

# Malé Declaration

on Control and Prevention of Air Pollution  
and Its Likely Transboundary Effects for South Asia



NEPAL

An overview of progress  
within the last decade...



# NEPAL

## Status of Implementation 2008



### Background

Air pollution has become the most visible component of environmental degradation in Nepal, especially in the urban centers such as Kathmandu Valley, Birgunj, and Biratnagar. Kathmandu Valley is particularly vulnerable to air pollution due to its bowl-like topography, exploding population inflow, rapid urbanisation, valley-centric industrialisation and significant increase of vehicular transport in its narrow streets.

Indoor air pollution in rural households is a major concern as households consume traditional sources of energy such as firewood, animal dung and litter. Moreover, households are poorly ventilated, aggravating indoor air pollution.

Prior to the creation of then Ministry of Population and Environment in 1996, no agency was assigned to monitor the quality of air in Nepal. Monitoring at that time was conducted on ad hoc or project basis in Kathmandu as well as in other neighboring municipalities.

In 2002, then Ministry of Population and Environment, HMG/MOPE (now the Ministry of Environment Science and Technology (GoN/MOEST)) and DANIDA Environmental Sector Program Support (ESPS) implemented a long-term air quality monitoring programme in Kathmandu Valley. Six monitoring stations were placed strategically in the valley.



*Kathmandu Valley air quality Monitoring Network System*

Nepal is a landlocked country sandwiched between two giant industrialised countries, China and India. The transboundary movement of air pollutants which has regional as well as global implications may affect the country. Acid deposition, global climate change, and stratospheric ozone depletion are among the emerging issues that transcend political boundaries. To address these issues, the two initiatives that have been initiated are:

- Malé Declaration on Control and Prevention of Air Pollution and Its Likely Transboundary Effect for South Asia
- Project Atmospheric Brown Cloud

### Major Sources of Air Pollution and Impacts

**Transportation:** Nepal's transport sector is dominated by road transportation due to the country's land-locked geographical position. Most of the land-based urban air pollution in Nepal, particularly in Kathmandu Valley, is caused by vehicular emissions due to poor traffic management, poor vehicle maintenance, and the use of adulterated, substandard fuel. Resuspended dust from roads, due to poor maintenance of roads magnifies the air pollution problem.



*Polluting air by poor vehicle maintenance*

**Industry:** Though the manufacturing sector is relatively small in Nepal, it has caused significant pollution. The brick industries located south of the Valley center are assumed to be the major air polluting industries, however with the banning of moving bull trench kilns, the situation has visibly improved.

**Biomass burning:** The use of biomass fuels such as wood, dung, agricultural waste, and charcoal (for cooking) and heating fuel is the principle cause of indoor air pollution in the rural areas of Nepal.

**Outdoor fast-food stalls:** Many temporary eating places are coming up, operating specially during evening. Kerosene and charcoal are the major source of fuel to cook. As these types of joints are multiplying in numbers, it may aggravate localized air pollution.

### Impacts of Air Pollution

**Impact on Health:** Though there has been no real epidemiological study conducted in Nepal to assess the impact of air pollution on public health. A number of dose-response relationships study, especially in the Kathmandu valley area, suggest adverse health outcomes from air pollution. Records from three major hospitals in Kathmandu indicated that the number of lung disease patients with Chronic Obstructive Pulmonary Disease (COPD) patients admitted to hospital, as well as the percentage of COPD patients as a percentage of total medical patients has increased significantly in the last 10 years.

**Impact on Climate:** The atmospheric data obtained from Kathmandu airport from 1970 onwards show that there has been a substantial decrease in visibility in the valley since 1980. The number of days with good visibility (>8,000m) around noon has been decreased in the winter months from more than 25 days/month in 1970 to five days/month in 1992.

**Impact on Tourism:** As most tourists come to Nepal to enjoy the mountains and beautiful landscapes, the reduced visibility might affect tourism. A recent survey found that 94% of the respondents felt that tourists shorten their stay in Kathmandu because of environmental problems such as air pollution.

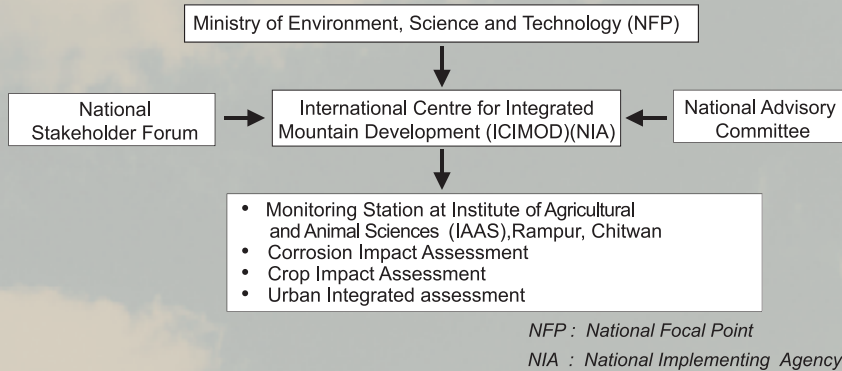
**Impact on Vegetation:** Crop yield has been decreasing every year particularly near the industries and along the roads, (due to decrease in photosynthesis when dust blocks the stomata of plant leaves).





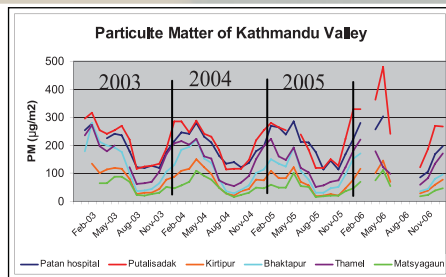
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### Institutional Arrangement : Nepal



### Achievements

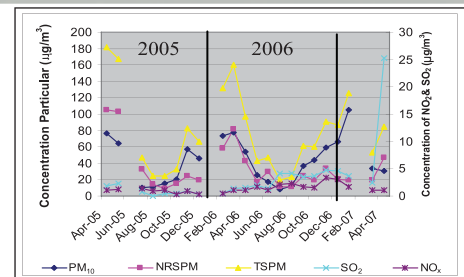
- Banned two stroke three wheelers (Vikram tempo)
- Banned two stroke two wheelers, for new registrations
- Introduced National Ambient Air Quality Standards
- Established permanent monitoring station
- Achieved closure of Himel Cement Factory
- Shifted from Bull Trench Brick Kilns to Vertical Shaft Brick Kilns



Average monthly  $PM_{10}$  levels at different places in Kathmandu



Average  $PM_{10}$  value in Kathmandu during the most polluted period (March to May)



Concentration of particulates,  $NO_2$  and  $SO_2$  at IAAS, Rampur

### Status of Air Pollution

Pollution	Status of problem
Particulate matter	Major problem. 24hr average measured value of all six stations is $115 \mu\text{g}/\text{m}^3$ which is less than national ambient level (120). Generally reduced at residential and urban background since 2003 and this trend is continued in 2006
$SO_2$	Moderate (only monitored at IAAS through the Malé Program)
$NO_2$	Moderate. Average data from 6 stations is $29 \mu\text{g}/\text{m}^3$ for 2003, which is less than the national ambient standard (monitoring is done at IAAS by Malé Program)
$O_3$	Moderate (only monitored through the Malé Program)
CO	-
HC	-
Pb	Between March to December 2006, Pb content in $PM_{10}$ was found below the national ambient level of $0.5 \mu\text{g}/\text{m}^3$ at all times (Campaign monitoring only). All fuel is unleaded since 1999
Others	Benzene-very high at road sides ( $77 \mu\text{g}/\text{m}^3$ ) ( $HNO_3$ monitoring only through the Malé Program)

### Summary of Baseline Information

	2000	2008
Nature of problem	<ul style="list-style-type: none"> <li>• Vehicular</li> <li>• Resuspended dust from road</li> <li>• Industry (Cement Factory)</li> <li>• Brick Kiln</li> </ul>	<ul style="list-style-type: none"> <li>• Vehicular</li> <li>• Resuspended dust from road</li> <li>• Industry</li> </ul>
Status of monitoring	Sporadic monitoring, One monitoring station in the Department of Hydrology and Meteorology	Six permanent monitoring stations in Kathmandu Valley, Transboundary monitoring station in IAAS (Rampur), Godavari and ICIMOD headquarters
Pollutants monitored	SPM, $PM_{10}$ , $SO_2$ , $NO_2$ , Pb	$PM_{10}$ , $PM_{2.5}$ , $SO_2$ , $NO_2$ , Aerosols, radiation, pH, EC
Number of monitoring stations	According to the project need, mostly in Kathmandu Valley-sporadic monitoring	$PM_{10}$ monitoring at 6 stations in Kathmandu Valley, $PM_{10}$ , $SO_2$ , $NO_2$ , cation and anion in rain water at IAAS Aerosols in Godavari Radiation in ICIMOD HQ
Capacity to study air pollution	Minimal	Increased
AQ Standards	NA	Nepal Government has established an ambient air quality standard in 2003



Monitoring station

### The Malé Declaration in Nepal

In Nepal, the Focal Point is the Ministry of Environment Science and Technology (MOEST) and the National Implementing Agency is the International Centre for Integrated Mountain Development (ICIMOD).

In phase I, baseline studies were conducted which identified the gaps in the existing monitoring systems. An action plan was also prepared. Phase I outputs were reviewed and adopted at the 2<sup>nd</sup> Network Meeting held in March 2000.

In phase II, a transboundary air pollution monitoring station was established in the Institute of Agriculture and Animal Sciences (IAAS) Rampur, Chitwan; which is near the Indian border. The laboratory facilities at IAAS were also upgraded. Measurement of  $PM_{10}$ , TSP,  $NO_2$  and  $SO_2$  was initiated. Capacity building of the IAAS staff was done to analyse samples. In phase III, monitoring activities continued with addition of rainwater monitoring and analysis. Rain water analysis has been carried out on an event basis. An Atomic Absorption Spectrophotometer (AAS) was also provided to IAAS, to conduct the analysis. Apart from this, the following activities have been initiated:

- National emission inventory preparation
- Corrosion impact assessments
- Rapid Urban assessment of Kathmandu Valley
- Crop impact assessments



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### Response

#### Legal

- 1991 Ban import of two-stroke three-wheelers
- 1997 Environment Protection Act and Regulations
- 1999 Import of unleaded fuel
- 2003 Introduction of National Ambient Air Quality Standards
- 2004 Chimney Bull Trench Brick Kilns banned from Kathmandu; two-stroke three-wheelers banned in Kathmandu

#### Financial

- 1996 Financial incentives for electric vehicles
- 1998 Alternative energy subsidies
  - Solar photovoltaic (50 % subsidy)
  - PV pumping system (75% subsidy)
  - Solar dryer (50 % subsidy)
  - Bio-Gas plant (variable subsidy)
- 1999 Removal of over 600 diesel three-wheelers from Kathmandu
- 2007 Replace 15-year-old vehicles (33% tax subsidy)

#### Technology

- 1995 Introduction of in-use vehicle emission standards and emission testing of vehicles
- 2000 Introduction of EURO I equivalent norms for new vehicles
- 2000 Electric and LPG vehicles introduced
- 2004 Introduction of cleaner brick kiln technology (vertical shaft brick kiln)



Participants in Malé Meeting



Introduction of electric vehicles to replace three-wheeler diesel vehicle



Vertical Shaft Brick Kiln

### Recommendations

- Monitoring stations should be increased nationwide to have a wide spatial database for various air pollution studies, planning and mitigation measures.
- Road condition should be improved in terms of black topping, walking and cycling lanes.
- Mass transport should be encouraged.
- Integrated action plans and programmes need to be made to improve the air quality such as: proper road planning for cities, planned settlements, promotion of cleaner fuels and cleaner production industries, proper standards for large-scale industries, strict rules for phasing-out old vehicles.
- Mass awareness programmes about air quality, air pollution impact, effect and mitigation measures among the different levels of people including policy makers, other government agencies and the general public.

### Coordinating Agencies



UNEP Regional Resource Centre for Asia and the Pacific (UNEP RRC.AP) Bangkok, Thailand



South Asia Cooperative Environment Programme (SACEP) Colombo, Sri Lanka



Stockholm Environment Institute (SEI) Stockholm, Sweden



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Nepal NFP : Ministry of Environment Science and

NIA : International Centre for Integrated Mountain Development