to identify and check 'polluter vehicles'. They regularly check vehicles and the polluters are being given Red Cards while the safer ones get Green Cards. Vehicles with Red Cards get 15 days' time to rectify the faults in their engines.**

0.4 tons of sulphur dioxide and 0.69 tons of particulate matter are discharged daily by these vehicles.

There has been a spurt of growth in the industrial sector during the last decade in Kathmandu valley. Over 2,000 large and small industries, including cement and plastic factories, brickfields and carpet dyeing units that cropped up in and around Kathmandu, have now become major industrial polluters. The emissions from these industrial units, particularly during the monsoon season when southerly winds blow over the valley, make the situation worse. Domestic emissions from heating, cooking and refuse burning also contribute to

Kathmandu's deteriorating air pollution situation.

In view of the worsening air pollution scenario in the city, the government and its various agencies as well as the NGO's and professional groups, have come up with several programmes to tackle the problem. Several laws have been enacted and the programmes have been included in the five-year plan to curb air pollution. To encourage use of environment-friendly engines in vehicles, the government has allowed import of automobiles fitted with Euro-1 quality engines with only one per cent duty. It has also decided to allow 99 per cent duty exemption on the import of pollution-free vehicles, which will replace those which are environment-hostile. The private sector companies are being encouraged to introduce vehicles operated by electricity. One such company has already marketed battery-operated SAFA tempos.

The traffic police in Kathmandu have introduced the Green Card and Red Card system to identify and check 'polluter vehicles'. They regularly check vehicles and the polluters are being given Red Cards while the safer ones get Green Cards. Vehicles with Red Cards get 15 days' time to rectify the faults in their engines.

Meanwhile professional organisations like the Nepal Forum of Environment Journalists (NEFEJ) have come forward with specific programmes to create awareness among people about environmental problems. Besides focussing on environmental issues through newspapers and television, the NEFEJ broadcasts environment-related programmes from its own radio station -- Radio Sagarmatha. This is the first non-governmental public radio station in South Asia that was given a license to operate round the clock.

Today the air of Dhaka, the capital of Bangladesh, is considered one of the most polluted in the world. In fact, according to the scientists of the Bangladesh Atomic Energy Commission, Dhaka city has beaten Mexico City to earn the dubious distinction of having the dirtiest and most dangerous air in the whole planet. If the government and different professional bodies of Nepal, with their limited resources and expertise, can venture to curb the growing air pollution in Kathmandu, there is no reason why the Bangladeshi authorities, with active support from NGO's and professional groups, should not be able to combat the pollution problem in Dhaka city.

**In Bangladesh some strong measures -- including enactment and enforcement of relevant environmental laws, encouraging import of environment-friendly vehicles, patronising battery-operated or CNG-fuelled tempos, introduction of Green Card and Red Card for vehicles -- should immediately be taken to improve the air quality in Dhaka and other urban centres.**

In Bangladesh some strong measures -- including enactment and enforcement of relevant environmental laws, encouraging import of environment-friendly vehicles, patronising battery-operated or CNG-fuelled tempos, introduction of Green Card and Red Card for vehicles -- should immediately be taken to improve the air quality in Dhaka and other urban centres. Besides, following the Nepalese experience, the authorities in Bangladesh may consider allowing non-governmental radio and television stations to broadcast programmes highlighting different environmental issues.

# Air pollution mitigation measures

By Sk. Enamul Haque

The authorities in Kathmandu, the capital of Nepal, have taken up several measures to curb air pollution, which has been bedevilling the city-dwellers for years. First, the traffic department, in cooperation with the Ministry of Environment, has introduced a system of identifying the polluting and non-polluting vehicles. For this, they have initiated the practice of compulsory testing of all motorised transports. After the test, if a vehicle is found to be emitting black smoke, it is given a red card or sticker and its owner is asked to overhaul the engine within a specified time, usually 15 days. The vehicles found to be alright and pollution-free are given green cards or stickers. Those having the green cards can ply all across the city but there are restrictions on the movement of red card-holding vehicles.

Each car must paste its red or green sticker in front of the vehicle.

**A standard was determined for the motorised transports plying the Kathmandu valley roads. The vehicles made before 1980 should not emit more than 4.5 grammes of carbon monoxide per kilometre and those made after 1981 should not emit more than 3.1 grammes carbon monoxide per kilometre. And the motorised three-wheelers, which were registered after 1991, should not emit more than 3.5 grammes of carbon monoxide per kilometre.**

The owners of the red card-holding vehicles are given 15 days of time to make them pollution-free. They are given two successive warnings for violations, after which they are totally banned from plying the streets. The privately-owned vehicles holding green cards are given one year's time to renew their cards.

There are only two places for testing and assessing the emission of motorised vehicles : one for petrol-operated and another for diesel-operated vehicles. But Nepal still does not have the appropriate equipment for correctly measuring vehicular emission levels. The equipment will cost 10 million Nepalese rupees. State Minister Belayar said that the government was trying to arrange the funds to buy a dynamometer and to

install an emissions laboratory. He added that experts had recommended the use of environment-friendly microbuses and the transport entrepreneurs had agreed to cooperate and were importing environment-friendly microbuses which were supposed to arrive within two months.

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Balayer said that Nepal plans to enforce Euro-1 emission norms strictly in all the new vehicles seeking registration after the year 2000 in a drive to make Kathmandu city free from air pollution. As part of its anti-pollution drive, the European Union (EU) introduced the Euro Standard all over Europe during the early 1990s. Recently the EU has advanced to the Euro-IV Standard. India has announced that it would adopt the Euro-II Standard after the year 2000.

If the Euro-1 emission standards are to be followed, a moving vehicle should not emit more than 2.72 grammes of carbon monoxide per kilometre -- an ideal norm under the present situation. The minister further said, "We have to import all the motorised vehicles. So henceforth we will import only environment-friendly ones." He added that from September 17, 1999 Nepal has banned some 650 diesel-operated Vikram tempos (three-wheelers) from the valley. Experts said that Nepal's Euro-1 emission law will be effective only when the authorities keep strict vigil on vehicles imported from outside. The Minister said that the Dutch government would provide 1.3 billion Nepali rupees for fighting industrial pollution in the city. The Asian Development Bank has also assured help. The Finnish and Canadian governments will also provide assistance for containing air pollution. With pledges of support coming from different donors, there should not be any shortage of funds to combat air pollution.



# Groping in the smoke of Kathmandu

By Dr. Rizwan Siddiqui

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It was a foggy evening when we alighted from the plane at Nepal's Tribhuban airport. Surrounded by green mountains, the airfield's atmosphere was calm and quiet. The golden rays of the evening sun were spreading over the runway and lush green fields around. Flocks of birds were returning to their nests fearlessly as the airport was silent for the time being. The evening descended when we moved out of the airport after completing the immigration formalities.

But it was a shock when we emerged from the terminal building and saw many dilapidated taxis and micro-buses lined up and waiting to pick up the passengers. In the line there were Japanese as well as Indian vehicles. Japanese cars were older in age but the Indian cars, that were comparatively new, also had a shabby and battered look. The Indian Maruti cars had already become defective. Some of those had been smashed in accidents while others had bonnets hanging from their sides. As environmental activists we could comprehend from the look of the cars the extent of air-pollution in Nepal caused by such unroadworthy vehicles.

**It appears that the business community in Nepal is very conscious about the protection of environment. In many hotels entry with polythene bags is restricted. The hotels, provide paper bags that are produced mostly by children. In some hotels the furniture is environment-friendly.**

An Indian Maruti car zipped past. Black smoke engulfed the whole airport parking area as soon as three to four Maruti cars moved out of the place where we were standing. We had to grope through the black smoke to find our way to the taxi.

We were trapped for what seemed to be hours in a horrendous traffic jam on our way to the hotel in Kathmandu. It became almost unbearable when the black smoke emitted from the defective Indian-made two-stroke engine-powered three wheelers, taxis, buses, trucks, cars and pick-ups engulfed us. We could not even see our

way through the black smoke. By the time the driver casually declared that 'Kathmandu is like that', tears were rolling down our eyes, inflamed by the black smoke.

After fighting through the horrible jam and black smoke we finally reached the hotel. The notices hanging on the walls of the hotel rooms for the boarders were interesting and informative. The boarders were requested not to waste electricity as there was severe scarcity of power. They had also been requested not to waste water, which was also in short supply. They were asked not to wash even the undergarments in the bathroom; if they did so they would be fined 50 dollars!

Mother Nature does a very good job in cleaning up and freshening Kathmandu. As the city is situated in a valley, the rainfall washes away almost all the dirt of the city. Otherwise, the dirt would have accumulated to such an extent that the environment would have become polluted to a higher degree.

It appears that the business community in Nepal is very conscious about the protection of environment. In many hotels entry with polythene bags is restricted. The hotels, provide paper bags that are produced mostly by children. In some hotels the furniture is environment-friendly.

Smoke from brickfields and industrial wastes of dyeing factories are also polluting the environment of Kathmandu. But the black smoke emitted from defective Indian vehicles is mainly responsible for air pollution in the Nepali capital. Due to econo-political reasons, Nepal has been forced to import air-polluting Indian vehicles.

The sky of Kathmandu looks foggy most of the day due to black smoke emitted by the defective vehicles. The two-stroke

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A leader of the environmental activists in Nepal, Bharat Besnet, is very vocal against the import of three-wheelers with two-stroke engines. He and his fellow activists have achieved some success. Battery-driven tempos, known as "Safas", are now being increasingly used on the roads of Kathmandu. They do not pollute the air as they do not emit any smoke. But because of corruption of the politicians and in

the bureaucracy, the wider introduction of Safas is not possible in Kathmandu; for the same reason a ban cannot be imposed on the tempos and three-wheelers.

Punnahari, environmentalist and a prominent member of the Forum for Environment Journalists in Nepal, said that the government had never fulfilled its commitment to ban the import of environment-polluting vehicles. The importers bribe the authorities to bring in such vehicles. So the situation remains as it is.

Corruption has gripped the police administration in Nepal. Most of the vehicles that move on the roads of Kathmandu are junks; they are more or less unroadworthy and should not have been given fitness certificates. But bribes can buy fitness certificates, so they go on plying the roads and polluting on the air.

The additional superintendent of police, Kharel Pande, denied such allegations. He assured us that action would be taken in phases to curb such corruption and to develop Kathmandu as the most environment-friendly city in the world. But nobody was able to tell us how far these measures would be effective and in how many years.

# Nepal to enforce Euro-1 norms

By Mrinal K. Roy

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Nepal is planning to strictly enforce Euro-1 emission norms in all the new vehicles seeking registration after the year 2000 as part of a drive to curb air pollution. The European Union (EU) introduced the Euro standard all over the continent during the early 1990s. Today, the EU countries have advanced to Euro-IV standard. And in neighbouring India, the authorities are planning to introduce Euro-II standard after the year 2000.

Under the Euro-1 emission standard, a moving vehicle should not emit more than 2.72 grammes of carbon monoxide (CO) per kilometre. But according to sources in the Nepalese Department of Traffic, only three per cent of some 200,000 vehicles are maintaining the proper carbon monoxide level.

Bhakta Bahadur Balayar, Minister of State for Environment, said that the government was planning to import only environment-friendly vehicles in the future. He further pointed out that in September 1999, the government banned some 650 diesel-operated Vikram tempos from the streets of Kathmandu. The authorities are also offering 90 per cent exemption of customs duty on the import of environment-friendly minibuses. He said that the government's move to curb air pollution was gaining popular support.

The Minister said that the Dutch government would provide 1.3 billion Nepali rupees to help the country reduce industrial pollution in Kathmandu valley. Support from other donors like the Asian Development Bank (ADB) and the governments of Finland and Canada will also be available for different environment protection projects.

# Keeping Kathmandu air clean

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By Aditya Man Sheshtra and  
Purna Hari Amatya

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**S**ome 20 years ago a tourist landed at Kathmandu airport. On disembarkation, the first thing he did was to take a deep breath. People thought he was airsick. "No", he said, "After a long time, I have a chance to breathe in clean fresh air." The table has turned upside down now. Today, it is only after getting out of Kathmandu valley that one can inhale some fresh and unpolluted air. In Kathmandu, the state of air quality has deteriorated over the last two decades or more. But look at the situation in California, USA. Newsweek published two pictures -- one some 25-year old and one of a recent sky. The old one showed smog-filled sky. But the new one was a picture of clear sky. That is also a change that occurred in the last 20 or 30 years.

**The difference between the ignorant and the enlightened media is that the former write about the exhaust fumes emitted by the vehicles as an evidence of the air pollution. But the latter quote the experts and their scientific findings on air pollution to make their point. Environmental journalism does not stand on visual and sensuous experience alone. Its merit lies in making the stories unquestionable, based as they were on scientific evidences.**

What does it mean? It means that the developed countries have taken care of their environment whereas the developing countries are increasingly suffering from pollution. It also means that air pollution, and for that matter, the environmental pollution, is not an insoluble phenomenon. Given the right policy and their effective implementation, environmental problems can be addressed. It further means that the development concept we are following in the footsteps of the countries in the north has a basic flaw, the flaw of making us suffer from what the developed countries had themselves suffered in the initial stages of their development. It also means that the rich countries have the

resources to revert to clean air, which the poor countries do not. The reverting process is a costly affair and technology-oriented, which the wealthy nations can afford and the poor countries cannot.

How bad is the situation in Kathmandu valley can be realised by a study of the air quality. It has been found that the roadside air is by far the worst as it is full of fume, dust and other elements harmful to health. A study has established that the worst is the dust pollution that is found to be almost five times more than the acceptable level set by WHO. The study attributed as much as 60% of the pollution to this factor and the remaining 40% to vehicular emission. The bad road condition, traffic load and piled up solid wastes are responsible for the major pollution. The presence of carbon monoxide, sulfur dioxide and nitrogen oxides -- elements measured in the air-monitoring tests -- is found on the higher side of the acceptable level but not at an alarming scale. However, there is a growing concern over its impact on public health. Doctors have come up with records of increasing respiratory diseases, chest and throat infection and heart complaints. Especially newborn babies and children have been the worst victims of air pollution.

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What then is the way out? First, there should be awareness. Until people get aware of what is going on around them, there is no commotion. Unless there is commotion there is no action. The media has played its role, sometime enlighteningly and sometimes ignorantly. Our job is to sensitise the media first so that they could educate the people. The difference between the ignorant and the enlightened media is that the former write about the exhaust fumes emitted by the vehicles as an evidence of the air pollution. But the latter quote the experts and their scientific findings on air pollution to make their point. Environmental journalism does not stand on visual and

sensuous experience alone. Its merit lies in making the stories unquestionable, based as they were on scientific evidences. Public awareness stemming from this source cannot but be effectual and commotion raising. Public commotion is indeed necessary to coerce the authorities to act.

Hence, the second important thing is that the government should act. At least, for once, the government in Nepal acted to drive the polluting 3-wheeler transport out of the road. The arguments in favour of those 3-wheelers were overwhelming. That they are cheap, easy to move on the narrow roads of the capital and that they have provided employment to hundreds of people. However, the authorities did not relent in their stand or submit to these pressures. Now that they are out, no tears are shed for them. It was a big battle won in the sense that the investors in the discarded transport were mostly none other than the policy officers. Not that the disappearance of that kink of vehicles has completely stopped the polluting process, but that it demonstrated that given the political will and government's determination, a change can be effected in controlling air pollution as on other public issues.

The third important point is related to good governance. In other words, the government introduces a measure with good intention to curb air pollution but then gets frustrated by bad governance. For example, the introduction of emission test of the vehicles, cars, trucks, buses, etc., was a welcome step towards the goal of clean air. It has indeed become a regular phenomenon in Kathmandu city. Vehicles not passing the test are debarred from entering into many public premises, like the government secretariat. They are granted a grace period to improve their running conditions. Thus, they are not immediately nabbed on the roads. This is all in theory and principles. The reality is that almost all vehicles fail the test but obtain the official certificate or clearance on payment of an "unofficial fee". It has now become one of the biggest tools for the traffic police to line their own pockets. The net result is that vehicles still run, emission-tests are still carried out certificates obtained and, thus, the policy of the government is visibly implemented. But the main objective of controlling air pollution remains far from being attained. Thus, corruption is eating away the principles, the objectives and all efforts for

curbing air pollution.

It is this ugly reality that pushes us into such a territory where angels fear to tread. When you have a motive of making extra backs from your jurisdiction, there is no way we can expect to see our objectives fulfilled. To cite yet another example, the government has enforced the emission standard for vehicles called Furo-1. So much so that standard is being applied

to all new vehicles to be imported. The result is that hundreds of vehicles are waiting at the border point to be technically declared that they meet the new emission standard. It is a simple knowledge that the manufacturers mention such standard in their manuals, on the basis of which the vehicles in question can either be accepted or rejected. However, the technical hassle is not actually technical. It is in fact financial. Soon the technical problem is solved by financial intervention in terms of bribery.

**Dust pollution, which is almost five times more than the acceptable level set by WHO, accounts for 60% of the air pollution while vehicular emission account for most of the remaining 40%.**

The most interesting has been the story of fossil fuel, a source of air pollution. Normally, refined petrol and diesel are held responsible for pollution. Now think of their adulteration and imagine how much harms they can do to the air. It is an open secret that this vehicle fuel is contaminated with cheaper liquids like kerosene and other assorted items. There, too, the government tried to enforce certain regulations for controlling adulteration. When tested, all petrol and diesel were found contaminated with undesirable liquids which were not only worsening air pollution situation but also causing mechanical troubles for the vehicles. Transporters of fuel were brought to book. But instead of complying with the government regulations, they went on strike. The fuel depots, too, joined the fray because the , too, were partly involved in the adulterating process. The government had to bow down to the agitators conceding them the right to cheat the people, to damage the vehicle engines and to pollute the air. Given the use of such adulterated oil, no vehicle can come up to the emission standard set by the government.

The media has been highlighting these problems day in and day



out. The stories are not full of conjectures. They carry authentic data and quote from the officials and experts. People are, of course, agitated. Officials are indeed aware of all this. The government has taken note of the problems and included them in its agenda. But the real things are still not happening. It means media, like all other public institutions has a limited influence. A constant media hype helps highlight the problem but its solution takes its own time depending upon so many other factors - political, economic, social and so on.



Photo: Md. Kamruzzaman, FEJB

Air Pollution is one of Karachi's woes

## AIR POLLUTION IN ASIAN CITIES





Street scene – Karachi

Photo: Md. Kamruzzaman, JEJB

# Karachi's crippling air

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By Quamrul Islam Chowdhury with  
Mir Lutful Kabir Saadi

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**A**ir pollution in Karachi city area is the highest among the South Asian cities, except Dhaka. It adversely affects man and his environment in many ways. There are many sources of air pollution in Karachi. The primary pollutants are carbon dioxides, carbon monoxides, sulphur oxides, nitrogen oxides, hydrocarbons, halogen compounds, organic compounds and radioactive compounds. The most significant effect of air pollution is its threat to human health.

The present population of Karachi city area is about 12 million and the area is about 560 sq. kilometres. The daily quantum of waste in Karachi city is about 6000 tons. The evening breezes of the Arabian Sea on the south are a blessing for overcrowded, polluted and dirty Karachi. During the north-eastern monsoon season pollutants are pushed towards the beach and inland during the south-westerly monsoon.

According to scientists, clean, dry air contains about 78 per cent nitrogen, 21 per cent oxygen, 0.9 per cent argon, 0.03 per cent carbon dioxide and other trace elements and compounds, including methane, helium and neon. Water vapour in the atmosphere varies from zero to approximately four per cent by volume.

The term air pollution refers to the presence of solid particles, liquid droplets or gaseous compounds in the atmosphere which are not normally present or which are present in a concentration substantially greater than normal and are harmful for living organisms. The duration of exposure of

**Among these pollutants, CO concentration is most severely high, sometimes exceeding 80 ppm. SO<sub>2</sub> shows next high concentration and sometimes exceeds 300 ppb. Also, PM<sub>10</sub> shows high concentration over 500 g/m<sup>3</sup> sometimes. These concentrations have exceeded the WHO standards.**

**The duration of exposure of the body to polluted air is also an important factor. On an average a man breathes 22,000 times and inhales 16 kg. of air each day. It has been estimated that a man can live for five weeks without food and water, but only for five minutes without air.**

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Brigadier (retd.) Akhter Zamin, director general of the Environment Protection Agency of Sindh, pointed out that Karachi is one of the fastest growing cities in South Asia. In terms of area and population, Karachi has continued to expand relentlessly since the independence of Pakistan. Mentioning migration as a major problem for

Karachi, he noted that for jobs and better livelihood there was a continuous, large-scale migration from Afghanistan, India, Bangladesh and also from the northern parts of Pakistan into the city. About 22 per cent of the urban population of the country live in Karachi. The big development projects like the Tarbela Dam are also responsible for migration of the rural population to Karachi, he opined.

He told members of the Forum of Environmental Journalists of Bangladesh (FEJB) on October 4, 1999 at his office that Pakistan has a comprehensive environment protection law that was enacted in 1997. But the law is neither followed nor implemented strictly.

Brigadier Zamin also mentioned that the Sindh provincial government is planning to introduce environmental issues in the academic curriculum from primary to university levels. There will be an additional subject on environment in class IX and X, he said, and added that essay and painting competitions are also held on environmental issues. There is a good number of environmental clubs at school and college levels. "We are trying to create environmental awareness among our young generation as well as general members of the public," he said.

The Karachi radio station broadcasts a 40-minute programme on the environment once a week in Urdu while the Larkana and Khairpur radio stations also broadcast a programme on

environmental issues once a fortnight. However, there is no regular television programme on the environment, pointed out Brigadier Zamin.

The quantum of lead in the air of Karachi during the low rainfall period reaches one of the highest known levels in the world. It may be mentioned here that the World Bank has called lead the 'greatest environmental threat' to many cities throughout the developing world. Lead has been added to petrol since the 1920s to increase octane numbers and improve engine performance. "Lead impairs the mental and physical development of children even at a low level of exposure," says a World Bank report. "A highly significant association has been found between the exposure of children to lead and their IQ".

Children also lose the ability to concentrate and can become socially maladjusted. These disabilities can be permanent.

It is well established that air pollution contributes to the incidence of chronic diseases like emphysema, bronchitis and other respiratory ailments. Polluted air is also linked to higher mortality rates from other causes, including cancer and arteriosclerotic heart disease. Smokers living in polluted cities have a much higher rate of lung cancer than smokers in rural areas.

Studies suggest that lead levels now found in the blood and urine of the urban population, although well below those associated with classic lead poisoning, may interfere with the ability of the human body to produce blood. Lead may exert toxic effects on the gastrointestinal, haematopoietic, nervous and renal systems. As air pollution becomes more widespread, an increasing number of people are being exposed to airborne lead, chiefly from automotive emissions.

Many studies have revealed that the effects of air pollution on human health - especially of certain irritants, either gaseous or particulate -- can slow down, even stop, the action of the cilia

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**The role of airborne particulate matter (APM) in endangering human health is extremely significant, according to the latest studies. The finer the particles are the deeper they encroach into the respiratory tract. Fuel combustion and industrial activities produce these fine particles. Lead and other metals thus released are deposited in the lungs and enter the bloodstream.**

and thus leave the sensitive underlying cells without protection. The irritants can cause production of increased or thickened mucus along with constriction of the airways. They can cause loss of cilia or even of several layers of cells.

Some pollutants which remain in the lungs may be carried by blood into the body and ultimately cause chronic damage to organs such as the kidney and liver. Irritant air pollution appears either to increase ones susceptibility to cold or at least to produce similar symptoms. These symptoms are medically described as acute non-specific upper respiratory diseases. Air pollution also causes other acute respiratory diseases. Experiments have shown that some of the gaseous

irritants commonly found in the atmosphere make the people more vulnerable to pneumonia. However, experts pointed out that this does not imply that the pollutants cause infections directly. All living things harbour assorted bacteria; when the body's defences are weakened, the germs cause active illness. The weakening of these defences appears to be the effect of some air contaminants.

Generally, when discussing air pollution, the outdoor air pollutants are given priority. The major focus is on the emissions by motorised vehicles. Due to the heavy traffic in Karachi city, smoke from motor vehicles, which is full of harmful hydrocarbons, carbon monoxide, lead and lead compounds and radon gas, pollutes the air and endangers the health of the city dwellers. The radon decay product lead, if inhaled, can cause gastro-intestinal damage, liver and kidney damage, and abnormalities in fertility and pregnancy. It also retards the mental development of children.

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the respiratory tract. Fuel combustion and industrial activities produce these fine particles. Lead and other metals thus released are deposited in the lungs and enter the bloodstream.

The APMs decrease visibility and are the primary cause of haze. The suspension time of fine particulate matter in the air is longer and hence they are responsible for distant transportation of pollutants. They adversely affect the atmospheric radiation balance, cloud formation, precipitation and atmospheric chemical processes.

**No survey on air quality has ever been conducted by the provincial government in Karachi though this mega city holds about seventy per cent of the industries of Pakistan.**

As the effect of APMs are dependent on their size, fractionated aerosol samples were collected at an urban site. Stringent quality control and quality assurance procedures were observed in the measurements through inter-laboratory comparison of the analysis of unknown samples. The effect of variation in the weather was clearly reflected in the results obtained. From the data obtained in the studies it was found that Karachi has a significantly high level of air pollution due to particulate matter.

Brigadier (retd.) Zamin said that the World Bank was going to finance a federal government programme to study the air pollution problem in ten selected cities in Pakistan, including Karachi. He expected this programme to be launched within four months.

Dr. Badar M. Khan Ghauri, director of the Space Science Division of the Space and Upper Atmospheric Research Commission (SUPARCO), informed us that most of the air pollution came from vehicles, power plants, tanneries and textile mills. SUPARCO conducted an atmospheric pollution survey in 1990 in Karachi city, which revealed that the content of carbon and nitrogen in the air surpassed the standard permissible limit. This survey also indicated that the carbon monoxide level in the air was 9-10 ppm along the busy urban streets. Carbon monoxide level in some of the streets is more than 370 ppm during rush hours. No survey on air quality has ever been conducted by the provincial government in Karachi though this mega- city holds about seventy per cent of the industries of Pakistan.



Most NO<sub>x</sub> is emitted by the petrol and diesel engines of the huge number of vehicles in downtown Karachi. The contaminants that exist in the air of busy areas, like M.A. Jinnah Road, Sadar, Korangi, Landhi are hazardous to health, Dr. Ghauri said.

M. Farhan Anwar, an environment engineer and executive of SHEHFI: CBE (Citizens for a Better Environment), an NGO, said the air quality of Karachi is declining drastically. Politicians are either unaware of environmental problems or not interested in them. So the politically motivated print media also gives lower priority to environmental issues. He, however, observed that English language newspapers are well ahead of the Urdu language newspapers in covering environmental issues. He noted that the electronic media, radio and television, can play a very significant role in making people conscious of the critical environmental issues.

Rafia Haider of APP, the national news agency of Pakistan, said environmental issues are nowadays getting more priority in the media, but this is not enough to make people sufficiently conscious of the degradation of the environment. She felt that more extensive coverage of environmental issues was needed, both in the print and electronic media.

Shahid Hussain of the Commonwealth News of Karachi observed that air pollution in Karachi city nowadays is at an all-time high. Many people become sick due to polluted air but no survey in this regard has yet been carried out. He felt that the government must be strict in implementing the environmental laws.

**Air pollution in Karachi city nowadays is at an all-time high. Many people become sick due to polluted air but no survey in this regard has yet been carried out. He felt that the government must be strict in implementing the environmental laws.**

Dhunmai Cowasjee, head of communication unit of IUCN -- the world conservation union -- noted that the National Conservation Strategy (NCS) of Pakistan Government guides the programme priority of IUCN in Pakistan. She said that IUCN is working to improve the quality of life for the present and future generations of the country. The IUCN, which has 40 regional and country offices all over the world, was commissioned in Pakistan in

1985 to encourage and assist the poor people and enable them to get a better livelihood.

Umer Afridi, coordinator of the communications unit of IUCN, pointed out that a Journalists' Resource Centre (JRC) has been set up in Karachi by IUCN to provide the journalists with a database and enable them to mainstream environmental issues. IUCN provides all kinds of support to the local journalists to help them create environmental awareness among the people. It is necessary that all concerned should come forward to protect and nurture our environment, he opined.

But the citizens of this mega city have to go many more miles for cleaning one of the dirtiest cities of the globe.

# Assessment of air quality in Karachi

By Mizanul Karim

We toured two Pakistani cities -- Karachi and Lahore -- on a one-week visit from the 2nd of October last year. The programme was organised by the Forum of Environmental Journalists of Bangladesh (FEJB) as part of its study of air pollution in some selected Asian cities. The team of journalists which visited Pakistan from October 2-7 consisted of eleven members led by FEJB Chairman Quamrul Islam Chowdhury.

## About the city

Karachi is a well-known megapolis. It is not only the ex-capital of Pakistan, but also its biggest industrial centre and commercial hub. Regarding both area and population, Karachi tops the list of the Pakistan cities. Moreover, it is an important seaport and a very big international airport.

The population of Karachi city was around 7 million in 1985. Now about 12 million people reside there. The urban area of Karachi expanded from 250 km<sup>2</sup> in 1972 to 353 km<sup>2</sup> in 1982. Since then, Karachi has been growing rapidly every year and has consequently turned into a 560 sq. mile megacity with increased pollution of both air and water.

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## Tours and talks

We reached Karachi by plane in the afternoon of October 2. Next day, a meeting with Urban Resource Centre was held on urban issues, particularly those related to Karachi, at the office of the International Union for the Conservation of Nature (IUCN).

In the meeting the problem of air pollution in Karachi and some other cities was highlighted. Black smoke emitted by vehicles, excessive carbon (Co and Co<sub>2</sub>) in the atmosphere, damage done by air contamination to public life, community response to this menace, environmental laws and their enactment, NGOs' role, etc. were the main topics of discussion.

During the exchange of views, it was mentioned that as poverty is one of the main causes of environmental pollution, poverty alleviation programmes have been taken up in Karachi. It was also noted with concern that despite regulations for checking pollution, their implementation is insufficient. In Pakistan, the media's role in creating environmental awareness is not up to the expectation, some resource persons alleged in the meet. Lack of political commitment in respect of environment was also criticised.

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Farhan Anwar, a member of the managing committee of 'Citizens for a Better Environment' (CBE), Umer Afridi and Dhunmai Cowasjee of the IUCN were among the speakers.

We were informed that in some areas of Karachi (i.e. Malir, Leari, Landhi, Korangi, Sadar, etc.) the magnitude of pollution is comparatively high. Industrial pollution, especially, is giving birth to many types of health hazards. For this reason, the need for the establishment of a chemical plant to detoxify waste and garbage was emphasised.

We had some experience of the severe industrial pollution of Leari area on that very day. On October 4, the study team of FEJB met Brigadier (Rtd) Akhtar Zamin, Director General of the Environmental Protection Agency, government of Sindh. He spoke on the government's role and regulating measures to check environmental pollution and maintain ecological balance. He said that people's awareness and the role of non-government organisations were very important in this regard.

At around noon we, the members of the visiting team, had a meeting with Dr. Badar Ghauri, principal engineer of Pakistan Space and Upper Atmosphere Research Commission (SUPARCO). He is also Director of Environmental and Space Sciences Division of this organisation. He explained the air quality of Karachi with slides, graphs and satellite photos. He put stress on planning wisely and carefully to mitigate environmental degradation since there is a very close

relationship between man and environment. He identified industrial growth and poverty as two of the main causes of degradation of environment and pollution of air.

The same day after lunch a programme of IUCN presentation was held. The objectives and activities as well as structure of this international organisation, which is also known as the World Conservation Union, were discussed. The main participants were Dhunmai Cowasjee, the head, Umer Afridi, the coordinator, and Faiza Ansari, the executive secretary of the communications unit of IUCN. Enginner Amal Sayeed also took part in the discussion. We were informed that the IUCN was working, especially on bio-diversity, at regional and national levels.

At the same venue, the IUCN country office of 1, Bath Island Road, a meeting with local journalists was held in the afternoon. Raifa Haider, staff reporter of the news agency APP and Shahid Husain, senior reporter of the Financial Post, spoke on the occasion, putting emphasis on media's role in protecting the environment.

**"The effect of contaminants that exist throughout urban communities or in localised areas (such as M. A. Jinnah Road, Sadar, Korangi) of Karachi metropolitan area is of great importance to health.**

**Most of the air pollution in these highly populated localities, as well as in the commercial areas, comes from the combustion of fuels by vehicles, power plants, tanneries and textile mills, etc."**

Then we visited some areas of the city to have the first-hand experience of the air pollution in Karachi. At around 4.45 p.m. we stood on the over-bridge of M.A. Jinnah Road. To the west we found that some vehicles were emitting clouds of black smoke. At the foot of that bridge we talked to a young man, Sultan. He said he had never seen so much black smoke in his life.

We could not study and investigate the air pollution situation of the city thoroughly due to our short stay in Karachi. But even then our visit to the market area of Sadar and the busy thoroughfare of Jinnah Road convinced us that these are among the most polluted areas of Karachi in respect of air contamination.

This view was corroborated in a report

prepared by Badar Ghauri, Manzar Salam and M. Ishaq Mirza of SUPARCO. Their report said: "The effect of contaminants that exist throughout urban communities or in localised areas (such as M. A. Jinnah Road, Sadar, Korangi) of Karachi metropolitan area is of great importance to health. Most of the air pollution in these highly populated localities, as well as in the commercial areas, comes from the combustion of fuels by vehicles, power plants, tanneries and textile mills, etc."

### **SUPARCO Studies**

SUPARCO sources told us that an Atmospheric Pollution Survey was carried out at 13 sites of Karachi simultaneously from 6 A.M to 9 P.M or from the early morning to night during the summer. Meteorological measurements were also taken along with the study. The monitoring sites were determined after careful observation of wind patterns, from which the direction and movement of air pollutants can be inferred. The sites were located mostly near the industrial areas.

Industrial pollution is one of the major concerns of those who are engaged in the effort to conserve the environment and maintain the ecological balance. Karachi is the industrial centre of Pakistan. The city and its suburbs abound in textile, paper and steel mills, tanneries, food and rubber industries, cement factories, different types of chemical factories, metal works with coke ovens, battery manufacturing units, power plants, oil refineries, etc.

The study conducted by SUPARCO found that internal combustion engines of vehicles are mainly responsible for the air pollution of Karachi. The levels of carbon monoxide (CO), one of the most poisonous gases, in the throbbing streets and the surrounding air were found to be alarmingly high. Carbon dioxide (CO<sub>2</sub>), less dangerous than CO, exceeded 370 ppm in the air of these localities.

Hydro-carbon (HC) emissions come mostly from vehicles. Careless handling of petrol and allied products add to this

**Hydro-carbon (HC) emissions come mostly from vehicles. Careless handling of petrol and allied products add to this dangerous pollution. It should be noted that when petrol is not properly and adequately burnt, it vaporises from the cranks, and the fuel system and the exhaust contribute HCs to automobile emissions.**

dangerous pollution. It should be noted that when petrol is not properly and adequately burnt, it vaporises from the cranks, and the fuel system and the exhaust contribute HCs to automobile emissions.

The survey indicated that the quantity of Nitrogen Oxide (NO<sub>x</sub>) in the air was not within the standards specified by the concerned authority of the US. The standard is 0.05 ppm (parts per million) as annual mean and 0.10-0.17 ppm as 1 hour mean. But in Karachi NO<sub>x</sub> concentrations in the air were 0.3-0.5 ppm during daytime. In the main urban area of Karachi, most of NO<sub>x</sub> compounds are derived from petrol or diesel combustion in vehicles whose numbers are rapidly increasing day by day.

**An examination of the data gathered on lead shows that its concentrations are approximately three to seven times higher than average. Such a situation prevails due to the exclusive use of leaded petrol in Pakistan.**

Lead (Pb) is a very toxic pollutant and children, particularly, are its victims. The principal source of particulate lead is leaded petrol. Lead is present in diesel fuel but is proportionally far less than in petrol.

An examination of the data gathered on lead shows that its concentrations are approximately three to seven times higher than average. Such a situation prevails due to the exclusive use of leaded petrol in Pakistan.

Aside from gaseous substances, particulate matter plays a big role in polluting the air of Karachi. The natural source of this type of matter is mainly marine salt. Manmade sources of particles include motor vehicles (i.e., trucks, cars, etc.), steel mills, cement plants, ceramic industries and incinerators which burn solid refuse. The study indicated the manmade particulate emissions exceed those originating from nature in certain urban zones.

In a busy and flourishing city like Karachi, the particulate matters polluting the atmosphere mostly result from motorised transport, either road or rail or water. The engines of both light-duty petrol and heavy-duty diesel vehicles, locomotives and watercraft emit particulate pollutants. (It ought to be noted that on an average an urban vehicle runs 45 km. and consumes

about 8 litres of fuel a day).

Total suspended particulate (TSP) measurements were taken daily for the last 3 years at different localities of Karachi city.

The same report also mentioned that the air of Karachi city contains SO<sub>2</sub> due to sulphur emission by various sources. Fuels with trace amounts of organic and inorganic sulphur are responsible for this sort of pollution.

Pakistan Steel Mills, a large industrial plant of the country, is situated in Karachi. Almost all the sulphur emission around this mill is caused by the burning of coal. 13,600,00 tons of coal are imported annually to produce coke. This coal contains about 2-3% sulphur by weight. When sulphur dioxide (SO<sub>2</sub>) is transported from the steel plant, the air is oxidised even at Nooriabad area, which is 40 km distant from the steel plant.

The report observed with a sigh of relief that although a considerable amount of SO<sub>2</sub> is being produced everyday, even the roadside levels of this harmful gas were well within the prescribed limits of 0.50 ppm as the mean per hour. In this case, the Arabian Sea is a blessing indeed because the well-established sea breeze pattern of Karachi keeps the level of SO<sub>2</sub> below the specified limits.

The study revealed that soil component concentration in the surrounding air is eight times higher in Karachi than in the large cities of the US. These components mainly include aluminium, calcium and sodium, which originate from limestone and sea water.

A considerable portion of these components is undetermined, but they mainly comprise a mixture of soot, vehicular traffic aerosols, water vapour and some aerosol constituents (organic and inorganic). It is notable that the soot is formed by fossil-fuel combustion. Half of the aerosol mass is limestone and silicated components. Experts have expressed anxiety over the silicate particles. They are respirable and their concentration is high in the air of Karachi, so they are causing various lung diseases, including silicosis.

The study-report indicates that five sources are mainly responsible for pollutant elements in the air of Karachi : a)



Fossil fuels for selenium (Se) and non-marine sulphates. b) Vehicular traffic for lead (pb) and bromine (Br). c) Soil-limestone for aluminium (Alm) calcium (Ca), iron (Fe), manganese (Mn), etc. d) Sea spray for sodium (Na) and chlorine (Cl). e) Metal plating and air conditioning for bromine.

The SUPARCO report concluded that emissions from the major industrial plants have considerable impact upon the workers. As the number of industries is high and as they vary widely in type, it is doubtless that innumerable people are going to fall victim to high levels of air pollutants in their respective working places.

In another study, the experts have identified cement factories as a major source of air pollution in Karachi city. The study was jointly conducted by P.P Parckh of the Wadsworth Centre for Laboratories and Research, New York State Department of Health, Badar Ghauri of SUPARCO, Karachi, and Zikrar Rahman Siddiqui of the Department of Environmental Health and Toxicology, School of Public Health Sciences, State University of New York.

Ozone, though only a trace constituent of our atmosphere, is a significant contributor to the conservation of the global environment. It absorbs most of the biologically harmful ultraviolet rays of the sun and thus protects the flora and fauna of the earth from the damaging radiation. So the depletion of ozone could seriously affect not only the health, but the very survival of mankind and other global life-forms. Sad to say, manmade chemicals are responsible for ozone destruction.

A study by Rizla Zareen and Badar Ghauri of SUPARCO found that in the lower latitudes (where Karachi is situated), depletion of the ozone layer was not significant. On the other hand, maximum depletion was noticed over Lahore, Quetta and Chitral.

# Public perception and mitigation efforts

By **Abdur Rahman Khan**

It was a pleasant, bright morning on October 4 in Gulshan-e-Iqbal, a residential area in Karachi. After a brief shower the previous evening, the roadside trees wore a fresh, green look, with the leaves waving in the breeze and the tiny birds dancing and chirping on the branches.

At nine o' clock in the morning, two kids were seen taking a pair of goats out for grazing. Some elderly people of the locality were walking along the road in a leisurely manner and two men were riding bicycles to reach their work-places early.

It was still easy to breathe while walking along the road as the air was yet to get heavy with the daily load of dust, carbon, and suspended particles of various kinds.

The roads in the area were calm and quiet and the traffic movement was still thin as the residents were yet to start their cars to take their kids to schools, go to business places or attend their offices which generally begin at 10 a.m.

But soon the whistle started blowing at Sohrab Gate, an area near the Edhi House in North Karachi. Public and private transports joined the race in the streets, making noise, emitting smoke and blowing dust while moving speedily towards the industrial zone, government offices and the business centres.

By 9.30 a.m., the Civic Centre crossing, Adamjee Nagar, the Sadar and the port area were taken over by different kinds of cacophonous automobiles emitting poisonous smoke and raising the dust that would make the air hazy and dangerous to breathe by the afternoon.

The clock struck 10 at the VVIP thoroughfare of Sharah-e-Faisal, and the motorcycles were seen weaving through the busy traffic, most of their riders wearing masks of cloth over their mouths and noses in a futile effort to filter out the poisons in the air. All that

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the masks could do was to stop some of the bigger particulate suspended matter, but the finer matter and the poisonous gases would inevitably get through the cloth. What they needed were gas-masks to avoid inhaling the gaseous pollutants.

"Edhar kanun nahi chalta, sreef note chalta", said Mohammad Ismail, a 22-year old driver of a minibus operating to and from the Sadar area, implying that the motorised vehicles could pollute the city and its air without punishment or penalty since money was the means of placating the law. He estimated that that motorised transport was responsible for 90 per cent pollution of the city air.

Talking to this reporter at a bus stand at M.A.Jinnah Road in Sadar, Mohammad Sultan, a bus conductor, expressed his ignorance of any law relating to pollution. But he admitted that he suffers from chest pains, has vomiting tendency, burning in the eyes, hearing and respiratory problems when he returns home every night after several hours of duty on the smoky roads.

Dr. Adnan Ahmed, an Assistant Professor of Baqai Medical University in Karachi, confirmed that continuous inhalation of polluted air leads to respiratory diseases, burning of eyes, common cold, cough and bronchitis. Children and elderly people are most vulnerable to these diseases, he said, adding that the automobiles and the industries were the major contributors to air pollution in Karachi.

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Dr Adnan said that sound pollution was also a big menace for the citizens of Karachi. The playing of audio systems at public places, widespread use of loudspeakers and indiscriminate blowing of horns on the streets disturb the mental peace and increase the anxiety of the urban people. The psychiatric patients in his department at the University were found to be more sensitive to sound pollution than normal people, he added.

"I feel distressed and sick after I return home by driving my car," said Sheikh

Yasir, a young businessman residing in North Karachi. He reaches home every evening with dust covering his face and clothes. He suffers from headache for about half an hour after he returns home.

Yasir's Datsun 1000 cc car of '69 model does not have an air-conditioner. He has to drive it for at least two hours a day, and thus inhales a lot of dust and smoke in the northern area of the town where almost 20 per cent roads are kutchra (unpaved). He maintains that restriction on diesel-operated vehicles, planting more trees along the streets, improvement of the city sewerage system, proper disposal wastes, and strict enforcement of environmental laws can curb the growth of air pollution and keep the air clean.

**The low price of diesel encourages the public transport owners to buy more diesel-operated vehicles and so the use of diesel is increasing every day. Thus more carbon is released into the city air.**

"Pollution is on the increase because the citizens do not take care of their own city," observed Mrs. Ismat Shaheed, a social worker of Karachi. She maintained that it was not the responsibility of only the government, municipal authorities and the NGOs to improve the situation but the citizens also have a duty to come forward and help create a better city for themselves. She also observed that the disposal system of city garbage was not hygienic and the underground sewerage system was not maintained properly.

According to Zakir Hossain, production manager of a textile factory in Karachi, air pollution was caused mainly by the use of diesel by the public transport system. The price of diesel in Karachi is Rs.12 to 15 per litre against Rs.27 per litre of petrol and Rs.32 per kg of liquefied natural gas, all used as fuel in automobiles. Zakir said that the low price of diesel encourages the public transport owners to buy more diesel-operated vehicles and so the use of diesel is increasing every day. Thus more carbon is released into the city air.

Badar Anwar Lari, director of a fashion garments factory in the Federal B Industrial area, holds the transport sector mainly responsible for polluting the Karachi air. He referred to the growing industrial units in and around the city and conceded that the industries also contribute to the pollution in Karachi.

Industries are usually powered by gas, furnace oil or electricity in Karachi. He observed that the existing practice of burning garbage in the city adds to the suspended carbon particle load of the Karachi air.

He said the Chamber of Commerce and Industries works in close coordination with the government to implement the programme to minimise industrial pollution. He also observed that the green campaign by the media in recent years had contributed a lot to making people aware of environmental degradation and the mitigation measures.

“So much awareness has been built up and so much pressure has been mounted that the government just has to come up with effective environment protection laws,” said Brigadier (retd.) Akhtar Zamin, director general of the Environment Protection Agency of Sindh. According to him, Pakistan has a comprehensive environment protection law which was enacted in 1997, involving the stakeholders in the process of its formulation. Since the creation of Pakistan in 1947, Karachi has continued to keep on expanding in terms of area and population. Besides the large-scale migrations from India, Bangladesh and Afghanistan, people from the northern parts of the country continued to settle in Karachi for jobs and livelihood. The green revolution in Pakistan also forced many agricultural labourers and marginal farmers to leave their ancestral villages and settle in the port city where they could find jobs. Big development projects like the Tarbela dam also contributed to migration of the rural people to Karachi, which accommodates 22 per cent of the urban population of Pakistan.

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The informal sector provides job opportunities for 60 per cent of the unskilled and 50 per cent of skilled labour force of the city, according to Noman Ahmed, an architect and coordinator of Urban Design Resource Centre.

The city of Karachi, with its present population of about 12 million in an area covering about 560 sq. kilometres, is finding it extremely difficult to cope with the ever increasing growth of urban population and to provide them with housing and other civic amenities which are already under heavy strain. The concentration of industrial estates, congestion of traffic and insufficient civic amenities are contributing to a daily load of 6000 tons of waste in Karachi.

An atmospheric pollution survey carried out in Karachi by the Pakistan Space and Upper Atmospheric Research Commission (SUPARCO), back in 1990, revealed that carbon and nitrogen content in the air was above the standard permissible level. According to the survey, carbon monoxide level in the ambient air was found to reach 9-10 ppm along the busy urban streets, and carbon dioxide level exceeded 370 ppm. The quantum of nitrogen oxide (NO<sub>x</sub>) also exceeded the American ambient air quality standard (0.05 ppm as annual mean). The maximum concentration of NO<sub>x</sub> was observed between 0.3-0.5 ppm during daytime.

According to Dr. Badar M. Khan Ghauri, Director of the Environmental and Space Science Division of SUPARCO, most of the hydro-carbon emissions in an urban atmosphere come from vehicles and careless handling of petrol and allied products. In downtown Karachi, most of the NO<sub>x</sub> is caused by the combustion of petrol and diesel in an ever-increasing number of vehicles.

The internal combustion engines are blamed for most of the air pollutants in urban areas. However, garbage burning also contributes a lot to the total load of pollutants in the air.

Sulphur emission in the form of SO<sub>2</sub> arises mostly from fuel combustion because of the trace amounts of inorganic and organic sulphur in the fuel. Coal combustion accounts for approximately almost all the sulphur emission by Pakistan Steel Mills, which imports an approximate amount of 14 million tons of coal every year for production of coke.

According to Dr. Badar Ghauri, the contaminants that exist throughout the urban communities or in busy areas like M. A. Jinnah Road, Sadar and Korangi, are very hazardous to human health. Most of the air pollution, particularly in the highly polluted localities and commercial areas, is caused by

combustion of fuels from vehicles, power plants, tanneries and textile mills, said Dr. Ghauri.

It also appeared from the nine-year old survey that the emission from the major industrial plants may not be significant within the project area, but the local impact upon the working population might be considerable.

However, the provincial government is yet to conduct any survey on air quality in Karachi, the biggest industrial and commercial centre accommodating almost 70 per cent of the industries in Pakistan.

Briefing a group of visiting journalist from Bangladesh on October 4, 1999, Brigadier Zamin said the World Bank was going to finance a federal government programme to study the air pollution problem in ten selected cities, including Karachi. The programme was likely to be launched within the next three to four months, he hoped.

When asked about the political response to environmental issues, he said that when out of power, political parties drop the environmental agenda on the back seat.

M. Farhan Anwar, an environment engineer working with an NGO, SHEHRI (Citizens for Better Environment), appreciated the role of the media in creating awareness among the people. He, however, pointed out that the political motivation of the print media and lack of technical knowledge among the journalists were hampering the campaign for improving the environment.

According to him, the English language newspapers are well ahead of the Urdu language newspapers in covering the environmental issues. Because of their wider reach, the Urdu language newspapers and the electronic media should concentrate more on making people conscious about the environmental issues, Anwar said.

The state-owned Karachi radio station is broadcasting a 40-minute programme on environment in Urdu once a week to create environmental awareness among the general people. Two other radio stations in Larkana and Khairpur are also broadcasting a radio programme on the environment twice a month.

Environmental issues have also been incorporated in the academic curriculum at primary, secondary and university levels. The Sindh provincial government is planning the introduction of an extra subject on environment in class IX and X. There is, however, a difference of opinion among the academics in this regard. Some of them think that the environmental issues should be incorporated in the already existing subjects without burdening the students with an extra subject.

Meanwhile, IUCN -- the world conservation union -- was commissioned in Pakistan in 1985 to influence, encourage and assist people in achieving an improved quality of life for the present and future generations of the country. IUCN's programme priorities in Pakistan are determined by the National Conservation Strategy (NCS), a policy document backed by the Government of Pakistan's commitment to sustainable development.

IUCN is working closely with the government agencies and the NGOs. Of about 5,000 NGOs registered in Sindh province, about 100 are concentrating their efforts on the improvement of the environment.

In its effort towards capacity building for the environmentalists and pro-environment people, IUCN has established a Journalists' Resource Centre (JRC) in Karachi. The JRC has directed its efforts towards fostering a broader public understanding of environmental issues in Pakistan. It has also provided technical assistance to some of the neighbouring countries in South Asia.

"In each of our lives, in our own communities, environmental degradation threatens our very survival. It is time for us all to take personal responsibility," the IUCN said in its recent publication, 'You Can Make a Difference'.



# More trees, please!

By Elahi Newaz Khan

Karachi, once the capital of Pakistan, is one of Asia's 10 worst polluted cities as far as the air is concerned. Since the independence of Pakistan in 1947, two massive influxes of migrants have severely affected its environment. Soon after the partition, thousands of Urdu speaking people migrated to this city. The second influx took place in 1971 when several thousand Biharis from Bangladesh took shelter here after a bloody war gave birth to Bangladesh.

Karachi, the home of 1.2 crore people in an area of 560 square miles, is Pakistan's most important city from the economic and strategic points of view. It is the lone sea-port of the country. That is why it became the centre of Pakistan's commerce and industry.

But commercial importance has now made the city a victim of air pollution. The wind-flow from the Arabian Sea reduces the air pollution level, but in recent years it appears to be unable to clean up Karachi's air due to the massive growth of industrial units and the rapidly increasing number of vehicles.

**The inadequate number of trees in and around Karachi is also partly responsible for the deteriorating quality of the air.**

**According to environmental experts, forest must cover 25 per cent area of a country, but in**

**Pakistan the total forest area is only five to six per cent of the landmass, which is in no way sufficient to absorb the carbon dioxide.**

The inadequate number of trees in and around Karachi is also partly responsible for the deteriorating quality of the air. According to environmental experts, forest must cover 25 per cent area of a country, but in Pakistan the total forest area is only five to six per cent of the landmass, which is in no way sufficient to absorb the carbon dioxide.

Experts have divided Karachi into three parts to assess the extent of air pollution, which is highest in the older parts including Sadar Bazar area, north Karachi, Sanghanir, Liati Sadar, Peranga and the area around Mir Kashim Steel Mill. With the expansion of the electricity network the use of furnace oil is also increasing, causing emission

of more sulphur dioxide and thus more air pollution. Besides emission of manganese from steel plants and chlorine from chemical industries, hydrogen sulphide from refineries and pulp factories is also adding toxic elements to the air.

So far no study on air pollution has been carried out but the officials said they were planning to conduct such studies in 10 Pakistani cities with the World Bank's assistance,

Officials admitted that they have not yet succeeded in ensuring the installation of treatment plants in factories, as entrepreneurs are demanding complete exemption of duty on them.

## **Polluting-spewing old vehicles**

**By Alimuzzaman Harun**

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Despite being an old city, Karachi was not developed in a planned way. In terms of size, it is 10 times bigger than Dhaka. In terms of air pollution, Karachi occupies a high position in the list of the worst polluted cities of the world. Emission of black smoke from old and dilapidated vehicles is a regular scene in Karachi. Frequent traffic jams intensify the air pollution problem. NGO officials said that most of the motorised vehicles of Karachi do not have genuine fitness certificates. The traffic police are also not very active against pollution.

Auto-rickshaws with two-stroke engines use lubricants with fuel, causing more toxic emissions. According to experts, such two-stroke engines emit 13 times more gas than the four-stroke ones. Even 40-year-old dilapidated vehicles are also seen in the streets of Karachi. Like other residents, most drivers are least aware of air pollution. A driver of a 1938 model taxi said he was not concerned at all if his vehicle was emitting white or black smoke. But he admitted that he was suffering from frequent headaches, eye burning and had also developed vomiting tendency. But the Arabian Sea is a blessing for the residents of Karachi as winds from the sea clean up the city's air.

# Environment not a political priority

By Mofizur Rahman and  
Elahi Newaz Khan

Karachi, Pakistan's biggest city and its only major port, was once its capital. Because of its size and architectural superiority to the other cities it was called the 'drawing room' of Pakistan. It is still the business and cultural centre of the country and its most important city, having a population of 12 million and an area of 560 square miles. But its environment, especially its air, has become so polluted that drastic steps have to be taken to improve the situation. Thousands of people are becoming victims of respiratory diseases every day, and unless something is done many lives will be needlessly lost.

A SUPARCO study carried out recently has identified five main sources of air pollution in Karachi : Fossil fuel (for selenium and non-marine sulphates), vehicular traffic (for lead and bromine), soil limestone (for aluminium, calcium, iron, manganese, etc.), sea grey (for sodium and chlorine) and metal plating and air conditioners (for bromine).

Experts have divided Karachi into three parts to assess the extent of air pollution, which is highest in the older parts of the city including the Sadar Bazaar area, north Karachi, Sanghanir, Liati Sadar, Peranga and the area around the Mir Kashim Steel Mill. The emission of sulphur dioxide has increased dangerously with the growing use of furnace oil by the power plants in order to expand the electricity network. Emission of manganese from steel mills, chlorine from chemical plants, hydrogen sulphide from refineries and pulp factories is further aggravating the problem of air pollution.

Officials and residents of Karachi say that mechanised vehicles are responsible for more than 80 per cent of the air

**The emission of sulphur dioxide has increased dangerously with the growing use of furnace oil by the power plants in order to expand the electricity network. Emission of manganese from steel mills, chlorine from chemical plants, hydrogen sulphide from refineries and pulp factories is further aggravating the problem of air pollution.**

pollution. Most of the vehicles are dilapidated and do not have any emission control system. Moreover the people of Karachi have not yet begun to use lead-free fuel. But worst of all, many three-wheeled vehicles with two-stroke engines, which are the major polluters, are still plying on the roads.

Most of the drivers and their helpers do not have any scientific knowledge of air pollution, but by now they have understood that the air of their city has become dangerously polluted and is very hazardous to their health. Many of them are suffering from respiratory problems. Mohammed Ismail, a bus driver, complained that his health had deteriorated seriously due to the poisonous air. Mohammed Ali, a driver working for IUCN, said that he often suffers from breathlessness.

Dr. Adnan Ahmed, an assistant professor of Karachi's Baki Medical University, informed us that he had treated a large number of patients for breathing problems, eye inflammations and other diseases caused by air pollution.

In spite of these problems, a separate ministry on the environment has not yet been formed. However, there is a division under the Prime Minister's office which is supposed to deal with environmental issues, but it does not carry much weight.

Brigadier (retd.) Akhtar Zamin, chief of the Environment Protection Agency of Sindh, admitted that though tough environmental laws were enacted in 1991, their implementation has so far been a half-hearted effort and far from successful. He also admitted that the environment is still at the bottom of political priorities. But, he pointed out, radio and television have begun covering environmental problems. Moreover, environmental issues have been incorporated in the primary school curriculum. An award has also been introduced for 'green journalism'. School children are being encouraged to form environmental clubs.

But Umer Afridi, an IUCN official, said that the measures for generating environmental awareness were far from sufficient. In his opinion introduction of lead-free fuel was urgently needed, along with widespread tree plantation, to minimise air pollution.

# Karachi: could not care less

By Mofizur Rahman

The city of Karachi has often been called the "drawing room" of Pakistan, but now it has become one of the most polluted metropolises of the world. Emissions from dilapidated vehicles run on leaded fuel and two-stroke engines of the auto-rickshaws, as also emissions from industrial units, along with the indiscriminate burning of wastes, have made Karachi's air a threat to human health. Despite awareness of growing air pollution, few people are concerned about the environmental laws. There is no major initiative to generate environmental awareness.

In Pakistan, a separate ministry on environment is yet to be formed. There is a division under the Prime Minister's office to deal with the issue but it does not carry much importance.

Fortunately, the Arabian Sea in the south of Karachi is a blessing for the city as it drives away the polluted air. Yet, due to air pollution, thousands of people are becoming sick everyday.

Officials and residents of Karachi say the mechanised vehicles are responsible for more than 80 per cent of the air pollution of the city. Most bus drivers or helpers do not have any concrete idea of laws against air pollution. But they understand they are victims of polluted air as many of them, like Mohammad Ismail, complain that they are suffering from respiratory problems. Mohammad Ali, a driver of the IUCN, said he had no idea why, but he often suffers from breathlessness.

**According to Abul Hossain, a senior journalist, the press in Karachi was yet to take much interest in the environment, mainly due to the indifference or reluctance of the management.**

Dr. Adnan Ahmed, an assistant professor of Karachi's Baki Medical University, has treated a huge number of patients with breathing problems, eye inflammations and other maladies caused by air pollution.

According to Abul Hossain, a senior journalist, the press in Karachi was yet to take much interest in the environment, mainly due to the indifference or reluctance of the management.

Chief of the Environment Pollution Agency of Sindh, Brigadier (retd.) Aktar Zamin admitted that despite enactment of tough regulations in 1991, the implementation process is very weak. He blamed massive influx of migrants along with normal increase of population as the main reason for air pollution. The current population of Karachi is 12 million. Even in 1985 this figure was only seven million.

He said so far no study has been conducted on Karachi's air pollution but one survey was likely to be carried out soon.

Zamin said that though the environment is still at the bottom of political priorities, radio and television have started covering environmental issues. Environmental studies have also been incorporated in the primary school curriculum. An award has been introduced for green journalism. School children are being encouraged to form environmental clubs.

But IUCN official Umer Afridi said the measures taken so far for generating environmental awareness were not sufficient. He said introduction of lead-free fuel was urgently required along with tree plantation to minimise Karachi's air pollution.

Dr. Badar Ghauri, chief engineer of Pakistan Space and Upper Atmosphere Research Commission (SUPARCO), however, blamed poverty and unplanned development for Karachi's air pollution.

A SUPARCO study identified five sources of air pollution in Karachi. These are : fossil fuel (for selenium and non-marine sulphates), vehicular traffic (for lead and bromine), soil limestone (for aluminium, calcium, iron, manganese, etc.), sea grey (for sodium and chlorine) and metal plating or air conditioning (for bromine).

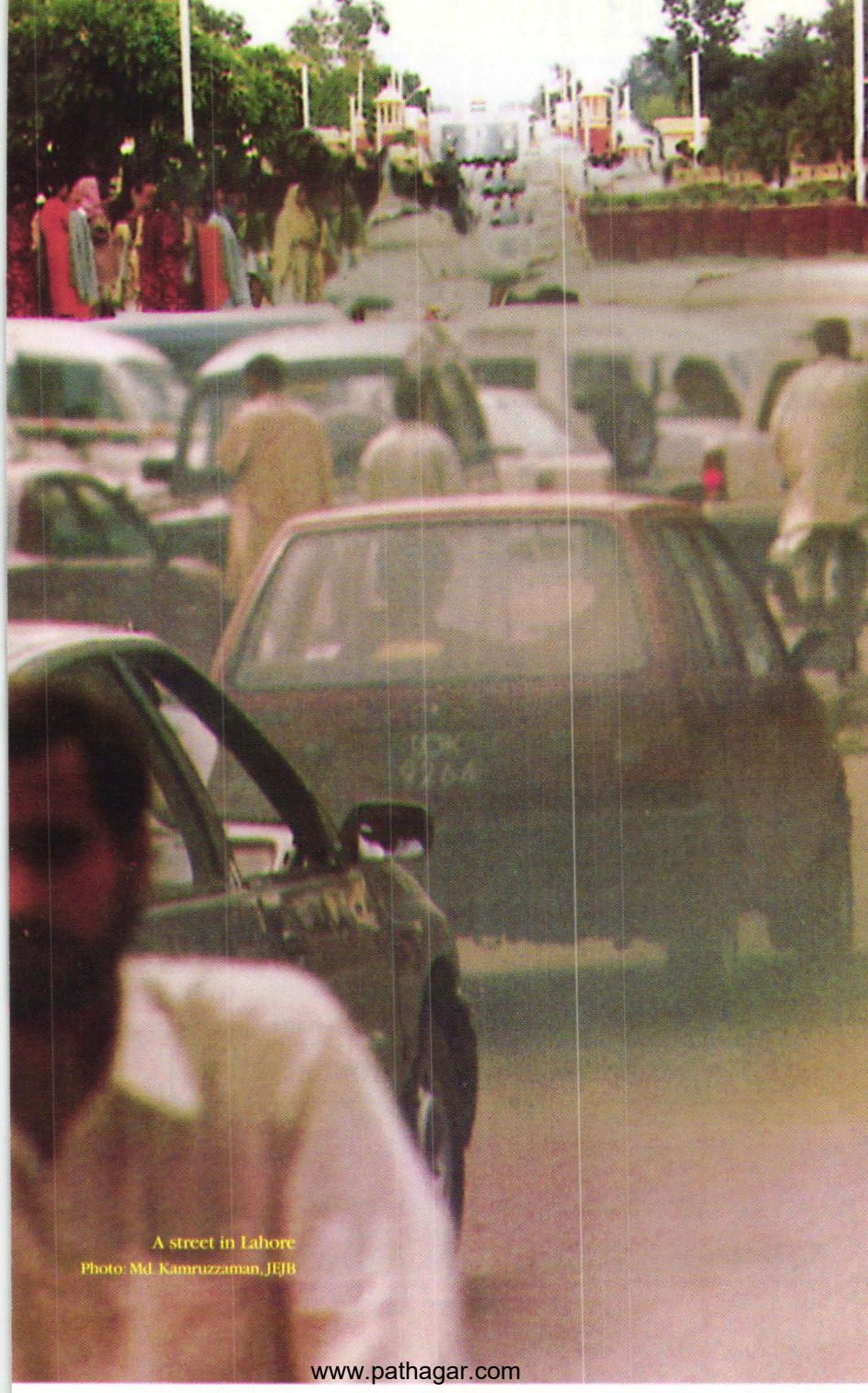


Photo: Md. Kamruzzaman, FEJB

Pollution knows on frontiers

## AIR POLLUTION IN ASIAN CITIES





A street in Lahore  
Photo: Md. Kamruzzaman, JEJB

# Can Lahore breath in fresh air?

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By Quamrul Islam Chowdhury with  
Zaigham Khan and A. Rauf

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**T**he sky of the majestic city of Lahore was shiny. It was not that dirty Karachi. At the picturesque Lahore, capital of Pakistani province of Punjab, we were told in the first week of October 1999 by taxi-drivers, passengers, passers-by, officials and journalists that it is not that dust-prone a city. Chief Minister Shahbaj Sharif is taking personal care to keep this city clean, said taxi-driver Golam Moula.

During the past three decades, research and technological development have made it possible for governments and people to recognise the risks associated directly, or indirectly, with air pollution. On the other hand, air pollution control entails costs and, according to the World Resources Institute (WRI, 1994), the growth rate of pollution abatement costs is higher than that of pollution.

Air pollution, however, is primarily an urban problem, because in the cities the density of industrial units and vehicles is sufficient to overcome the ability of the air to disperse the pollutants or dilute them quickly enough. Lahore is a classic case in point. Motor vehicle emissions account for approximately 90 % of the total annual emissions of hydrocarbons, aldehydes and carbon monoxide. (*Source: The Pakistan National Conservation Strategy*)

Cause for alarm? Indeed. Motor vehicles constitute the main source of air pollution in most of the cities of industrialised countries. In contrast, the cities of developing countries exhibit greater variety of air pollution sources. The relative contributions of mobile and stationary sources of air pollution differ markedly between cities and are dependent on the number of motor

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vehicles. This is backed up by the fact that the factory smoke, long considered a classic source of air pollution -- such stationary, point-source emissions are highly visible and represent a significant threat to people living nearby -- has come to represent less of a threat to Pakistanis -- Lahorites, in particular, than do the multiple mobile sources of automobiles and other vehicles.

Nevertheless, the combined emission of air pollutants from industry, power plants, domestic appliances, agriculture and commercial institutions is growing rapidly. Because of their detrimental effects on human health, and due to the

increasing international and regional regulatory restrictions, it has become of paramount importance for governments, industry and people to control all sorts of pollution.

Pollutants recorded are the standard emissions monitored throughout the world. Sulphur dioxide, a precursor of acid rain, is an irritant to the eyes, nose and throat as well as to the lungs. It is also phytotoxic, i.e. it has a harmful effect on plants. Carbon monoxide is considered to be the most toxic urban air pollutant since it reduces the oxygen carrying capacity of blood. Carbon monoxide concentrations in the range of 8-30 parts per million have been recorded in Lahore -- probably because of the increasing use of motor vehicles, the volume of which continues to grow at an alarming pace. (Source: The Pakistan National Conservation Strategy)

Suspended particulate matter (SPM) and dust particles less than 10 microns in diameter -- known as PM<sub>10</sub> and PM<sub>2.5</sub> -- can penetrate the lungs easily. The air on the rise because of the rapid increase the number of transports in Lahore. The World Health Organisation (WHO) has classified them as thoraic particles because their smaller size enables them to penetrate and lodge deeper in the lower respiratory tract.

PM 10 has been associated with both premature mortality

(death from cardiovascular diseases and respiratory illnesses) and increased morbidity (high incidence of chronic obstructive lung diseases, especially bronchitis and upper and lower respiratory tract infections). The United States Environment Protection Agency considers fine particulates to be the only widespread pollutant linked to premature mortality.

Add the debilitating effect that diesel engine emissions have and the situation appears even more disturbing. Collectively, diesel-powered vehicles account for nearly three-quarters of all direct particulates from US transport, says the Union of Concerned Scientists (UCS), a US-based group. Diesel contributes far more fine particulates than ordinary fuel, both in weight and number. Small particulate emissions, mainly from diesel engines and electricity generators, are coated with polyaromatic hydrocarbons that are carcinogens and can be fatal to humans.

A cost-effective and sustainable strategy aimed towards tangible improvements in ambient air quality requires a high level of commitment, careful analysis, extensive consultation with various stakeholders and effective inter-departmental coordination.

Air quality monitoring and reporting have to be upgraded to internationally acceptable standards, and the findings should be both accurate and made available on a daily basis to the public at large. Reliable and complete inventories of emissions from different sources (for example: domestic appliances, industrial machinery, different types of transport, re-suspended dust) are crucial for identifying priority areas for intervention. It is also necessary to match the emissions inventory with the monitored data and determine the sources that are the main contributors to ambient pollution in those areas where the majority of people are at risk. In particular, the roles of pollution sources that are most difficult to assess and thus are often

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neglected, such as small fires and cooking stoves, garbage burning, etc., need to be re-evaluated. The cost and benefits of interventions across a range of sectors need to be assessed. Policy failures -- not the back investment, much of which should come from the private sector -- play a key role in environmental degradation. So the assessment of possible interventions should focus on measures such as vehicle emission standards, their enforcement, fuel pricing and fuel distribution methods.

According to a World Bank report, 'Urban Air Quality Management Strategy in Asia: Guidebook', thousands of people die prematurely each year from air pollution in each of Asia's most polluted cities. In Jakarta, Bangkok and Manila, where motor transport is a major cause of air pollution, the social costs of exposure to airborne dust and lead were close to 10 per cent of the average urban incomes in the early nineties. In many Chinese cities, where reliance on coal is heavy, air quality is so poor that the costs of pollution-related sickness and death are even higher. Lahore may not quite be there yet, but if apathy, both at the civil and governmental level, continues to dominate the mind-set, it might not take long for its environmental stock, in terms of air quality, to plummet sharply.

Vehicular traffic emissions contribute substantially to air pollution in Lahore and constitute a major focus of all air pollution studies along with dust and particulate matter, the latter also being a prime component of air pollution, mainly caused by vehicular movements on unpaved or damaged roads.

The rapid increase in the number of vehicles in Lahore has a direct bearing on the increase in air pollution. Table 1 shows the number of vehicles in Lahore till 31 March, 1998 and Table 2 shows the number of vehicles registered by 30 June, 1998. From the comparison of these two tables it is evident that, over a period of only 3 months, the number of registered vehicles

increased by 9877, out of which 9188 were petrol vehicles and 769 were diesel vehicles.

The type and magnitude of the air pollution at a certain location depends, to a substantial extent, on the ambient conditions prevailing. According to a 1999 study conducted by the Environmental Protection Department, particulate matter (dust and smoke as PM 10 and TSP), NO<sub>x</sub>, NMETH and noise levels at most of Lahore's roadside areas exceed WHO guidelines and the US EPA ambient air quality standards.

**In Jakarta, Bangkok and Manila, where motor transport is a major cause of air pollution, the social costs of exposure to airborne dust and lead were close to 10 per cent of the average urban incomes in the early nineties.**

NO.	Parameters Guideline	WHO/USEPA	Qurtaba	Yadgar	Yateem Khana
		Chowk	Chowk	Chowk	
			28/8/99	30-31/8	3/9/99
01	Ozone (PPb)	50-60	3.1	7.7	3.1
02	SO <sub>2</sub> (PPb)	35-55	9.7	12.2	24.5
03	NO <sub>x</sub> (PPb)	75	189	158	194
04	CO(PPb)	09	4.2	2.3	1.9
05	TSP (mg/m-3)	150-230	1410	945	1340
06	PM10(mg/m-3)	150	1066	682	913
07	METH (ppm)	-	-	-	1.3
08	NMETH (ppm)	0.24	-	-	1.7
09	NOISE, db(A)	55-65	75	86	77

#### Abbreviations:

SO <sub>2</sub>	= Sulphur Dioxide
NO <sub>x</sub>	= Nitrogen Oxide.
CO	= Carbon Monoxide
NMETH	= Non-Methane Hydrocarbons
PM10	= Particulate Matter up to 10 microns in diameter
TSP	= Total Suspended Particulate
PPb	= Parts per billion
PPM	= Parts Per million
mg/m-3	= Microgram Per Cubic Meter
db(A)	= Decibel-A

Particulate matter (dust and smoke as PM10 and TSP), NO<sub>x</sub>, NMETH and noise levels at roadside areas exceed WHO Guidelines and US EPA ambient air quality standards

**Table 1**

Class of Vehicles    Number of Vehicles Registered

	<u>Petrol</u>	<u>Diesel</u>	<u>Total</u>
Motor Cycles	373,024	0	373,024
Motor Cars	169,919	1,218	171,137
Jeeps	4,178	1,1356	5,534
Buses	0	7,754	7,754
Mini Buses	0	3,455	3,455
Inter-city Route Motors	20,333	0	20,333
Station Wagons	0	12,495	12,495
Others	37,855	63,647	101,402
Total	605,209	89,925	695,134

*(Source : Motor Registering Authority, Lahore-1998)***Table 2**

Class of Vehicles    Number of Vehicles Registered

	<u>Petrol</u>	<u>Diesel</u>	<u>Total</u>
Motor Cycles	377,543	0	377,543
Motor Cars	173,630	1,513	175,143
Buses	0	7,792	7,792
Station Wagons	0	12,608	12,608
Inter-city Route Motors	21,039	0	21,039
Others	42,105	68,781	110,886
Total	614,317	90,694	705,011

*(Source : Motor Registering Authority, Lahore-1998)*



# MANILA

# THE PHILIPPINES



Photo: FEJB / CEJA

Manila, the Philippines

## AIR POLLUTION IN ASIAN CITIES

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Bumper-to-bumper automobiles in Metro Manila

Photo: FEJB / CEJA

# Cleaning up Metro Manila's foul air

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Manuel S. Satorre Jr.

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**T**he Philippines has entered the new millennium but the country is still facing great challenges on how to clean up the air in its premier cities like Metro Manila, Metro Cebu, Metro Davao and others. These challenges are great despite the passage of a Clean Air Act which mandates that the country should start phasing out air-polluting devices.

While many in the country have rejoiced over the passage of the law, the Philippine media, more particularly the environmental journalists, have remained sceptical about the prospects of implementing this mandate. They know that it will be difficult to implement the law without a large financial outlay that is necessary for the major changes needed to clean the air in the country's big cities.

The Philippine government has ordered that by March 2000, only unleaded gasoline will be sold in the market. The government may appear to have a strong resolve to address the problem by issuing this order. But the big problem is that it will take a long time before it can expect full compliance and less resistance. The media fears that there will be strong resistance to this move because most of the vehicles used in the country today not only use leaded gasoline but also diesel oil. Vehicle owners will have to install catalytic converters to be able to use unleaded fuel.

Import of old second-hand vehicles, which still use unleaded gasoline and diesel oil, continues in full swing. They are bought by dealers from Taiwan, South Korea and Japan.

Air pollution is mostly caused by mobile, stationary and area sources. Mobile sources (motor vehicles) emit

**The level of sulphur dioxide was found to be higher than the ambient standard of 0.03 ppm. Lead concentration was also found to be higher than the ambient standard of 1.5 ug/NCM.**

**With a growing population of over 12 million, Metro Manila's air quality continues to deteriorate, and the Philippine government thinks that this humongous problem can be addressed only by forcing the use of unleaded gasoline and monitoring pollution sources.**

the largest amount of carbon monoxide (CO), total organic gases (TOG) and nitrogen oxides (NOx). Stationary sources (industry) emit the greatest amount of sulphur oxides and area sources (such as construction sites) generate the highest amount of particulate matter.

In a recent air quality study in Metro Manila, the Department of Environment and Natural Resources (DENR) has noted that signs of air quality deterioration are still obvious. The pollutants include lead, particulate matter concentration in the ambient

air, along with primary dust, metallic particles and smoke.

In the eighties, the DENR report said, the highest level of particulate matter was recorded in Metro Manila at 250 ug/NCM, or three times the allowable standard of 90 micrograms per cubic metre. In the 1990s, this went up to 322 ug/NCM. The highest Total Suspended Particulate (TSP) levels recorded were in the town of Valenzuela in Metro Manila. The DENR report partly blamed the growing number of diesel-powered vehicles and industries for the dangerous increase of TSP.

It has also monitored sulphur dioxide pollution and found this to be higher than the set ambient standard of 0.03 ppm. Lead concentration was also found to be higher than the ambient air quality standard of 1.5 ug/NCM.

With a growing population of over 12 million, Metro Manila's air quality continues to deteriorate, and the Philippine government thinks that this humongous problem can be addressed only by forcing the use of unleaded gasoline and monitoring pollution sources.

But many believe this is not enough to solve the problem. The Philippines has to adopt measures similar to those that are being undertaken in California in the United States in which non-fossil fuel-based energy is being introduced to power vehicles and other facilities.

This move has forced major auto-makers to come up with new electrically-operated vehicles which were tested in California's highways in 1997. The big drawback, however, is how to extend the lifetime of the batteries being used. Because of this problem, auto-makers have devised fuel-efficient, low-emission hybrids. These hybrids use both gasoline and electric motors or diesel and electric motors.

While the Philippines and other developing countries of the world are still using fossil-fuel-powered vehicles, the biggest source of air pollution in big cities, the highly-industrialised economies in Europe and the United States are already using vehicles that are either electrically-operated, hybrids, or even use such sophisticated power sources as solar-hydrogen and fuel cell.

In the US, there is a race to design and make "greener cars" among the big auto-makers like Ford Motor Co., General Motors Corp. and Daimler Chrysler.

Honda Motor Co.'s Insight, an ultra-low-emissions hybrid car that uses both gasoline and electric motors, is being delivered to buyers now through its US dealers. Toyota Motor Corp.'s Prius hybrid will enter the market this summer. And Nissan Motor Co. later this year will begin selling a conventionally powered Sentra in California with a special 1.8-litre, four-cylinder gasoline engine, dubbed the CA (for California or "clean air"), that is cleaner than other gas-engine cars are even while parked in the driveway with the engine off. Each of the Big Three US auto-makers is promising a marketable hybrid vehicle by 2008. Hybrids could account for 20 per cent of all vehicle sales in the US by 2010, a Ford Motor official said.

GM has already displayed the Precept, a futuristic concept of a hybrid passenger sedan, at the recent North American International Auto Show in Detroit in January this year. It seats five and averages 80 miles per gallon with the combination of a diesel engine and an electric motor.

**In the US, there is a race to design and make "greener cars" among the big auto-makers like Ford Motor Co., General Motors Corp. and Daimler Chrysler.**

**While all these developments are taking place, the Philippine journalists are apprehensive over how the government's clean air law will be implemented. For a country that is facing financial problems, a hangover from the Asian financial crisis of 1997, it will be very difficult to fund the shift to the use of these non-fossil-fuel vehicles and plants.**

Ford Motor showed a potential competitor at the same show -- a diesel-electric car, the Prodigy -- which offered a much more conventional exterior than GM's and a mere 80 miles per gallon with the combination of a diesel engine and an electric motor.

Daimler Chrysler's US operation -- the former Chrysler Corp.-- is expected to unveil its hybrid concept at either the Chicago Auto Show in March or the New York International Auto Show in April.

Bayerische Motoren Werke (BMW) of Germany and Mazda Motor Corp. of Japan have put up a hybrid power plant, an internal-combustion engine

that burns pure hydrogen. But a hydrogen-powered engine isn't able to achieve zero-emission status because of the traces of carbon monoxide produced when engine lubricants are vaporised along with the oxides of nitrogen that are a product of any combustion process. The engine's basic by-product, however, is distilled water and steam. Proponents at BMW have reportedly argued that it produces no more pollutants than would a stationary power plant that is generating the electricity used to recharge electric-car batteries. Mazda is also working on a hydrogen-powered version of its rotary engine. BMW is already running a quartet of 7-Series luxury sedans with hydrogen-burning V-10 engines.

What all these new designs and use of cutting-edge technology reveal is that there is a race among auto-makers to produce "greener" cars to help improve air quality in the world today.

While all these developments are taking place, the Philippine journalists are apprehensive over how the government's clean air law will be implemented. For a country that is facing financial problems, a hangover from the Asian financial crisis of 1997, it will be very difficult to fund the shift to the use of these non-fossil-fuel vehicles and plants.

As a matter of fact, while Metro Manila has been provided with monitoring stations to check air quality, this facility does not exist in other big cities in the country, including Metro Cebu and Metro Davao.

Environmental journalists who focus on air quality issues will just have to pressurise the government to give priority to funding programmes that will result in zero emissions, such as the shift to the use of new technologies.

**Environmental journalists who focus on air quality issues will just have to pressurise the government to give priority to funding programmes that will result in zero emissions, such as the shift to the use of new technologies.**

The deterioration of atmospheric and climatic conditions has never been more noticeable than during the century that is just about to pass. The challenge of every environmental journalist in the Philippines today is to generate more public awareness so that air quality can be improved and the threat to human health, especially that of children who breathe in more air than adults, can be reduced, if not altogether removed.





# BANGKOK

THAILAND 



Photo:Azizur Rahim Peu, FEJB

Industrial emission in the suburbs of Bangkok

## AIR POLLUTION IN ASIAN CITIES

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Automobiles under the Sky-Rail in Bangkok

Photo: Bulbul Ahmed, F3J8

# Dhaka and Bangkok : Negative vs positive

By Syed Akhtar Yusuf

**T**he metropolis of Dhaka, home to nearly nine million residents, is now becoming unliveable because of environmental degradation. This grossly overcrowded city is already considered to be one of the world's most polluted urban areas.

The heaps of rubbish here and there, constant traffic jams, noxious emissions from all types of vehicles, especially the two-stroke engine-powered auto-rickshaws and motorcycles, dust due to road digging, construction and development activities, sound pollution, contamination of drinking water, etc., have made the lives of Dhaka-dwellers unbearable.

Even then the Dhaka City Corporation, Department of Environment and other concerned (it would be more correct to use the word 'unconcerned') authorities do not seem to have realised the seriousness of the situation and the impending doom. The high officials from these departments frequently visit foreign countries to acquire knowledge and experience. But it seems that after their return home they never try use the knowledge and experience that they have presumably acquired.

During a recent visit with an FEJB delegation to Bangkok, the capital city of Thailand, we saw a totally different scenario. Bangkok's environment has improved tremendously due to the sincere efforts of the city fathers and the people. The city is now much neater and cleaner and greener. No unsightly heaps of rubbish shock the eye. Garbage and refuse from houses, shops and markets are stored in trash-bags which are collected by the garbage carriers of Bangkok Metropolitan Administration (BMA) and disposed of scientifically. The

**Bangkok's environment has improved tremendously due to the sincere efforts of the city fathers and the people. The city is now much neater, cleaner and greener.**

carrying of rubbish without cover is a punishable offence.

But rapid urbanisation, industrialisation, continuous construction and development activities along with an increasing number of motor vehicle cause air and other forms of pollution in Bangkok.

Industrial units and power plants also contribute to the air pollution. Due to the severe air pollution in certain areas of the city a good number of drivers, traffic policemen and pedestrians were wearing masks. Respiratory ailments are quite common among these people.

It was not possible to know the exact number of flyovers that were constructed to get rid of traffic jams. The number of flyovers under construction does not seem less than the number of those that have been completed. Besides, there are expressways over the flyovers to ease the traffic and speed up the movement of vehicles. By this time the Sky Train, which will improve the traffic situation, has started operating. The

**Mr. Vichit Rattakul, the Governor of Bangkok, is very keen to keep the city clean. He frequently inspects different areas, roads and vehicles of the city to see for himself what is going on and takes serious action against any act of environmental pollution. Moreover, there is an extensive programme for improvement of the city's environment by planting half a million trees in the city during his tenure.**

Bangladesh Ambassador, Mr. Sohrab Hossain, was present at the inaugural ceremony of the Sky Train along with other invited foreign guests. After the inauguration the Sky Train was run on an experimental, not commercial, basis for some time. The ambassador told us that the security of the passengers gets priority over revenue earning.

Plying of 'Tuktuks', two-stroke engine-powered three-wheelers which cause heavy traffic jams and severe air pollution in Bangkok city, are now being phased out gradually.

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improvement of the city's environment by planting half a million trees in the city during his tenure.

The Deputy Director General of the Policy and Planning Department of the Bangkok Metropolitan Administration (BMA), Dr. Kasemsan Suarnarat, said, "We never waste our time or depend upon others for funds to implement the different development programmes. We just try our best with our own resources." According to him, vehicular and industrial emissions, dust pollution due to construction and other development activities, etc., are contributing to the city's pollution. The authorities think that the solution of environmental problems not only depends on formulation and enforcement of correct laws, but also on the creation of mass awareness. If people are environmentally aware they will observe the laws in their own interest.

Dr. Hansa Sanggyanoi, the adviser of Bangkok's Governor, said that due to the Governor's personal interest, a massive programme has been taken up for the improvement of the city's environment. Several organisations will coordinate their activities to implement the programme. In the meantime, three roads have been declared pollution-free. A programme for planting half a million trees is also being implemented. The Department of Environment is taking action against the vehicles that are polluting the environment.

Newspapers and NGOs are playing an important role in creating awareness among the people. In this context, Mr. Wasant Techawong of the Bangkok Post and journalist Komol of the Daily Nation said that usually the environmental reports are not given much importance, but if any serious environmental issue arises, the newspapers give prominence to the reports.

While tremendous initiatives are being taken in Bangkok to solve the environmental problems, in Bangladesh it is observed that the

**While tremendous initiatives are being taken in Bangkok to solve the environmental problems, in Bangladesh it is observed that the concerned authorities are not at all concerned. The plying of auto-rickshaws in the streets could not be stopped in spite of repeated announcements to that effect.**

concerned authorities are not at all concerned. The plying of auto-rickshaws in the streets could not be stopped in spite of repeated announcements to that effect. No effective measures are taken against faulty and unroadworthy vehicles. The river Buriganga has not yet been reclaimed from the encroachers. Construction of commercial buildings and industrial units in residential areas is not being stopped.

When even a single case of spitting in the streets was not seen in Bangkok, in Dhaka city about 5,000 tons of garbage are being dumped everyday. The Corporation officials could not tell us what percentage of this volume is removed and treated by their limited number of staff and vehicles.

# Two-stroke Tuktuks going off

By Khairul Anwar

Even in the 1980s, slums or shanties were visible on the sides of the street leading to Bangkok's city centre from the Tribhuban Airport. A great deal of time was wasted due to frequent traffic jams. Noxious black smoke added to the miseries, and made the lives of the residents as well as the tourists a hell.

Traffic congestion, air pollution and noise pollution were the three major problems of the city for a long time.

Some 5.6 million of the total 60 million population of Thailand live in Bangkok, so it is a crowded city. Thousands of tourists throughout the year add to the crowding. There are about 6 million mechanised vehicles across the country, out of which 2.2 million ply in the streets of Bangkok.

Recently some 2,000 new cars were introduced everyday to Bangkok's streets, but due to economic depression the import of cars has been cut down. The huge number of vehicles not only caused severe traffic congestion but also dangerous air pollution. In the recent past, the residents of Bangkok suffered from various ailments.

The main culprit of air pollution was the two-stroke engine-powered three-wheelers called Tuktuks.

But significant, if not massive, changes have been observed in recent years with improvement in the traffic system and removal of the slums. Wide flyovers and expressways have made life in Bangkok easier as well as healthier.

Bangkok can be called a city of flyovers, which were constructed to reduce traffic jam. The policy planners did not feel that their task was over with the construction of flyovers, so later they decided to build expressways. Those who want to reach their

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destination in a shorter period can use the expressways after paying a toll of 40 Baths. Currently they are building sky rails for smoother vehicular movement.

Like traffic jams, the problem of air pollution has also been solved to some extent. The smoke-emitting Tuktuks have been restricted to certain areas, and plans have been made to phase them out as soon as possible. Three major streets of the city have been declared pollution-free. The city authorities now regard the government buses to be the main culprit of air pollution.

"Air cleaning" was one of the election pledges of the current governor of Bangkok. At times, he himself

monitors the vehicles in the streets. The anti-pollution laws are enforced ruthlessly. The fines for driving old and smoky vehicles are quite high.

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The traffic policemen, drivers, pedestrians, toll plaza officials and others use masks in those streets where vehicles still emit black smoke.

The city laws against dust pollution caused by construction are also very tough. The authorities even impose ban on construction if the regulations are violated.

The media and the voluntary organisations are also playing a significant role along with the government in protecting the environment of Bangkok.

## Good governance counts

By Bakhtiar Rana

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Only a decade ago, Bangkok -- the City of Angels -- was literally choking in polluted air. The air in the sprawling capital city of Thailand in those days was dirtier than that in Dhaka.

But that has changed now. Today, it has been the other way round. Visitors arriving in Dhaka, once known for its greenery, virtually enter into high concentrations of intoxicating smoke emitted from tens of thousands of vehicles -- mostly the two-stroke autorickshaws.

While the three-wheelers have almost been phased out from Bangkok, Dhaka on the other hand, has an unabated proliferation of the smoke-belching autorickshaws. We may recall that in defiance of a government restriction some traders here recently imported 3,500 autorickshaws with banking support from a nationalised commercial bank.

Today's Bangkok, dotted with innumerable temples and pagodas as well as aluminium and glittering sky scrappers, has changed a lot -- thanks to an array of pragmatic anti-pollution measures taken to restore the city's lost charm.

All those measures basically stemmed from governmental decisions and the Governor of Bangkok is committed to their effective implementation. "The Governor is very strict. He means business and knows nothing but rules ... The offender of any rules anywhere in the city will be brought to book," said a taxi driver in Bangkok.

Bangkok came to international spotlight during the Vietnam War in the late 1960s. During that war, as soon as the United States set up their military base in the city, a construction boom started leading to rapid urbanisation. In the 1980s, urbanisation was further geared up by a faster economic growth.

But the city's initial development had

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been unplanned, sprouting out a discrepant road network, housing estates and lack of civic utilities. No wonder, the city soon became infamous for massive traffic jams with resultant heavy air and noise pollutions.

Home to about 15 per cent of Thailand's total population, Bangkok also plays a pivotal role in economic, social and political activities. The unplanned expansion of the city and influx of huge population that migrated from the rural areas not only put a heavy pressure on its infrastructure and basic public services, but also largely contributed to creating adverse effects on the quality of life of the citizens.

Experts in Bangkok told a visiting team from the Forum of Environmental Journalists of Bangladesh (FEJB) that one of the fundamental aspects of the city's development has been the unmanageable increase in the number of motor vehicles. At present more than two million automobiles are plying in Bangkok and these have been blamed for being the main source of air pollution.

Huge density of motor vehicles that are mostly run by leaded gasoline contributes directly to the air pollution. Lead is mixed with gasoline because it is the cheapest means to enhance octane level and prevents knocking down of engines. But almost 70 per cent of the lead exhaust out after being used and then shore up in the ambient air.

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Lead is a heavy metal that is highly toxic to human health. It is a minute particle and when inhaled it can easily pass through the respiratory system into the lower respiratory tract and alveoli. Lead has been reported to be the cause of a wide range of health problems, including damage of the nervous system, kidneys and reproduction capacity. Besides, lead is believed to be the cause of different cardiovascular and gastrointestinal ailments.

Since ambient lead in urban areas is associated mainly with the use of

leaded gasoline in the transport sector, people living and working in close proximity to the streets and roads are at greater risk of being exposed to lead concentrations. This has been happening in Bangkok for years. It was estimated that average blood and urine lead levels in the adult population in Bangkok was just double the limit set by WHO (World Health Organisation).

High ambient air lead concentrations in Bangkok prompted the Thai government in 1989 to start phasing out the use of leaded gasoline. Lead content in the gasoline was gradually reduced and finally eliminated in 1996. Unleaded gasoline was introduced in 1993 to support the use of catalytic converters and to reduce ambient air lead levels. As a result, daily and monthly average lead concentrations in general ambient and roadside air in Bangkok gradually decreased.

The authorities started phasing out leaded gasoline with a campaign to educate the public about the adverse effects of its use. "Today, people are becoming increasingly aware of environment pollution ... The campaign led to a sort of public pressure on us to implement the programme as quickly as possible," said Dr. Ksemsan Suwarnarat, Deputy Director General of Policy and Planning Department of Bangkok Metropolitan Administration (BMA).

In carrying out its aggressive policies, the government faced some resistance from oil companies since the burden fell initially on them. A collaborative approach involving discussion and consensus building among all relevant stakeholders and decision makers, including the oil companies, government agencies, and automobile manufacturers, was adopted to phase out leaded gasoline and introduce unleaded petrol. Various financial incentives were also given to the oil companies to comply with the government's policy and modify

**And it took only six years to completely phase out leaded gasoline. A Thai can take pride in saying that Thailand is now the only country in Southeast Asia using a 100 per cent lead-free gasoline. It also joins a handful of countries in the world, including Austria, Brazil, Canada, Columbia, Costa Rica, Japan and Sweden, which have eliminated lead from the gasoline.**

**The plan also aims at developing quality of the city's environment by increasing green areas and reducing water, air and noise pollution and hazardous wastes. There is also provision for developing public utility services infrastructure and social services.**

configurations to meet the specified fuel quality requirement. On the other hand, as the additional refinery costs for producing unleaded gasoline affected the consumers, the authorities decided to slash down excise duty on it.

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Columbia, Costa Rica, Japan and Sweden, which have eliminated lead from the gasoline.

The authorities in Bangkok are also enforcing stringent rules to control air pollution by the construction industry. Construction work has to be done there with caution by not letting clouds of dust blow in the wind. "Your neighbour will complain to the city authorities if you violate the rules," said a Thai journalist.

Meanwhile, the 5th Bangkok Metropolitan Development Plan (1997-2001) has been pursuing a number of measures which, perhaps, have led to the phenomenal development in controlling pollution in the city. It spells out a city plan for Bangkok in line with its growth and expansion and development of people's quality of life, keeping in view their basic needs, particularly those of the underprivileged group.

The plan also aims at developing quality of the city's environment by increasing green areas and reducing water, air and noise pollution and hazardous wastes. There is also provision for developing public utility services infrastructure and social services.

To execute the plan, all agencies under the supervision of the BMA were assigned to make operational strategies for one year to five years. In this context, different agencies were given guidelines by the BMA and all planned operations were to be conducted through proper coordination.

A new road network was built to ease traffic congestion. Steps were taken to develop new schools, hospitals, recreation areas and even arrange socio-cultural activities to uphold and promote local traditions and heritage. One measure is quite noteworthy of this 5th Plan -- transformation of all vacant land in the metropolitan Bangkok, whatever their sizes be, into parks and public recreational facilities.

Thus, while things appeared to be improving in a city only two hours' flight away from Dhaka, it is a pity that the situation in our own capital is heading for the worst. Our policy makers and planners may possibly emulate from Bangkok's success in curbing urban environmental pollution.

**"If they can do it, why can't we ?" asked businessman Zaman, a frequent visitor to Bangkok, whom the FEJB team met on their return flight to Dhaka. He lamented that our implementation status is very poor and discouraging. "We lack commitment, we care less, ignore rules and can't enforce those."**

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Dr. Rezaul Karim, chief of the environmental section of Bangkok-based ESCAP, sees a significant progress in the Asia-Pacific region on awareness of the issues. "Some initial steps have also been taken on monitoring, standard setting, legal measures, introduction of clean fuel and capacity building."

Besides, for importing unleaded petrol and low-sulphur diesel, he feels, that Dhaka should establish a government funded private monitoring system, which is cost-effective. It should phase out two-stroke engines and ensure enforcement of rules by the city authorities.

Dissemination of information, enforcement of rules and training of the people concerned are important for making the Clean Dhaka campaign a success. Transforming Dhaka into a city of pleasant living calls for a firm commitment and aggressive polices like those being carried out by the authorities in Bangkok.

# Bangkok's Sky-Rail

By Khondokar Monirul Alam

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Sky-rail has been the latest addition to the ever-busy traffic system of Bangkok, the Thai capital. An overhead railway, sitting on concrete pilings 12 metres (40 feet) above the ground and running along 23 kilometres (16 miles) of the city's worst streets was recently opened, giving Thais their first modern pollution-free mass transport.

The sky-rail project costing US\$ four billion was conceived as a means of minimising the city's agonising traffic jams as well as curbing air pollution caused by the automobiles. Nearly one-third of Thailand's total number of mechanised vehicles ply in Bangkok. There are some 1.5 million private cars and taxis.

Besides, there were the traditional Tuktuks -- the three-wheeler autorickshaws run by two-stroke engines. But of late, the city fathers have imposed restrictions on the movement of the once popular Tuktuks, because they emit black smoke to pollute the air.

## **Bangkok can be an example for Dhaka**

**By Saiful Alam**

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Bangkok, the Thai capital, has got rid of the Tuktuk, the three-wheeler auto-rickshaws powered by two-stroke engines. As part of a drive to curb air pollution, the authorities recently banned the Tuktuk that had for long been a popular mode of public transport in Bangkok. But the Tuktuks were notorious for emitting black smoke and creating traffic congestion.

Environmental experts have identified 'auto-rickshaues', which are three-wheelers like the Tuktuk and are also powered by two-stroke engines, as the main culprits responsible for air pollution in Dhaka. Authorities in Dhaka over the past several years have been planning to phase them out or ban them. But, due to the powerful lobby of auto-rickshaues owners and the prospect of unemployment for thousands of drivers, they have not yet taken any steps to implement the plan. The City Corporation could also do nothing to ban or restrict the movement of these two-stroke engine-powered vehicles in Dhaka.

The Bajaj company of India, which produces most of the two-stroke vehicles, last year announced that they would not market the two-stroke engines any more and would replace them with four-stroke engines. But the customers are not very interested as the price of four-stroke engines is much higher.

What has not been possible in Dhaka, one of the world's worst polluted cities, was possible in Bangkok. The determined steps taken by the city fathers to improve the environment of the Thai capital should be a good example for the authorities in Dhaka to emulate.

## Bangkok's air on the mend

By Syed Akhtar Yusuf

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Air pollution is a serious problem in the Thai Capital of Bangkok. Many drivers, traffic policemen and pedestrians are seen with masks in the streets because of the pollution.

But the situation is rapidly changing now. We could not learn how many fly-overs are there in Bangkok. The number of under-construction fly-overs does not seem to be any less. But to reduce the air pollution and minimise traffic jam the authorities have built expressways.

Diplomats, foreign mission representatives and regular visitors to Bangkok said that in less than a decade the city has witnessed tremendous development, making it one of the megapolises of the world. This is due to appropriate planning, dedication of the concerned people and strict enforcement of laws related to environment.

Law has given the city authorities, especially the Bangkok Metropolitan Administration, enough power to protect the environment. But the city authorities believe strict enforcement of the laws alone cannot ensure a better environment unless people cooperate wholeheartedly. Officials said they undertook a number of initiatives on the basis of co-ordination with all concerned agencies.

The Press and NGOs are also playing a significant role in this regard. The Bangkok Post and The Nation said that though the environmental issues do not dominate the newspapers, the Press gives due importance to the environment when any issue arises. Concerned officials frequently visit other cities abroad to learn from their experiences and to study their environmental strategies. But it appears that these visits do little good.