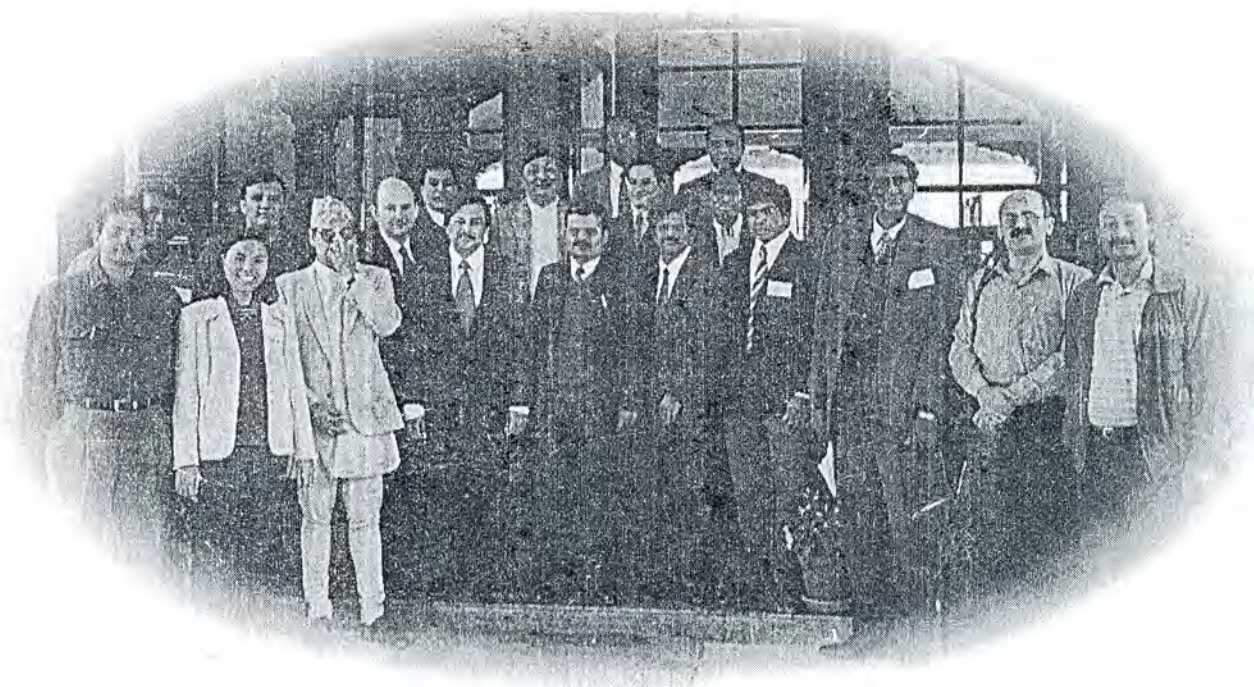




*Atmospheric Environment Issues
in Developing Countries*

Implementation of the Malé Declaration on Control and Prevention of Air Pollution and it's Likely Transboundary Effects for South Asia



Discussion Record
of the
Inception Workshop

Kathmandu, Nepal
22-23 February 1999



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LIST OF ACRONYMS

AIT	Asian Institute of Technology
ICIMOD	International Centre for Integrated Mountain Development
MoPE, Nepal	Ministry of Population and Environment, Nepal
NIA	National Implementing Agency
SACEP	South Asia Co-operative Environment Programme
SEI	Stockholm Environment Institute
Sida	Swedish International Cooperative Development Agency
UNEP/EAP-AP	United Nations Environment Programme / Environment Assessment Programme for Asia and the Pacific

DISCUSSION RECORD

The Inception Workshop for the implementation of the Malé Declaration on the Control and Prevention of Air Pollution and its Likely Transboundary Effects for South Asia was held in Kathmandu during 22-23 February, 1999. The workshop forms a continuation of the process which began in Bangkok in March 1998 where a policy dialogue concerning regional air pollution in South Asia was held at AIT. At this dialogue a Draft Declaration was agreed upon by delegates from South Asian countries. Subsequently, during the 7th SACEP Governing Council meeting held in the Maldives in April 1998, the Malé Declaration was adopted. Accordingly, National Implementing Agencies (NIAs) were nominated by the ministries of environment for each country in South Asia for the follow-up and implementation of the Malé Declaration.

The participants at the inception workshop included representatives from the Ministries of Environment and the National Implementing Agencies (NIA), ICIMOD, SACEP, SEI, UNEP and an independent regional advisor. A list of the participants is enclosed in Attachment I.

The meeting was organised by UNEP/EAP-AP, in collaboration with SACEP and SEI, and the local organiser was ICIMOD. The meeting was funded by Sida as part of the Programme on Atmospheric Environment Issues in Developing Countries which is coordinated by SEI and implemented in collaboration with organisations and institutes world-wide.

1. Opening Session

The Meeting was inaugurated by Mr. Varun Prasad Shrestha, Secretary, MoPE, Nepal. The Secretary welcomed the participants to Nepal and thanked UNEP for constantly addressing issues related to the Environment in the region. He also thanked Sida for their support of the meeting, baseline studies and Malé Declaration action plan

Dr. Ananda Raj Joshi, Director General, SACEP, thanked the participants and identified the environmental priorities in the region: natural resources management, cleaner production, extension of policies at the local level, and air pollution. He highlighted the importance of addressing the emerging issues through institutional capacity building and environmental assessment. He also emphasised that optimal and timely results can be achieved only with strong regional cooperation with committed support from all countries in implementing the policies.

Dr. Johan Kuylensstierna, Coordinator, SEI-York, thanked the participating NIAs for their continued commitment towards implementation of the Malé Declaration. He mentioned that SEI is an independent international institution, which assists to help link the science and policy making process. He explained the organisation of the Sida-funded programme and that Sida funds other projects in addition to the meeting being held in Kathmandu: the Baseline Studies and Action Plans. He reiterated that the Guidelines for National Baseline Studies and Malé Declaration Action Plans are expected to be made clear at the workshop. Based on the Baseline Studies and Action Plans, a follow-up programme document will be developed for funding from Sida for the next two years.

Mr. Surendra Shrestha, Regional Coordinator, UNEP EAP.AP, expressed his appreciation to the organising team including ICIMOD and SACEP, and Mr. Raghunathan Rajamani, who assisted EAP.AP since the conceptualisation of the project. He noted that air pollution

programmes similar to the Malé Declaration have been followed with interest in Latin America and Africa. He mentioned that UNEP Governing Council referred to the air pollution monitoring as a priority issue in the region and should be addressed accordingly.

Mr. Surendra Shrestha also gave a brief on EAP.AP, highlighting the partnerships with intergovernmental institutions which will play key roles in the implementation of the Air Pollution program. He further presented the current initiatives on the issue in the other regions. In Southeast Asia, the ASEAN in collaboration with UNEP and the Asian Development Bank, is currently implementing the agreement on transboundary haze for the last 10 months. The program aims to establish a regional monitoring unit based in Jakarta, which will activate the needed action in all countries. In Northwest Korea and Japan, monitoring stations are set-up and monitoring activities have been initiated.

Following the self introductions by the delegates, the Meeting unanimously elected Mr. Dilip Biswas, Chairman, Central Pollution Control Board, India, to Chair the first day Session and requested Mr. Varun Prasad Shrestha, Secretary, MoPE, Nepal to Chair the second day's Session.

Mr. Raghunathan Rajamani, designated Meeting Facilitator, outlined the background of the Malé Declaration project and highlighted the objectives and expected outputs of the Meeting, including a) discussion on the implementation program and schedule of activities to be carried out under the project; b) review on the suggested guidelines for baseline studies and action plan; c) presentations on the national arrangements to carryout the baseline studies and action plan from the national implementing agencies; d) discussion on the need for model, standards and methodologies to support the implementation of the Declaration; and e) improvement to the information exchange on air pollution between the countries in the region.

2. Brief on Guidelines on the Baseline Studies and Malé Declaration Action Plan (National)

Dr. Johan Kulenstierna of SEI and M. Iyngararasan of UNEP/EAP-AP presented the draft guidelines to prepare the baseline studies and national action plans.

Based on the discussions and comments suggested, the meeting adopted

1. Guidelines to prepare the Baseline Studies (Attachment 2);
2. Guidelines to prepare the Malé declaration Action Plan (national) (Attachment 3);
3. The following time frame for implementation of the programme.

Activity	Deadline
Network Establishment (Database on Experts & Institutions from NIAs)	15 March 1999
Baseline Studies Interim/Draft Report from NIAs Final Report from NIAs National Database on Air Pollution from NIA	15 May 1999 15 June 1999 15 August 1999
National Action Plan Interim/Draft Report from NIAs Final Report from NIA	30 July 1999 30 August 1999
Subregional Action Plan Subregional action plan by SACEP	30 October 1999
Final Meeting (for Phase I)	November 1999

Note: For any clarifications during the production of baseline studies or Malé Declaration Action Plans the NIAs should contact SACEP, UNEP/EAP-AP or SEI.

3. National Reporting and Discussion

National implementing agencies from Bangladesh, India, Iran, Maldives, Pakistan, Nepal and Sri Lanka presented their national level activities being carried out as well as the planned activities under the Malé Declaration Programme (*Attachment 4*).

The meeting recommended that the NIAs forward a request to UNEP for a visit to their country suggesting a suitable time in order to monitor and review progress on the project.

4. Discussions

The meeting recommended that the NIAs include in their action plans required activities including capacity building activities (ie. training) and UNEP and SEI shall locate the necessary funding accordingly. The meeting reiterated that planned follow-up activities based on the baseline studies and action plans could be included in the programme document to Sida to be developed by SEI at the end of the year.

Representative from Maldives requested for a short Basic Training Course on Air Pollution for Bhutan and Maldives. Representative from India has indicated that the training could be conducted by the Central Pollution Control Board, India.

Revised guidelines for the baseline studies and Malé Declaration action plans with the attachments will be aggregated by UNEP and be distributed to the participants accordingly.

Dr. Johan Kuylenstierna illustrated some tools used in assessment of air pollution and its control in the European Context for information and reference. Subsequently he presented the outline of a model that could form the basis for the development of an integrated assessment model for South Asia (*Attachment 5*). The participants stressed the need for full involvement of country experts and focal points as well as NIAs in this exercise.

The meeting decided to request SACEP/SEI/UNEP to initiate early participatory development and dissemination of tools such as tailored integrated assessment models for the South Asia region to facilitate early implementation of the Malé Declaration. Dr. Johan Kuylenstierna will prepare and disseminate a brief on the needs and requirements of the proposed model for information and reference.

5. Closing Remarks

Brief references were made by SEI, SACEP and UNEP/EAP-AP pledging the continued support to the program.

Dr. Johan Kuylenstierna and Dr. Ananda Raj Joshi expressed appreciation for the active and positive contributions of the participants.

Mr. Surendra Shrestha noted that the project has been implemented on-time and hence, follow-up activities should be complete accordingly. He expressed his appreciation to ICIMOD for successfully organizing the workshop.

Mr. Rajamani summarized the proceedings of the two days. He expressed deep appreciation of the contributions from all delegates which helped the workshop being time bound and action driven. He requested the delegates to pursue the compilation and reporting on return and try to adhere to the agreed schedule. He noted that Bhutanese delegate could not attend but was confident UNEP/EAP-AP will interact with Bhutan and get their view of matters discussed. He hoped the final workshop could be held in November 1999 as projected, perhaps in Tehran.

Mr. Varun Prasad Shrestha, the chairman of the workshop, expressed satisfaction at the outputs of the meeting. He indicated that Malé Declaration was the first environmental understanding of its kind in South Asia and a successful follow up should result in more such efforts in the field of environmental concerns. He thanked all the delegates for their whole hearted and meaningful participation.

The meeting ended with the delegates of Pakistan and Iran thanking the Chair. The delegate from Iran promised all support if the final meeting in November 99 were held in Tehran.

ATTACHMENT 1: LIST OF PARTICIPANTS

IMPLEMENTATION OF MALÉ DECLARATION ON CONTROL AND PREVENTION
OF AIR POLLUTION AND ITS LIKELY TRANSBOUNDARY EFFECTS
FOR SOUTH ASIA

Inception Workshop

Kathmandu, Nepal

22-23, February

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**ATTACHMENT 2 & 3: GUIDELINES FOR THE PREPARATION OF
BASELINE STUDIES AND MALÉ DECLARATION ACTION PLAN**

(PROVIDED IN A SEPARATE DOCUMENT)

**ATTACHMENT 4: PRESENTATIONS: NATIONAL
IMPLEMENTING AGENCIES**

BANGLADESH

**Implementation of Male Declaration on
Control and Prevention of Air Pollution and
Its Likely Transboundary Effects for South Asia.**

Baseline Study

**A. R. Khan
Director General
Department of Environment
Government of the People's Republic of Bangladesh**



Section 1: The National View of Air Pollution

Many Asian cities are on the threshold of a major environmental crisis in the form of air pollution. The deteriorating air quality in cities is a result of rapid economic expansion, rise in population, increased industrial output and unprecedented growth of passenger vehicles. The impact of air pollution on public health and consequent health costs, damage to ecological and cultural properties, deterioration of built environment etc. is well known.

Bangladesh is one the least developed countries of the world as such its industrial base is not very developed. Industries are mainly concentrated in major urban areas. Namely in the Capital Dhaka, Port city Chittagong and in other divisional towns. Accordingly Air pollution is concentrated mainly in those cities and towns.

There are mainly two sources, which cause air pollution to these cities. Vehicular emission and industrial emissions are the main cause of air pollution in cities. Other than these brick kilns scattered throughout the country cause some air pollution to rural areas. But alarming rate of pollution exists only in Dhaka City.

Dhaka is one of the densely populated and busiest cities in the world. After independence the importance of Dhaka City has increased many fold. But most of the development with respect to the growth of industrial and commercial establishment has happened unplanned. None of the industry is equipped with any kind of emission control system.

Along with the development in other sector, in recent years the vehicle fleet in Bangladesh and particularly in Dhaka has increased very rapidly, growing at over 10 percent per year. The current statistics on of vehicle by type in Dhaka City has been given in the following table(Table-1)

Table-1

SL.	Vehicle type	Total Number of Vehicles in Dhaka City
1.	Motor car	45,000
2.	Jeep/Station wagon/Microbus	15,000
3.	Taxi	1,500
4.	Bus	500
5.	Minibus	2,000
6.	Truck	12,000
7.	Autorickshaw/Tempo	35,000
8.	Motorcycle	30,000
9.	Others	1,200

Source: BRTA-1996

Much of the growth has occurred in the fleet of three wheelers, which are powered by two-stroke engines that are not well maintained and have high exhaust emission. In Dhaka City the main contributor of air pollution is the transport sector followed by industrial units, garbage and other biomass burning by the slum dwellers and burning of coal and wood by the large number of brick fields in and around the city. In Chittagong City, vehicular emission and industrial emissions almost

equally contribute air pollution problem. In other cities, the problems are not yet acute. Rural areas are still outside the effect of air pollution, in general excepting emissions from brick kiln which are widespread throughout the countryside.

Although the total number of vehicles in Dhaka and in other cities are not large relative to human population. High level of ambient air pollution due to vehicular emissions is one of the worst environmental problems affecting the ten million inhabitants of Dhaka City. This is due to the poor and inadequate road system, high density of traffic, poor traffic system, poor maintenance of a majority of commercial vehicles, lack of proper monitoring and strategies, policies and plan of action for the enforcement of existing laws and rules and regulations etc. Auto exhaust emission alone accounts for 50-60 percent of the total pollution in Dhaka city. Reports of different lung related diseases, headaches, nausea, irritation of eyes; risks of miscarriage etc. in Dhaka are wide spread.

Section 2 Existing Air Pollution Monitoring

2.1 Current Monitoring Network:

Air quality monitoring is a comparatively new phenomenon in our country. Department of Environment started collection of data on ambient air quality from 1992. It started this program in 4 divisional town namely Dhaka, Chittagong, Khulna and Bogra. The Department of Environment (DOE) has been measuring SPM, SO₂, NO₂ and CO concentrations in these cities for the past three years on a regular basis. DOE also carryout lead analysis from the particulate matter for research purposes. Measurement is taken place at or near street level along busy roads within the central city using High Volume Air Sampler. SPM measurements are taken on 4 to 5 day per month using 8 hour sampling periods for consistency with the WHO standards. Near instantaneous CO measurements taken place along side busy street.

Monitoring Station	Parameters monitored	Monitoring Technique	Organization responsible	Mode of Dissemination
In 4 Division (Dhaka, Chittagong, Khulna & Bogra)	SO _x , NO _x , SPM, CO on a regular basis. Lead for research purpose only.	Mainly with High Volume Sampler.	Department of Environment mandated to do regular air quality monitoring. Bangladesh Atomic Energy Commission and Bangladesh Centre for Scientific and Industrial Research also collects data.	Available as and when required by any organization or researcher.

2.2 Sitting of Monitoring Stations:

Under a study conducted by the Department of Environment and Bangladesh University of Engineering and Technology on Air Quality Monitoring identified different residential, commercial and industrial areas as the sample sites in the 4 divisional towns including Dhaka. The following criteria were taken under consideration for sitting the monitoring stations.

- landscape
- wind pattern
- Dispersion and dilution and
- Stationary & mobile source of air pollution.

Monitoring stations are mainly concentrated to urban areas; even no reference station exists in rural areas as air pollution monitoring program is still confined in urban areas.

2.3 Examples of Monitoring Results:

Current data on ambient air quality is provided in **Annex-1**.

2.4 Data Availability:

As stated earlier DOE performs ambient air quality monitoring since 1992 and it is the Government designated Agency to monitor ambient environment quality including air round the year. Other than DOE, Bangladesh Atomic Energy Commission (BAEC), Bangladesh Center for Scientific and Industrial Research (BCSIR) also collects data for research purpose. DOE is compiling all available data and at the time of submission of Final Baseline Study Report, these shall be incorporated in the report

Transboundary Data:

- Actually overall data availability is poor, particularly for the purpose of transboundary air pollution measurement.

Data on Urban Area:

Available data is mostly urban, as urban problems at present are most intensive in nature due to:

- Transport fuel combustion.
- Two stroke engine three wheeler (baby taxi).
- Increasing traffic congestion.

Data on Rural Area:

- Largest source is cooking, using biomass, wood in rural areas; but very limited data is available.
- Brick Kiln also emit fumes and dust, but data is limited.

2.5 Data Quality Checks:

DOE follows the standard procedures (standard method followed by USEPA) for sampling and testing on air quality. DOE exchange views with Bangladesh Atomic Energy Commission on collected data from time to time. But no Institutional Reference Laboratory has yet established. In future one of the capable lab shall be designated as a Reference Laboratory for quality checks.

2.6 Future Development of Monitoring Networks:

Under WB assisted Air Quality Management Project the existing monitoring network will be extended in major cities. Dhaka alone will have 10 monitoring stations. Moreover there is a plan

to increase Satellite Monitoring Stations in different parts of the polluted cities and towns. Under existing monitoring network DOE measures Concentration of SPM, NO_x, SO_x on a regular basis, CO on a random basis, and lead content for research purpose.

Under AQM project other parameters will be measure the following parameters:

- Particulate Matter less than 10 & 2.5 micron is size (PM₁₀ & PM_{2.5}).
- Hydrocarbon (HC)
- Ozone (O₃)
- Non Volatile Organic Compound (NVOC) etc.

It is expected that AQMP will start its function from July 1999 and it will expand its network of air quality monitoring and control measures for the next three years, which will usher a new era for systematic and regular monitoring and control measures on air pollution. AQMP has been taken to address the present alarming situation, which is now prevailing in Dhaka City.

Under the Male Declaration on Control and Prevention of Air Pollution and Its Likely Transboundary Effects for South Asia can take up a project and can provide a systematic network at several point particularly to monitor transboundary air pollution.

Other than Government Organizations Bangladesh have a number of universities, research organizations working in Environment and Environmental Monitoring, and this project can be implemented together. Male Declaration based support can help further such a system of network for air quality and transboundary monitoring.

Section 3 Emission Sources and Estimates:

3.1 Energy Estimate:

Bangladesh has one of the lowest per capita commercial energy consumption rates in the world at 56Kgoe/yr. (1990). As a result, Bangladesh's energy sector contributes a small amount of GHGs to the global environment. In future however, this scenario may change considerably. A large population situated in one of the fastest growing regions of the world will inevitably increase its energy consumption several fold in the next two and a half decades. The situation is exacerbated by the fact that energy utilization efficiency is extremely low both in the supply & demand sides. From the point of view of carbon dioxide emission there are however the following redeeming features:

- Over 60% of the energy presently comes from biomass
- Over 60% of the commercial energy comes from natural gas
- The single largest user of energy (other than power generation) is the fertilizer industry which utilizes natural gas and state-of-the-art technology.

Consumption of different fuels during the period 1977-78 to 1995-96 is shown in Figure 1. As can be seen there is a heavy reliance upon traditional fuels but the proportion of commercial fuels is gradually increasing mainly due to the increased use of natural gas which has grown from

25% in 1977-78 to over 67% in 1992-93 and so on of the commercial fuel requirement. The use of imported oil has been restricted to only those uses, which cannot or are difficult to be met by natural gas. Energy consumption in Bangladesh for the year 1992-93 is shown in Table 2.

Figure 1 Consumption of Different Fuels (1977-78 to 1995-96)

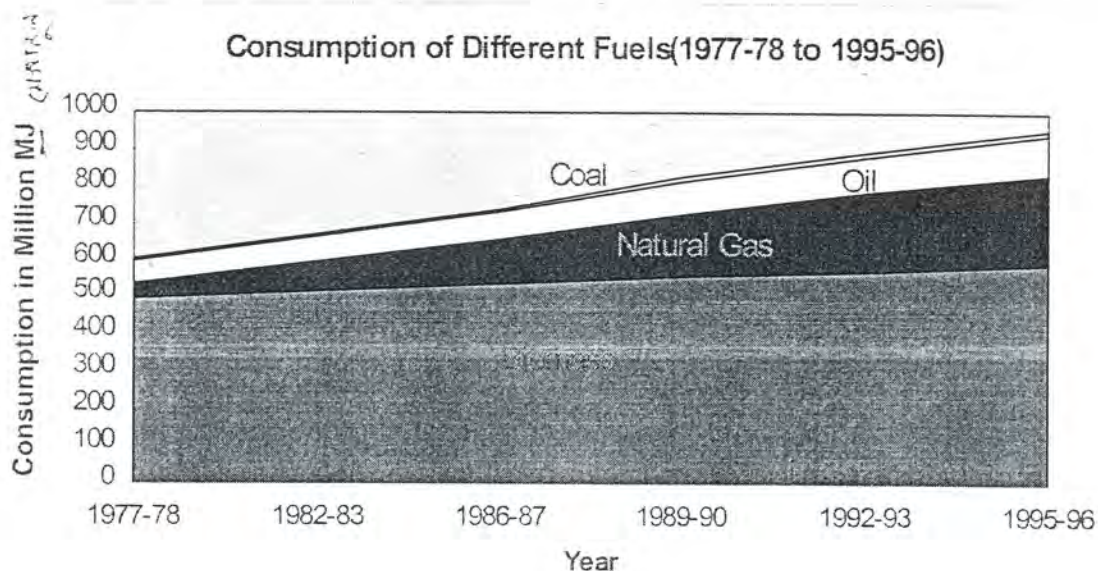


Table 2 Energy Consumption of Different Fuels (1992-99)

In million GJ					
Sector	Coal	Oil	Natural Gas	Total Commercial	Biomass
Power Generation		8.9	104	112.9	
Residential		16.1	14.8	30.9	415
Commercial			3.2	3.2	2.5
Industrial	1.80	6.8	17.8	26.4	93
Transport		41.3		41.3	
Agriculture/ Others	0.085	10.0		10.085	
Non-energy use (Urea Fertilizer Production)			77	77	
Losses and Own use			16.2	16.2	
Total	2	83	233	318	511

Note: In addition 608 kWh of Hydro electricity was generated, Source: BBS, 1995.

However, commercial energy consumption in Bangladesh is growing at a rapid rate (>5% per year). With population growth and economic development energy consumption will increase

further. Shortfall in the supply of biomass will also result in increased consumption of commercial energy. The most visible effect of economic development will be the gradual replacement of biomass fuels by fossil fuels. The factor, which will affect future emissions the most, is the availability of natural gas. The existing reserve of 10.44 TCF is projected to be exhausted by the year 2015. Unless new discoveries replenish this reserve, Bangladesh will have to shift to coal and/or oil. However, with increased participation of multinational companies in the gas and power sectors it is expected that the natural gas reserve will be enhanced, and increases in electricity generation efficiency will be achieved.

3.2 Estimates of SO_x & NO_x:

Estimates on emissions of SO_x & NO_x in the cities or in the countryside are not yet available. AQMP shall attempt to develop baseline data on such issues. These data shall be incorporated in future study reports. A cursory study will also be conducted under this program for primary data generation.

Section 4 : Research Studies into Air Pollution:

4.1 Atmospheric Transport of Air Pollution

No study has been conducted on Atmospheric Transport of Air Pollution in the country as yet. Some Researcher claim that the degradation of Sunderban the largest mangrove of the world, which is a now, a world heritage site is being destroyed by Transboundary airborne pollution. Some even suggest the pollution may move towards China. But as there is no systematic study on those matters it is mere prediction. So thorough study on these matters need to be done and Bangladesh is eager to participate in this study.

4.2 National Air Quality Criteria:

Air quality monitoring is being performed in urban areas under the 4 categories of zoning such as Industrial & mixed, commercial & mixed, residential & mixed, and sensitive as fixed under environmental quality standard in the Environmental Conservation Rules, 1997(Annex-2). In addition vehicular air pollution standards has also been incorporated in the ECR, 1997(Annex-3).

Air Quality Management Project will further develop the criteria but it is mainly focused on urban pollution problems.

Male Declaration assisted Project can help to prepare transboundary air quality criteria for Bangladesh in line with South Asian Countries.

4.3 Impacts of Air Pollution:

Current air pollution problem in Dhaka is of concern to all Dhaka City dwellers. Basically, air pollution in Dhaka emanates from vehicular pollution. Two-stroke engine driven Baby Taxies & Buses/Trucks are the main contributor for air pollution in Dhaka.

The major symptoms as complained by the inhabitants of Dhaka are as follows:
Headache, nausea, eye irritation, suffocation, asthma, anemia, lung diseases, hearing disability etc.

According to one study 50% of Dhaka's new born babies suffer from respiratory diseases and case of Asthma and other respiratory diseases are on the rise in Dhaka city.

In rural areas women suffer from various diseases related to inefficient cooking practices such as Respiratory diseases, Eye irritation and sickness and ultimately it effect their longevity.

4.4 Future Trends in Emitting Sources:

With population growth and economic development energy consumption will increase further and so the emissions in terms of vehicular and industrial emissions, in particular. However attempts under AQMP for stricter on road fitness compliance, improvement in the fuel quality and enforcement of the regulations is expected to bring significant improvement on air quality.

But what Bangladesh is now doing is mainly related to urban air pollution but to address the current transboundary air pollution issue the following measures should be taken:

- Monitoring system is urgently required.
- South Asian Initiative is welcomed.

SECTION 5: NATIONAL RESPONSES TO AIR POLLUTION PROBLEMS:

Recently the Government has taken many important decisions to contain the pollution level in Dhaka City. Some of them are mentioned below:

- Banning new registration of two stroke engines, and phasing out of existing two stroke engines within 3-5 years.
- Stringent enforcement of regulations on roadworthy test, emission checks and fitness tests.
- Import of unleaded and low sulfur gasoline for improvement of air quality.
- Under World Bank assistance Dhaka Urban Transport Project has been taken at a cost of US\$ 237 million. Under this project a major improvement work of the road networks of Dhaka will be taken such as: (i) construction of Road Intersections, (ii) Fly-over, (iii) Foot-Overpass, (iv) construction of Bus & Truck Depot and (v) Development of parking facilities etc. It is expected that by improving the transport network of Dhaka City the level of Air pollution will come down to allowable limit.
- Under a 5 million US\$ Air Quality Management Project (AQMP) which will be implemented shortly, DOE will set up check posts in the Dhaka city and Chittagong city to check the level of emission from vehicles including in some other major cities. Under this project vehicle inspection, air quality monitoring, awareness raising campaign, emission inventory, training to the drivers and mechanics of all kinds of vehicles will be undertaken.

Implementation of all these measures are expected to bring significant improvement in the Air quality of Dhaka City, and environmental standard shall be raised to accepted level.

Source	Control Option	Abatement efficiency
Vehicular Air pollution (Mainly Urban area based)	• Phase out leaded gasoline by July 1999 • Ban new licenses and route permits for tow stroke engine 3 wheelers (baby taxi) for Dhaka city in the first phase. • Introduction of low sulfur content fuels	Decision taken by the govt. and it is expected to be implemented by July 1999.
Transboundary air pollution	Not yet considered as no available data exists.	

ANNEX-I

Analysis Sheet of Ambient Air Sample of Dhaka City for the Month of August-September 1998.

Location	Date	Ambient Air Pollutant Concentration in micro gram/cubic meter			Remarks
		SPM	NO _x	SO ₂	
Farmgate, Near Police Box	03-08-98	228.9	31.04	21.48	Rainy, Cloudy and Windy
Farmgate, Near Police Box	04-08-98	506.9	72.46	47.40	Cloudy, Slight Rainy
Farmgate, Near Police Box	05-08-98	695.2	70.79	62.56	Sunny, Slight Cloudy
Fire Service, Mirpur Road	06-08-98	653.9	71.83	58.85	Cloudy, Slight Rainy
Fire Service, Mirpur Road	07-08-98	427.5	154.33	38.51	Sunny, Cloudy
Fire Service, Mirpur Road	08-08-98	751.9	30.36	67.67	Sunny, Slight Cloudy
Fire Service, Mirpur Road	09-08-98	710.3	79.41	63.92	Sunny and Cloudy
Fire Service, Mirpur Road	10-08-98	598.5	51.83	53.87	Rainy, Cloudy, Slight Sunny
Fire Service, Mirpur Road	11-08-98	569.6	21.23	51.26	Rainy and Cloudy
Fire Service, Mirpur Road	12-08-98	537.0	50.30	48.33	Rainy and Cloudy
Fire Service, Mirpur Road	16-08-98	221.2	60.35	19.90	Cloudy, Slight Rainy
Fire Service, Mirpur Road	17-08-98	236.9	116.69	21.32	Rainy
Fire Service, Mirpur Road	18-08-98	180.7	58.63	16.26	Cloudy, Slight Rainy and Sunny
Fire Service, Mirpur Road	19-08-98	364.0	224.54	32.76	Sunny, Cloudy and Slight Rainy
Fire Service, Mirpur Road	23-08-98	345.3	44.88	32.76	Sunny, Slight Cloudy
Fire Service, Mirpur Road	25-08-98	385.5	36.35	34.69	Rainy and Cloudy, Slight Sunny
Farm gate, Near Police Box	28-08-98	338.6	47.96	30.47	Rainy, Cloudy, Slight Rainy
Farm gate, Near Police Box	30-08-98	449.2	57.10	40.42	Sunny, Rainy and Cloudy

Farm gate ,Near Police Box	31-08-98	519.9	42.81	46.79	Cloudy , Slight Rainy
Farm gate ,Near Police Box	01-09-98	495.4	77.07	44.58	Sunny , Slight Cloudy
Farm gate ,Near Police Box	02-09-98	542.8	68.25	48.85	Cloudy and Slight Sunny
Farm gate ,Near Police Box	03-09-98	566.2	62.24	50.95	Cloudy, Slight Sunny and Rainy
Farm gate ,Near Police Box	04-09-98	644.9	69.41	58.41	Cloudy , Slight Rainy and Cloudy
Farm gate ,Near Police Box	14-09-98	519.45	53.37	46.75	Cloudy, Slight Rainy and Sunny
Farm gate ,Near Police Box	15-09-98	660.53	55.42	59.44	Sunny
Farm gate ,Near Police Box	16-09-98	924.5	60.10	83.20	Sunny , Slight Cloudy
Farm gate ,Near Police box	20-09-98	687.48	55.86	61.87	Cloudy , Slight Sunny
Farm gate ,Near Police box	25-09-98	1188.22	56.51	106.93	Sunny
Farm gate ,Near Police box	26-09-98	863.15	48.83	77.68	Sunny
Farm gate ,Near Police box	27-09-98	397.65	50.84	35.78	Cloudy
Fire Service , Mirpur Road	28-09-98	640.73	45.54	57.66	Sunny and Cloudy
Farm gate ,Near Police box	30-09-98	487.19	51.10	43.84	Cloudy , Slight Rainy and Sunny
Farm gate ,Near Police box	01-10-98	814.68	52.20	73.32	Sunny, Slight Cloudy
Farm gate ,Near Police box	02-10-98	776.59	54.52	50.95	Sunny, Slight Cloudy
Farm gate ,Near Police box	03-10-98	514.97	50.86	56.34	Rainy and Cloudy , Slight Sunny
<i>Standard value For Commercial and Mixed Area</i>	<i>400</i>	<i>100</i>	<i>100</i>		

Source: Department of Environment

Analysis Sheet of Ambient Air Sample of Dhaka City for the Month of December 1998

Location	Date	Ambient Air Pollutant Concentration in micro gram/cubic meter			Remarks
		SPM	NO _x	SO ₂	
Farm gate, Near Police box	02-12-98	2382.11	37	119.79	Sunny
Farm gate, Near Police box	03-12-98	2361.86	41	105.36	Sunny
Farm gate, Near Police box	06-12-98	2192.53	52	97.32	Sunny
Farm gate, Near Police box	07-12-98	2185.09	45	86.65	Sunny
Farm gate, Near Police box	08-12-98	2606.61	63	138.59	Sunny
Farm gate, Near Police box	09-12-98	2702.44	96.58	149.21	Sunny
Farm gate, Near Police box	10-12-98	2785.42	94	153.04	Sunny
<i>Standard Value For Commercial and Mixed Area</i>		400	100	100	Sunny

Source: Department of Environment

Note:

1. SPM - Suspended Particulate Matter.
2. NO_x - Oxides of Nitrogen
3. SO₂ - Sulphur di - Oxide

Air Quality Standards set by Government

(Concentration in microgram per meter cube)

SL.	Category of area	SPM	SO ₂	CO	NO _x
1.	Industrial & mixed use	500	120	5000	100
2.	Commercial & mixed use	400	100	5000	100
3.	Residential & rural	200	80	2000	80
4.	Sensitive	100	30	1000	30

Note:

1. National mausoleum, health center/hospital, Archeological site, Educational Institution and Government designated place (if any) are defined as sensitive areas.
 2. Industries located outside Industrial areas, will not discharge or emit pollutants, which may help to exceed the set standards of the ambient air quality of area (3) and (4) above.
- SPM (Suspended Particulate matter)
 - SO₂ (Sulfur-di-oxide)
 - CO (Carbon-mono-oxide)
 - NO_x (Oxides of Nitrogen)

Standards set By Government for Vehicle Emission

Product	Unit of measurement	Standards
Black smoke	Hartridge Smoke Unit (HSU)	65
Carbon mono-oxide(CO	gm/Km	24
	Volume in percent	04
Hydrocarbon (HC)	gm/Km	02
	PPM	180
NOx	gm/Km	02
	PPM	600

Note: Measured at the two-third speed of the highest spinning speed.

List of Publications:

1. Vehicular Air Pollution Control in Dhaka; Recommendation made by the Consultative Group Meeting, Dhaka, April 26-27, 1998.
2. National Report on Asia Least-Cost Greenhouse Gas Abatement Strategy (ALGAS); DOE, BCAS, BUET, BIDS & BUP, May 1998.
3. DOE/BUET, 1997. Air Quality Monitoring in Bangladesh, Government of Bangladesh.
4. Vulnerability of Bangladesh to Climate Change and Sea Level Rise. DOE, Govt. of Bangladesh and The Govt. of the Netherlands, 1994.
5. Bangladesh Climate Change Country Study, Govt. of Bangladesh, 1996.

National Action Plan

1. Monitoring and Evaluation

1.1. National Monitoring Network

In Bangladesh Air Quality is being increasingly recognised as a major concern due to its rapid degradation particularly in the urban sector. The National Environment Committee, the highest body on Environment dealing with environmental issues and concerns headed by the Prime Minister, has prioritised Air Quality as a major concern for action, but the following setback exists in relation to Transboundary Air Pollution;

- The focus is on Urban Air Pollution
- Existing National Monitoring is weak, needs to be strengthen.
- Only Department of Environment performs the regular systematic monitoring on Dhaka City.

Under Air Quality Monitoring project

- Increased number of air quality monitoring network will be established,
- Data quality will be ensured,
- Increased number of pollutants will be measured and
- Revision of current air quality standards and adoption of new standards will be set.

All these measures are for urban air quality monitoring. So Transboundary Air Pollution issues needs to be addressed as soon as possible as it was not perceived as important as we see at present. It is also to be noted here that transboundary air pollution monitoring and evaluation needs the integrated efforts both from government and non-government sector those have adequate knowledge on it. The training from international expert is also required to develop national level expert to run the monitoring and evaluation system for long run.

Criteria to be followed for siting of Monitoring Network:

The following criteria should be considered during the selection of monitoring station related to transboundary air quality movement.

- Wind Direction
- Location of Industrial belt

Eastern part of Bangladesh could be the ideal site for locating the monitoring stations as northwest Monsoon travels over India and enter into Bangladesh which may carry the pollution laden air from Indian South Eastern part. But as no data is available so monitoring needs to be done.

1.2. National Emission Inventory

In Bangladesh no inventory on Air Quality has been done. The only inventory is on Greenhouse Gases undertaken by Department of Environment and leading research institutions (BCAS, BUET, BIDS & BUP) under Asia Least Cost Greenhouse Gas Abatement Strategy (ALGAS). So detail inventory on energy emission estimates is required and this could be done under Male Declaration initiative.

Compile a GIS based Emission Inventory of pollution sources by Category and type of pollutant.

An emissions inventory is an essential, basic tool used in air quality management to identify the effectiveness of control programmes, track pollution trends and identify sources.

2. Assessment

Other than the atmospheric transfer modelling of air pollutants, integrated assessment modelling, some studies of health effects are needed to understand the magnitude of the problem.

No comprehensive assessment exists. AQMP will develop some outline but will not address transboundary questions. Moreover there is a lack of instruments, network and trained people.

3. Action

Under the present monitoring and control measures the following is being done to control urban air pollution;

3.1 Socio-economic options

- Govt. and NGO s are involved in raising awareness.
- To discourage the import and use of 2 stroke engine government has imposed increased tax on this item.
- Removal of lead from petroleum will be implemented by July 1999.
- Content of sulphur will be reduced from fuel in phases.

But no action has yet been taken on transboundary air quality monitoring and control. Therefore we would like to pursue for an integrated action taking participation from all regional states as well as participation from Bangladeshi research institute.

3.2 Technical options

Bangladesh need a countrywide network particularly for transboundary air pollution. Moreover the following item is required for improvement of capability of the Government:

- Instruments needed for measurement
- Training capability for handling and measuring the required monitoring
- Awareness to be developed to industrialist and others regarding the effect of transboundary air pollution.

Bangladesh willing to play its due role under the Male Declaration on Control and Prevention of Air Pollution and Its Likely Transboundary Effects for South Asia.

4. Implementation

The issue of Transboundary Movement of Air Pollution is a new one, so Bangladesh suggests to take a new integrated programme by the South Asian countries to make a comprehensive industrial emission inventory part of which has already been covered by ALGAS study. Study on acid deposition and effect on flora & fauna should be under taken by these countries. Together with the study, regular monitoring and atmospheric transfer of air pollutant it will be possible for a country like Bangladesh to assess its responsibility in the midst of South Asian Countries. Stockholm Environment Institute (SEI), UNEP, WB can assist Bangladesh to undertake such a study which could be implemented by Department of Environment (DOE) together with the ALGAS study consortium (BCAS, BUET, BIDS & BUP).

Recommendation on Integrated Approach to Vehicular Air Pollution Control in Dhaka:

I Public Awareness:

- Mass media Campaign concerning seriousness of the problem, Health Concerns, and Actions to be taken by individuals and by Government/NGO & Civil Society
- Training for Vehicle Owners, Drivers & Mechanics
- Implement Daily Air Pollution Advisory Report
- Establish Air Pollution Information Centre

II Regulations & Enforcement

Vehicles:

- Revise current Motor Vehicle Regulations Act to Impose Increasing Penalty for Repeatedly Violation of Traffic Regulation.
- Revise and Establish New and In-use Vehicle Emissions Standards for All Classes of Vehicles, if possible to adopt single standard for both newer and older models and compel them to adapt to new standard.
- Monitoring effectiveness of the regulation nos. 1 & 2, and strengthen vehicle licensing rules.
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- Driving license test should also include knowledge on cause & consequences of vehicular air pollution.

Mobile Source Fuels:

- Phase out leaded Petrol by 1999
- Ban new licences and route permits for two-stroke engine 3-wheelers(baby-taxi)for Dhaka city in first phase.
- Phase out two-stroke Engine 3-wheelers from Dhaka city.
- Promote use of alternate fuel vehicles.

III. Vehicle Inspection & Maintenance:

- Carry out quarterly vehicle emission on-road inspection and enforcement program.
- Acquire Vehicle Emission Inspection Monitoring Equipment Required for Enforcement.
- Promote Better Vehicle Maintenance by the Proposed Fitness certificates.
- Automation of the vehicle fitness inspection system.

IV. Transportation Planning Measures

Reduced Road Congestion by:

- Promoting and funding mass transit through fuel and road-user taxes.
- Improved traffic planning, engineering & enforcement of Traffic laws.

V. Institutional

- Form air pollution steering committee of stakeholders
- Form air pollution research consortium of Research Laboratories and scientific establishments.

VI. Ensure effectiveness of control Programmes through air monitoring:

- Implement a quality assured monitoring programme through equipment purchase & training.
- Develop knowledge base which can independently absorb and contribute information.
- Open analysis and reporting of air pollution data.
- Use of monitoring data for mid-course correction.

VII. Pollution Inventory and assessment plans

- Compile a GIS-based Emissions Inventory of Pollution Sources by Category and Type of Pollutant.
- Studies on Impact of air pollution on Human Health in different Professional Groups vulnerable to air pollution.
- Conduct policy analysis and mitigation studies.

VIII. Petroleum Sector:

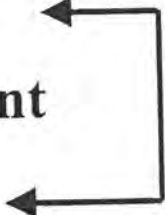
- Adjust gasoline & diesel/kerosene fuel taxes to make prices compatible
- Fix minimum standard for Lube oil
- Fix minimum octane number of petrol and ensure supply of only unleaded petrol.
- Reduce the sulphur content of diesel
- Study the long term environmental/economic viability of the refinery/petroleum sector.

INDIA

FUNCTIONS OF CENTRAL POLLUTION CONTROL BOARD (CPCB)

- **To advise the Central Government**
- **To co-ordinate the activities of SPCB's/PCC's**
- **To provide technical assistance to SPCB's/PCC's**
- **To plan & organise the training of the persons engaged in environmental management**
- **To organise through mass media a comprehensive programme regarding the prevention & control of pollution**
- **To collect, compile and publish technical & statistical data**
- **To lay down, modify or annul the standards**
- **To plan & cause to be executed a nation-wide programme for the prevention, control & abatement of pollution**

INSTITUTIONAL MECHANISM

- 1. Ministry of Environment & Forests,
Govt. of India**
 - 2. Central Pollution Control Board**
 - 3. State Departments of Environment**
 - 4. State Pollution Control Boards**
 - 5. Other Concerned Ministries/Agencies
at the Centre & State Level :**
- 

- Industries
- Surface Transport
- Petrol
- Coal
- Power
- Meteorological Department

6. Research Institutes :

- Central Scientific & Industrial
Research Laboratories
- Tata Energy Research Institute
- Jawahar Lal Nehru University
- All India Institute of Technology

MONITORING FACILITIES

- **National Ambient Air (290 Stations) Quality Monitoring Programme**
- **State Ambient Air Quality Monitoring Programme**
- **National Environment Engineering Research Institute**
- **Major Industries**
- **Bombay Municipal Corporation**

PARAMETERS MONITORED

Suspended Particulate Matter	:	8 hourly - 24 hourly Twice a week
Sulphur Dioxide (SO₂)	:	4 hourly - 24 hourly Twice a week
Oxides of Nitrogen (NO_x)	:	4 hourly - 24 hourly Twice a week

ADDITIONAL PARAMETERS **MONITORED**

CPCB IN DELHI

Carbon monoxide
PAH in SPM
Heavy Metals in SPM
Ozone
Respirable Suspended
Particulate Matter
Meteorological Parameters

NEERI IN 10 CITIES

Heavy Metals in SPM
PAH's
Hydrogen Sulphide
Ammonia

IMPLEMENTATION OF MALE DECLARATION

**PROPOSED NATIONAL PROGRAMME:
INDIA**

BASELINE STUDIES

- **Policy Initiatives For Air Pollution Control**
- **Monitoring Activities**
- **Emission Sources & Estimates**
- **Research Studies**
- **Assessment of Initiatives**
- **National Responses to Air Pollution**

BASELINE STUDIES

TASKS

MODUS OPERANDI

- | | |
|---|---|
| <ul style="list-style-type: none">• POLICY MEASURES & PROGRAMMES
• MONITORING ACTIVITIES | <ul style="list-style-type: none">- Collation by CPCB in consultation with concerned agencies
1. COMPILATION OF DATA<ul style="list-style-type: none">* By CPCB<ul style="list-style-type: none">- Information from SPCB's / PCC's, Research Organisations & Major Industries
2. ACTUAL MONITORING<ul style="list-style-type: none">* By CPCB, SPCB's / PCC's, Research Laboratories & Major Industries |
|---|---|

BASELINE STUDIES

TASKS

MODUS OPERANDI

- | | |
|---|---|
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|---|---|

BASELINE STUDIES

TASKS

- **RESEARCH STUDIES**
- **NATIONAL RESPONSES TO AIR POLLUTION**

MODUS OPERANDI

- Compilation of information by CPCB
- Information to be obtained from SPCB's/PCC's & other institutions
- * Constitution of team of experts from Ministry of Environment & Forests, SPCB's /PCC's, Research Organisations & Industries
- * Co-ordination by CPCB

National Action Plan

- **Monitoring & Evaluation**
 - * **National Monitoring Network**
 - * **National Monitoring Inventories**
- **Assessment**
 - * **Assessment Tools**
 - * **Assessing Air Quality**
 - * **Assessing Impact**
 - * **Assessing Abatement Options**
- **Action**
 - * **Socio-economic Options**
 - * **Technical Options**
- **Implementation**

NATIONAL ACTION PLAN

TASKS

MODUS OPERANDI/ AGENCIES

- **MONITORING & EVALUATION**
 1. **NATIONAL MONITORING NETWORK**
 - **CPCB, SPCB's / PCC's, Research Laboratories & Major Industries**
 - **Use of air quality data from the National Air Quality Monitoring Network (290 Stations)**
 2. **NATIONAL EMISSION INVENTORIES**
 - * **THROUGH QUESTIONNAIRE**
 - **Compilation by CPCB**
 - **Information to be provided by SPCB's /PCC's, Ministry of Petroleum, Surface Transport, Chemicals, Power, Agriculture, Industries Department & Research Organisations etc.**
 - * **PHYSICAL**
 - **CPCB's/SPCB's/ PCC's, Industry Departments & Central Statistical Organisation**

NATIONAL ACTION PLAN

TASKS

AGENCIES

- ASSESSMENT

- | | | |
|---------------------|---|-----------------------|
| 1. ASSESING TOOLS | - | CPCB in consultation |
| 2. ASSESSING AIR | | with Ministry of |
| QUALITY | | Environment & |
| 3. ASSESSING | | Forests, States |
| AMBIENT OPTIONS | | Department of |
| 4. ASSESSING IMPACT | | Environment, SPCB's / |
| | | PCC's, Industry |
| | | Departments & State |
| | | Planning Commissions |

NATIONAL ACTION PLAN

TASKS

AGENCIES

• ACTION

1. SOCIO-ECONOMIC OPTIONS

- CPCB in consultation with Ministry of Environment & Forests, State Departments of Environment, SPCB's / PCC's, Industrial Departments, NGO's, Department of Science & Technology, Department of Economic Affairs

2. TECHNICAL OPTIONS

- CPCB in consultation with Department of Industries, Science & Technology, SPCB's / PCC's, Instrument Manufacturers, Experts in Process Technologies, & Research Organisations

NATIONAL ACTION PLAN

TASKS

AGENCIES

- **IMPLEMENTATION** - Ministry of Environment & Forests as nodal body in association with :
Ministry of Petroleum, Surface Transport, Chemicals, Power, Agriculture, Industries, Finance, Bureau of Indian Standards, Department of Science & Technology
- CPCB as executing body under Ministry of Environment & Forests in co-ordination with :
State Departments of Environment,
SPCB's/PCC's

SCOPE OF WORK :

TASKS	DEAD LINE AS MENTIONED	PROPOSED DURATION*
1) Completion of reports containin address lists of experts in the country that form part of the network with full contact details & specialisation	January, 1999	February, 1999
2) 2.1) Prepare national level arrangements to carryout project (Baseline Studies & Action Plan) in the country and present plan at the inception workshop	February, 9	February, 99
2.1) Baseline Study Report	June 15, 1999	June 15, 1999
2.2) Database on Air Pollution	August, 1999	August, 1999
3) 3.1) A national action plan to cope with the air pollution issues in the country	August, 1999	August, 1999
3.2) Presentation of the action plan along with the baseline studies in the final worksho	November, 1999	November. 1999

* As the approval for the proposal has not been received, the targets cannot be achieved & need to be extended

SUSTAINABLE DEVELOPMENT STRATEGIES

- **COUNTRY WISE COMPILATION**
 - * **ADMINISTRATIVE SET UP**
 - * **PROGRAMME/ ACTIVITIES**
 - * **STATUS OF ENVIRONMENT**
- **ISSUES OF CONCERN**
- **AREAS OF MUTUAL INTEREST**
- **STRATEGIES**
 - * **EXCHANGE PROGRAMMES**
 - **TECHNICAL/SCIENTIFIC EXPERTS**
 - **TRAINING / SEMINARS / WORKSHOPS**
 - **TECHNOLOGICAL EXCHANGES**
 - * **DEVELOPMENT POLICIES**
 - * **COMMON REGULATIONS AT REGIONAL LEVEL**

IRAN



ISLAMIC REPUBLIC OF IRAN
THE DEPARTMENT OF THE ENVIRONMENT

**Male Declaration on Control
&
Prevention of Air Pollution
&
its Likely Transboundary Effects for South Asia**

COUNTRY REPORT

**Presented at
INCEPTION WORKSHOP
Kathmandu
22-23 February, 1999**

**Presented by :
S. Ferdowsi**



CONTENTS

1. Introduction	1
2. Current Situation of Air Pollution	1
3. Legislation	2
4. National Institutional Framework	3
5. Monitoring and Control	5
6. Special Arrangement under Male Declaration	5

In the name of God . the Compassionate . the Merciful

1. INTRODUCTION

I.R.Iran is an Asian country situated in the region called " the Middle East" The land territory is extended over the high altitudes of Iranian Plateau. The surface area of Iran amounts 1/648/000 square kilometers. Iran is bordered by Azerbaidjan , Armenia , and Turkmanistan in the north , Afghanistan and Pakistan in the east , and Iraq and Turkey in the west . The southern border is encircled by the Persian Gulf and Oman Sea which along with Caspian sea in the north offers great coastal possibilities to the country .

Vast land area , broadly divers climate condition and extremely heterogeneous topography provides for the astonishing richness of biodiversity and environmental variability . Almost all types of terrestrial and aquatic ecosystems could be found within the Iranian territory . the plant and wildlife biodiversity of Iran is far greater than that of the whole continent of Europe.

According to the latest census records the population of Iran is about 65 million with an age structure dominated by youngsters . The urban population is roughly the same as rural one and is continuously increasing . The rate of population growth has been sharply declining during the last decade and stands under 1.5 at present .

2. CURRENT SITUATION OF AIR POLLUTION

Air pollution has long been a matter of concern in larger cities of Iran . The main problem regarding the air quality is the health effects of over standard concentrations of atmospheric pollutants . The capital city of Tehran has been attracting the greatest focus of concern , research and monitoring during the last two decades.

Tehran is a large city with around 8 million inhabitants. With more than two million cars and a large number of factories around it. Every day more than 14 million single trips take place in Tehran. Passenger cars consume over 6 million liters of gasoline a day. The natural condition of land topography causes thermal inversion during a considerable number of days a year. This makes the problem of air pollution more severe.

There are also a large number of sunny days with intense solar radiation. This leads to the development of secondary pollutants in the air. According to a research programme conducted jointly by Tehran University and the Department of Environment 70 percent of air pollution load is emitted by vehicular traffic in Tehran.

There are other large cities like Isfahan, Meshed and Tabriz which encounter unacceptably high levels of air pollution and would soon face environmental and health problems unless due control measures are taken.

3- LEGISLATION

According to the article 50 of Constitutional Law "The environment is a national asset and any activity, economic or other, resulting in irreversible damage to the environment is forbidden."

There are also more specific laws and regulations pertaining to the air pollution control and abatement.

Air Pollution Prevention Act was enacted in 1995 by the parliament. According to the Act the Department of Environment is the official authority which sets up the national air pollution regulation and standards with assistance from other relevant governmental bodies like ministry of Industry, ministry of petroleum, ministry of power, etc. The regulations and standards would take effect after endorsement by Environmental Supreme Council or the Cabinet.

This act divides the air pollution sources into four main categories, namely:

- i) automotive sources
- ii) industries and workshops
- iii) households and commercial sources
- iv) miscellaneous

The Air Pollution Act provides the basis for promulgation and enforcement of some groups of air pollution standards as follows:

- 1) Ambient air standards sets the maximum acceptable level of classic air pollutants in the ambient air.

ii) Emission standards identify the maximum permissible emission of certain air pollutants from point sources (stacks) based on an industry -by industry - basis. The standards take into account the type of industry , the existing and available technology and the sensitivity of the surrounding area.

iii) Vehicular standard under which there are two main types of standards :

- * type approval standards for newly produced vehicles , and
- * exhaust standards for inuse vehicles.

iv) site selection criteria

A set of criteria has been put in the place for industrial activities and commercial centers. More polluting the activity is, more distant from the sensitive areas it must be . The sensitive areas in this regard are human settlements ,naturally valuable areas , surface waters etc.

4- NATIONAL INSTITUTIONAL FRAMEWORK

According to the law ,the Department of the Environment is the relevant national body for dealing with all cases of environmental contamination including atmospheric pollution as well as wild life protection .

A professional office was created inside the Department of Environment works exclusively on air pollution and air quality .More over , there are expert groups working on air pollution in each provincial office of D.O.E all round the country . The organizational chart of D.O.E and the situation of air quality bureau within the organization is showed in fig 1 .

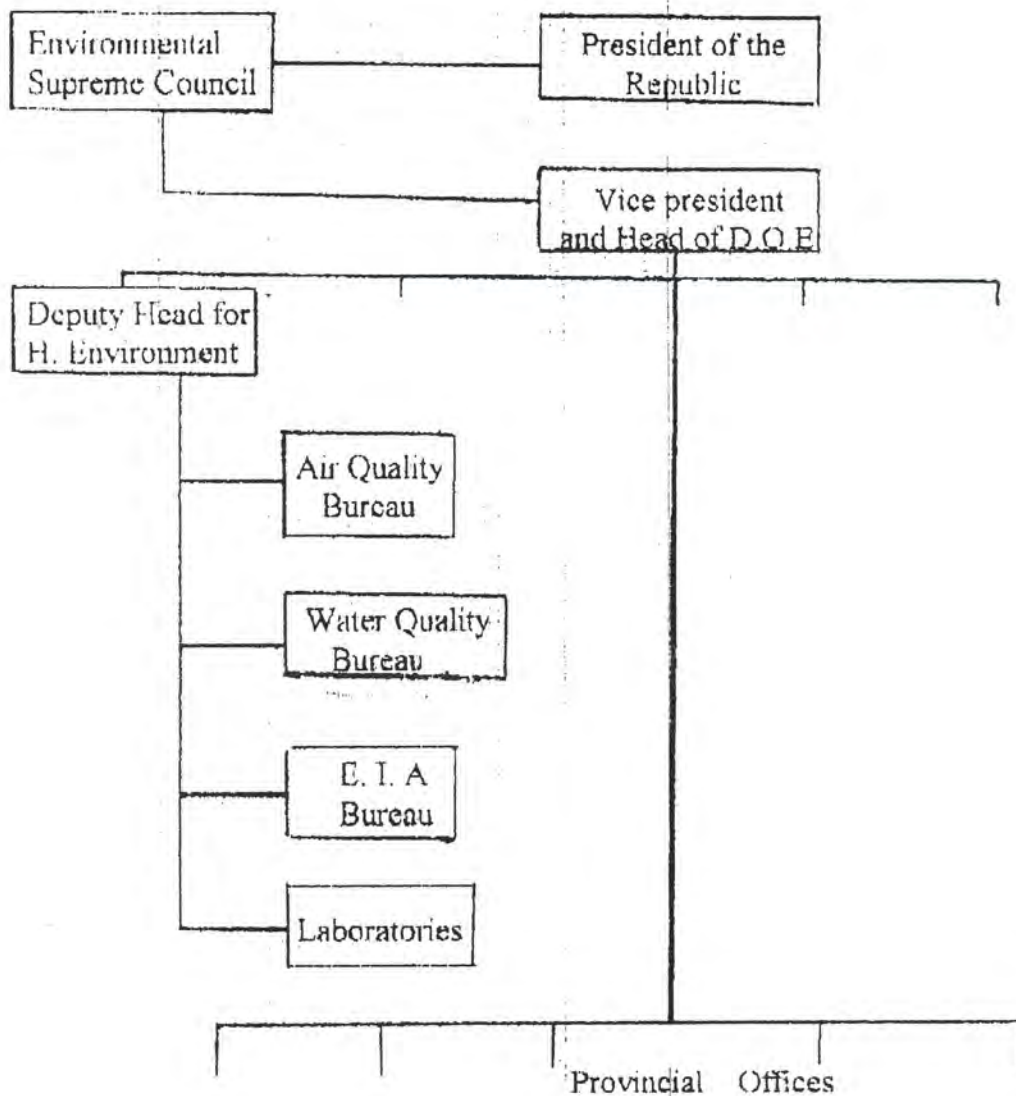


Fig 1 Simplified organizational structure of D.O.E

- ii) Emission standards identify the maximum permissible emission of certain air pollutants from point sources (stacks) based on an industry -by industry - basis. The standards take into account the type of industry , the existing and available technology and the sensitivity of the surrounding area.
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5-MONITORING AND CONTROL

In order to monitor the air pollution levels in large cities, monitoring stations have been installed by the Department of Environment. In Tehran there is a network of fully automated continuous measurement stations along with some manual stations.

Steps have been taken for reducing air pollution in urban areas. Among these measures are:

- i) Popularizing the natural gas use within the residential areas as a cleaner alternative to other fossil fuels,
- ii) Conversion of 20,000 taxis in Tehran from gasoline fueled to LPG and a number of buses from diesel to CNG,
- iii) Better law enforcement in industrial centers regarding the installation of air pollution control equipment,
- iv) Defining a restricted area in downtown of Tehran into which unpermitted vehicles can not enter,
- v) Decommissioning of industrial manufactures located inside urban areas and moving them to preplanned industrial estates and
- vi) Cultural incentives and educational activities

Anyhow the air pollution is becoming more and more a matter of public concern and the government should respond to it more promptly and more effectively.

6-SPECIAL ARRANGEMENT UNDER MALÉ DECLARATION

A special arrangement worked out in order for effective implementation of the provisions of Malé Declaration.

According to this arrangement D.O.E has the official responsibility for handling the job and would act as the national implementing agency. The Deputy Head of D.O.E for Human Environment Affairs is the National Project Director (NPD) for the activities under the Malé Declaration. He would implement the Malé Declaration with the assistance of Air Quality Bureau.

A Panel would report its activities to NPD fortnightly.

The NPD would sign official contracts with each member of the Panel. The contracts include TORs as time schedules for carrying out the tasks included in TOR every members of the Panel can set up a small

working group under his own supervision for more expedited reaction and better fulfillment of his / her job.

The Panels Secretary has the responsibility of requesting for progress reports from each expert and compiling them into integrated progress reports which would regularly be submitted to NPD. Fig. 2 indicates the composition of the Panel of Experts.

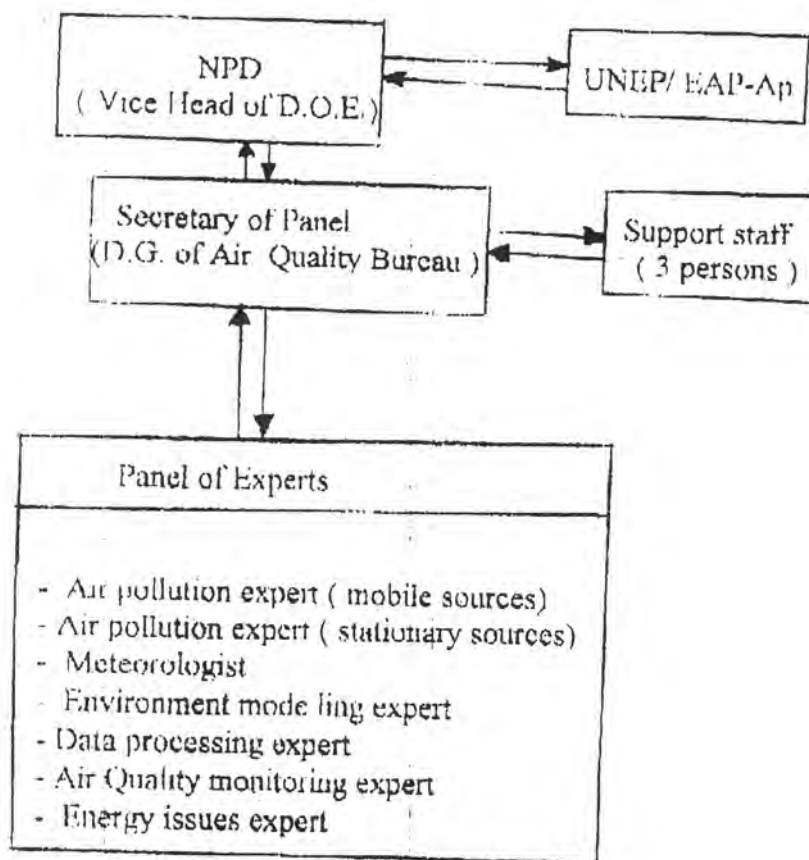


Fig.2 organizational arrangement for the Implementation of Male Declaration

PAKISTAN

INCEPTION WORKSHOP

FEBRUARY 22-23, 1999, KATHIMANDU, NEPAL

PRESENTATION BY

ASIF S. KHAN

DIRECTOR GENERAL

PAKISTAN ENVIRONMENTAL PROTECTION AGENCY

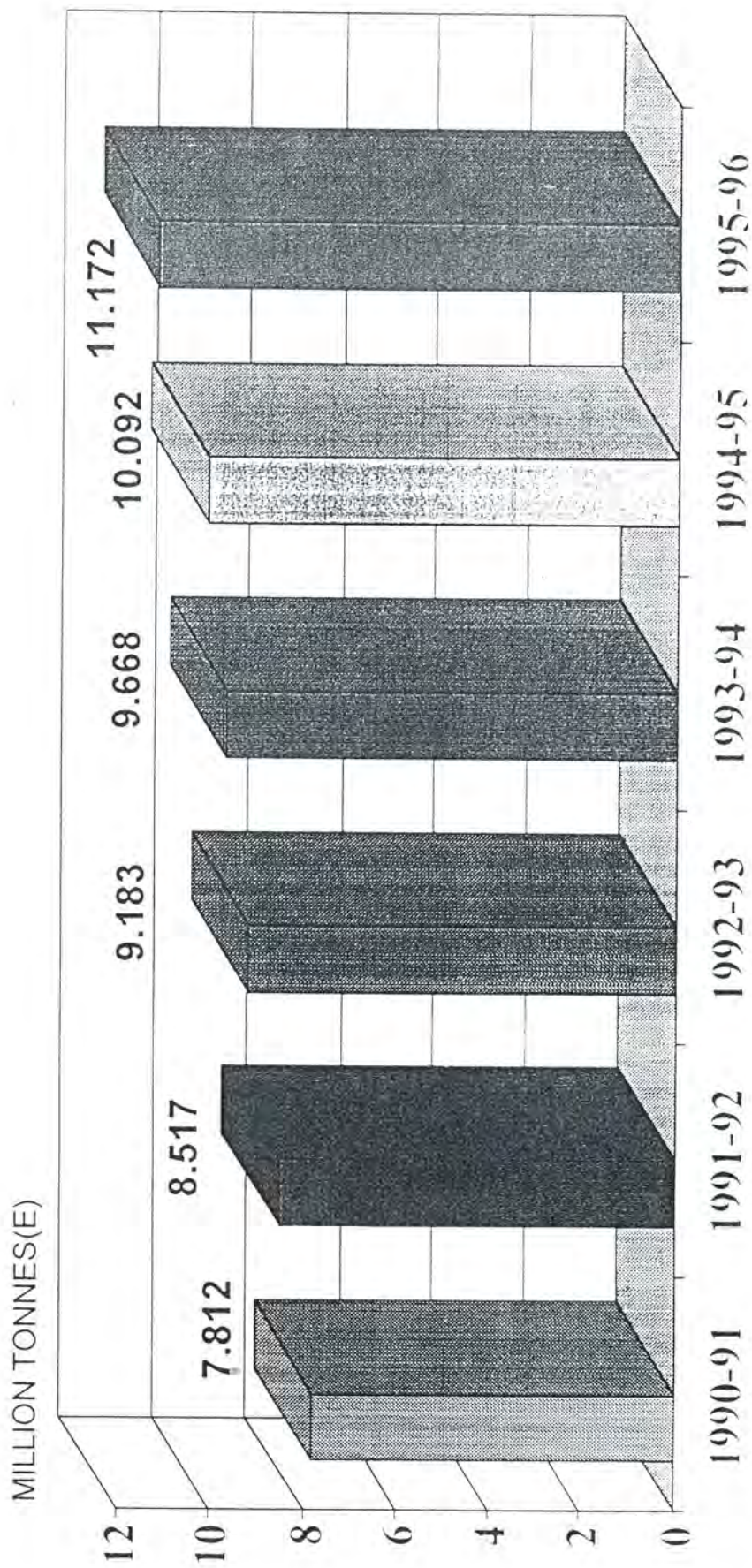
FACT SHEET

Country Name:	Islamic Republic of Pakistan
Land Area:	882,000 km ² (88.2 million ha)
Forest Area:	3.61 mil h
Cultivated Area:	21.54 mil h
Deforestation:	Woody biomass declining @ 4 to 6% /year
Agriculture:	Major crops: wheat, rice, maize, sugarcane cotton, tobacco, potato and pulses
Population:	131.63 million (1995-96)
Population Density:	149.2 persons per km ²
Population growth rate:	2.81 % / annum (1996)
Adult literacy rate:	37.9 % (1995-96)
Main Industries:	Textiles, leather, electrical, surgical, steel, chemical, pharmaceuticals, sports goods
Sources of air pollution:	Power generation, Industrial emissions Vehicular emissions, Burning of solid waste
No. of vehicles on road:	3,497,500 (1996)

CAUSES OF AIR POLLUTION IN PAKISTAN

- 1. INCREASE IN FUEL CONSUMPTION**
- 2. RAPID GROWTH OF VEHICLES**
- 3. USE OF UNCLEAN FUELS**
- 4. OLD VEHICLES (MAJORITY 15-20 YEARS OLD)**
- 5. POPULARITY OF DIESEL DRIVEN VEHICLES**
- 6. UNABATED INDUSTRIAL POLLUTION (26 CEMENT AND 8 FERTILIZER PLANTS)**
- 7. PRESENCE OF NATURAL DUST**
- 8. LOW LEVEL OF AWARENESS AND EDUCATION**
- 9. WEAK MONITORING**

ENERGY CONSUMPTION OIL

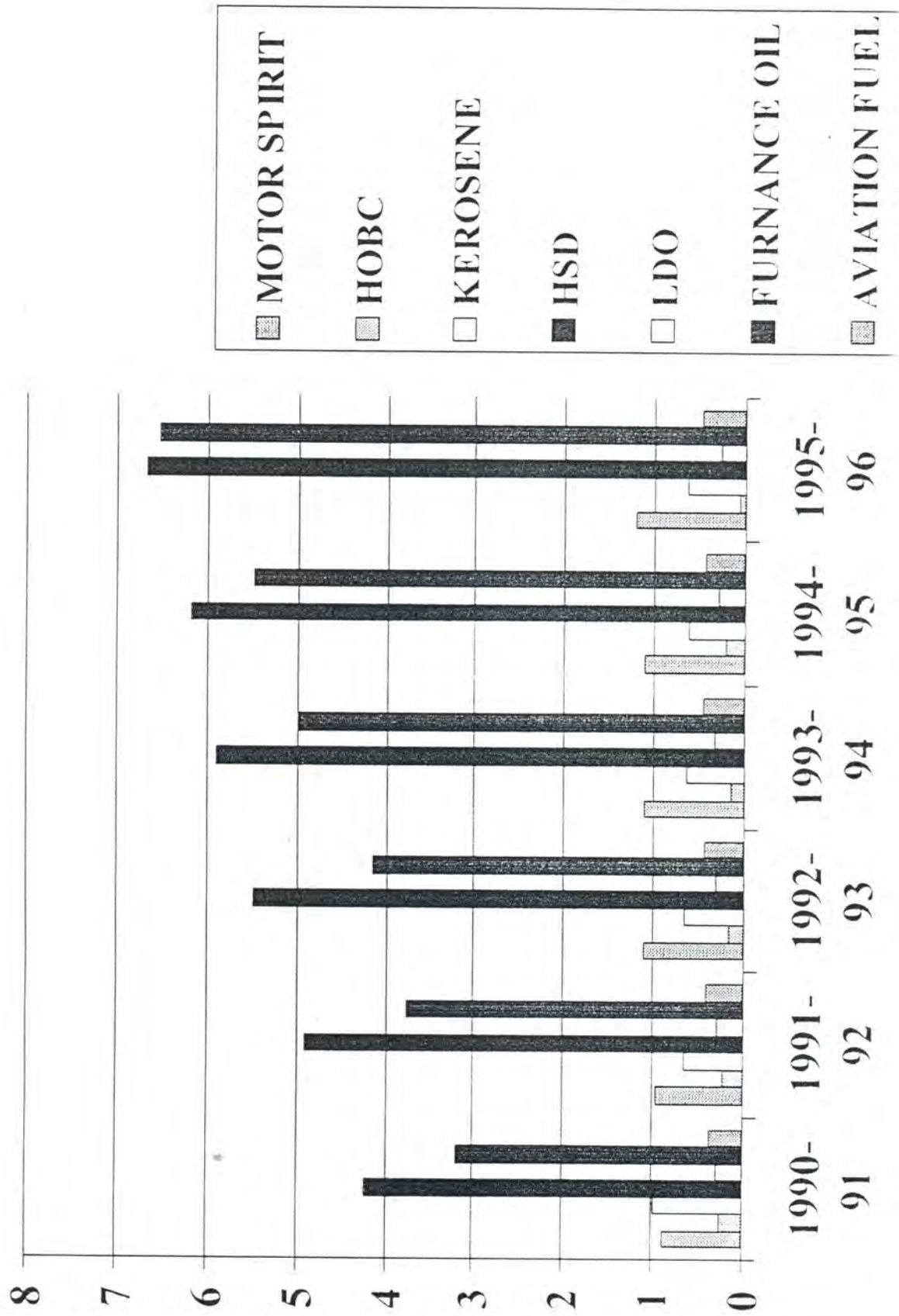


ANNUAL COMPOUND GROWTH 7.4%

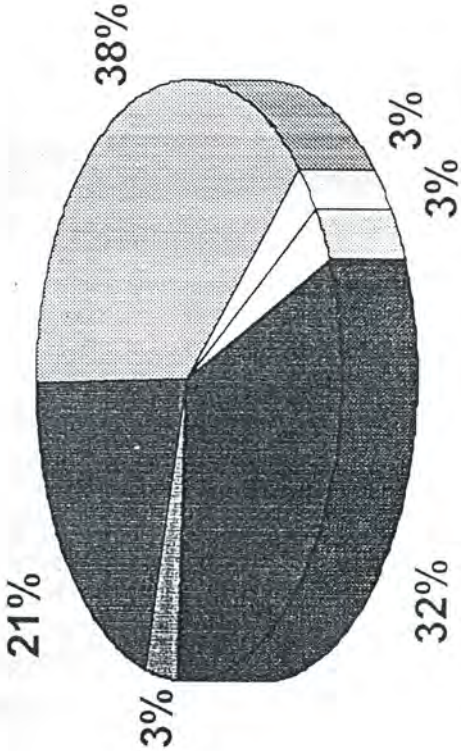
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CONSUMPTION BY TYPE OF FUEL



ENERGY CONSUMPTION BY SECTOR (EXCLUDING THERMAL POWER
GENERATION)



VEHICLE POPULATION

1980	0.682 Million	
1985	1.288 Million	
1990	1.990 Million	
1995	2.876 Million	
1998	3.200	
RISE SINCE 1980		300 %

PRESENT ANNUAL AVERAGE GROWTH: 11.9%

ISLAMABAD	21.76%
BALUCHISTAN	11.7%
NWFP	10.3%
PUNJAB	10.2%
SINDH	8.08%

GASOLINE QUALITY

COUNTRY	GRADE	OCTANE#	LEAD g/l
Pakistan	HOBC	97	0.84
	Super (MTBE)	87	0. 63 (0.36)
	Regular	80	0.42
India	Premium	93	0.42
	Regular	87	0. 42
	ULG	95	-1996
Iran	Premium	95	0.19
	Regular	87	0.19
Turkey	Premium	95	0.40
	Regular	91	0.15
	ULG	95	-
UAE	Premium	97	-
	Regular	90	0.40
	ULG	97	0.40
Bangladesh	Premium	96	0.70
	Regular	80	0.42
Afghanistan	Regular	83	0.56
Philippines	Premium	93	0.15
	Regular	81	0.15
China	Premium	90	0.22
	Regular	80-93	0.10
	ULG Regular	91	-

VEHICLE POPULATION

1980	0.682 Million	
1985	1.288 Million	
1990	1.990 Million	
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ISLAMABAD	21.76%
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PUNJAB	10.2%
SINDH	8.08%

DIESEL QUALITY

COUNTRY	CETANE NUMBER (MIN)	SULPHUR % WT. (MAX)
PAKISTAN	47	1.00
INDIA	48	0.50 *
INDONESIA	55	0.50
EUROPE	ABOVE 50	0.20 → 0.05 (1996)
USA	47	0.05
CHINA	50	0.20
TAIWAN	52	0.30 *
HONG KONG	ABOVE 55	0.50
THAILAND	47	0.50 → 0.25 (1996) *
JAPAN	50	0.20 *
AUSTRALIA	52	0.30

* By 1998 the Sulphur levels are going to be as low as 0.05 % wt.

AIR QUALITY AIRPORT (OCT-NOV 1996) 24-HOURS AVERAGE

SITE/AREA	O3	SO2	CO	NO	NOX	METH	NMTN	PM10	TSP	W.SPD
	ppb	ppb	ppm	ppb	ppb	ppm	ppm	ug/m3	ug/m3	m/s

ROADSIDE	25.6	3.0	2.1	7.6	28.6	3.3	0.3	630	1030	0.6
RESIDENTIAL	20.2	2.3	1.8	6.5	20.2	0.6	0.1	510	870	0.2
INDUSTRIAL	20.2	3.3	2.0	6.1	23.7	2.9	0.3	545	900	0.4
WINDY HILLS	10.6	0.26	0.04	1.46	8.4	0.46	0.0	60	110	0.7

WHO	47-56	35-52	9	73
-----	-------	-------	---	----

ESTIMATED POPULATION: 2.7 MILLION
 ANNUAL MEAN PRECIPITATION: 186 MM
 TEMPERATURE RANGE: 4.5-43 C
 MOTOR VEHICLES: 150,000

ANNUAL MEAN WIND:
 SPD: 2.4 KT
 DIR: S

AIR QUALITY

KARACHI (1994-95)

24-HOURS AVERAGE

O3	SO2	CO	NO	NOX	METH	NMTN	PM10	TSP	W-SPD
ppb	ppb	ppm	ppb	ppb	ppm	ppm	ug/m3	ug/m3	m/s

MAXIMUM	20.21	5.62	0.67	0.88	14.49	6.86	168.23	435	
MINIMUM	1.01	0.54	0.06	0.97	3.22	2.50	11.01	1.59	
55th PERCENTILE	10.40	1.40	0.17	2.10	8.30	1.50	140.75	3.93	

WHO	47-56	35-52	9	73	-	-	-	-	-
-----	-------	-------	---	----	---	---	---	---	---

ESTIMATED POPULATION: 10 MILLION
 ANNUAL MEAN PRECIPITATION: 167 MM
 TEMPERATURE RANGE: 14-33 C
 MOTOR VEHICLES: 700,000

ANNUAL MEAN WIND:
 SPD: 5.8 KJ
 DIR: 261W

MAJOR AIR POLLUTION SOURCES

- VEHICLES
- INDUSTRY
- BURNING OF SOLID WASTE
- NATURAL DUST

TONNES/YEAR

SOURCE	PM	SO ₂	CO	HFC	NO ₂	ALDEHYDES
VEHICLES	2,014	1,377	123,054	29,536	14,565	209
INDUSTRY	4,406	358	1,010	162	-	-
BURNING OF SOLIDS WASTE	1,119	302	1,569	3,424	-	-

BLOOD LEAD LEVELS

UNIT: U_g/dl

SAMPLE POPULATION	KARACHI	ISLAMABAD	PESHAWAR
-------------------	---------	-----------	----------

TRAFFIC CONSE.	47.7	27.7	-
CHILDERN	36.9	2.3	19.0
ADULTS	33.3	-	-

ACCEPTABLE LEVELS: 15 U_g/dl

APPROACH FOR CONDUCTING BASELINE STUDIES AND NATIONAL ACTION PLAN

Options Available For Study:

1. EPA conduct study itself
2. EPA engage consultants

Selected Option: # 2

Reasons For Selecting Option # 2:

- Infrastructure weakness
- Inadequate and untrained staff in the field of air monitoring
- Lack of resources and logistical support
- Lack of expertise for data analysis
- Lack of quality control checking system

CRITICAL EVALUATION OF AVAILABLE DATA BY EPA

Purpose of the evaluation would be to assess the relevancy of data with the project objectives

Data collected by the consultant would be critically evaluated by Pak-EPA bearing in mind the following factors:

- Documentation of sampling and analysis techniques in terms of:
 - Detection limits
 - Precision and accuracy
 - Specificity
 - Analysis speed
- Sampling strategy in terms of ;
 - Reference points
 - Spatial and temporal resolution
- Documentation of atmospheric conditions

ACQUISITION OF DATA

- Acquisition of air monitoring data is not particularly straightforward because of the large number of sources of such data and wide variety of program objectives
- Although a few data compilations are available, no single comprehensive source of monitoring data exists
- Consequently the best approach towards obtaining relevant data is to contact several sources (local, regional and national)
- Following would be the primary sources of information
 1. Federal EPA
 2. Provincial EPA's
 3. Contractors and universities performing work through contracts and grants with EPA's and related agencies
 4. Research institutes
 5. Variety of other government, semi government, non-government and related research organizations

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- Sampling strategy in terms of ;
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 - Spatial and temporal resolution
- Documentation of atmospheric conditions

END RESULTS OF BASELINE STUDIES

- Air emission inventory which would provide data on location, type of emission sources and the magnitude, frequency, duration and relative contribution of emissions from the sources
- Deficiencies prevalent in the air pollution monitoring activities and current infrastructure
- Database on Institutions, experts, equipment and research studies in the field of air pollution
- Influence of emission sources in the region

ACTIVITIES AND PROPOSED TIME FRAME

S.No	ACTIVITY	TIME FRAME
1	Finalization of budget	Last week of February
2	Signing of agreement between Pak-EPA and UNEP/EAP-AP	Third week of March
3	Preparation of TORs for consultants (based on guidelines provided by UNEP)	Third week of March
4	Invitation of proposals from consultants	Last week of March
5	Award of contract to consultants	Second week of April
6	Baseline studies for air pollution in Pakistan	Third week of June
7	National Action Plan on air pollution for Pakistan	Last week of August
8	Database on air pollution literature	Third week of June
9	Database on institutions and experts	Second week of March
10	Database on air pollution	Last week of August
11	Presentation at final workshop	November, 1999

END RESULTS OF NATIONAL ACTION PLAN

- Action procedures which would provide a series of planned control steps designed to bring out an immediate reduction of pollutant emissions
- National Action Plan would set forth requirements for prevention , abatement and control of a given type of air pollution and would establish a time frame for attaining compliance with those requirements
- Actions stipulated in the action plan would be the product of a comprehensive assessment of the nature and extent of the pollution in the air quality region involved
- Nation action Plan would provide information on the available control technologies, costs and effectiveness of various control devices to evaluate different alternative emission control tactics to meet NEQS in the most cost effective way
- Air quality dispersion models which can simulate the air quality based on emission source data, meteorological and topographical conditions
- Establishment of ambient air quality standards

SRI LANKA

NATIONAL ARRANGEMENTS TO CARRY OUT THE BASELINE STUDIES & NATIONAL ACTION PLAN ON MALE DECLARATION SRI LANKA

Air pollution is an increasing problem in Sri Lanka. Following issues have already been identified as the major causes for the air pollution in Sri Lanka.

- Transport Sector being the major air polluting source
- Power sector pollution at present is very low, but has the highest growth rate in view of the shift to thermal power generation in the near future.
- There has been a shift to diesel vehicles causing excessive SO₂ in urban areas.

Following steps have already been taken to mitigate the air pollution problems arising from the above issues.

- vehicular emission standards have already been finalized and will be gazetted soon.
- EIA systems in place which ensure that new projects will not cause ambient air quality to deteriorate.
- Ambient air quality standards have been gazetted since 1994, and emission standards for stationary sources are in the drafting stage.
- Use of LPG for vehicles will be encouraged under the amendments to the Motor Traffic Act.

Long Term Plans

Clean Air 2000 Action (CA2000-AP) which is a comprehensive action plan for the control of air pollution came into effect in 1992. The objective of the CA2000-AP was to achieve percentage reduction of the following pollutants within a period of eight years.

Particulate	40%
Carbon Monoxide	40%
Oxides of Nitrogen	30%
Lead	30%
Oxides of Sulphur	75%
Hydrocarbons	20%

However, it is not possible to reach the target due to many reasons. Out of 50 issues that have been identified for action under the CA2000-AP to achieve the above percent reduction, around 5-10 activities have been completed. One of the reasons for the delay in completing the CA2000-AP activities has been the lack of funds. Having recognized the reasons for the delay in the completion of CA2000-AP activities, 15-20 activities have been prioritized by the CA2000-AP implementation committee. The reduction of vehicular emissions, creation of awareness among vehicle owners/drivers and the introduction of cleaner fuel are the main activities among them to be implemented during the next few years. Cabinet decisions have also been made on the following issues.

- Import cars that can utilize only unleaded gasoline by the year 2000.
- Change the production process at the Ceylon Petroleum Corporation (CPC) to enable the production of unleaded gasoline by the year 2005.
- Completely phase out the production and sale of Leaded gasoline by the year 2007; and
- adjust the price of unleaded gasoline in order to encourage its use.

Having identified the importance of a clear national policy on air quality management by the CA2000-AP implementation committee, a national policy on air quality management is being prepared by the CA 2000-AP implementation committee which is expected to get the approval of the Cabinet of Ministers soon. The priority actions under this policy are as follows;

- Fuel reformulation and fleet mix
- Vehicle inspection and maintenance
- Emission inventory and Monitoring
- Institutional framework and Regulatory compliance
- Transport Planning and Traffic Management &
- Public Awareness

Following studies have already been completed under the Country Studies Programme (CSP) funded by the USEPA.

- Preparation of the national inventory of greenhouse gas emissions and sinks.
- measurement of emission factors for emission of gases during biomass combustion.
- evaluation of mitigation options in agriculture sector (emissions from rice fields) and in the energy sector.

Monitoring

Three state of the art ambient air quality monitoring stations have been set-up under the Colombo Urban Transport Project (CUTP) funded by the World Bank in December, 1996. One of the monitoring station is a mobile station. One of the fixed stations is located near the main railway station in the city of Colombo to monitor the traffic oriented air pollution. The other fixed station is located in a more residential locality in the Colombo city where traffic movements are much less. The monitoring stations have the capability to monitor the air pollutants such as CO, SO₂, NO_x, ground level O₃ and PM₁₀ together with full meteorological parameters on a continuous basis. The mobile station is used to monitor the air quality at selected locations islandwide. A programme to monitor the ambient air quality in major towns has been set-up with the use of the mobile station. The monitored data for the last two years indicates that the ambient air quality in the Colombo city is still within the National Ambient Air Quality Standards except for Ozone. Rs. 3.5 Million is being allocated annually by the Central Environmental Authority for the operation and maintenance of three stations.

Air Pollution Database

Arrangements have already been made in order to prepare the air pollution database in collaboration with the relevant institutions and Ministries under the Male declaration. It was also identified that there is a lack of data during the 1980's, specially for the agricultural sector. It is planned to hire a consultant by the implementing agency (i.e. Central Environmental Authority) for the systematic collection of data for the preparation of the air pollution database.

National Action Plan

It is intended to prepare the National action plan on the Male declaration incorporating the relevant activities that are to be implemented under the Clean Air 2000-action plan for the purpose of filling identified gaps from the baseline studies for the development of the policy process in South Asia. In this connection, sharing of information and lessons learnt among the countries in the region is an urgent necessity.

C.K. AMARATUNGA
ASST. DIRECTOR
CENTRAL ENVIRONMENTAL AUTHORITY
SRI LANKA

22nd February, 1999

References

Clean Air 2000 - Action Plan - Metropolitan Environment Improvement Project, Colombo - 1992

A proposal for preparing a National Action Plan on Climate Change - Environment Division, Ministry of Transport, Environment & Women's Affairs - 1996.

MEIP Programmatic review (1990-1995) - Environmental Foundation Ltd. - 1998

Guidelines for the preparation of baseline studies - UNEP, SIDA & EEI - 1998

A case study of urban air quality management early stages - (Sri Lanka) - Ramani Ellepola, (Actg. DDG/CEA) - 1998

Transport Statics in Sri Lanka - 1996 - Transport Studies & Planning Centre.

NEPAL

Nepalese views on Implementation of Male Declaration (Inception Workshop, Kathmandu 22-23 February 1999)

Nepal: XX

General Environmental Problems: XX

Air Quality:

Getting worse in both rural and urban areas

Rural areas: combustion of biomass, fossil fuel, poor
Ventilation

Urban areas: bad fuel, old vehicles, narrow streets, poor
maintenance, and inappropriate location
of industries

Kathmandu is the worst:

over 50 % of all the vehicles; and 80 % of
gasoline and 25 % of diesel; industries
also contribute to ambient load of air
pollutants.

GHGs (CO₂, methane, nitrous oxide,):

Combustion of fossil fuel and
deforestation

Environmental policies and Legislation

- The constitution of Nepal 1990: Environmental consideration in Article 26(4) as “Directive Principle of the State”
- The Fifth Plan (1975-80) and the subsequent plans: integration of environment in development planning.
- National Conservation Strategy: 1987
- EIA: Emphasized during 1990s
- NEPAP: 1993
- Various Master Plans: 1989 and (1992-97)
- EIA Guidelines: National in 1993, and forestry and industry sectors in 1995
- Forestry, National Park, Soil and Water Conservation, Electricity, Industrial related Acts and Regulations
- Environment Protection Act 1996 and Environment Protection Rules 1997

EIA system

Pollution control and prevention

Conservation of heritage and environmental conservation sites

Environmental trust fund

Incentives to minimize pollution

Compensation for environmental damages

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General Environmental Problems: XX

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GHGs (CO₂, methane, nitrous oxide,):

Combustion of fossil fuel and
deforestation

Environmental Institutions

- National Committee on Man and Biosphere: 1974
- National Resources Conservation Commission: 1980
- Environmental Impact Study Project: 1982
- Environment and resource Conservation Division at NPC: 1987
- Ministry of Forests renamed as Forests and Environment: 1992
- Environment Protection Council: 1992
- Sectoral Ministries: Forestry, Agriculture, Industry, Water Resources, Transport, Local Development,
.....
- Several NGOs, CBOs, Universities and other institutions
- Ministry of Population and Environment (MOPE): 1995
Responsibilities include:
 - formulate and implement policies, plans and programs*
 - prepare Acts, rules and guidelines*
 - conduct surveys, studies, and research*
 - disseminate information*
 - act as a focal point for environmental affairs*
 -*

Progress:

Metropolitan Environment Improvement Program (MEIP) launched jointly by the World Bank and UNDP assisted local institutions to develop action plans having an integral part of Air Quality Management System (AQMS).

An exercise was started to enforce traffic pollution control by prescribing a standard of 65 HSU (Hartidge Smoke Unit) for diesel, and 3% CO (by volume) for petrol operating vehicle. At certain specified road corridors, regulated obedience of this prescription has been observed.

Substantial addition of battery-charged and LPG tempos with provisions of battery charging stations and some economic incentives.

With ADB support works are underway in air pollution standards and monitoring.

MOPE has made a few contractual arrangements as the following:

1. Formulation of air quality standard for urban centers of Kathmandu, Pokhara and Biratnagar.
2. Drafting of guidelines to control pollution.
3. Preparation of Operational Plan to limit traffic pollution in Kathmandu.

Lots of other works studies by many individuals and institutions difficult name them; they are all scattered.

Problems:

Very little monitoring and data (transboundary,):
*institutional infrastructure, human resources,
overlapping mandates, multiple stakeholders, multiple
ministries, multi-disciplinary approach, and too simple
and too vague.*

Solution:

*Joint and coordinated approach.
MOPE plays role; but it needs resources.*

Male Declaration calls for the national arrangement for pollution control with the measures like baseline studies, implementation process, national action plan, etc.

What can we do?

1. New programs/projects to monitor pollution and its transboundary effects
2. Training and equipment support
3. Strengthening of networking
4. Coordination between institutions by MOPE taking a lead role: *modus operandi*

MOPE – UNEP/EAP-AP – Sectoral Ministries
and other institutions,

i.e. GOs-NGOs-International organizations-
Donors-Research Organizations,

Finally:

- Male declaration can be a success.
- MOU: will discuss in-house and with UNEP and finalize it soon.
- Baseline studies and Action Plan: Can be completed with the consolidated and coordinated approach. The timing, however, may vary little bit depending upon the MOU, and the resources availability.

**ATTACHMENT 5: DEVELOPMENT OF INTEGRATED
ASSESSMENT MODEL FOR SOUTH ASIA**

CONCEPT NOTE –

Integrated Assessment Modelling to Aid the Development of Policies in South Asia for the Prevention and Control of Sulphur and Nitrogen Emissions

A. Summary

Proposed activity: Development of an integrated assessment model to assess air pollution impacts in South Asia

Purpose: To allow South Asian countries to develop in-house capacity in integrated assessment modelling to enable the development of protocols

Duration: 18 Months

Geographical Area: South Asia

Collaborators: AIT/EAP-AP; SEI; SMHI; NIAs

B. Background and Rational

While rapid economic development has created dynamism and wealth, Asia has at the same time become more polluted, less ecologically diverse and more environmentally vulnerable. Regional air pollution, especially from the emissions of sulphur and nitrogen compounds, is becoming an increasingly important aspect in Asia. The impacts of these emissions are felt locally, sub-nationally, nationally and regionally.

Scientific information and public concern over these issues are developing in Asia and being linked with the policy process. Sida are funding a Programme on Atmospheric Environment Issues in Developing Countries which includes projects on Regional Air Pollution in Developing Countries. The projects are developing information and methodology transfer to inform the policy process. SEI together with UNEP/EAP-AP are facilitating the development of action plans agreements and policies in Asian countries that prevent and control sulphur and nitrogen emissions. The policy dialogue organised by SEI and UNEP/EAP-AP formed the basis for the 'Malé Declaration on Control and Prevention of Air Pollution and its Likely Transboundary Effects for South Asia' which represents the first inter-governmental environmental agreement of its kind in South Asia. Baseline studies and action plans are currently being developed as a follow-up to this agreement. There is however a gap in the current project set-up which, if filled, would encourage the further development of policies in this region. This is the development in Asia of a model that is able to integrate the different aspects of regional air pollution and act as a tool to guide policies. At a meeting of the National Implementing Agencies (NIAs) in Kathmandu in February 1999, the delegates agreed the following:

‘the meeting decided to request SACEP/SEI/UNEP to initiate early participatory development and dissemination of tools such as tailored Integrated Assessment Models for the South Asia region to facilitate early dissemination of the Malé Declaration.’

C. Objectives

The main aim of the proposed activity is to provide an integrated assessment tool to catalyse the development of protocols between countries in South Asia for the control and prevention of sulphur and nitrogen emissions.

D. Activities for model development

In recent years, integrated assessment models developed in Europe and North America have been used to inform international negotiations on emission reductions. These models have provided negotiators with an integrated regional view of the air pollution problems and their potential solutions. Such models have not been produced in Asia for South Asia. A great deal of information is required to understand policy relevant questions concerning air pollution. Integrated assessment models allow the information to be combined to investigate different strategies for the reduction of transboundary air pollution and have proved very useful tools in the European negotiations.

In order for an integrated assessment model to be used effectively for the analysis of emission control or prevention, it is essential that countries in the region have the necessary scientific and technical capabilities in the region to build-up, update and modify the model as required. Models not developed and produced in Asia suffer from problems of acceptability and ownership. The model needs to be seen as belonging to the region for which it is developed and the process and methods used should be transparent and participatory. Such a model will then be able to be used in policy development.

The following steps are suggested to build and develop an Asian integrated assessment model, initially for the South Asian region to aid the follow-up to the Malé Declaration:

- (i) Assess the needs of countries for an integrated assessment model, as well as worries about such models and experience from using similar models;
- (ii) Determine the components required as input to the model;
- (iii) Develop the model (design and programming) to integrate the necessary components in collaboration with modelling experts and institutes;
- (iv) Create model outputs and examine model results in consultation with country experts;
- (v) make any necessary modifications to the model;
- (vi) prepare user and reference manuals for the model.

SEI has developed the Coordinated Abatement Strategy Model (CASM) which was used in the negotiations for the UN ECE Convention on Long-Range Transboundary Air Pollution (LRTAP) Second Sulphur Protocol. This experience can be used to

inform and aid the development of an Asian model. Programming will be carried out at AIT.

From the experience gained through CASM, it is known that the main inputs to the model could include:

- i) an emissions inventory;
- ii) an ability to derive consistent emission scenarios;
- iii) transfer coefficients from an atmospheric transfer model;
- iv) modelled or measured base cation deposition from soil dust;
- v) critical deposition or concentration values that protect the environment;
- vi) information regarding the efficiency and cost of abatement measures.

(refer to Figure 1 for an overview of the potential structure of such an integrated model).

Many of the main inputs that are likely to be needed for the model already form part of the existing Sida-funded 1998/99 workplan. These are:

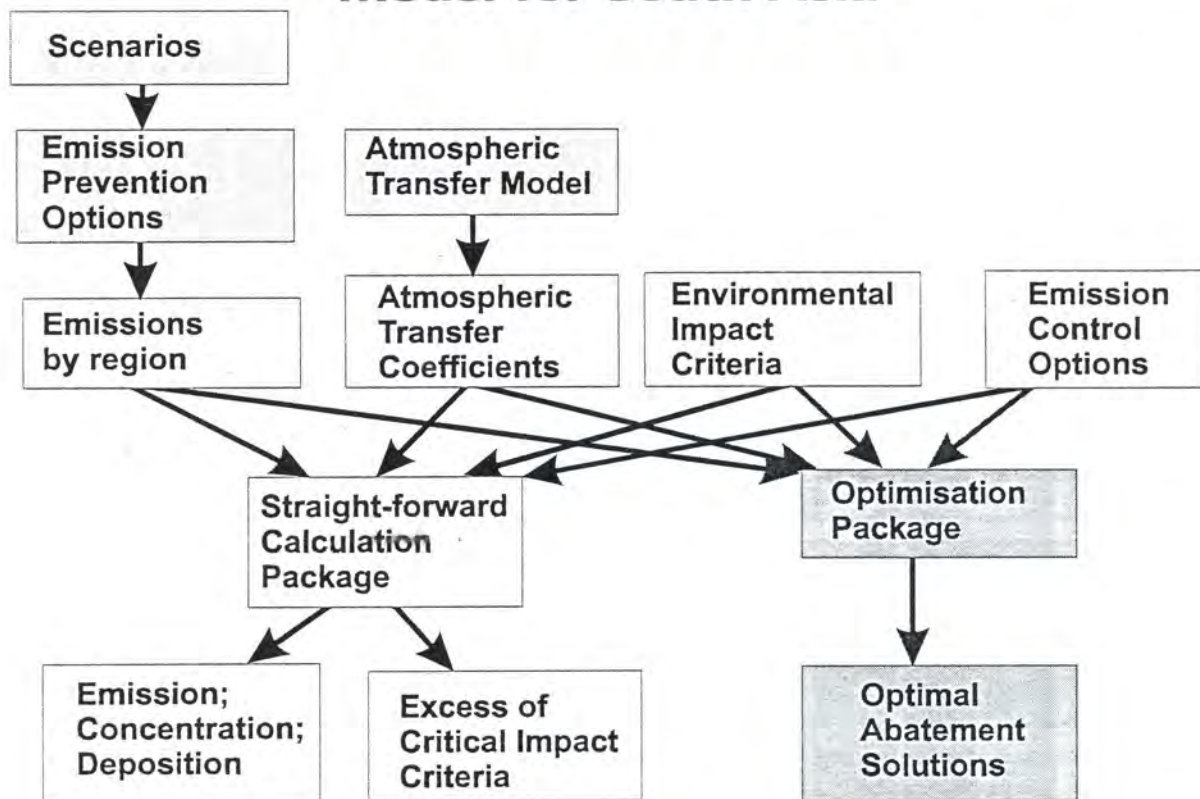
- i) emissions (currently available from GEIA and further national information will be produced by the baseline studies and action plans in South Asia; scenario work is also being developed in Activity 2.6 of the Programme);
- ii) transfer coefficients to allow dispersion of emissions in the model (being developed by SMHI in Activity 2.3 using the MATCH model);
- iii) development of information on impacts of air pollution to illustrate risks of pollutant damage.

The final component is the determination of abatement measures using end-of-pipe technologies. This would include efficiency and costs of potential methods. This aspect is not included in the current workplan. The most appropriate control options for the Asian region need to be determined through consultation with IAMs. After this the appropriate technologies and cost functions may be applied in the model.

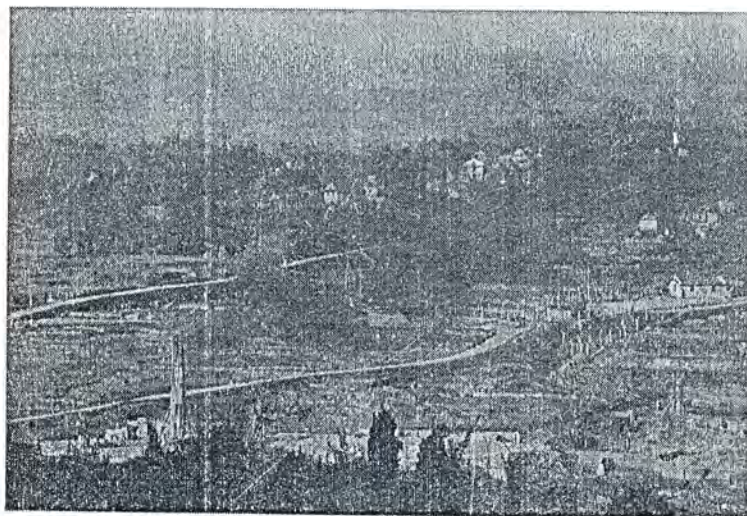
Workplan

The work would commence upon funding of the proposal. Initial discussions have begun and will continue.

Development of an Integrated Assessment Model for South Asia



The meeting held in Kathmandu on 22-23 February, 1999 was the inception workshop to initiate the implementation of the Malé Declaration. Delegates from ministries of Environment and National Implementing Agencies from South Asian Countries discussed the baseline studies and Malé Declaration action plans to be developed in 1999 with delegates from UNEP/EAP-AP, SEI and SACEP. ICIMOD were the local hosts and Sida provided the funding as part of the Programme on Atmospheric Environment Issues in Developing Countries.



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