



Air Pollution Reduction and Control in South Asia

Mahmood A. Khwaja*, Faiqa Umer, Nazima Shaheen,
Anusha Sherazi and Faisal Haq Shaheen

Working paper Series 121

Sustainable Development Policy Institute (SDPI)

Islamabad.

May 2012

All rights reserved. No part of this Policy Paper may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording or information storage and retrieval system, without prior written permission of the publisher.

A publication of the Sustainable Development Policy Institute (SDPI).

The opinions expressed in the paper are solely those of the author, and publishing them does not in any way constitute an endorsement of the opinion by the SDPI.

Sustainable Development Policy Institute is an independent, non-profit research institute on sustainable development.

© 2011 by the Sustainable Development Policy Institute

Edited by: Ayesha Salman

First Edition: May 2012

Dedicated to (Late) Abdul Nasir Khan

This paper is dedicated to my dear friend and colleague (late) Abdul Nasir Khan ... who formatted this paper to the best of his skill, as always with time constraints and for his most willing & most valuable support, in many ways, including with so many of my publications at SDPI over the years. This paper was the last one in his life time With prayers for him & his loved ones... MAK

Mailing Address: PO Box 2342, Islamabad, Pakistan.

Telephone + (92-51) 2278134, 2278136, 2277146, 2270674-76

Fax + (92-51) 2278135, URL: www.sdpi.org

TABLE OF CONTENTS

Section A: Overview	2
1. Air Pollution in Countries of South Asia	2
2. Key Air Pollutants of Priority Concerns in South Asia	4
2.1. Particulate Matter:.....	4
2.2. Sulfur oxides:.....	5
2.3. Nitrogen oxides:	6
3. Health and Socio-Economic Impacts of Air Pollution	6
Section B: Legal and Regulatory Frameworks for Environmental Protection and Air Pollution Control	10
4. Environmental Legal and Regulatory National Frameworks in South Asia.....	10
5. Examining the Roles of National Institutions Focused on Environment.....	12
6. Selected Regional Frameworks for Air Pollution Reduction and Control	13
6.1. ASEAN Haze Agreement.....	13
6.2. Convention on long-range trans-boundary air pollution.....	14
6.3. Malé Declaration.....	14
7. Role of South Asian Association for Regional Cooperation in Air Pollution Reduction in the Region	17
Section C: Recommendations	18
8. Recommended Policy Actions at the Regional Levels.....	18
9. Regional Action for Air pollution Control – A Legally Binding Agreement.....	21
References	23

Acronyms

ADB	Asian Development Bank
ARI	Acute Respiratory Infection
ASEAN	Association of Southeast Asian Nations
COPD	Chronic Obstructive Pulmonary Disease
CZMW	Coastal Zone Management Center
DALY	Disability Adjusted Life Years
DSH	Dhaka Shishu Hospital
ECA	Emission Control Areas
ELV	Emission Limit Value
ENT	Ear-Nose-Throat
FAO	Food and Agricultural Organization
GDP	Gross Domestic Product
GHI	Global Hunger Index
ICIMOD	International Center for Integrated Mountain Development
IFPRI	International Food Policy Research Institute
HIS	Institute of Health Sciences
INDOEX	Indian Ocean Experiment
IUCN	International Union for Conservation of Nature
Kg/he/yr	Kilogram per Hector per year
LBA	Legally Binding Agreement
LBA-SA	Legally Binding Agreement for South Asia
LBI	Legally Binding Instrument
LRTAP	Long Range Trans-Boundary Air Pollution
MD	Male Declaration
MoE	Ministry of Environment

Nox	Nitrogen Oxides
Pak-EPA	Pakistan Environmental Protection Agency
PM	Particulate Matter
RAPIDC	Regional Air Pollution in Developing Countries
SA	South Asia
SAARC	South Asian Association for Regional Cooperation
SACEP	South Asia Cooperative Program
SAEO	South Asia Environment Outlook
SDPI	Sustainable Development Policy Institute
SFC	SAARC Forestry Center
SMART	Self-Monitoring and Reporting Tool
SOX	Sulfur Oxides
SPM	Suspended Particulates Matter
Ug/m	Microgram per Meter Cube
UN	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
WHO	World Health Organization

Acknowledgment:

During his short stay at SDPI, Rafay Khan 's valuable inputs to the study described in this working paper, are acknowledged with most appreciative thanks ... **MAK..**

Air Pollution Reduction and Control in South Asia

Mahmood A. Khwaja, Faiqa Umer, Nazima Shaheen,
Anusha Sherazi and Faisal Haq Shaheen

With increasing urbanization and economic growth, air pollution is becoming an urgent concern in South Asian countries Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. The objective of this study is to look into and discuss the socioeconomic situation of South Asia, the existing situation of air pollution in the countries of the region, its resulting health impacts on the population and the responses, if any, of national governments to combat air pollution. Among others the paper makes recommendation, including a legally binding agreement for South Asia (LBA-SA), for strengthening the framework for air pollution reduction at regional and national levels in South Asia.

Section A: Overview

In order to understand the importance of reducing air pollution and its likely trans-boundary effects, it is important to first review the socioeconomic situation of the South Asian member states. South Asia with a combined population of roughly 1.6 billion people, is a low-income region and is home to half of the world's poor. Traditionally, the South Asian economies are centered on agriculture, however recently manufacturing and services have become major contributing sectors as well. The strong recovery in India and the growth in the economies of Bangladesh and Sri Lanka are the primary reasons for this economic rebound (World Bank, 2010a). India, as an emerging economy of the world is the dominant political power in the region. The state of education and health in the region leave much to be desired. With the worst score on the Global Hunger Index (GHI)¹, South Asia along with Sub-Saharan Africa suffers from the highest level of hunger (International Food Policy Research Institute, 2010).

1. Air Pollution in Countries of South Asia

Environmental degradation remains a challenge in countries of South Asia. With the projected increase in industrial activity, exponential growth in number of vehicles and population, the contribution of each South Asian country to the regional air pollution will increase over time. (World Bank, 2010) India is the biggest energy user, followed by Iran and Pakistan. With increasing urbanization and industrialization, air pollution is an increasing concern in South Asia. Sulfur dioxides, nitrogen oxides and particulate matter (PM) emissions have been rising steadily over past few decades. Owing to economic growth and increasing demand, greenhouse

¹ Global Hunger Index (GHI) is a multidimensional statistical tool used to describe the state of hunger in countries. The GHI captures three dimensions of hunger: insufficient availability of calories, shortfalls in the nutritional status of children, and child mortality (IFPRI, 2010).

gas emissions have risen in South Asia by about 3.3% annually since 1990. Coal is the main source of energy in the region, followed by natural gas (World Bank, 2010c).

Air pollution is one of the major sources of environmental degradation in Bangladesh. There are 3 main causes of air pollution in Bangladesh; these are (1) Vehicular emissions (2) Industrial emission (3) Brick kilns (Ministry of Finance - Bangladesh, 2009). In addition, due to the high density of vehicular traffic and industries in the urban areas of Bangladesh, air pollution is a growing concern for the inhabitants of urban areas. The geographic location coupled with low income and over reliance on climate sensitive sectors makes Bangladesh particularly vulnerable to natural disasters.

Bhutan is one of the few countries in the world where the environment is still protected. Two main reasons behind Bhutan's excellent record of environmental protection are (1) Recent start of the development process and (2) Constitutional protection given to environmental sustainability. The constitution of Bhutan specifically states that at least 60% of Bhutan landmass must be under forest cover at all times. Over the years the government has rigorously followed its policy of environmental sustainability and currently almost 51% of Bhutan's land mass falls into the category of protected areas and forests. Forest fires are the biggest sources of air pollution in Bhutan. Constitutional protections and government efforts have allowed Bhutan to limit air pollution to fairly low levels despite steady economic growth over the last few years.

Rapid growth and industrialization over the last few years has led to some major changes in India's environment. More and more cities are experiencing unhealthy levels of air pollution as a direct consequence of unplanned urbanization and growth in population. A number of reasons have contributed to the sharp rise in air pollution and environmental degradation in India. Some of these include (1) Coal, (2) Oil, (3) Process emissions and (4) Traditional sources of energy. Coal is India's most abundant source of energy and currently almost 60% of its commercial energy needs are fulfilled by it. Besides having a very high ash content that is responsible for particulate matter emission, coal is also a large source of sulfur dioxide emission in India because of its high sulfur content. Oil is another major source of pollution in India. Lastly, widespread use of traditional sources of energy such as fuel wood and animal dung has also been contributing to air pollution. Estimates indicate that nearly 3 in 4 rural households depend on traditional sources of energy for cooking, heating etc. (Ministry of Environment - India, 2010).

Maldives is at the forefront of efforts to limit climate change impacts. Located in the Indian Ocean, most of the islands that comprise Maldives are between 1 and 1.5 meters above the sea level. Consequently, if global warming continues at its current pace, most of Maldives will be underwater before 2050 (MDEP, 2008B).

Years of unabated population growth and lack of a stringent pollution regulation and management systems has left a deep imprint on the environment in Nepal. Air quality in both urban and rural areas is deteriorating in the country with Kathmandu in particular being at very high levels of risk. The bowl like topography of the Kathmandu valley restricts air movement, thereby accumulating high levels of dangerous pollutants (UNEP2008 D).

Air pollution is one of the most pressing concerns for environmental protection agencies in Pakistan. Despite having very low energy consumption in comparison to international standards,

air pollution in Pakistani cities is soaring (Khwaja & Khan, 2005). Not able to afford gas or electric stoves and heaters, poor people across the country use firewood to cook food and provide heat during the coldest months of winter. Biomass burning is problematic because of the high level of particulate matter produced as well as carbon monoxide and other harmful gases. The level of particulate matter (PM) in major Pakistani cities is almost 2-3.6 times higher than WHO standards (Shigeta, 2000). . Environmental challenges facing Pakistan today are the result of a rapidly growing economy, and also unplanned increases in industrialization and urbanization. Increasing economic growth over the years has resulted in overexploitation of natural resources. In addition, unplanned increases in industrialization are leading to air, water and land pollution all across the country (Ministry of Finance - Pakistan, 2009)

Rapid growth over the last few decades has had a massive impact on the environment in Sri Lanka. Years of development with little regard for the environment has resulted in the forest cover decreasing from 70% in 1900 to less than 20% currently (FAO, 1991). Similarly an increase in the GDP per capita over time has resulted in a rapid increase in the number of motor vehicles in Sri Lanka. This in turn has increased the levels of air pollution, especially in the urban areas. Some of the key sources of air pollution aside from motor vehicles include (1) Open burning of domestic and industrial refuse, (2) Combustion of commercial energy and (3) Indoor cooking using fire wood (York University, 2003).

Air pollutants can be transported across state and national boundaries covering a distance from about 100s to a few 1000s of kilometers, therefore pollutants produced by one country can have adverse impacts on the environment of neighboring countries as well. Down-wind areas of the countries are likely to be affected more than the up-wind areas. Especially for landlocked cities, trans-boundary air pollution is an issue that demands critical attention. Some key air pollutants of priority concerns to South Asian countries are described below.

2. Key Air Pollutants of Priority Concerns in South Asia

2.1. Particulate Matter:

The suspended particulate matter (SPM) is of great concern in South Asia. In most of the South Asian countries, the levels of SPM exceed the set national standards and cause severe health impacts and environmental damage. WHO guideline levels of particulate matter (SPM) exceed in the air of most of mega cities of South Asia (Asian Development Bank, 2001)

The aggravated condition of SPM in Bangladesh, Bhutan, India, Iran and Maldives is no more a myth. In Bangladesh, the commercial sources include the combustion of fuels for power generation in industrial processes and powering motor vehicle. Another important source is different construction and development works United Nations Environment Program Regional Resource Center for Asia and the Pacific (UNEP, 2008 B). 3 wheeler 2 stroke and 2-wheeler 2 stroke are important emission factors, each emitting 0.75 g/km of PM. The main natural sources of particulate matter in Bangladesh are winds blowing over dry soil, and pollen from trees and flowers. In Bhutan, the SPM are usually emitted during the combustion of biomass fuels and responsible for both indoor and outdoor air pollution. In India, the combustion of fuels in the

domestic, industrial and transport sector are the major sources of SPM. Due to dry conditions, natural dust is one of the major sources of SPM both for indoor and outdoor air pollution. In the industrial sector, the cement sector is a major source of SPM besides small scale industries like foundry, textile etc. In Maldives, the particulate matters are usually found in the form of soot and coral dust. The main sources of their emission include the land and sea transport, power generation and construction activities (MDEP.2008 B).

The situation is no more different in Nepal and Pakistan regarding SPM but slightly better in Sri Lanka. In Nepal, the major source of SPM is vehicles, especially in Katmandu valley. The average values for PM10 fall under the range of 23 to 295 $\mu\text{g}/\text{m}^3$ in the core areas with the seasonal variation: higher in dry and lower in the rainy season (ADB and ICIMOD, 2006). Other main sources of SPM in urban areas include the industrial emissions. Very high levels of SPM are emitted from cement, brick, tile and textile factories (National Planning Commission Nepal and IUCN, 1992). In Pakistan, the main sources of SPM are vehicles. Dust due to mobile sources is mainly responsible for air pollution in Sri Lanka. The annual average ambient PM10 level in Colombo over the years has remained relatively within the 72 to 82 ug/m^3 range, peaking only in 2001. These values, however, consistently exceeded WHO latest annual guidelines value of 20 ug/m^3 for PM10, suggesting a very unhealthy situation in relation to the PM pollution in Colombo (MDEP, 2008 A).

2.2. Sulfur oxides:

The sources of Sulfur oxides vary from country to country, for instance in case of Bangladesh, Bhutan, India, Iran, Maldives, Nepal and Pakistan these considerably differ from each other. In Bangladesh, the major sources of emissions of Sulfur Dioxide are vehicles, brick kilns, paper and pulp industries, oil refineries and sulfuric acid production plants. The high emission factors of trucks (1.13 g sulfur dioxide/km), followed by minibuses, diesel powered, indicate that substantial Sulfur Dioxide emissions come from these sources. The estimated emission levels of SO₂ in Bhutan have indicated that major source is households. The petroleum refineries, textiles, pulp & paper and industrial chemicals produce about 87% of sulfur emission in India. The main emission factors for Sulfur Dioxide are coal, oil and industrial process of paper and pulp, copper, zinc and lead smelting, thermal power plants, oil refineries and sulfuric acid. In Maldives, Land transport Vehicles largely contribute to the air pollution of the country including sulfur dioxide along with carbon dioxide, carbon monoxide, oxides of nitrogen, lead, particulate matters and volatile organic compounds (MDEP, 2008 B). In Nepal, incomplete combustion of fossil fuels, including petrol, diesel, kerosene and coal produce large amounts of carbon monoxide, sulfur dioxide, oxides of nitrogen and hydrocarbons (National Planning Commission, Nepal and IUCN, 1992). Coal consumption in Pakistan is very low as compared to neighboring countries, so the predominant source of Sulfur Dioxide is vehicular emission. (UNDP, 2006). Other sources of SO₂ are vehicles, refuse burning, open dumps burning, vehicular automobiles and aircrafts (Pak EPA and UNEP, 2004). In Sri Lanka, SO₂ emissions are mainly from industrial activities, especially thermal power plants. Unlike ambient PM10, which was fairly stable within a small range of values, SO₂ levels in the Colombo air have shown an increasing trend from 1997 to 2000 and then a general decreasing trend from 2003 (MDEP, 2008 A).

2.3. Nitrogen oxides:

The sources of nitrogen oxides are also different for South Asian countries. In Bangladesh, Nitrogen Oxide is mainly emitted during energy consumption including energy transformation industries, transport and biomass burning. Nitrogen Oxide is also emitted during processing of iron and steel industries. Another major source of Nitrogen Oxide emission is burning of agricultural residues. In Bhutan, the sector wise emissions estimates of Nitrogen Oxide indicate that domestic sources are responsible for NO emission. In India, sources of nitrogen oxides emissions are vehicles. In India, the road transport is the main source of Nitrogen Oxide emissions (7.63 Million Tones/Year) as compared to industry and power sector. The number of vehicles, registered in India was 21 millions in 1990-91 which has grown to around 37 millions by 1996-97 (UNEP, 2008 C). Another important source of Nitrogen Oxide emission is the industrial process, especially the production of nitric acid, used in fertilizer manufacturing. In Maldives, domestic combustions are responsible for Nitrogen Oxide air pollution. In Nepal, major Nitrogen Oxide sources are associated with the combustion of fossil fuels and from fuel combustion in industries, especially the cement industry.

In any preventive pollution control strategy, “Reduction at Source” is considered to be the very first option. The same needs to be considered for air pollution reduction in South Asia, to minimize the resulting economical, environmental and health impacts in the region.

3. Health and Socio-Economic Impacts of Air Pollution

The level and nature of air pollution in any country has implications for the economy of that country as well as neighboring countries, owing to the trans-boundary nature of air pollution. The importance of a regional level framework for combating air pollution and its harmful effects can only be assessed after reviewing the socioeconomic situation in South Asia and establishing the impact of air pollution on various socioeconomic parameters. Once governments and society realize the potential damages caused by air pollution, sufficient support can be garnered at the national and regional levels to combat this environmental hazard.

High levels of air pollution have a serious impact on the environmental quality that imposes economic costs associated with reduced quality of life, lost productivity, due to acidification and ozone impacts and health care costs. According to the World Health Organization (WHO), approximately 3 million people die each year due to air pollution in the world (World Bank, 2003b). It is also responsible for increase in outpatient’s visits owing to respiratory and cardiovascular diseases.

The persistent Atmospheric Brown Haze over Bay of Bengal has been traced to emissions from South Asian and South East Asian countries. As part of the Indian Ocean Experiment (INDOEX), scientists discovered the Atmospheric Brown Haze (also referred as Cloud) that pervades most of South Asia. This haze consists of sulfates, nitrates, organics, black carbon, fly ash and other pollutants. Biomass burning, rapid industrialization, urbanization and lack of alternative environment-friendly energy sources are primarily responsible for this haze over South Asia. Other sources include industrial air pollution, indoor air pollution (biomass burning), increasing traffic trends, thermal power plants and incineration of solid waste (UNEP 2008 B)

Bangladesh:

About 132,000 premature deaths are caused annually due to air pollution (70 percent from indoor air pollution). According to the World Bank, up to 10% of respiratory infections and disease in Bangladesh may be attributable to urban air pollution. Dhaka is the most vulnerable city, owing to the high level of mobile sources of emissions and high population density. Particulate matter is the most significant pollutant. According to the same study, while the total burden of disease in Bangladesh is comparable to other South-East Asian countries with high mortality rates, the share attributable to respiratory infections and disease is about one third higher than the average for these countries. In the case of Bangladesh, environmental impacts result in economic losses of more than 4% of GDP (World Bank 2006) These costs fall disproportionately heavy on the poor. Respiratory diseases become more serious during the dry season. Acute Respiratory Infection (ARI) cases reported in Dhaka Shishu Hospital (DSH) have increased over the years. Most of these patients are severely exposed to PM air pollution (UNEP, 2005). Respiratory infections and disease are one of the top five causes of disease and death in Bangladesh. The share of Disability Adjusted Life Years (DALYs) lost due to respiratory disease and infections are 17%. Of this, indoor air pollution has a share of 30-50% while urban air pollution has a share of 6-10% . These health savings translate to about 0.7% to 3.0% of the gross national product if air pollution is reduced in just four major cities of Bangladesh. In a 2006 report by the World Bank, reducing exposure to indoor air pollution and urban air pollution can result in savings worth US \$114-458 million and US \$ 169-492 million, respectively, to the country (World Bank, 2006).

Bhutan:

Diseases like respiratory tract infection and diarrhea are still on the top ten health problems affecting the majority of the population. Due to increasing air pollution, especially in the urban areas of Bhutan, there has been an increase in the incidence of acute respiratory tract diseases, cough and colds, bronchitis and asthma. Morbidity due to respiratory diseases has shown increase from 1990 to 1998. Acute respiratory tract diseases have increased from 10.08% in 1990 to 14.02% in 1998, whereas other respiratory disease has increased from 2.45% in 1990 to 6.82% in 1998. Cough and colds, bronchitis and asthma have also gone up from 16% to 22.4% and 1.95% to 2.95% during the same period (UNEP, 2001). According to a press releases and reported statistics of the Ministry of Health, Bhutan has seen an increase in respiratory diseases between 2003 and 2006. The respiratory diseases were 44% of the total health referral cases and for about 20% of the deaths caused by all diseases (Bhutan Today, 2010).

India:

The primary health impacts of air pollution are impaired pulmonary functions, use of medication, reduced physical performance, frequent medical consultations and hospital admissions with complicated morbidity and even death in the exposed population. In the rural areas of Andhra Pradesh India, environmental factors account for 22-23 percent of the total burden of disease. Since urban areas have better infrastructure, access to clean drinking water and use of cleaner fuels for household cooking, the average burden of disease for urban population is much lower – 18-19% of the urban burden of disease. Mortality of children under 5 comprises almost two-thirds of the total rural burden of disease and women are the second most vulnerable group (World Bank, 2001). Various studies estimate the number of premature deaths (mainly among young children) caused by indoor air pollution at 400,000–2 million per year, while 40,000–300,000 adult deaths per year are attributed to urban air pollution (NFHS Bulletin, 1997; Smith

and Mehta, 2000). In a study to estimate the economy-wide costs of environmental degradation in India, Brandon et al. estimated the total health costs due to polluted air to be \$517-2102 million and the physical impacts were in terms of 40,000 premature deaths avoided (Brandon et al, 2005) According to 1990 data, indoor air pollution contributes 6% of total burden of disease and urban air pollution contributes 2% of total burden disease in India (World Bank, 1995).

Maldives:

In general, the air quality is considered to be good. Trans-boundary air pollution became apparent first in the Maldives in 1997, when the country was affected by a haze caused by Indonesian forest fires. The livelihoods of the Maldivians were adversely affected due to this haze from October to December 1997 (ADB, 2007). Although the relationship between respiratory diseases and ambient air quality in Malé has not been studied in detail, there has been an increase in the reported cases of respiratory diseases in the past years. Available data shows that in 2003, over 52,000 cases of respiratory diseases have been recorded. A study conducted by the Institute of Health Sciences (IHS) 1996, shows that Acute Respiratory Infections (ARI) are one of the five leading diseases in Malé. Moreover, as much as 60% of out patient children are diagnosed with ARI. Asthma is a common health problem amongst both children and adults (ADB, 2007).

Nepal:

Medical records from hospitals in Kathmandu Valley revealed that urban residents have more respiratory diseases than rural residents. Urban air pollution from construction and vehicles and indoor air pollution from using wood, for domestic purposes have increased the incidence of acute respiratory infection (ARI). ARI is one of the top five diseases in the country and reason for 12% of outpatient visits (Ministry of Health, 1999). ARI continues to be the leading cause of death among young children, accounting for more than 30% of deaths in children under five years of age (Niraula, 1998). The records of three major hospitals in Kathmandu reveal that the number of Chronic Obstructive Pulmonary Disease (COPD) patients has increased significantly in the last ten years. Khanal and Shrestha (2005) have estimated that out of total 16,966 deaths, 1,337 cases of deaths can be attributed to air pollution, taking threshold limit as 10 $\mu\text{g}/\text{m}^3$ for PM10 for the year 2004. The atmospheric data obtained from the Kathmandu airport show that visibility has suffered in the valley since 1980. The number of days with good visibility (> 8,000m) around noon in the winter months fell from more than 25 days/ month in 1970 to 5 days/month in 1992 (UNEP, 2001).

Pakistan:

Urban air pollution in terms of particulate matter is estimated to cause around 22,000 premature deaths among adults and 700 deaths among young children annually. Indoor air pollution causes the deaths of more than 30,000 children per year (World Bank, 2006). In terms of total DALYs lost due to urban air pollution, mortality accounts for an estimated 60%. Of this, premature adult mortality has the largest portion. A medical study conducted in 2002 on the health of 1000 traffic policemen, showed that about 80% of traffic policemen had chronic ear-nose-throat (ENT) problems and about 40% showed lung problems. Another phenomenon is winter fog- caused by air pollutants. The health impact of this winter fog is estimated at 40% of total urban population in Pakistan and about Rs. 25.7 billion each year (EPA,2005). A study in Pakistan demonstrated that a 40 per cent reduction in rice crop yields was due to the presence of air pollutants (Hameed et al, 2009;EPA,2009). In case of Pakistan, the World Bank has estimated that the mean annual

damage to the environment is 6% of GDP, or Rs. 365 billion per annum. Damages from indoor pollution have been estimated at Rs. 67 billion while damage from urban air pollution has been estimated at Rs. 65 billion or about 1% of GDP (World Bank, 2006).

Sri Lanka:

Since 1995, diseases of the respiratory system, excluding diseases of the upper respiratory tract, pneumonia and influenza are ranked as the second leading cause of hospitalization. Moreover, respiratory diseases ranked the first five leading causes of death in all age groups, except 15 – 24 and 25 – 49 years. Hospital data from 1995 – 2001 showed that asthma and acute bronchiolitis have become major reasons for hospitalization (Senarath, 2003). According to latest available statistics, 2,399 cases per 100,000 persons have been reported for suffering from respiratory diseases in 2007. In the same year, diseases of the upper respiratory tract were the 12th leading cause of hospitalization in Sri Lanka, resulting in 0.18 millions asthma cases and 721 deaths due to asthma (Government of Sri Lanka, 2007). In Sri Lanka, the total environmental damage is estimated at Rs. 10,201 million or 2.4% of GNP, of which Rs. 64.5 millions are due to air pollution (UNEP, 2001).

As discussed for each South Asian country, air pollution has serious health impacts on the population of the country. Air pollution has pushed respiratory disease up in the ranks as the leading cause of hospitalization. Asthma, chronic bronchitis, heart disease and cancer are pervasive in areas with high pollution. Urbanization and industrialization have led to an increase in urban outdoor pollution. The level of indoor air pollution has arisen due to poor ventilation and domestic use of biomass or ‘dirty’ fuels. Women, children and senior citizens are most vulnerable to indoor air pollution.

Air pollutants such as sulfur dioxide, nitrogen oxides, and ammonia are known to also affect plants. Absorption of pollutants by soil can lead to poor germination of seeds. Exposure to polluted air can harm the growth of plants, reduce crop yield, and make them harmful for human or livestock consumption. Considering that most of the economies of South Asian countries are agrarian in nature and employ a large percentage of the workforce (around 25%), air pollution has serious implications for crop loss in these countries. Crop loss would result in food insecurity, health problems and malnutrition. Moreover, crop loss would reduce the agricultural exports of the South Asian countries, upsetting the balance of trade and creating numerous economic and financial challenges. Needless to say, these local impacts in the countries would be further aggravated by trans-boundary air pollution.

Through channels of health, agriculture and other factors mentioned above, air pollution could have serious implications for the socioeconomic status of South Asian. The environmental burden of ill health, disease or mortality is borne in both rural and urban areas. However, the environmental burden of disease and mortality is borne disproportionately by the poor, especially the urban poor. Air pollution exposes the poor to high medical and health related costs. Moreover, ill health, impairment or disability owing to air pollution can lead to loss of job or other socioeconomic opportunities for the poor. People living close to sources of air pollution (industrial sites, houses with unclean fuel and poor ventilation) are more vulnerable to its harmful effects. Rising health costs push these people into deeper poverty. An important impact associated with air pollution is that women and children (under the age of 5) are most vulnerable.

Women who are already marginalized in developing countries suffer increasingly from maternal health issues.

Despite the fact that most countries are moving towards industrialization, agriculture still forms the backbone of economies of most of South Asian countries. Degradation of soil and reduced crop yield has serious implications for food security, exports and economic viability of these countries.

Air pollution can increase poverty, widen the classes and gender-divide and harm the agriculture sector in South Asian countries. Local impacts due to air pollution, as emphasized above, would be only further aggravated by the trans-boundary air pollution. Therefore, it is imperative to identify a regional level framework not only for reducing the trans-boundary impacts of air pollution in South Asia but also to support enforcement for adopting control measures at country level towards improvement of ambient air quality in general.

Section B: Legal and Regulatory Frameworks for Environmental Protection and Air Pollution Control

To minimize the socio-economic and health impacts, resulting from air pollution, South Asian states have developed environmental legal and regulatory frameworks in their respective countries. However, the implementation of national environmental action plan has been limited due to lack of financial resources and technical know-how.

4. Environmental Legal and Regulatory National Frameworks in South Asia

“Environmental Policies” only exist in Bangladesh, India, Nepal and Pakistan. The policies mainly focus on assessment of existing policies, multi-sector frame-works, policy guidelines and suggesting action plans. The environmental policy of Pakistan is ahead of other member states in addressing the enactment of National Clean Air Act. “Environmental Acts” exist for all the countries in the region, while India takes distinction in also having an Air Act. The environmental acts of South Asian countries are generally defined for ecosystems, hazardous substances, forest and mineral resources, air, water, soil, human and plant resources. The environmental act of Bhutan addresses the principles to reduce, reuse and recycle and the polluter pay principle, while India and Nepal address the protection of property and heritage. These are the exceptional privileges taken up by Bhutan, India and Nepal, with respect to Environmental Acts.

“Sustainable Development Strategies” are established at the national levels by Bangladesh, India, Maldives, Nepal, Pakistan and Sri Lanka. The major areas of emphasis under every strategy are livelihood, environment, social justice, poverty alleviation, public participation, and good governance. All the sustainable development strategies focus over the promotion of clean and healthy environment but none of them addresses the problems related to air pollution. “National Conservation Strategies” have been adopted by Bangladesh, India, Nepal, Pakistan and Sri Lanka. The focus of all the strategies is mainly upon the conservation of ecosystems, cultural heritage, conservation of natural resources, improving energy efficiency and promotion of clean technologies. The National Conservation Strategy of India exceptionally emphasizes the use of control system for air and noise pollution.

“Environment Action Plans” exist for six South Asian countries. Bhutan lags behind in the formulation/adoption of the action plans. The fundamental approach of every action plan is based over sustainable development. The objectives of all plans are to investigate, demonstrate, implement, monitor and evaluate the sustainable approaches. The key areas of consideration under the action plans in general are health, environment, and economic sectors. Although the plans fully emphasize over the protection of environment there is no emphasis on air pollution related issues in particular. The “Air Quality Standards” exist for all South Asian countries except for Maldives. Generally the Ambient Air Quality Standards are defined for sulfur dioxide, carbon monoxide, nitrogen oxide, black smoke, hydrocarbons, suspended particulate matter, lead and ammonia in the countries of the region. The criteria for categorization of the pollutants in all the countries are also more or less the same for industrial, commercial, residential and sensitive areas. Bhutan, Maldives and Sri Lanka have established specific emission standards for vehicular emissions. Nepal and Pakistan have defined specific standards for extreme winter seasons, atmospheric washout, natural cleansing, poverty level, and institutional capacities.

A number of “International Conventions and Treaties” have been signed by all South Asian member states. Every member state has its own designated organizational authority for the implementation of conventions and treaties. However the major hurdles in the implementation of these treaties and conventions are common to all states, which include lack of financial and technical support, lack of coordination, inefficient legal and regulatory framework, no access to relevant databases and lack of awareness among the local populations.

The environmental legislation in Bangladesh seems to be quite weak, especially with reference to air (SAARC, 2009). The implementation of frameworks and policies in Nepal are still under the initiation process. In general, in South Asian countries, there seems to be a lack of institutional/technical support along with a considerable resource limitation and financial support (SAARC, 2009) Apparently it could be seen that Bhutan has a good structure of polices and legislation from the institutional standpoint. However, Bhutan has resource constraints, both for the implementation and monitoring of its frameworks and policies, related to the environment. The Indian environmental legislative framework seems to be well acquainted in terms of acts, plans and policies. Integrated approaches at local, national, regional and global scales are needed, duly supported by international agencies and donors as well as through national means (RAPIDC, 2002). The environmental litigation setup of Maldives has got two important elements, including environmental protection and sustainable development. But, the legal framework seems to be weak and lacks the cohesiveness to bring together the disparate sector

environmental policies and regulations under one “roof”. Pakistan has a well-structured legislative framework. Yet, much attention is still to be paid to a few sensitive issues. A multi-sector approach for the management, protection and conservation of the environment need to be emphasized. Sri Lanka’s legislative framework for environment seems to be relatively mature in general, however, it lacks some of the major structural blocks in particular. Sri Lanka also enjoys a coordination mechanism between the sectors, for environmental concerns through Committee. The Technological/Financial aspects should also be addressed in country’s litigation.

5. Examining the Roles of National Institutions Focused on Environment

Undoubtedly, any effort to control air pollution levels in South Asia will be daunting, in light of the continued policy push for unabated economic growth by the region’s governments. The role of the social and environmentally focused institutions of the state, serving at the least as a forum for monitoring, should be expanded towards knowledge sharing between industry, non government organizations and state authorities in sub regional contexts. Any efforts to control trans-boundary air pollution will require a policy and administrative appreciation of cross cutting national/provincial and environmental/social development policy objectives similar to that being called for in trans-boundary forest and water resource management. To this end, stakeholder collaboration between adjacent provinces in their monitoring and outreach efforts to engage point sources of pollution will be critical.

On the household front the persistent increases in population, will continue to place increased pressure on the environment through increased commuter traffic (motorbike, automobile, bus, etc.) in particular. It must therefore be assumed from the outset that any progress towards defined goals will likely be suppressed or at least marginalized to some extent by continued urbanization. In light of this reality, including only the ministries of environment and forestry departments in stakeholder consultations limits the scope of the declarations sponsorship. More inter governmental support needs to be committed to in order to exploit opportunities for sector niches and technology facilitate solutions to point source pollution control. Knowledge sharing on technology aspects is one part of it but knowledge sharing in terms of advocacy, education and outreach is another. As the state will likely be unable to achieve much on its own, more partnerships with recognized organizations focused on education and outreach will be essential. Furthermore, sufficient intra state capacity (accompanied by the concerted push from regional partners) will hold states accountable for reporting on trans-boundary air pollution and providing top down support for policy solutions. Regional cooperation has often been called for across the region in economic terms, but the call has yet to be answered institutionally in terms of social and environmental concerns.

In terms of industry, more technology sharing for low emissions industrial development must take place. The task is daunting, in a market based context where competitive forces and national interests often trump environmental concerns and collaboration. However, the appropriate sector based mix of private firms, state regulatory agencies and civil society experts may allow for the removal of constraints to sector based progress. For example, pollution prevention for vehicle emissions and brick kiln industries in both Pakistan and Indian Punjab should speak to the same

initiatives and means of reducing emissions. Progress that has been made in technology solutions as applied to the transportation sector (elimination and phasing out of two stroke auto rickshaws) now needs to be rolled out to other industries such as brick kiln (based on regional experiences such as the Vertical Shaft Brick Kiln in Bangladesh) and larger vehicles.

In the absence of sufficient national and regional political support, multi lateral sponsorship and cooperation is valuable in moving the discussion forward. As will be discussed, a mass of regional knowledge and reporting in the baseline reporting by South Asian countries has revealed opportunities for development of controls. Donors such as UNEP, can facilitate the discussion and assist in taking such opportunities of development of control forward, by filtering through and developing the knowledge sharing of technology based solutions. Sector specific aspects can be contributed to by other multi lateral and private sector actors, as a means of encouraging technology transfer and influencing policies on point source pollution control, as has been recommended in East Asia. Some conventions, protocols and agreements have been successful, as will be discussed in this section. Air pollution, climate change, economic development and green economy initiatives are all contemporary policy alternatives that need to be taken into consideration. Only a regional institutional capacity and forum for engagement will be able to facilitate knowledge dissemination in a way that it is non competitive and effective.

6. Selected Regional Frameworks for Air Pollution Reduction and Control

The Association of Southeast Asian Nations (ASEAN) Haze Agreement, the Acid Deposition Monitoring Network in East Asia, Convention on Long Range Trans-Boundary Air Pollution (LRTAP) and the Malé Declaration on control and prevention of air pollution and its likely trans-boundary effects for South Asia & Iran are current reflections of regional efforts to control emissions at a regional level. These are briefly described and discussed here for their relevance and some guidance and direction towards air pollution reduction and control in South Asia.

6.1. ASEAN Haze Agreement

Political momentum in adjacent regions has been created through the signing of the ASEAN Haze Agreement, from which several lessons can be extracted, while developing any regional framework. The recognition of disasters must be addressed, such as from forest fires, floods & earthquakes. Hence, the potential for cooperation exists, for South Asian states. It is a matter of substituting the intention of reactive responsiveness to emergencies (forest fires) with the proactive objective of addressing point source pollution (industries). ASEAN agreement recognizes the problem of forest fires, along with the economic loss and the road map for member countries signing on. Prevention, operational mechanisms and enforcement activity strengthening are included in the agreement. The latter part of enforcement is particularly noteworthy as it should be essential for any regional agreement. In terms of preventative measures, national policies, national plans, curbing sources of forest fires through enforcement, legislation, monitoring, task forces and information technology are all included. Regional

monitoring is also spoken to as an outcome of information technology and multilateral support from the ADB is sought for as a means of facilitating technical expertise.

6.2. Convention on long-range trans-boundary air pollution

The Convention on long-range trans-boundary air pollution (LRTAP) aims to reduce air pollution through the exchanges of information, consultation, research and monitoring. This treaty offers a viable example of a science-based, legally-binding convention from 1979 and eight associated protocols (1984-1999) of increasing ambition level and sophistication which have been successfully implemented over the years, resulting in major emission reductions of agreed air pollutants in Europe and North America and established a stable mechanism for regional cooperation on science, monitoring, policy and assessments. It holds that each Contracting party undertakes to develop the best policies and strategies including air quality management systems. LRTAP emphasizes the control measures compatible with balanced development, in particular, by using the economically feasible best available technology and low or non-waste technology; should be adopted. Various improvements in the research sector are advised such as research over existing and proposed technologies for reducing emissions of sulfur compounds. Among others, LRTAP strongly recommends the introduction of improved models for a better understanding of the transmission of long-range trans-boundary air pollutants; establishment of scientific basis for dose/effect relationships designed to protect the environment. It emphasizes the economic, social and environmental assessment of alternative measures for attaining environmental objectives including the reduction of long-range trans-boundary air pollution; education and training program related to the environmental aspects of pollution by sulfur compounds and other major air pollutants.

The above are some of the pertinent guidelines derived from the convention. LRTAP also emphasizes flexibility for change of information pertaining to trans-boundary air pollution. The exchange of information is essential and may include emissions at periods of time to be agreed upon, agreed air pollutants, (starting with sulfur dioxide) coming from grid-units of agreed size; or on the fluxes of agreed air pollutants across national borders, at distances and at periods of time to be agreed upon and their potential impacts which would be likely to cause significant changes in long-range trans-boundary air pollution. For the implementation and further development of the cooperative program for monitoring and evaluation of the long-range transmission of air pollutants, a comparable or standardized procedures for monitoring is recommended whenever possible which should be based on the framework of both national and international programs.

6.3. Malé Declaration

While the Malé Declaration (MD) was adopted in 1998 and the baseline data continue to be collected, a number of limitations are noticeable in the Declaration's framework. These gaps and omissions, no doubt a result of a daunting negotiating process, rather than intentional, have likely contributed to the limitations of the Declaration in achieving substantive results in the control of

regional air pollution. It goes without saying, that continued increases in population growth, urban concentration and a push towards industrialization have also taken their toll on progress, thereby deflating progress with the pressures of increased fuel consumption, industrial emissions and net vehicle operation.

The consistent flow of meetings and activities under MD should be built upon and maintained as part of the membership's efforts to disseminate and share knowledge. The intergovernmental forum, successful in its regularity serves as a useful discussion of baseline studies but a more robust roadmap in moving forward is required to elevate the profile of the networks efforts. Stakeholder participation forums are also regular but involve knowledge sharing among state and non-state stakeholders. Training has also been regular but how institutional capacity and capability to retain learning has progressed is questionable, with staff turnover and attrition. Monitoring stations are located in rural areas to avoid the focused and concentrated impacts of urban pollution. Nevertheless, the urgency of dealing with point source pollution emitters by sector needs to be factored into the discussion and agreements in moving forward.

A number of recommendations are already outlined within the MD and are emphasized in this section. However, while progress has been made in areas such as fuel emissions reductions and technology introduction, a number of areas require improvement. This section outlines the main characteristics of the Declaration and highlights the gaps and weaknesses in terms of the Declaration's ability to serve as a policy framework for implementing institutions:

- 6.3.1. The first few paragraphs of the declaration are focused on highlighting the recognition, reiteration and realization goals of advocacy regarding the spirit of the document. Given that the stakeholders are largely the ministries of environment and forestry (with some participation from technology in the smaller member states), these efforts are perhaps to form an inter-governmental coalition around the issue of air pollution and trans boundary effects in South Asia. The following specific points could be attributed to undermining the urgency for action in the declaration.
 - a. An institutional omission is the lack of assignment of responsibility of national measures and institutions that are engaged in the task of controlling and abating such pollution. This should already be understood as far as the ministries of environment are concerned. While the state ministries may not be able to point to their adjacent ministries and agencies, non government stakeholders should be aware of and point to the responsible bodies that should be empowered and engaged to take the pollution abatement forward either through regulatory control or market based instruments and incentives.
 - b. In terms of Agenda 21, we need to include elements of technology sharing and best practices as a means of moving the policy agenda for trans boundary pollution control forward. There is a need to focus on technology sharing and solution development, along with regulatory control.

- c. Knowledge sharing and best practice mechanisms and institutional arrangements (from the LRTAP and ASEAN) need to be defined and outlined in more detail for administrative bodies at the national levels to follow.

6.3.2. In terms of programs to carry forward, there is ample space dedicated to assessing, studying, strategizing, allocating resources, economic mobilization and network development but limited discussion on specifics such as:

- a. Assessing institutions and identified partners is a good start but an implementing and responsible agency in the state needs to be assigned and empowered with responsibility
- b. Developing initiatives and working in cooperation to monitor specific emissions and concentrations/levels is good but accountable bodies need to be identified.
- c. Standardized methodologies emerge from this but a defined and accountable hierarchy of institutional agencies and capacities is required
- d. Training programs and securing incremental assistance can only happen if joint capacities are assigned and defined early on.
- e. The commitment to national reporting systems, consultation, protocols and institutional structures are all made, but at such a point, it should be identified which agencies are best positioned to carry out and manage the commitments that have been made.

The declaration text and content reflects a good advocacy and awareness campaign protocol, but not one that takes the necessary monitoring and evaluation steps to move the agenda forward. In the inter governmental forum summary pages, the focal points are outlined for each meeting as involving multilateral institutions as well as international non governmental agencies and national authorities. However, in the contact pages, the focal points for the national level are merely contacts from the Ministry of Environment and Forests, with natural resources, energy and water and science and technology components included in the smaller countries Nepal and Maldives. The influence of the Ministries of Environment is limited compared to other ministries, such as those linked to Finance. It is therefore important for the MD to have more effective links with all the relevant ministries. There is a need to draw upon inter governmental partnerships between ministries of economic development, industries and commerce to ensure that all of the necessary growth concerned cells are in partnership with one other. At the least, the ministries of environment should have initially or eventually included the interests of the ministries of health as well as other inter governmental colleagues included.

The present study does not attempt to delve into the complexities of negotiations between MD member states. Credit must be given to UNEP, SACEP and other partner organizations for establishing the initiative, maintaining the declaration documentation along with progress report information that tracks baseline data and information. No doubt, a number of issues have been avoided and/or excluded in the declaration in order to ensure that the declaration could be signed by all stakeholders. In any event, the limitations of progress by stakeholders towards meeting the aims of the negotiations are of interest to this study. An assessment of the policies and actions that should be taken, should involve a review of the existing baseline data that has been

accumulated from the various partners. Naturally, the common initiatives should be reviewed and aligned between partners with information sharing on technical points in the profile. Where initiatives are more heterogeneous, knowledge sharing and transfer should lead to the inception or at least agenda setting of sector specific policies.

Several useful proposals can be developed from the regional efforts described above to control emissions, including MD, as elements of a legally binding agreement (LBA) for air pollution reduction and control in South Asia. Such LBA may also have as a basis, the recognition of the problem of increasing air pollution and its resulting environmental, socio-economic and health impacts on the population of parties to the agreement and elements of the same may, accordingly, be built further.

7. Role of South Asian Association for Regional Cooperation in Air Pollution Reduction in the Region

The South Asian Association for Regional Cooperation (SAARC) could be a possible forum for looking into ways & means of generating possible support for strengthening MD or a regional LBA for air pollution reduction in the region.

Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka together form the South Asia Association for Regional Cooperation (SAARC), an organization developed to promote regional economic cooperation. Established in 1985, the organization has these core objectives: (i) to promote and strengthen collective self-reliance among the countries of South Asia; (ii) to develop mutual trust, understanding and appreciation of one another's problems; (iii) to promote active collaboration and mutual assistance in the economic, social, cultural, technical and scientific fields; (iii) to strengthen cooperation with other developing countries; (iv) to strengthen cooperation among themselves in international forums on matters of common interest; and, (v) to cooperate with international and regional organizations with similar aims and purposes. SAARC support to MD or a regional LBA would be in line with its objectives 3 & 5.

SAARC has organized different summits since 1987 focusing on climate change and natural disasters. The SAARC Environment Action Plan was adopted by the 3rd Meeting of the SAARC Environment Ministers (Malé, 15-16 October 1997). This action plan identified some of the key concerns of Member States and set out the parameters and modalities for regional cooperation. The action plan was based over the fundamental principles of causes and consequences of natural disasters, protection and preservation of environment and greenhouse effect and its impact on the region. A number of measures outlined in the SAARC Environment Action Plan have been reportedly implemented. [SAARC Coastal Zone Management Center \(SCZMC\)](#) and [SAARC Forestry Center \(SFC\)](#) were established in 2004 and 2007, respectively. These centers could also house some/all of the future activities of MD or a regional LBA.

Member States finalized South Asia Environment Outlook (SAEO) 2009 in collaboration with the United Nations Environment Programme (UNEP) and it was launched during the Eighth

Meeting of the SAARC Environment Ministers (New Delhi, 20-21 October 2009). The SAEO 2009 addresses the air pollution and attracts the attention of the governments, civil societies, and industries in South Asia States towards deteriorating air quality due to environmental damages, migration from rural to urban areas, and exacerbating vehicular emissions. SAARC Convention on Cooperation on Environment as stipulated under Item 17 (Legal Framework) of the Action Plan was signed during the [Sixteenth SAARC Summit](#) (Thimphu , 28-29 April 2010), (SAARC, 2009). The convention promotes the exchange of best practices and knowledge, capacity building and transfer of eco-friendly technology in a wide range of areas related to the environment. However, the convention does not address air pollution in particular (SAARC, 2009) and MD member states, also members of SAARC may consider proposing its inclusion. Unresolved conflict or post-conflict issues are the major reasons for poor integration of South Asia. However, SAARC has made landmark achievements and it would be worthwhile for MD member states to seek SAARC support for enabling member states in meeting the objectives of MD.

While SAARC has been in function for about 35 years now, the impact of its framework, specially with regard to air pollution reduction and control is yet to be seen. SAARC needs to be strengthened with a monitoring and evaluation mechanism to observe whether the member countries are making progress in reducing air pollution and minimizing its associated impacts in the South Asia region. Moreover, there needs to be a mechanism of binding commitments such that member countries take the promises of reducing air pollution seriously and if it could be mandatory for them to make some progress in this regard. SAARC summits should be more frequent so that the momentum of its agenda on the air pollution is not lost.

Section 3: Recommendations

The following section outlines actions that could be taken at the regional and national levels, given the progress that has been made by South Asian countries. Finally, this section concludes with recommendation of a legally binding regional policy instrument for air pollution reduction and control in South Asia and some proposed elements for the same that should also be considered by countries in the region.

8. Recommended Policy Actions at the Regional Levels

Given the progress that has been made at the national levels in terms of institutional building and development, a number of initiatives are recommended which should first create forums for more regular technology sharing and dialogue. In terms of actions, the following broad initiatives have been undertaken by the following South Asian countries and should be noted:

- 8.1 Bangladesh is focusing on awareness building activities/outreach, data dissemination, regulatory measures, technical options: vehicle inspection and maintenance;

transportation planning; fuel reformulation/pricing/tax; industry standards and stack heights; standard setting; institutional frameworks and regulatory compliance; dissemination of data and sub regional cooperation.

8.2 India is taking action through various policies: air pollution control act; environmental protection act; national policy on pollution abatement; environmental action program; motor vehicle act and central motor vehicle rules. Various abatement measures, specific to industries that emit a high level of pollution are prescribed, along with lead phase out programs, diesel sulfur phase out programs, traffic flow, monitoring, industrial pollution and community sources.

8.3 Sri Lanka is taking action on penalizing vehicles that are high emissions loading, linking duties and taxes on low emission vehicles, vehicle inspection and maintenance, fuel reformulation, pricing and fleet mix; standard setting, institutional framework establishment and transportation planning.

In light of the above, at the regional level, the following recommendations are suggested:

8.1.1 Establish consensus sharing between national and provincial bodies on common issues of concern related to trans-boundary pollution. Policy sharing and alignment is already in process and should be discussed at subsequent technical work shops in areas such as motor vehicle emissions, inspection and maintenance (including fuel quality improvement, use of alternatives, design and standards improvement for new vehicles – hybrids/low emissions, enforce tail pipe emissions norms, identify high polluting vehicles); traffic management measures (traffic management, staggered office hours, pedestrian flow, mass transit such as bus rapid transit that will reduce automobile traffic and congestion); Monitoring; Industrial pollution; Community sources related to air pollution (Refuse burning, wood & other fuels burning, dust suspension).

8.1.2 Ensure that dissemination of work to other regional bodies takes place on a regular basis. Pilot projects should be set up and their progress monitored regularly, reported on and disseminated to other groups and interested agencies region wide. Web based reporting should also be implemented to ensure transparent dissemination of all data and information – either static through regulatory updated documents or dynamic through the creation of a clearinghouse. The solution's sophistication should reflect data being collected and ideally, should evolve to encompass GIS based and mapping technologies. A work plan of such data mapping should follow soon and be used to gauge progress on regional reporting.

8.1.3 Look at ways of defining the precautionary principle for usage that encourages solutions and alternative development while not constraining economic growth and development imperatives.

8.1.4 Establish working groups on specific sectors which involve public and private sector stakeholders and actors in priority areas such as and automobile emissions and industrial emissions standards.

- 8.1.5 Stakeholder groups that look at impacts should continue to be examined as have been in the past and they should also be linked with the preceding sectors (Health; Crops; Corrosion; Rapid Urban; Soil Acidification)
- 8.1.6 Regional expert committee/working groups may be constituted to recommend, in light of national emission inventories and metrological data (wind speed, direction etc):
- a. Pollution reduction option/s (specified such as 25% reduction or maintenance of the existing) over an agreed period of time, 20 or 30 years (with specified base year, time scale and target year).
 - b. Minimum standards vehicles road worthiness, fuel quality and emissions from brick-kilns.
 - c. Emission limit values (ELVs), for SO_x and NO_x emission control areas (ECAs)
 - d. Minimum critical load (Kg/ha/yr, for SO_x and NO_x
- 8.1.7 In order to ensure that emission levels are in compliance with international health and environmental standards, it is imperative that industrial sector of South Asian countries need to be educated and sensitized. These standards should also be imposed with legal implications to ensure that control equipment/filters are installed at factories or industries to control the type and amount of pollutants that are released into the atmospheric environment. Regular inspections should be made mandatory such that external auditors or inspectors visit the industrial sites and ensure that minimum standards are being observed when releasing emissions into the environment. Similarly, standards should be formalized regarding vehicular emissions. Annual vehicle inspection should be made compulsory, in which the emissions and smoke emitted from each private or commercial vehicle is monitored and filters are checked
- 8.1.8 National emission reduction targets to comply with agreed regional targets.
- 8.1.9 Consideration of replication of “Self-monitoring and Reporting/SMART program for industrial sector in Pakistan, for other South Asian countries (Pak-EPA/MoE, 2000; Khwaja, 2001)
- 8.1.10 Technical Assistance Protocols should be set in place for countries to assist each other in matters regarding air pollution and its likely trans-boundary effects. Such protocols would allow South Asian countries to benefit from each other’s experiences viz-a-viz air pollution reduction and control. This technical assistance could encompass (1) emission standards (2) implementation and legal matters regarding emission standards (3) health and socio economic impacts of air pollution. Through technical assistance protocols, countries would be able to learn from each other, thereby making the goal of minimizing air pollution and its trans-boundary effects possible in the region.

9. Regional Action for Air pollution Control – A Legally Binding Agreement

Besides possible support from SAARC forum, another option for consideration by South Asian member states is preparing and in-acting a legally binding instrument, specifically for air pollution reduction and control in the region.

MD encourages intergovernmental cooperation to address the increasing level of trans-boundary air pollution and its negative impacts. The declaration exists for countries to assess and develop strategies for mitigating air pollution, set up monitoring arrangements, collect and analyze air quality data and their impacts. However, much more collaboration and practical efforts are needed to strengthen the framework. It is also important to expedite the process of improvement, since the MD has been in existence for over 12 years already.

Pollution levels continue to rise due to unabated economic growth (vehicle emissions) and unsustainable industrial practices (stack emissions) that mitigate efforts on controlling pollution at the country level in South Asia. Air pollution leads to atmospheric transport of pollutants, also affecting countries of the region in more than one way, thus making pollution a regional issue. The costs are not only social (human health), but also economic (crop losses, lost productivity) and environmental (forest degradation). Being a regional problem, no one country, especially in poor and diversified region like South Asia, can tackle this on its own. National actions in this regard seem to be insufficient. Lack of financial support, skilled and trained manpower, technology and technical know-how, further limit one single country capability to handle it.

As air pollution impacts the region, to combat it, a regional focus and approach is essential in which all member countries of the region have a role to play, with equal and diversified responsibilities. Member states, either need to strengthen the MD, with agreeing to and implementing some, if not all the recommendations already described in the preceding pages or South Asian states, after due consideration, develop and in-act an agreement to manage air pollution, similar to ASEAN and LRTAP regional agreements.

Proposed Elements of a Legally Binding Instrument for Strengthening the Framework of Air Pollution Reduction in South Asia

A legally binding instrument may be constituted to ensure that the South Asian countries follow through with progress on monitoring stations, collection and analysis of data, sharing of air quality and health data and information across member countries and steps to reduce air pollution. A legally binding instrument would ensure that each country meets its specific targets in reducing trans-boundary air pollution.

A main feature of the envisaged instrument would be the recognition that obligations regarding control and reduction of emissions of agreed pollutants should allow for flexible and

differentiated national programs to be implemented by individual party to the agreement with a view to achieving the most cost-effective and environmentally benign improvements of air quality in the whole region

Importantly, this instrument would encourage governments to pass legislation in their respective countries, set up minimum emission standards for vehicular and brick kiln emission and fuel quality, banning the use of unclean or 'dirty' fuels for domestic or industrial consumption.

It would also encourage the governments to pass laws requiring the use of filters to 'clean' emissions from factories before they are released into the environment.

The instrument would also encourage steps to ensure sufficient and quick investment in (a) building technical expertise viz-a-viz air pollution control and (b) financial resources allocated from country budgets for combating air pollution.

The objective of such an instrument should be to protect human health and ecosystem by setting up time framed air pollutants (starting with SO_x and NO_x) reduction targets.

The instrument specific elements may be further built up on the above proposals to also address/accommodate "Policy Actions at the Regional Level " recommended earlier in sub-section 8.

For effective implementation of LBI on air pollution reduction by South Asian states, mechanisms would need to be established for capacity building and intra-state available technology transfer, knowledge and information exchange (about emissions, exposures, monitoring data, socio-economic impacts), reporting and evaluation of LBI effectiveness.

The instrument should contain provisions for independent compliance monitoring, analysis and assistance in case of non-compliance". Legal framework should include the harmonization of air pollution policies (ambient and emission standards) addressing the pollutants that have high potential of regional transport (fine PM, SO_x, NO_x, ozone precursors, etc.). At national and regional levels, both air quality and climate policies should be integrated.

Support funds should be explored through a sustainable financial mechanism, by setting up a dedicated fund for LBI negotiations and follow ups with contributions (as may be agreed upon) by the South Asian member states, UN agencies, including UNEP and other possible regional/international donors.

The LBI should acknowledge and ensure an active role of civil society in the development and implementation of the LBI and in development and implementation of national and regional implementation plans for air pollution reduction and control

Finally, among others, the LBI should establish effective and enforceable treaty compliance provisions.

A LBI on air pollution reduction and control prepared and adopted by South Asian countries would not only enhance a better understanding and cooperation among the member states but would also effectively implement air pollution reduction measures across the region. The expected likely outcomes of this would be halting effects on acidification, corrosion, eutrophication and deterioration of visibility; higher agric productivity; better quality of food and shell-life; fewer hospital admissions; lower death rate; less absence from work place; and, improved health.

References

Asian Development Bank & International Center for Integrated Mountain Development (ICIMOD) 2006, *Environment Assessment of Nepal: Emerging Issues and Challenges*, ICIMOD, Nepal

Asian Development Bank 2001, *Asian Environment Outlook*, ADB, Manila

Asian Development Bank 2007, *Maldives: Environment Assessment*, Asian Development Bank, viewed on December 7, 2010, <<http://www.adb.org/Documents/Assessments/Country-Environmental/MLD/Environment-Assessment.pdf>>

Bhutan Today 2010, 'Air Pollution, a home truth', viewed on November 20, 2010 <<http://www.bhutantoday.bt/?p=2957> Air pollution, a home truth>

Brandon C, Hommann K & Kishor NM 1995, 'The Cost of Inaction: Valuing the Economy-Wide Cost of Environmental Degradation in India'. Paper presented at the *UN University Conference on the Sustainable Future of the Global System*. Organized by the UN University/Institute of Advanced Studies NIES, 16 October 1995, Tokyo, Japan

Bryant, N 2004, 'Maldives: Paradise soon to be lost', BBC, London. Viewed on December 20, 2010, <http://news.bbc.co.uk/2/hi/south_asia/3930765.stm>

FAO 1991, *Banking for the environment*, Food and Agriculture Organization, viewed on December 31, 2010, <<http://www.fao.org/docrep/t0719e/t0719e03.htm>>

Government of Bangladesh 2009, *Economic Survey of Bangladesh*, Ministry of Finance, viewed November 20, 2010, <http://www.mof.gov.bd/en/index.php?option=com_content&view=article&id=71&Itemid=1&hpMyAdmin=GqNisTr562C5oxdV%2CEruqlWwoM5>

Government of India 2009, *State of the Environment*, Ministry of Environment, viewed on January 7, 2011, <<http://envfor.nic.in/soer/list.html>>

Government of Nepal 1999, *Annual Report 1998/99*, Ministry of Health Services, Kathmandu.

Government of Pakistan 2005, *State of the Environment Report*, Environmental Protection Agency (EPA), Islamabad

Government of Pakistan, 2009, *Economic Survey of Pakistan*, Ministry of Finance, viewed on November 11, 2010, <http://www.finance.gov.pk/survey_0910.html>

Government of Pakistan 2009, *Draft report on Institutional Analysis of Air Quality Management in Urban Pakistan*, Pakistan Environmental Protection Agency, Islamabad, viewed on November 27, 2010, <http://www.environment.gov.pk/NEW_PDF/AQM%20Draft%20Final%20Report.pdf>

Government of Pakistan 2009, Retrieved from Ministry of Environment Pakistan. viewed on January 7, 2011, <www.environment.gov.pk/NEW-PDF/AQM%2520Draft%2520Final%2520Report.pdf>

Government of SriLanka 2007, *Annual Health Statistics 2007*, viewed on December 28, 2010, <<http://www.health.gov.lk/AnnualHealthBulletin.htm>>

Hameed, S, Mirza, MI, Ghauri, BM, Siddiqui, ZR, Javed, R, Khan, AR, Ruttigan, OV, Qureshi, S, & Hussain, L 2009 'On the widespread winter fall in North-eastern Pakistan and India', *Geophysical Research Letters* Vol. 27, Issue 13, pp. 1891-1894.

International Food Policy Research Institute 2010, '*Global Hunger Index 2010: The Crisis of Child Under Nutrition*', IFPRI, viewed on November 11, 2010, <<http://www.ifpri.org/pressroom/briefing/2010-global-hunger-index-crisis-child-undernutrition>>.

Khanal, RH & Shrestha, SL 2005, *Development of procedures and the assessment of EDB of local levels due to major environmental risk factors*, Nepal Health Research Council, Kathmandu.

Khwaja, MA and Khan, SR 2005, "*Air Pollution: Key Environmental Issues in Pakistan*," Working Paper 99, SDPI, IslamabadPakistan.

Khwaja, MA 2001, '*Present Status of Self-Monitoring and Reporting /SMART Program for Industry in Pakistan*', Policy Brief Series 13, SDPI, Islamabad, Pakistan

Mishra, V and Retherford, RD 1997, Cooking Smoke Increases the Risk of ARI in Children., *National Family Health Survey Bulletin*, September (8), pp.1-4

National Planning Commission (NPC), Nepal & International Union for Conservation of Nature (IUCN) 1992, *Environmental Pollution in Nepal: A Review of Studies*, NPC/IECN NCS Implementation Program, Katmandu, Nepal.

Niraula, BP 1998, 'Health' in 'A Compendium On Environment Statistics 1998', Central Bureau of Statistics, Kathmandu.

RAPIDC 2002, *Regional air Pollution in Developing Countries, Air Pollution in Asia and Africa: Approaches in the RAPIDC Programme*, viewed on November 20, 2010, <http://seiinternational.org/mediamanager/documents/Publications/Atmospheric/airpollution_asia_africa_approaches_rapidc.pdf>

SAARC 2009, *Areas of cooperation: Environment*, viewed on 31 December 2010, <http://www.saarc-sec.org/areaofcooperation/cat-detail.php?cat_id=54>

SAARC 2009, *South Asian Environment Outlook 2009*, SAARC, viewed on November 1, 2010, < <http://www.saarc-sec.org/userfiles/SAEO%202009.pdf>>

Senarath, C 2003, 'An Overview of Air Pollution And Respiratory Illnesses In Sri Lanka' in Martin J. Bunch, V. Madha Suresh and T. Vasantha Kumaran, eds., *Proceedings of the Third International Conference on Environment and Health, Chennai, India, 15-17 December, 2003*. Chennai: Department of Geography, University of Madras and Faculty of Environmental Studies, York University, pages 489 – 501.

Smith, KR, and Mehta, S 2000, *The Burden of Disease from Indoor Air Pollution in Developing Countries: A Comparison of Estimates*. WHO/USAID Global Technical Consultation Health Impacts of Indoor Air Pollution in Developing Countries, viewed on November 25, 2010, <http://pdf.usaid.gov/pdf_docs/PNACN654.pdf>

UNDP, The National Energy Conservation Center (ENERCON), Space & Upper Atmosphere Research Commission (SUPARCO) & Solution Environmental and Analytical Laboratory (SEAL) 2006, '*Baseline (Ambient Air Quality) study in major cities of Pakistan*', UNDP/ ENERCON, Pakistan.

UNEP 2001, *State Of Environment: Bhutan 2001*, United Nations Environment Programme, viewed on October 14, 2010, <<http://www.rrcap.unep.org/pub/soe/bhutansoe.cfm>>

UNEP 2005, *Dhaka City: State of Environment 2005 A*, United Nations Environment Programme, retrieved from Dhaka City SOE Report 2005, viewed on October 14, 2010, < <http://www.rrcap.unep.org/pub/soe/dhaka-soe-05/3-5dhaka-health.pdf>>

UNEP & MDEP (Male' Declaration Exchange Program) 2008, '*Maldives: Country Report*', Thailand, United Nations Environment Programme, viewed October 4, 2010, <www.unaids.org/.../monitoringcountryprogress/2010progressreportsubmittedbycountries/maldives_2010_country_progres>.

UNEP 2008 B, [Malé Declaration on Control and Prevention of Air Pollution and Its likely Transboundary Effects for South Asia](#), United Nations Environment Programme, viewed on October 9, 2010, <www.rrcap.unep.org/male/>

UNEP 2008 C, *Emission Sources and Estimates*, viewed on October 9, 2010,
<<http://www.rrcap.unep.org/male/baseline/Baseline/India/INCH3.htm>>

UNEP 2008 D, *The National View of Air Pollution*, Nepal, United Nations Environment Programme, viewed on November 3, 2010,
<<http://www.rrcap.unep.org/male/baseline/Baseline/Nepal/NEPCH1.htm>>

UNEP 2010, '*Air Pollution – Promoting Regional Cooperation*', United Nations Environmental Protection Programme, Nairobi, Kenya.

UNEP & MDEP 2008, *A Country Report: Thailand*, United Nations Environment Programme and Male' Declaration Exchange Program.

World Bank 2003b, '*Health Impacts of Outdoor Air Pollution*, South Asia Urban Air Quality Management Briefing, No. 11.

World Bank 2006a, *Bangladesh Country Environmental Analysis*, Bangladesh Development Series, No. 12.

World Bank 2010, *Economic updates, Sri Lanka*, Sri Lanka Economic Brief, viewed on October 27, 2010, <http://siteresources.worldbank.org/SRILANKAEXTN/Resources/233046-1267051087828/SriLanka_Economic_Brief_May_3_2010.pdf>

World Bank 2010c, '*Economic Update: Maldives*, viewed on October 27, 2010
<<http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/MALDIVES/EXTN/0,,contentMDK:20146253~menuPK:306367~pagePK:1497618~piPK:217854~theSitePK:306313,00.html>>

York University 2003, Retrieved from Air Pollution in Sri Lanka,
<www.yorku.ca/bunchmj/ICEH/proceedings/Senarth_C_ICEH_papers_489to501.pdf>