Youth for Clean Air

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

SAYEN
South Asia Youth Environment Network

This report has been compiled by the South Asia Youth Environment Network in collaboration with Malé Declaration Secretariat as part of the phase III implementation of the Malé Declaration on Control and Prevention of Air Pollution and Its Likely Transboundary Effects for South Asia. The report has been reviewed by the Ninth Session of the Intergovernmental Meeting of the Malé Declaration. The contents of the report do not necessarily reflect the views, policies or opinions of any participating country and organisation.

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Coordinating Agencies

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South Asia Co-operative Environment Programme (SACEP) Colombo, Sri Lanka

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Foreword

Air pollution impacts locally but also regionally and globally. Emissions from power stations and factories up to cars, ships and aircraft can travel around the world harming ecosystems and human health.

In April 1998, South Asian countries established an important initiative for regional cooperation on air pollution among member states. The *Malé Declaration on the Control and Prevention of Air Pollution and Its Likely Transboundary Effects for South Asia* is the first inter-governmental declaration of its kind in the developing world.

The Malé Declaration calls for the meaningful engagement of other air quality stakeholders to collaborate in the efforts and activities to address air pollution issues that affect all sectors of society.

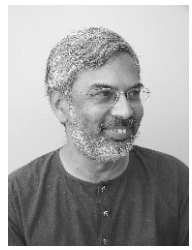
In the spirit of this partnership, *Youth for Clean Air* is published by the South Asian Youth Environment Network and the Malé Declaration to encourage various actors, especially the young people, to contribute towards the control and prevention of air pollution in South Asia.

The report, *Youth for Clean Air* identifies the sources and impacts of air pollution, and presents practical measures that can be undertaken to reduce atmospheric emissions at various levels of society—encompassing individual efforts, collective efforts, government efforts, regional efforts, as well as global efforts.

The publication is timely, as the world gears up to face the biggest challenge of our time: climate change. The publication also underlines the multiple environmental, economic and social benefits of tackling the twin challenges of climate change and air quality and thus promotes measures for climate change mitigation, alongside measures to control and prevent air pollution.

I believe this publication will bring atmospheric issues to the attention of a wide range of interested parties including young people whose shared future depends on action today. In doing so I am sure it will inspire a new generation with creative and innovative ways promoting a low-emission society and a transition to a low carbon one—not only in South Asia but around the globe.

Achim Steiner
UN Under-Secretary General and
Executive Director
United Nations Environment Programme



Preface

Young people are a major force in the contemporary world. They are at the forefront of global, social, economic and political development. In addition to their intellectual contribution and their ability to mobilise support, youth have a different, but unique perspective that brings fresh ideas to the process of development.

In South Asia, youth comprising 40 per cent of the population, are one of the major stake holders for Sustainable Development (SD). Through the UNEP's South Asia Youth Environment Network (SAYEN), with its secretariat at the Centre for Environment Education (CEE), youth have been working on several initiatives related to sustainable development.

Clean Air is one of the major concerns in South Asia for which there have been several efforts by countries in this region. As part of the Malé Declaration, an important initiative undertaken by governments in South Asia towards air pollution and its likely transboundary impacts, youth are seen as important change agents. This publication *Youth for Clean Air* has been developed by youth as part of SAYEN's engagement with this process. The publication has been developed through a series of workshops and sharing of inputs among SAYEN members. This publication will be used by youth organisations in South Asia in getting oriented to the issue of clean air and conduct awareness programmes among different groups.

Awareness programmes on sustainable development related issues is one of the key activities of SAYEN. Youth in South Asia are working on climate change and related issues. Thus, this publication, *Youth for Clean Air* is the need of the hour and will surely help youth to get a better understanding about the atmospheric emissions and initiatives that they could undertake to address the concern.

Kartikeya V. Sarabhai
Director
Centre for Environment Education

Acronyms

ABC	Atmospheric Brown Cloud
CEA	Central Environmental Authority
CEE	Centre for Environment Education
CMA	Colombo Metropolitan Area
DoE	Department of Environment
DoM	Department of Meteorology
ECYI	Earth Charter Youth Initiative
EIA	Environmental Impact Assessment
EMS	Environment Management System
ESPS	Environmental Sector Program Support
FAO	Food and Agriculture Organization
IAAS	International Association of Agricultural Students
ICT	Information and Communication Technology
IEE	Institute of Electrical Engineers
IPCC	Intergovernmental Panel on Climate Change
MEEW	Ministry of Environment, Energy and Water
MENR	Ministry of Environment and Natural Resources
MOEST	Ministry of Environment Science and Technology
MOPE	Ministry of Population and Environment
MoTC	Ministry of Transport and Communication
NEC	National Environment Commission
NFPs	National Focal Points
NIAs	National Implementing Agencies
OIYP	Oxfam International Youth Parliament
SACEP	South Asia Cooperative Environment Programme

SAYEN	South Asia Youth Environment Network
SD	Sustainable Development
SEI	Stockholm Environment Institute
Sida	Swedish International Development Cooperation Agency
SLSI	Sri Lanka Standards Institutions
UNEP	United Nations Environment Programme
UNEP RRC.AP	UNEP Regional Resource Center for Asia and the Pacific
UTEIS	Urban Transport and Environment Improvement Study

Content

Section A

About Atmospheric Emissions

Introduction

Breathing is the most basic human function required to sustain existence, as life without air is measured in moments. Pure air is a mixture of invisible and odorless gases, mainly nitrogen and oxygen with small amounts of water vapor, argon, carbon dioxide, neon, helium and hydrogen. In activities such as launching into space, scuba diving, climbing to the highest elevation on the globe or searching for coal within the deepest crevices of the earth, this mixture is life's elixir.

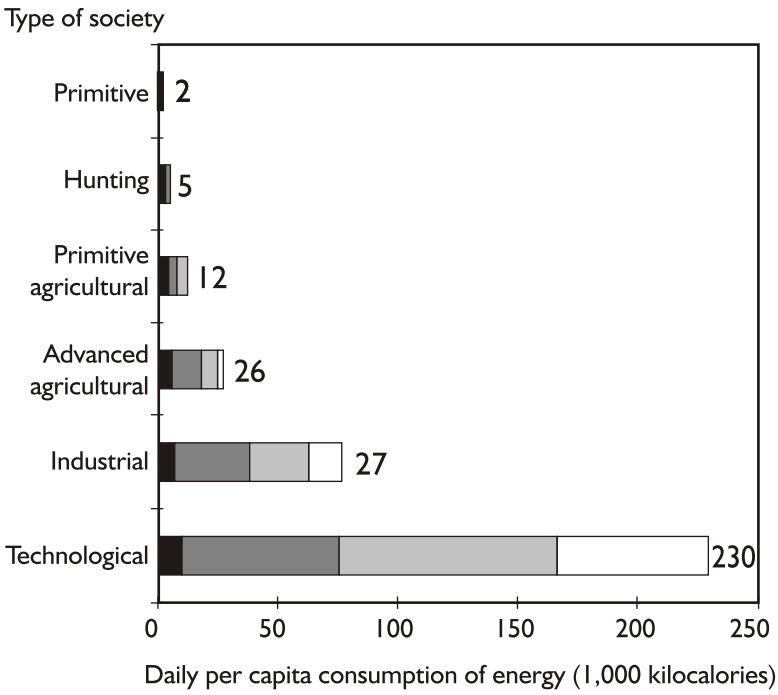
The one universal tool that stretches across all of our endeavours is air. In daily life most of us take our source of air for granted, inhaling and exhaling with little thought of what we are actually pulling into our bodies. On average most adults breathe roughly 35 pounds of air per day and children breathe almost twice that amount. More air enters the body and the bloodstream than any other substance.

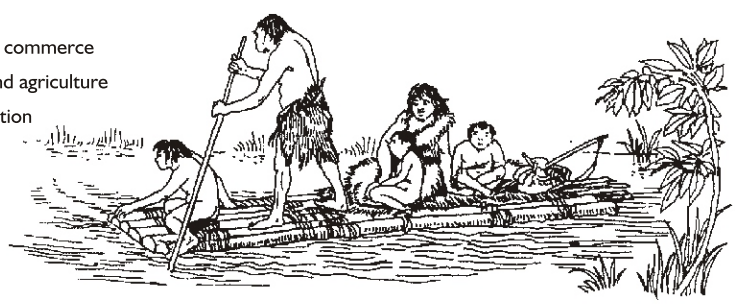
> It is easy for us to look up at the sky and marvel at the vastness, imagining an endless air supply that stretches off into space. However breathing space only stretches somewhere between 5 and 9 miles above the earth's surface.

Modernization is a concept the globe is still coming to terms with. 200 years ago, the world was a different place, and the mankind lived in relative simplicity. Automobiles, air conditioners, and manufactured goods were luxuries. Day to day, humans had little impact on the environment.

The dawn of the industrial revolution changed that simplistic existence dramatically. It gave rise to the cities in which we live today. The effects of living in the urban centers are still being determined. It was only in 1952 that the word "smog" was coined, combining the words smoke

Consumption of Energy in the Development of Human Society





Source: Earl Cook, 1971. "The flow of energy in an industrial society" Scientific American 225(3):136.

and fog to describe the soup that enveloped London. Air quality was a distant concept. Only after thousands perished was it understood that a city's population pays a price for modern living. And the question was raised- "what are we releasing into our atmosphere"?

Air quality is affected by

- Natural processes like a volcanic eruption, a dust storm, or a forest fire
- Human (anthropogenic) activities like driving cars, heating / cooling homes, or industrial operations.

Unhealthy air is created when air pollutants are found in quantities too great for the human body to accept without damage. Likewise, unhealthy air affects the environment by upsetting the ecological balance of life that exists in nature.

A great deal of power is needed to run the factories of modern nations. Automobiles, trains, buses, homes and offices – everything, for that matter, needs power. Nearly all of this power is produced by burning fuels. This burning produces wastes. Some of the wastes get into the air, causing air pollution.

Particulates of both natural and human origin also cause pollution. Smoke from natural fires and industries for example causes damage to both human and animal life. The chemicals that are most troublesome in air pollution are formed in the atmosphere by gases. The gases from engine exhaust are the oxides of nitrogen and the unburned hydrocarbons. The energy that causes these gases to react to form new compounds comes from the sun. The pollutant introduced into the atmosphere in the largest quantity by human activity is carbon monoxide. Carbon dioxide (CO_2) is also a product of combustion of fossil fuels and identified as a Greenhouse Gas. It is a minor constituent of natural air (about 0.03%), but the increased use of fossil fuels cause an increase in the amount of carbon dioxide in the atmosphere.

> Naturally occurring greenhouse gases have a mean warming effect of about 30 °C (54 °F), without which Earth would be uninhabitable. The average surface temperature of Earth is about 15 °C (59 °F)." The global average air temperature near the Earth's surface rose 0.74 ± 0.18 °C (1.33 ± 0.32 °F) during the last 100 years.

The problem in this century centres on how the strength of the greenhouse effect is changed when human activity increases the atmospheric concentrations of some greenhouse gases above the acceptable limit.

Fossil fuel burning has produced about three-quarters of the increase in CO_2 from human activity over the past 20 years.The rest is due to land-use change, in particular deforestation. Climate studies indicate that even if greenhouse gases were stabilized at 2000 levels, a further warming of about 0.5 °C (0.9 °F) would still occur. Including uncertainties in future, greenhouse gas concentrations and climate modeling, the Intergovernmental Panel on Climate Change (IPCC) anticipates a warming of 1.1 °C to 6.4 °C (2.0 °F to 11.5 °F) between 1990 and 2100.

> On Earth, the major greenhouse gases are water vapour, which causes about 36–70 per cent of the greenhouse effect (not including clouds); CO_2, which causes 9–26 per cent; methane (CH_4), which causes 4–9 per cent; and ozone, which causes 3–7 per cent heating. Some other naturally occurring gases contribute very small fractions of the greenhouse effect; one of these, nitrous oxide (N_2O), is increasing in concentration owing to human activity such as agriculture. The atmospheric concentrations of CO_2 and CH_4 have increased by 31 per cent and 149 per cent respectively above pre-industrial levels since 1750.

The damage caused by atmospheric emissions is enormous. Pollutants released into the air eventually make their way back down to the earth's surface. An increase in global temperatures is expected to trigger major changes such as Climate change, including sea level rise, increased intensity of extreme weather events, and changes in the amount and pattern of precipitation. Other effects include changes in agricultural yields, glacier retreat, species extinctions and increases in the ranges of disease vectors. Economically, atmospheric emissions account for tremendous loss to infrastructure.

The effects of air pollutants on human health may include subtle biochemical and physiological changes. The effects of poor air quality on human health are far reaching, but principally affect the body's respiratory system and the cardiovascular system. Individual reactions to air pollutants depend on the type of pollutant a person is exposed to, the degree of exposure, the individual's health status and genetics.

The impact of air pollution could be local, national or transboundary based on quantum and the ability of the receptor. Local air pollution begins at source of generation. Local air pollution is a major health threat. It ranges in scale from smoke in a house to the photochemical smog that can cover a city. Open fires, kerosene fires, and gas fires can all cause problems if they are not properly ventilated. Carbon monoxide and carbon dioxide etc. come into picture and cause deleterious effects.

Transboundary air pollution is a particular problem for pollutants that are not easily destroyed. These are transboundary pollutants that can be generated in one country and felt in others. These require international actions and collaboration to control their formation and effects. Transboundary air pollutants can survive for periods of days or even years and can be transported hundreds or thousands of kilometers before they affect the air we breathe, or soils, rivers, lakes, and our food. Transboundary air pollutants cause a number of different problems e.g. formation of particles, ground level ozone which are hazardous to health, the formation of acid rain which can damage buildings and sensitive ecosystems, and some that are toxic to human health and the environment.

Nearly all of us are affected by air pollution. The effects of continuous lifelong exposure to low levels of certain pollutants are still unknown. People across the globe now consider air quality as an important issue and governmental agencies increasingly monitor it, while scientists research its effects. Most national governments have signed and ratified the Kyoto Protocol aimed at reducing greenhouse gas emissions.

South Asian Governments have gone a step further and signed the Malé Declaration: An inter-governmental forum on control and prevention of air pollution and its likely transboundary effects. As part of this, countries have identified National Focal Points (NFPs) and

National Implementing Agencies (NIAs). With the help of United Nations Environment Program Regional Resource Center for Asia and the Pacific (UNEP RRC.AP) at AIT Bangkok, its partner the South Asia Cooperative Environment Programme (SACEP) in Colombo, Swedish International Development Cooperation Agency (SIDA) and Stockholm Environment Institute (SEI), baseline studies have been completed in all Malé Declaration countries. Monitoring stations have been set up and capacities for monitoring and analysis have also been built. Concerted efforts in partnership are underway not only with the government but also regional and national levels, consultations are being held with stakeholders, NGOs, experts, etc.

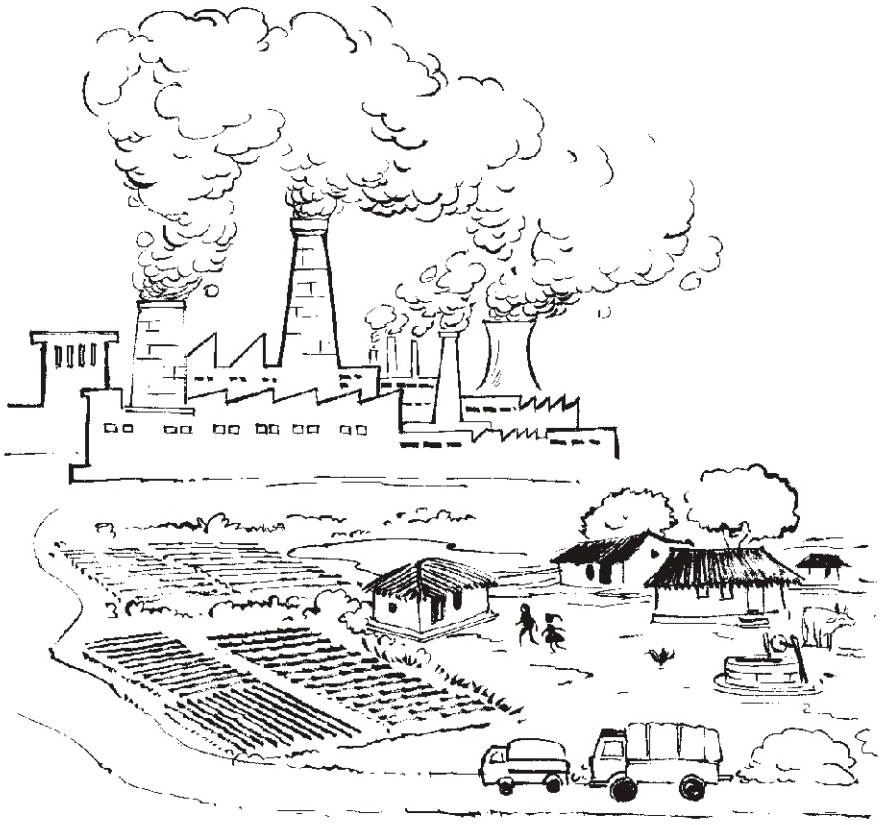
In South Asia, (with support from UNEP) youth organizations have come together and formed South Asia Youth Environment Network (SAYEN). Centre for Environment Education in India hosts the Secretariat for the network. In SAYEN, youth work on issues related to sustainable development. Air pollution is one concern.

Youth can contribute a lot towards Clean Air in several ways. For this, we have to speak out and ask countless questions, the ultimate aim is to find solutions to the questions. The environment has been damaged beyond repair. However, the focus today must be on repairing and preserving what remains.

Youth as individuals can take action for Clean Air by adopting sustainable choices like car pooling, using bicycles or public transport. Collectively they can make informed decisions, and switch to better practices such as green purchasing, use of bio fertilizers and organic farming. Youth can influence NGOs, Government initiatives, City Council members, religious leaders, policy makers, environmentalists, unions, communities, international corporations, and local media. They can join youth parliaments, use Information and Communication Technology, launch e-campaigns and work together for Clean Air for Sustainable Development.

The document '*Youth for Clean Air*' covers the above mentioned aspects. It contains two sections. The first section discusses the sources of air pollution and its impacts, as identified by the young people and their

views on the wide-range of air pollution problems we are facing today. The second section deals with measures for reducing air pollution. Action points have been identified which can help us mitigate this growing menace of air pollution at all levels – as individuals, communities, policy makers and nations at large.



The Sources of Atmospheric Emissions

Atmospheric Emissions is a cross-border socio-economic and environmental menace that South Asians have learnt to endure, as have millions of others in Asia. Atmospheric emissions are caused by various sources that could be either human induced or naturally occurring. Human induced air pollution is caused through a myriad of human activities.

Industries such as mining, refineries, petrochemical industries etc are responsible for emission of large quantities of pollutants. Energy generation, especially through fossil-fuel fired thermal power stations is causing large quantities of emissions, especially carbon dioxide (CO_2), oxides of sulphur (SOx) etc. Land use changes result in displacement of vegetation, resulting in emission of stored CO_2 and this severely undermines the ability of the land to sequester carbon. Agriculture is the lifeline of a large percentage population of South Asia, employing a large percentage of population and sustaining the rural economy. However this sector is responsible for a large percentage of methane emissions, the second largest greenhouse gas (GHG). Ineffective disposal of waste, especially substantial amounts of municipal waste, and open burning cause large amounts of emissions. The transport sector, along with being the third largest emitter of GHGs, releases large amount of other pollutants such as SOx and oxides of nitrogen (NOx), carbon monoxide (CO) etc. Finally, the domestic sector is also contributing significantly to the problem of air pollution. Industrial disasters such as fire, gas leakage and acid spills can occur unexpectedly and contaminate the whole region, and can also cause loss of human life and property.

Industries

The first and the most obvious way in which industries affect the environment is through the emissions caused by them. The most visible are the water, air and soil pollution which affect the well-being of humans,

animals and other living and non-living things. The pollution is caused by the products which are produced during the processes occurring in the industry. Depending upon the type and scale of industry as well as the control measures practiced to curb pollution, there are different levels of pollution caused by different industries.

Thus, industrial sources of air pollution include factories, power generation plants and incinerators. Because these sources exist in fixed locations, they are often referred to as "point sources".

Smoke emanating from chimneys of industries is a common sight in industrial areas. This consists of different gases and particulate matter, which pollute the air and harm biodiversity in the area. Industries also generate large quantities of waste water and produce immense noise pollution, which is harmful to the communities residing in their close proximity. A few examples of industrial units generating air pollutants include boilers, kilns, heaters and furnaces that capture and transfer the thermal energy from a burning fuel, turbines and reciprocating engines.

Industrial estates are large facilities for production of goods, such as automobiles, fertilizers, iron and steel factories etc. For example The golden corridor in Gujarat (a state on the western coast of India) extends from Vapi in the south to Ahmedabad in the north. While this is a golden corridor from the point of view of the industry, it is a dark and dangerous corridor for the people living near the industrial estates. There are over 50 industrial estates in this region, most house over a thousand industries (some being chemical estates) and many are spread over a thousand acres.

Cement manufacturing is the third largest contributor to the man-made carbon dioxide emissions. While energy generation, fossil fuel combustion and deforestation each produce significantly more carbon dioxide (CO_2), industrial manufacturing of cement is responsible for approximately 14% of total worldwide GHG emissions from industrial sources. Industrial processes involve large scale combustion of fossil fuels, resulting in the emissions of naturally occurring and synthetically derived pollutants such as CO_2, NOx, SOx, volatile organic compounds (VOCs) , chloro fluoro carbons (CFCs), hydro chlorofluorocarbons (HCFCs), halons and other substances.

Mining

Mining is the extraction of valuable and useful minerals from the earth. Mining activities produce the majority of the world's precious minerals such as gold, silver, diamonds, industrial minerals such as bauxite, hamatite, copper, limestone and fossil fuels such as coal. Although mining activities are necessary for extraction of essential minerals and fossil fuels, they have an inherent degrading effect on the environment.

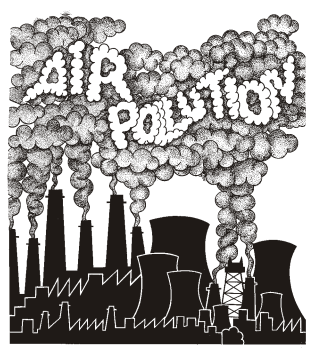
Mining is an inherently polluting activity, and releases large amount of a variety of pollutants. The air pollutants in the mining projects are generally found above the acceptable limits because of the operations that are carried out in the mining clusters, the handling of the material and other transportation activities at the mining site which generate suspended particulate matter and lead to a deterioration in the quality of ambient air at the mining sites.

Coal mining and coal burning contributes to a major share of atmospheric emissions. It emits vast amounts of greenhouse gases when ignited in the presence of air in thermal power stations. Opencast mining is extremely environmentally degrading and causes a high degree of air pollution and greenhouse gas emission. It causes the release of stored methane, a dangerous greenhouse gas. Coal stacked after extraction

contains sulphur, which leaches out through highly acidic and metal-laden drainage during rainfall. The mining processes release approximately 20 toxic chemicals into the atmosphere, ground and water, many of which are contained on the mining site. These include asbestos, mercury, sulphur, cadmium, zinc, selenium, molybdenum, coal dust, etc. There is heavy leaching of Sulphuric Acid. Mining also releases dust and fine particulate matter generated by the pulverization and blasting processes. Large amounts of water are used in mining operations in opencast mines, during while water is turned into water vapour. Water vapour is also considered to be a greenhouse gas as it has an overall warming effect.

Spontaneous combustion is another process wherein coal ignites upon exposure to ambient air, and releases Carbon dioxide, Methane, NOx, SO_2 and other dangerous pollutants. Sometimes, the smoking coal develops into open fires, which could lead to even larger emission of greenhouse gases and other pollutants, and mine accidents. This also releases fly ash and varying quantities of other particulate matter, which are prone to easy transport through winds.

Oil Refineries and Petro Chemical Industries



Oil Refineries and Petro chemical industries also contribute to a major proportion of atmospheric emissions.These often have large industrial establishments and use complicated manufacturing processess involving raw fossil fuels, thus emitting large amounts of atmospheric pollutants. An oil refinery is an industrial plant where crude natural oil (petroleum) extracted from the earth is refined and processed into petrol, diesel, gasoline, kerosene, aviation turbine fuel, lubircating oils, paraffin wax, Naphtha etc. The end products of these processses are petroleum fossil fuels, which are widely used as fuel of choice in transport, aviation and energy generation, and petrochemicals.

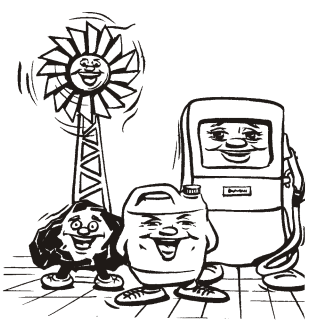
Petrochemicals are also produced in large quantities at oil refineries, as these are chemical products obtained from petroleum. The two basic classes of petrochemicals are olefins and aromatic hydrocarbons. Fossil fuel hydrocarbons, being primarily composed of carbon, emit large amounts of carbon dioxide and other greenhouse gases when ignited.

The end products of oil refineries thus correspondingly cause large amounts of atmopsheric pollution and emission of greenhouse gases.

The process of refining of oils itself adds substantially to the emissions of an oil refinery. The use of a gas flare, an elevated vertical chimney present in oil refineries for burning off unusable waste and flammable gases, emits large quanitities of natural gases into the atmosphere through the large flame. The largest natural gas flaring operations from oil refineries occur in Nigeria, Russia, Iran, USA, Algeria and Venezuela.

Oil refineries and petrochemicals industries release upto 1000 different pollutants from stacks and leaking equipment. The largest pollution is caused by emission of Lead, dust particles called PM10, and gases like sulphur dioxide, nitrogen dioxide, carbon dioxide, methane, dioxins, hydrogen fluoride, benzene ,etc. Crude oil and coal, used as fuel in some refineries, contain high amounts of sulphur. When crude oil is heated in the process of extracting and refining fuels, suphur dioxide is emitted.

Energy

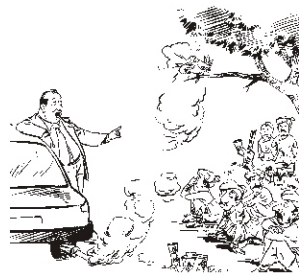


The global economy derives its power from consumption of energy. The cumulative energy consumption worldwide was 916 Terra Watt (TW) in 2004. The majority of the world's energy is generated through combustion of carbon-intensive fossil fuels; mostly through coal-fired thermal power stations. The energy generation sector is responsible for 24% of all GHG emissions globally. Other forms of energy generation are also carbon intensive and are responsible for emission of pollutants, such as CO, NOx, SOx and VOCs. In rural areas, dependency on biomass for energy generation, due to the lack of availability of other conventional alternatives, causes substantial emissions. Flaring of natural gas during exploration and extraction activities in offshore oil fields, leads to emissions.

Fossil Fuels

Electricity is mainly generated from burning of coal in thermal power stations which is an inherently polluting activity. Apart from power generation, there is a common need for energy, currently satisfied by fossil fuels.

The exhaust gases from burning coal and oil contain primarily particulates (including heavy metals, if they are present in significant concentrations in the fuel), sulfur and nitrogen oxides (SOx and NOx), and volatile organic compounds (VOCs). For example, a 500 MW plant using coal with 2.5% sulfur (S), 16% ash, and 30,000 kilojoules per kilogram (kJ/kg) heat content will emit each day 200 metric tons of sulfur dioxide (SO_2), 70 tons of nitrogen dioxide (NO_2), and 500 tons of fly ash if no controls are present. In addition, the plant will generate about 500 tons of solid waste and about 17 gigawatt- hours (GWH) of thermal discharge.



Fuel Adulteration

The unauthorized introduction of foreign substances into motor fuels results in alteration and thus, degradation of the quality of the base transport fuels. Fuel adulteration causes an increased tailpipe emission of hydrocarbons (HC), carbon monoxide (CO), NOx and SOx ,other than particulate matter (PM).

Biomass

Biomass burning releases large amounts of particulates (solid carbon combustion particles) and pollutants. These include gases such as carbon dioxide, carbon monoxide, methane, hydrocarbons, and oxides of nitrogen. Studies suggest that biomass burning has increased on a global scale over the last 100 years, and model results indicate that a hotter Earth resulting from global warming will lead to more frequent fires.

Recent measurements suggest that biomass burning may be a significant global source of methyl bromide, which leads to the chemical destruction of ozone in the upper atmosphere. It is thought that as much as 90% of global biomass burning is human-initiated and that such burning is increasing with time. Hence, biomass burning is an important driver for atmospheric pollution and climate change.

Land Use

Land Use refers to the utilization of available land resources for various human pursuits such as mining, agriculture, industrial development,

housing, waste disposal and irrigation. Rapid urbanization in the last decade has markedly altered the land allocation by resorting to shifting of forest lands into built-up lands. This has resulted in large-scale deforestation and has caused extensive loss of forest cover. This has adversely affected climate and air quality because it undermines the ability of this land to capture the pollutants from the atmosphere. Impacts are increasingly visible on the hydrological cycle, agriculture, the energy budget of earth in the form of irregular rainfall distribution, and the monsoon,resulting in an increase in the frequency of droughts and floods. Large tracts of forest land are consumed by forest fires which may be human induced or naturally occurring. Forest fires emanate gargantuan levels of pollutants every year.

Construction and Demolition

Energy is consumed during construction, demolition and the day-to-day management of buildings for cooling, ventilation and lighting which account for a major share of emissions from housing. Many activities at construction sites can impact air quality, including operation of diesel engines, open burning, land clearing, and demolition. The materials used to build the house itself can cause problems. The pollution levels in a new house can be quite high. Asbestos, a construction material, accumulates in the lungs upon inhalation and creates health hazards. Airborne dust generated from construction activities may be regulated by regional and local rules as dusts contains lead or asbestos.

Lead-based paint has been banned, but many older structures still have this paint on walls, woodwork, siding, windows, and doors. Construction and demolition workers can be exposed to lead contamination during cutting, scraping, sanding, heating, burning, or blasting lead-based paint from building components, metal bridges and metal storage tanks. In addition to this lead-based paint debris or dust can also accumulate in the air as pollutant causing potential hazard.

Deforestation

The major causes of deforestation are increasing rate of urbanization, expansion of shifting agriculture and increasing demand for fuel wood. Forest lands are being converted into permanent arable lands, for

building infrastructure, developing commercial fisheries etc. This conversion in the land use pattern itself results in severe emission of pollutants. As more habitats are destroyed, more species are facing extinctions. Deforestation in watersheds causes erosion, flooding, and siltation. Upstream land loses fertile topsoil,contributing to desertification.

Forests are among the most productive of Earth's natural ecosystems. Mature forests store more carbon (in biomass) than any other kind of ecosystem. This is especially true of old-growth forests, which typically contain large trees and, in temperate regions, a great deal of dead organic matter. Because all of the organic carbon stored in forests was absorbed from the atmosphere as carbon dioxide (CO_2), these ecosystems are clearly important in removing this greenhouse gas from the atmosphere. Conversely, the conversion of forests to any other type of ecosystem, such as agricultural or urbanized lands, results in a large difference in the amount of carbon stored on the site. That difference is made up by a large flux of CO_2 to the atmosphere. In fact, deforestation has been responsible for about one-half of the CO_2 emitted to the atmosphere as a result of human activities since the beginning of the industrial revolution. Soil erosion due to wind can also increase in the amount of particulate matter in the atmosphere.

Agriculture

Agriculture and its associated activities engage a vast population in the South Asia. However, a large amount of agricultural land is being converted for urban use. The changing cropping patterns owing to entry of cash crops is creating food deficit in the sub region.

However agricultural activities contribute to atmospheric emissions as well. Permanently water laden fields such as rice paddies are a constant source of methane emission. Methane is also a highly potent greenhouse gas with a global warming potential twenty five times that of CO_2, the most abundant Greenhouse Gas. Methane is present in abundant quantities in the earth's crust in geological faults and other cavities, and is often released through activities such as coal mining when it occurs in conjunction with coal, in land fills, construction work, natural gas exploration,etc.

Methane is also released from the natural decay and induced fermentation of organic materials such as dead plant and animal material, feedstock and manure. Methane is formed from the anaerobic decay of organic matter at shallow levels, from where it escapes into the atmosphere. Plants are a natural source of methane emission. A variety of wetlands such as bogs, fens, moors, swamps, marshes etc consist of a large quantity of decaying plant and animal material, and hence are a continuous source of methane emission. South Asia, has a large portion of agricultural land dedicated to paddy and other food cultivation across several agro climatic zones, requiring water stagnation, and consequently emits large quantities of methane through agriculture.

Methane emissions are also affected by other factors such as tilling, transplantation time, farm management, availability of water, application of nutrients, strain selection, precipitation and evaporation levels, soil type and humidity etc. Human induced wetlands in agriculture such as rice paddies contribute significantly to air pollution and consequent global warming through the emission of methane.

Agro Chemicals

Chemicals are used in agriculture to control or manage weeds, diseases, insects, rodents, and other pests. They include herbicides, fungicides,

insecticides, rodenticides, and anti-microbials such as bactericides, germicides, and microbicides. Pesticides are used in domestic, commercial and industrial applications worldwide. Large amounts of fertilizers are applied to augment crop efficiency and net yields, resulting in further methane generation and emission. Soil resources are under pressure from a variety of chemicals that have the potential to contaminate the soil, or change the soil properties. These chemicals originate from various municipal, industrial and agricultural operations Fertilizers also use nitric acid or ammonium bicarbonate; the production and application of these results in emissions of nitrogen oxides, nitrous oxide, ammonia and carbon dioxide into the atmosphere.

Cows release 50 million metric tonnes of methane per year

Livestock

Livestock rearing activities also contribute to air pollution, as cattle generate methane gas in their gut through the process of enteric fermentation. According to a 2006 United Nations report, livestock is responsible for close to 5% of the world's greenhouse gas emissions as measured in CO_2 equivalents. A large percentage of forest land is razed to make way for grazing land, and this adds to the pollutant emissions from the growing livestock sector. In addition to CO_2 emissions, livestock produces 65% nitrous oxide (which has 296 times the global warming potential of CO_2) and 37% of human-induced methane.

Waste

Everyday the huge population of South Asia generates gigantic quantities of various kinds of waste with various compositions. Most of these wastes are disposed off in an unregulated way and scattered in municipal dump sites where there is often open burning. These uncontrolled, uncovered wastes when subjected to open burning contribute to air pollution.

Test have shown that areas as far as 1,000 kilometres away are impacted directly by the chemical particulates, metals, dioxins, products of incomplete combustion etc., contained in wastes. These wastes also generate highly toxic and persistent organic pollutants.

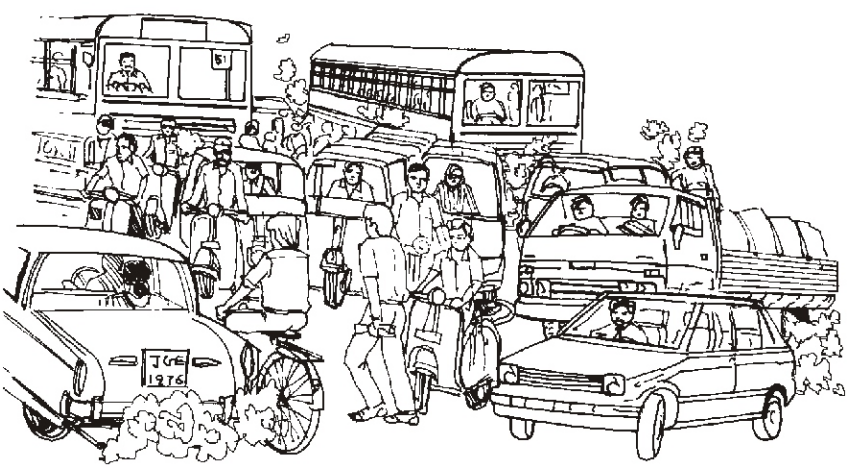
Landfill, also known as a dump or tip, is a site for the disposal of waste materials by burial. These landfills contribute to air pollution through offgassing of methane generated by decaying organic wastes particularly from improperly operated landfills.Dust is generated from vehicles accessing a landfill as well as from working face operations. Landfill gas is about 40-60% methane, with the remainder being mostly carbon dioxide (CO_2). Landfill gas also contains varying amounts of nitrogen, oxygen, water vapour, sulfur and other contaminants — most of which are known as "non-methane organic compounds". Inorganic contaminants like mercury are also known to be present in landfill gas. Sometimes, even radioactive contaminants such as tritium (radioactive hydrogen) have been found in landfill gas.

Incineration is another waste treatment technology that involves the combustion of organic materials and/or substances. Though it is very efficient, it produces significant amounts of dioxin and furan emissions to the atmosphere. Dioxins and furans are considered by many to be serious health hazards. Other gaseous toxins in the flue gas from incinerator furnaces include sulphur dioxide, hydrochloric acid, heavy metals and fine particles.

Transport

In one year, a car can produce four times its own weight of carbon monoxide.

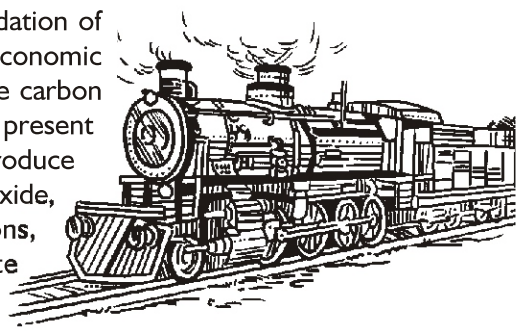
The global economy is based upon the combustion of fossil fuels, such as petrol, diesel and aviation turbine fuel used for driving automobiles.



Transportation represents a key element of the economy and society and is one of the major sources of air pollution. It accounts for 14% of all GHG emissions.

Road and Rail Transport

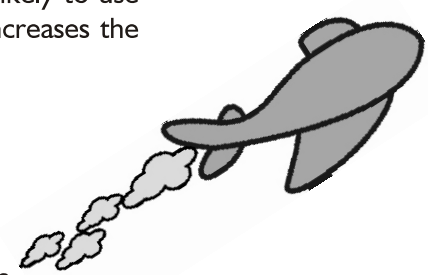
With technological advancement humans have progressed, and along with this there has been a phenomenal increase in the number of vehicles. Road and rail's share of total freight has remained fairly constant over the past decade. Transport is a major user of energy, and transport burns most of the world's petroleum. Hydrocarbon fuels also produce carbon dioxide, and inefficient petroleum-powered engines create air pollution, emitting nitrous oxides and particulates (soot). Transportation can also contribute to the degradation of urban environments, with loss of quality of life and economic productivity. The pollution is caused due to incomplete carbon reactions, unburned hydrocarbons or other elements present in the fuel or air during combustion. These processes produce various pollutants including carbon dioxide, carbon monoxide, soot, various gaseous and liquid vapour hydrocarbons, oxides of sulphur and nitrogen, sulphate and nitrate particulates, and ash.



The factors which can be identified as influencing the amount of emissions attributable to the transport sector include excessive vehicle use. Older vehicles are associated with higher emissions of both global and local pollutants than newer vehicles, both because performance deteriorates as a function of age and because older vehicles are more likely to use obsolete, higher emitting technology. Poor maintenance increases the per kilometre emissions of pollutants.

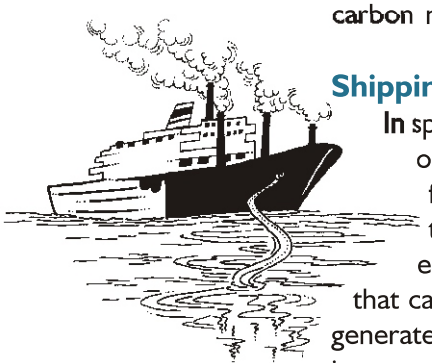
Aviation

There is increasing concern over the environmental impacts arising from pollutants emitted by aircraft engine exhausts. Aviation fuels consist of blends of over a thousand chemicals, primarily hydrocarbons (paraffins, olefins, naphthenes, and aromatics) as well as additives such a. antioxidants and metal deactivators, and impurities. Principal components include n-octane and isooctane. The emissions from these



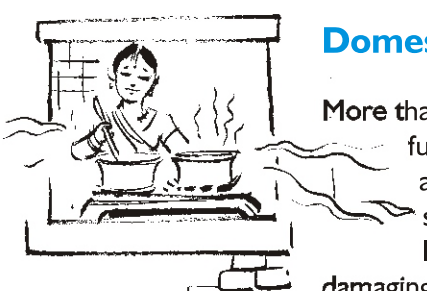
fuels can affect local or regional air quality leading to ozone production or destruction causing climate change.

Kerosene is the main component of aviation fuel which is used to provide propulsion for current commercial aircraft. Like other fossil fuels, kerosene produces carbon dioxide and water vapour as the products of complete combustion. Inefficient combustion of kerosene produces partial oxidation products such as carbon monoxide and oxygenated organic compounds. Depending on the load on the engine and the mixing processes in the combustor, soot can be formed and emitted together with unburnt hydrocarbons. The emission profiles vary with the phase of the flight. Although the sulphur content of the fuel is reduced during the refining process, aviation fuel still contains a small amount of sulphur and this is converted to sulphur oxides during the combustion process. The temperatures reached in the jet engine combustor result in the formation of nitrogen oxides (NOx) through high temperature reactions of the nitrogen and oxygen present in the combustion air. The pollutants of concern from the aviation sector are the emissions of nitrogen oxides, carbon monoxide, hydrocarbons and soot.



Shipping

In spite of overall improvement in marine fuels and engines in terms of air quality, there is a need to further reduce air emissions from marine vessels. Ships are estimated to generate almost thirty per cent of the world's smog-forming nitrogen oxide emissions and nearly ten per cent of sulfur dioxide emissions that cause acid rain and deadly fine particles. One ship entering port generates the air pollution of 350,000 cars in one hour. Shipping trade is expected to triple in the next two decades.



Domestic

More than three billion people worldwide continue to depend on solid fuels, including biomass fuels (wood, dung, agricultural residues) and coal, for their energy needs. Cooking and heating with solid fuels on open fires or traditional stoves results in high levels of air pollution. Indoor smoke contains a range of health-damaging pollutants, such as small particles and carbon monoxide. The

particulate pollution levels may be 20 times higher than accepted guideline values.

Indoor air pollution is contamination of the air inside buildings. In South Asian countries, the most common cause is smoke from open fires or stoves that burn solid fuels, such as coal, wood, dung or crop residues. This smoke contains a range of health-damaging pollutants, in particular fine particles and obnoxious gases.

Every year, indoor air pollution is responsible for the death of 1.6 million people, that is one death every 20 seconds

We spend most of our time indoors surrounded by sources of emissions; consumer products, gas appliances, building materials, cigarettes, and furniture can all contribute to the problem. These pollutants can build up rapidly indoors to levels much higher than those usually found outdoors. This is especially true if large amount of pollutants are released indoors. Moreover, closer construction in newer homes can prevent pollutants from escaping to atmosphere.

Air pollution levels in the domestic setting are often higher than that in the ambience. Exposure to pollutants released due to tobacco smoke and radon occurs almost entirely indoors. The growing use of synthetic materials, modern office equipment (photocopiers, laser printers, and computers), cleaning products, and other household materials also contribute to indoor air contamination. Off-gassing from domestic chemicals and their by-products in the indoor environment can also cause pollution. Other sources of pollutants in the households are burning candles, or improperly maintained or vented combustion devices, such as gas or propane cooking stoves, furnaces, water heaters, wood stoves.

Bukharis: Home Heating Stoves which use wood

A survey carried out for 8,421 households in Thimphu, Bhutan revealed that 3,902 households have installed bukharis and other heating appliances, which use wood and charcoal.

Bukharis are used normally between November and March. Most houses lack proper insulation. Around 50% of heat is lost through ceilings and cracks in door and windows. As a result most of the

heat is lost within a few hours and more firewood needs to be burnt.

More than 96% of the houses in and around Thimphu have electricity connections, of which 60% indicated a willingness to switch over to electrical appliances for heating and cooking.

The burning of firewood causes high levels of pollution during winter mornings

SOURCE: (NEC 1999b).

Impacts of Atmospheric Emissions

Atmospheric Emissions move from a source to a receptor. A receptor is adversely affected by polluted air: a receptor can be people, animals, vegetation, materials, and aquatic life. Atmospheric Emissions is a major environmental concern.

Atmospheric emissions affect our health significantly. We depend on air to breathe. Polluted air impacts our health.Atmospheric Emissions affect vegetation as well and have a direct effect on the crop yield. Wildlife is affected by atmospheric emisions, by breathing it in, by consuming it via food and water or by absorbing it through the skin.

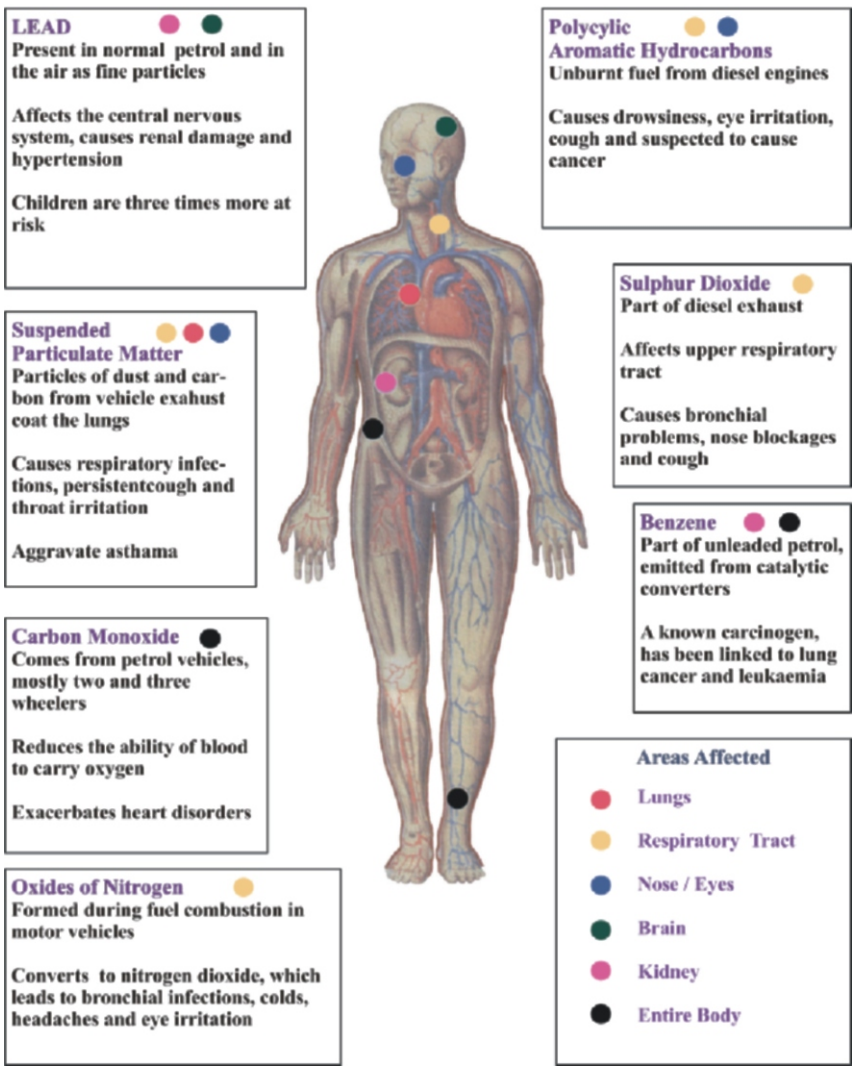
Presence of acidic gases such as Sulphur dioxide and nitrogen oxides causes acid rain. Acid rain affects lakes, trees and other life forms.

Atmospheric Emissions impact economy of a nation. Industries such as tourism, fishing suffers losses due to this. Presence of pollutants in the air damages our infrastructure. Residential and commercial buildings, monuments, and many other physical assets are damaged by presence of pollutants in the air. Atmospheric Emissions can significantly reduce fish stocks which could have a serious implication for both recreational fishing and commercial fishing industry.

Human Health

Atmospheric Emissions can affect our health in many ways with both short-term and long-term effects. Different groups of individuals are affected by the emissions in different ways depending on their age and general health, the type of pollutant and how long they are exposed to pollution. Health problems caused by these emissions range from less serious breathing difficulties, to asthma and even cancer.

How the Poisons in the Air Affect Us



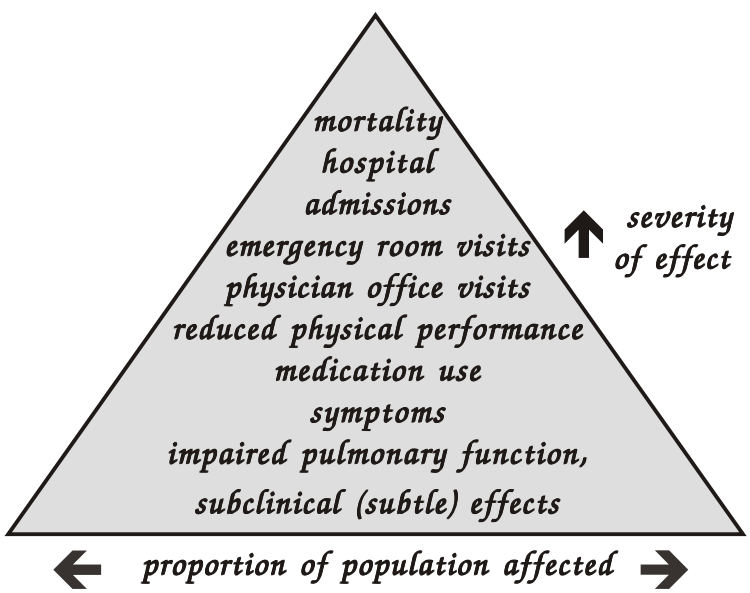
Some individuals are much more sensitive to pollutants than are others. Young children and elderly people often suffer more from the effects of atmospheric emissions. People with health problems such as asthma, heart and lung disease may also suffer more when the air is polluted. The extent to which an individual is harmed by atmospheric emissions.

usually depends on the total exposure to the damaging chemicals, i.e., the duration of exposure and the concentration of the chemicals.

Examples of short-term effects include irritation to the eyes, nose and throat, and upper respiratory infections such as bronchitis and pneumonia. Other symptoms can include headaches, nausea, and allergic reactions. Short-term air pollution can aggravate the medical conditions of individuals with asthma and emphysema.

Long-term health effects can include chronic respiratory disease, lung cancer, heart disease, and even damage to the brain, nerves, liver, or kidneys. Continual exposure to air pollution affects the lungs of growing children and may aggravate or complicate medical conditions in the elderly.

Atmospheric Emissions can affect both the respiratory and cardiac systems. The health effects of air pollution can be seen as a pyramid, with the mildest but not common effects at the bottom of the pyramid, and the least common but more severe at the top of the pyramid.



Children are particularly vulnerable to air pollution- they breathe faster than adults and inhale more air per pound of body weight

The pyramid demonstrates that as severity decreases the number of people affected increases.

Seasonal "holes" in the ozone layer in the atmosphere above Antarctica and the Arctic, is also a result of atmospheric emissions coupled with growing evidence of global ozone depletion. This increases the amount of ultraviolet radiation reaching the earth, which causes damage to the human beings, leading to skin cancer and cataracts.

The following is a list of the major air pollutants and their associated health hazards –

Name of pollutant	**Health impacts**
RSPM	Respiratory illness, including chronic bronchitis and asthma; heart diseases.
SO_2	Heart diseases; respiratory problems including pulmonary emphysema, cancer, eye burning, headache, etc.
NO_2	Lung irritation, viral infection, airway resistance, chest tightness etc.
SPM	Pneumoconiosis, restrictive lung diseases, asthma, cancer, etc.
Benzene	Immunotoxicity, carcinogenicity, asthma, anemia, unconsciousness etc.
Ozone	Impaired lung function, chest pains, coughing, irritation of eyes, nose etc.
CO	CO poisoning cause cherry lips, unconsciousness, death by asphyxiation etc.
Lead	It causes decreased hemoglobin synthesis, anemia, damage the nervous and renal (kidney) systems etc.

Bhopal Gas Tragedy

The Bhopal Gas Tragedy took place in the early hours of December 3, 1984,in the heart of the city of Bhopal in the Indian state of Madhya Pradesh. A Union Carbide subsidiary pesticide

plant released 40 tonnes of methyl isocyanate (MIC) gas, immediately killing nearly 3,000 people and ultimately causing at least 15,000 to 22,000 deaths. Bhopal is frequently cited as one of the world's worst industrial disasters. Over 120,000 people continue to suffer from the effects of the disaster, such as breathing difficulties, cancer, serious birth-defects, blindness, gynaecological complications, and other related problems

Source: http://en.wikipedia.org/wiki/Bhopal_disaster

It is estimated that we are losing 137 plants, animal and insect species every single day due to rainforest deforestation. That adds up to 50,000 species a year.

Animals

There are three ways in which animals can be affected by atmospheric emissions They can breathe in gases or small particles, eat particles in food or water or absorb gases through the skin. Mainly soft-bodied invertebrates, such as earthworms, or animals with thin, moist skin, are affected by absorbing pollution.

Ozone, as well as sulphur dioxide and nitrogen oxides, can affect the breathing of animals. Particulates, given off by diesel-powered cars, buses and lorries, can cause many problems. When the particulates contain heavy metals such as iron (Fe), zinc (Zn), cadmium (Cd) etc., they are especially dangerous, as high levels can build up in the body tissues of animals. Changes in the environment caused by pollution and acid rain also affect the animal health. A change in the acidity of the water that animals live in may cause serious problems for wildlife.

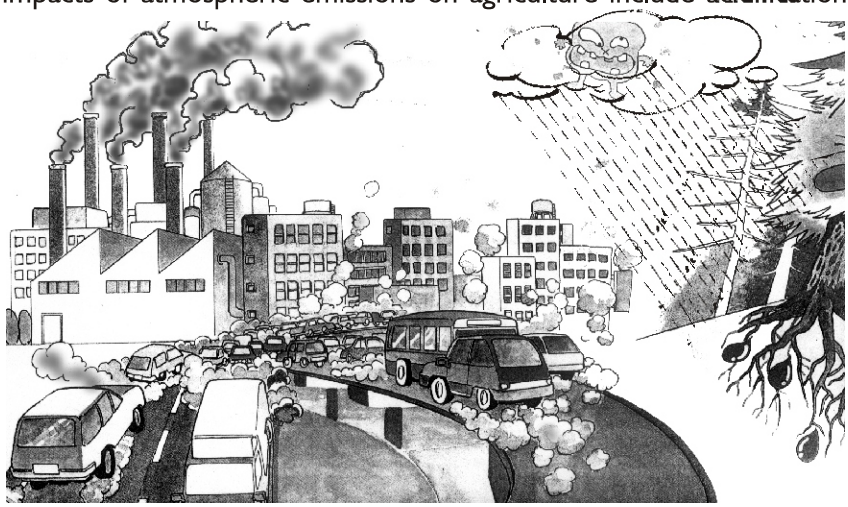
Air toxics pose a serious threat to animal health for three reasons. First, they are poisonous, or may become poisonous after combining with other substances in the food chain. The toxics may cause death, disease, birth defects, genetic mutations and behavioral abnormalities as well as physiological or reproductive harm in organisms or their offspring. Second, the toxins bioaccumulate in the fatty tissue of animals and are difficult or impossible to metabolize or excrete. Even minute amounts may have a major effect on wildlife as the toxics build up to a dangerous level over the lifetime of the animal. Third, these toxics are persistent; they do not break down easily in the environment and may remain intact for decades, or even centuries.

Fluoride deposition on leaf surface impacts grazing animals (mottles their teeth and ultimately causes them to fall out). Other impacts of air pollution on biodiversity include direct impact on fish, amphibians, reptiles, macro-invertebrates, birds, mammals; loss of species and habitat; bleaching of coral reefs and loss of ecosystem productivity.

Vegetation

Increasing levels of pollutants in the air significantly effects the vegetation. Vegetative growth may be inhibited by continuous exposure to 0.5 ppm (parts per millions) of NO_2. Levels of NO_2 more than 2.5 ppm for periods of four hours or more, causes a condition called necrosis, spotting of the leaf surface due to loss of protoplasm. Sulphur dioxide also causes necrosis at much lower levels of 0.3 ppm for eight hours. Chlorosis commonly known as bleaching occurs from the long-term exposure to lower levels of sulphur dioxide. This results in less growth and smaller fruits.

Atmospheric Emissions cause reduction in the crop growth and yield, the productivity gets hampered and thus, has a significant detrimental effect on the economic viability. It is thus a cause of serious concern. Trees lose their leaves in the presence of excess air pollutants, their growth is affected and it also causes leaf damage. Other perceived impacts of atmospheric emissions on agriculture include acidification



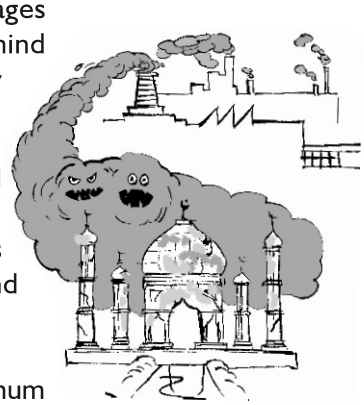
of soil and water sources, change in soil moisture levels, crop selection and productivity, loss of soil fertility, bleaching of leaves by deposition of soot, along with the stunting and failure of crops.

Atmospheric Emissions have a direct impact on soil. Soil gets acidified when the addition of acid forming compounds in air such as sulphur and nitrogen exceeds the buffering capacity of soils. Changes to the chemical and physical properties of the soils can have negative effects on vegetative growth, and soil health. As soils become more acidic, their ability to retain many essential nutrients, minerals and elements, such as calcium (Ca), magnesium (Mg) and potassium (K), decreases. As a result, these nutrients, minerals and elements are transported, or leached, by water that flows through the soil, making them less available for the plants to use.

Infrastructure

Increasing level of pollutants in the air affects our infrastructure. Residential and commercial buildings, monuments, and many other physical assets are damaged by poor air quality. Repairing this damage accounts for a large sum of money that could be invested more productively elsewhere.

Acid rain accelerates the corrosion of materials such as limestone, sandstone, mortar and many metals, causing serious problems for older buildings, outdoor sculptures and monuments. Acid rain damages stonework because it dissolves calcium carbonate, leaving behind crystals in the rock when it evaporates. As the crystals grow they break apart the stone.



These damages are a major problem for national monuments and historical structures, which can be very costly to repair or protect. Different National Centers for the Preservation of these monuments are developing innovative conservation methods to restore and protect historical structures and cultural monuments.

Presence of acidic gases in the air dissolves paint and corrodes aluminum siding, accelerating the need for repairs and repainting, affecting the

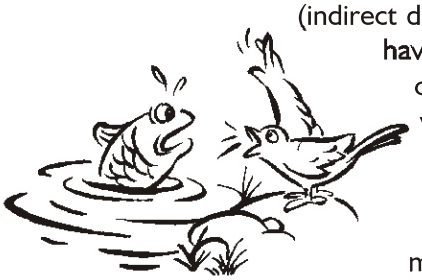
The Gangotri glacier has been receding at an alarming rate. In the last 13 years, the glacial channel feeding the Ganges river has shifted 20 metres. A time may come when Ganges may just disappear.

aesthetic appearance of houses. Dirt particles in the air also make buildings dirty.

Water Resources

Atmospheric Emissions can have a substantial impact on the water bodies. The air pollutants deposit onto the water bodies, sometimes at great distances from the source, and become an important contributor to declining water quality. Pollutants in water bodies that may originate in part from atmospheric sources include nitrogen compounds, sulfur compounds, mercury, pesticides, and other toxic substances.

Biomagnification, also known as bioamplification, is the increase in concentration of a substance, such as the pesticide DDT, that occurs in a food chain. Airborne pollutants can fall to the ground in precipitation, in dust, or simply due to gravity. This is called "atmospheric deposition" or "air deposition." Pollutants deposited from the air can reach water bodies and get biologically magnified in two ways. They can either be deposited directly onto the surface of the water (direct deposition) or be deposited onto land and be carried to water bodies through run off (indirect deposition). Once these pollutants are in the water, they can have undesirable health and environmental impacts, such as contaminated fish, harmful algal blooms, and unsafe drinking water.



Rivers, lakes or coastal areas are polluted because of acid precipitation from rain, snow and particulate matter. They may be indirectly harmed when nutrients, elements and heavy metals such as aluminium (Al), iron (Fe), cadmium (Cd), mercury (Hg) etc. leach from soils and get suspended within the water column. Lakes affected by acid precipitation are often clear because vegetation and aquatic wildlife cannot withstand a lower pH.

The global sea level has risen between 10 to 25 cms over the last century.

Thus the impacts of atmospheric emissions can be felt on all the spheres including human health, plants and animals, agriculture and infrastructure. It's high time that we prevent atmospheric emissions for "Happy Living".

Section B

Reduction Measures of Atmospheric Emissions

Atmospheric Emissions lead to climate change, smog, acid rain and ozone depletion and thus, pose a serious threat to the environment and our health. Diseases such as asthma, bronchitis, emphysema, and other respiratory diseases resulting from such emissions may even cause death. Also there are a host of other health problems linked to atmospheric emissions.

Prevention is the key to controlling atmospheric emissions. Regulatory agencies can play an essential role in reducing and preventing atmospheric emissions in the environment. Efforts to reduce pollution may range from individuals or group of individuals taking appropriate actions to making policy level changes at the global level. Not only scientists, business leaders and legislators, the concerted efforts of each individual can also help reduce the amount of atmospheric emissions on the planet. This challenge must be met by all of us in order to assure that a healthy environment will exist for ourselves and our children.

Individual Efforts to Reduce Atmospheric Emissions

Increasing atmospheric emissions is a major global issue impacting our health, communities and environment. It is imperative that we address these concerns, before it is too late. Each of us can take action on this, and remember, no matter how small these steps may seem, it all adds up to cleaner air.

People travelling by car can be exposed to higher levels of pollution than pedestrians or cyclists

We can all reduce our energy consumption, which in turn will reduce emissions that lead to air pollution.
This can be done through:

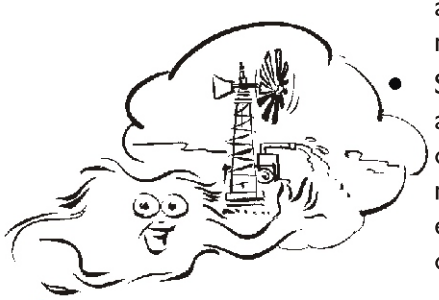
- Installing energy-efficient appliances and devices in our homes, like pressure cookers, smokeless chulhas.
- Making sure that lights and appliances are turned off when not in use.
- Using renewable technologies such as solar cookers, geysers, calculators.
- Adopting clean fuel technologies such as electric, hybrid or biofuel cars.
- Walking or cycling, instead of driving to nearby places.
- Forming carpool with others at work or in the neighborhood
- Taking public transportation as an alternative to using personal vehicles.
- Insisting on buying low energy florescent lights – bulbs which are economical.
- Insisting on buying an air conditioner or a heater that has a programmable thermostat.

Changes in Lifestyle

- Insist on turning on the fan rather than the air-conditioning.
- Insist on buying eco-friendly building materials and non-toxic paints.

- Prevent the use of oil-based paint and solvents.
- Select products that are water-based or have low amounts of volatile organic compounds (VOCs).
- While getting a paint job done, paint with a brush, not a sprayer, and store the solvents in air-tight containers.
- Eat organic "unprocessed" vegetables and fruits, locally grown foods or less pesticide-dependant foods.
- Adopt a calmer style of driving, by driving slower, more smoothly and avoid revving the engine unnecessarily.
- Maintain your vehicles; keep the engine properly tuned and the tyres at the right pressure to improve fuel efficiency.
- Add a catalytic converter to your cars and use an energy-conserving grade of motor oil.
- Reduce, Reuse, Recycle — less consumption of products will reduce air pollution.
- Choose products with recyclable packaging.
- Print and photocopy on both sides of paper.
- Defer lawn and gardening chores that use petrol/diesel-equipment.
- Limit dry cleaning.
- Properly dispose of household paints, solvents and pesticides.
- Wear fabrics and clothes appropriate to the climate, such as cotton clothing in summer.

Campaign

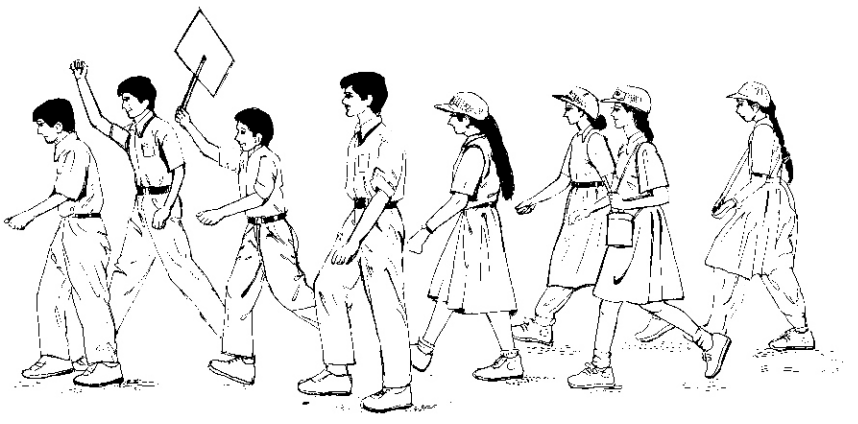


- Undertake campaigns in your community by lobbying local authorities, by making phone calls or writing letters to promote measures like air quality monitoring and appropriate actions.
- Start an energy conservation programme in your neighbourhood and create awareness among the residents by asking them to calculate the utility bill of energy in their households, and review measures to reduce the same. The households with the lowest electricity bill could be awarded with certificates. This certificate could be given on an annual basis.

Get involved in local efforts to reduce atmospheric emissions

- As an individual or as a representative of a concerned group, speak up at hearings and let our local public officials know how we feel about air pollution problems in our community.
- Learn about local efforts and issues by talking to the local agencies and finding out what they are doing in our area.
- Work with a local group or join a community group that is working to improve air quality
- When we see an air pollution problem, we must take the responsibility to inform our local agency and assist them to take immediate appropriate action.

If we all do our share to reduce atmospheric emissions, the benefits will be tremendous.



Collective Efforts to Fight Against Atmospheric Emissions

To achieve clean air the world needs everyone: Young people like you and me, NGOs, Governments, religious leaders, environmentalists, unions, communities, international corporations, and others to curb the menace of atmospheric emissions

The world needs us, our friends in order not to see another person dying because of polluted air. We can take actions and wherever we feel we have no control; we can influence the party that has the control.

Collectively we can do a lot :

Work with Government:

- . Influence government to have policies to prevent atmospheric emissions.
- Join with an existing organization or start a new group and undertake activities that would influence the government to put in place appropriate policies, and their implementation.
- Collect more information from different websites, and give our inputs to the government for pollution-free air.
- Assist the government,through poster campaigns,for closure of polluting industries and to stop manufacturing of polluting vehicles.
- Request assistance from the government in form of information, financial and legal, for creating awareness towards a pollution free environment.
- Assist the government in preventing emissions by implementing the rules related to the air pollution issue
- Invite government to interact with youth action groups for their support in preventing air pollution.

- Promote literature and/ or initiate programmes on actions undertaken by government, or questioning the government regarding the actions implemented.
- Inform relevant officers and public if you detect any air pollution related issue.
- Launch e-campaigns that advocate for policy change, send out emails that encourage people to adopt greener technologies.
- Organize workshops, chaired by the politicians so as to involve them in programmes related to air pollution.
- Take up sick projects - those left unfinished by the government bodies and implement the same
- Take up the responsibility of reaching out to areas where the government has not yet reached and thus try and ensure that awareness programmes is conducted in the whole country.

A good example of working with government is the case of Kathmandu. The two-stroke engine three-wheelers, numbering approximately 2600, were the main cause of pollution in Kathmandu. "Non Government Organisations and the media worked together to build public opinion against the smoke spewing from these vehicles. They also pressurized the government to take action on this issue. Most of the three wheelers were more than ten years old and had lived out their economic lives," says Programme Officer, Environment Nepal, Anil Raut. The Government of Nepal eventually put a ban on two-stroke three wheelers in Kathmandu, aimed at completely phasing out the existing ones by July 2004. The Government gave incentives to the three-wheeler owners by allowing them to import mini buses, giving them customs waivers, and allowing the auto rickshaws to ply outside Kathmandu.

More and more major Asian cities including Bangkok, Manila, Jakarta, Dhaka, and Kathmandu are discouraging the registration of two-stroke engine vehicles.

(Source: www.moest.gov.np)

Initiate more actions through

City Administration/ Municipal bodies

- Gather our friends on free days/ holidays and talk about what efforts the city administration can undertake so as to reduce air pollution and plan for the same.
- Come out as an organization working with the city administration on air pollution related issues.
- Go to city administration representatives and discuss the current issues with regard to air pollution.
- Elect a representative who can represent the youth voice.
- Support the administration as volunteers.
- Arrange awareness programmes and poster campaigns through peer groups with support from city administration on clean air.
- Arrange garbage recycling programs in our neighbourhood through city administration and share information with regards to proper disposal of waste.
- Propose changes/alternatives in city administration such as efficient mass transport system, cycling tracks, etc. for preventing air pollution
- Release hand outs and booklets about air pollution and the responsibility of each of the stakeholders in preventing pollution.

Work with the School board members

If the students are motivated from a very young age, from their school days, they would grow up to be responsible citizens of tomorrow. We as youth can orient/ capacity build large numbers of students in private and the government schools for undertaking actions to prevent air pollution.

We Can:

- Organize exhibitions and group discussions related to air pollution in the schools.
- Encourage students to get involved with the eco clubs, wherein they can organize campaigns and workshops on clean air.

- Organize quiz in the school relating to the air pollution issues.
- . The students can be motivated to share knowledge regarding air pollution with their friends, parents and relatives at home. S lowly but gradually, from schools to societies to city to the country, people can be made conscious about the hazards of air pollution and motivated to adopt more sustainable life patterns.
- Through the platform of school authorities, we can reach out to school students - future youth leaders and help them undertake actions related to the issue of air pollution
- Make the students in the school understand the precautionary measures to fight against air pollution through films, street plays, dramas and mime.
- Encourage the school authority to make students participate in the programmes conducted by government authority to prevent air pollution.

CLEAN-India Helps Manage Waste Better

The members of CLEAN programme are made aware of the glaring (but overlooked) problem of waste in our cities. Activities and film shows have made students aware of the solid waste problem in urban areas and their role in reducing it. Issues like the ill effects of polybags, littering on our streets, excessive consumerism are all discussed and deliberated with student groups. Clean-up drives in local parks and markets are organized in which students very enthusiastically help in cleaning up, and drive home the message that adults should not indulge in littering.

Many CLEAN-India schools that have their own canteens and gardens have adopted this project. Hands-on-experience in vermicomposting shows students effective ways of taking care of biodegradable waste. The project not only solves the problem of solid waste to an extent and gives rich compost in return, it also helps students realize the importance of small creatures like earthworms and helps them shed their fear. In the process it brings alive the concepts learnt in class about decomposition in nature and the role of earthworms. In many schools, the compost

produced is also sold to the parents. Few schools like Shri Ram and Joseph and Mary in Delhi are now providing earthworms and helping people of nearby villages to initiate their own vermicomposting units.

(Source: www.cleanindia.org)

Reach out to other youth and the general community

- Join youth networks like SAYEN, Oxfam International Youth Parliament (OIYP), Earth Charter Youth Initiative (ECYI) or World Bank Youth Programme by visiting their websites and share your views.
- Communicate your opinion concerning an issue by sharing at youth meetings or gatherings.
- Talk about ideas concerning issues in your locality with other youth and discuss ideas for organizing programmes like conferences, seminars and talks (formal or informal).
- Wear t-shirts with messages that can bring awareness about atmospheric emissions.
- Undertake actions that reduce air pollution such as sharing of vehicles/ resources and proper planning of daily activities so as to reduce usage.

Local Media

- Request local media to print articles/ broadcast films and programmes on air pollution. These could highlight the local issues or success stories.
- Whenever there are awareness programmes in the media, participate in the programmes and share your views.

Nepal: Asia's first community radio station offers clean up hope

In a sub-continent where governments have long kept a stranglehold on radio, community radio could have an extensive impact. Radio Sagarmatha is an exciting development from Nepal. Radio Sagarmatha launched an initiative called Safa Radio:The Clean Air Campaign in early January 1999.

Radio Sagarmatha, licensed in 1997, is South Asia's first independent community-based broadcaster. On the airwaves, Radio Sagarmatha presents a daily mix of music and spoken word programming, a package of information, entertainment and education.

Air pollution in the Kathmandu Valley was becoming worse and worse day by day. Sooty toxic smoke spews from exhaust pipes of a mind-boggling array of vehicles racing around the capital's streets.

Five days a week, Radio Safas DANIDA-financed safa (meaning clean) tempo - a van-sized three-wheeled electric vehicle that carries a half dozen or more people - measured the level of air pollutants at different points in the city.

Results were analysed in a lab, then explained the same day during the stations evening community news bulletin, Haalchaal. Some 30 locations were monitored on a rotating basis. Following five days of readings and broadcasts, the cumulative results were discussed on-the-air. Monthly results were presented to the media and the public in a press conference.

Playing on the pun, Sagarmatha's supporters say this radio station sitting atop the Himalayan country represents a "himalayan opportunity for public interest communications and development in the subcontinent".

(Source: www.radiosagarmatha.org)

Government Level Efforts to Reduce Atmospheric Emissions in South Asia

Government plays a major role in the prevention, control or abatement of air pollution, and the improvement of the quality of air, through making legislation, imposing taxes, levies, pollution fines, and carrying out certifications. The government bodies and departments plan and execute nation-wide programmes for the prevention, control or abatement of air pollution,and provide technical assistance and guidance, carry out and sponsor investigations and research relating to problems of atmospheric emissions.

Bangladesh

Atmospheric Emissions is one of the major problems in Bangladesh. People in cities like Dhaka, Chittagong and Khulna are facing serious health concerns due to increasing atmospheric emissions such as particulate matter (PM_{10} and $PM_{2.5}$) sulfur dioxides (SO_2), oxides of nitrogen (NOx), ozone (O_3) and carbon monoxide (CO). In Dhaka city, a huge fleet to motorized vehicles such as buses, minibuses, trucks, cars, jeeps, microbuses, three-wheeler and motorcycles emit toxic substances, contributing to the atmospheric emissions. As a response to the automobile pollution in 2002, the Government of Bangladesh has undertaken initiatives such as restricting the movement of vehicles more than 20 years old, imposing a total ban on two stroke three-wheelers, introducing environmentally friendly transport systems such as Compressed Natural Gas (CNG) -fueled four-stroke three-wheelers, double decker buses, and proper traffic management. The introduction to CNG-driven air-conditioned city bus service is an outcome of this initiative. Also, the Government of Bangladesh executed a landmark decision to provide only lead free gasoline, to address the major health hazard from lead emissions.

Response

Legal

The current vehicle emissions standards for Bangladesh were stipulated in the Environmental Conservation Rules 1997. The standards included in those rules were reviewed and new Vehicular Emission Standards for both in-use and new imported vehicles were gazetted in September 2005 by the government of Bangladesh.

- Promotion of CNG Vehicles: One of the major components of the Urban Transport and Environment Improvement Study (UTEIS) action plan was the abatement of 3-wheeler vehicular emissions by introducing new CNG fueled 4-stroke 3-wheelers.
- A number of CNG filling stations were opened in Dhaka and both public and private sector transport vehicles run by gasoline and diesel fuel, are being now converted to CNG.
- Standards for Stationary Point sources: The 1992 Brick Burning Control Act was introduced to mitigate emissions from brick kilns and fields. The Act is one of the primary pieces of legislation aimed at controlling stationary sources of emission in the country. The Environmental Conservation Rules stipulated the standards for gaseous discharge from industries under this rule, chimney height or the brick kilns should be 37m.
- Control of slow moving vehicles in the road: Government has imposed a ban on plying of rickshaws from few roads of Dhaka city. This has improved traffic movement and air quality situation in the city.
- Mass transport: To reduce air pollution in Dhaka, government has also introduced double-decker buses on some roads. Mass transport needs to be expanded as per the need of the country.

Financial

Financial support has been given to transport section for buying CNG buses in order to improve mass transport. Financial support has also been provided to set up CNG stations in various locations of the Dhaka city.

Potential Future Response

- Expansion of mass transport system should be given topmost priority
- CNG stations in all major cities should be set up, where natural gas is available.
- Road network needs to be increased, to avoid traffic congestion in Dhaka and other major cities.
- Flyovers should be constructed to ease traffic congestion.
- Keeping building construction materials in covered place.
- Environment Management System (EMS) should be introduced in all industries for emission control.
- Regular monitoring of ambient air quality and release of information for public awareness.
- More Monitoring Stations are required to set up in the country.
- Awareness raising on air pollution and role of individual should be emphasized

Bhutan

While atmospheric emissions is not currently a major issue in Bhutan, it is emerging as an important environmental concern due to rapid urbanization, growth in the industrial sector, increase in number of vehicles and continued dependence on wood-based fuels for energy during winter seasons. The Royal Government of Bhutan has started taking initiatives to address air pollution with the start of an air pollution programme since early 2000.

Response

Legal

1996	Banned import of second-hand vehicles and two stroke two-wheelers
1999	Developed road safety and transport regulations which included emissions requirements for all vehicles registered in Bhutan

2000 Enacted the Environmental Assessment Act, which requires all development projects (including industries) in Bhutan to seek environmental clearance, and allows the National Environment Commission (NEC) and its competent authorities to conduct compliance monitoring

2002 Required EURO1 type approval standards for all new imported light duty vehicles

2003 Established in-use vehicle emission standards and an emission testing programme

2004 Developed interim Industrial Discharge Standards

2004 Adopted the Regulation for Environmental Clearance of Project

2006 Contracted a vehicle testing programme to two private companies, each with testing locations in Thimphu and Phuentsholing

Financial

2002 Reduced import taxes on vehicles spare parts, and in particular parts relevant to vehicle emissions such as air filters, oil filters and fuel filters

2002 Reduced import taxes on imports of electrical rice cookers and water boilers

Since 1998 Explored resources for adoption of cleaner technologies and implementation of environmental management practices

Technological

2000 Started importing unleaded petrol.

2003 Started importing ultra low sulfur diesel fuel (0,025% sulfur content)

Potential Future Response

Understanding the Science

1. Strengthen existing monitoring systems, including infrastructure and human resources, as well as the "Pollution Watch" public reporting system.

2. Expand the existing monitoring network by establishing monitoring stations in highly populated regions and industrial areas.
3. Enhance capacity to conduct bio-monitoring and impacts on health assessment.
4. Integrate the monitoring database into the Environmental Information Management System.
5. Enhance capacity to conduct air pollution modeling in order to analyze national air pollution movements and provide pollution forecasts.

Mitigation and Prevention

1. Carry out awareness programmes to educate the general public and policy makers on air pollution issues.
2. Enhance the capacity of relevant agencies to ensure effective implementation of prescribed emission standards by the Government.
3. Promote eco-friendly technology in transportation, energy and industrial sector through subsidies provided by the Government.
4. Ensure that industries carry out environmental performance reporting, so that considerations for the environment are incorporated into company plans and policies.
5. Formulate and enact a Clean Air Act and other supporting legal instruments.

India

Atmospheric emissions due to transport and industrial sector have caused air quality deterioration in the country. In order to arrest this concern, Government of India has enacted Air (Prevention and Control of Pollution) Act in 1981. The responsibility has been further emphasized under Environment (Prevention) Act, 1986. Therefore, Central Pollution Control Board started National Air Quality Monitoring Programme (NAMP) in 1984. The number of operating monitoring stations under NAMP has increased, steadily, to 339 by 2007 covering various cities and towns in the country.

Response

Vehicular Pollution Control

- Auto fuel policy: Better technology and Improved Fuel Quality Bharat Stage-II- throughout the country:
- Bharat Stage-III in 11 cities
- Fuel Quality Standard: Fuel Quality specifications notified Gasoline Lead Phase Out: Entire Country
- Diesel Sulphur Reduction: (0.035% S in major cities)
- Gasoline Benzene Reduction: (1%- major cities)
- Lubricants quality: Improved
- Use of Pre-mix 2T oil dispenser: To avoid use of low quality
- Alternate Fuels: CNG, LPG, Ethanol blending in gasoline
- Restriction of Grossly Polluting Vehicles: Better Traffic Management, Flyovers, Count Down Timer, Public Transport System (MRTS)

Industrial Pollution Control

Emission Standards: Notified for major industrial sectors;regularly upgraded; inclusion of HAPs; bubble limits. Environmental Impact Assessment; also involves public consultations for development projects. Corporate responsibility for Environmental protection (CREP); Voluntary initiative for improvement beyond regulatory requirements in respect of 17 highly polluting industrial sectors; Small Scale Industries; Demonstration plant/pollution prevention technology set-up.

Other steps

- Non-attainment areas: Action plan formulation & implementation in 16 cities and 24 critically polluted areas. Fly ash utilization: enhanced from 2 to 45 million tons per annum during 2006-07. Present generation of flyash is about 112 million tons.
- Environmental audit: mandatory for all polluting industries.
- Clean coal initiatives: Power plants (coal based) located beyond 1000 km from the pit-head & in sensitive areas required to use low-ash content coal (not exceeding 34%) with effect from 1.6.2002

- Remote monitoring of industrial emissions: Pilot system for online data transmission od industry to Central Server of CPCB for better enforcement.
- Revision of National Ambient Air Quality Standards Development of Emission factors for vehicles development of emission profiles for vehicular and non-vehicular sources.

Potential Future Response

- Continuing ongoing monitoring at Sunderban (West Bengal), data to be made available on CPCB website.
- Urban Impact Assessment (SA studies) in a few cities – based on the results of six cities.
- More epidemiological studies to be taken up.
- Corrosion study to continue.
- Realtime data transmission from Continuous Ambient Air Quality Monitoring (CAAQM) Stations of other major cities to website.
- Strengthening of National Air Quality Monitoring Programme (NAQMP) with increased number of stations and parameters
- Linkage of related resource websites.

Iran

Atmospheric Emissions pose a serious threat to human health, particularly as the causal factor in higher prevalence of respiratory disease. Emission rates in Teheran and some other large cities in Iran such as Ahvaz, Arak, Esfahan, Mashad, Shiraz and Tabriz, normally exceed the standards set by the World Health Organization and the World Bank. To address this concern, the Islamic Consultative Assembly, on 24th April, 1995, presented an important aspect of Law on Air Pollution Abatement, where not only permissible emission limits from stationary source (Emission Standard for Industrial Working Places and Factories) are set, but also limits for outdoor air pollution (Ambient Air Standard), and the energy consumption and noise pollution are included.

Response

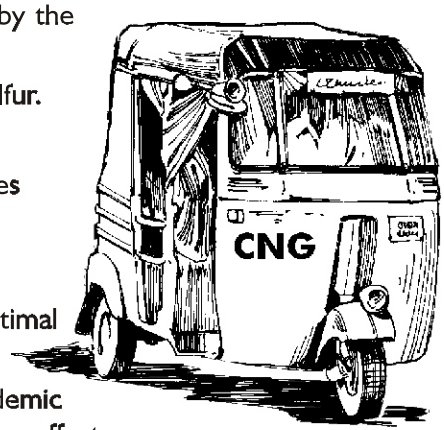
Legal

Item 20 of Section 55 of the Municipality Law of 1955 was among the first regulations adopted and put into effect concerning environment issues, which included aspects to deal with air pollution and reduction of pollution from the industrial sources. The preservation of the environment in which the present as well as the future generations have a right to flourish, is regarded a public duty in Iran. Economic and other activities that inevitably involve polluting the environment or cause irreparable damage to it are therefore forbidden. Since 1974 several regulations and laws have been enacted to ensure environmental conservation. One of the most important of these is air pollution prevention. This regulation consisted of the following parts:

1. definition of pollution and pollutant classification
2. regulations related to motor vehicles
3. regulations related to factories
4. regulations related to commercial, household and miscellaneous sources

Technological

- Establishment of 44 new air pollution stations by the Department of Environment (DoE).
- Establishment of on-line monitoring for industries by the Ministry of Industry.
- Improvement of fuel quality, especially reducing sulfur.
- Expansion of CNG fuel stations.
- Increased inspection and maintenance in all the cities
- Improved public transportation in the city.
- Phase out of old vehicles.
- Encouragment of economic analysis to arrive at optimal results.
- Engaging key stakeholders, such as industries, academic institution, NGO, communities and media etc, in the effort and activities.



- Take up the aforesaid programme and training programme which involves the transfer of financial resources and technology and work towards securing incremental assistance from bilateral and multilateral sources.

Potential Future Response

- Continue regional and national cooperation for capacity building in all aspects of trans-boundary air pollution.
- Monitoring capacity be strengthened

Maldives

Air quality in the Maldives is generally considered to be good. Since the islands of the Maldives are small, the sea breezes flush the air masses over the islands. However, during the latter part of the last decade it was observed that transboundary air pollution is affecting the air quality of the Maldives during the northeast monsoon season. Urban air pollution is a growing concern in the capital, Malé, and indoor air pollution is also an aspect which should be explored further in congested houses. Addressing this concern, two air pollution monitoring stations have been established under the Atmospheric Brown Cloud (ABC) project, initiated by the Centre for Clouds, Chemistry and Climate and UNEP, in collaboration with the Government of Maldives, to monitor long-range transport of pollutants from Asia to the Indian Ocean. These sites are located in Hanimaadhoo and Gan. Apart from these efforts, one additional monitoring station has been established at Hanimaadhoo under the Malé Declaration in order to collect transboundary air pollution data.

Response

Legal

In 1999, the Government of Maldives formulated the Second National Environment Action Plan in order to address the environmental planning and management needs of the country. The Second National Environment Action Plan states that air pollution by dust, smoke and fumes from motor vehicles are reaching levels of concern in the capital city, Malé. This plan called for assessing environmental and health

impacts due to land transportation in Malé and enforced measures to ensure that pollution from exhaust gases and cement dust do not reach critical levels. In order to reduce the need for motor vehicles in new growth centres, this plan prioritized the development and implementation of strategies which favour public transport by providing safe and appealing bicycle paths and footpaths.

As a means of reducing emissions from vehicles, several steps were taken by the Government of Maldives. To improve the air quality in Malé, in December 2000, the Government banned the import of reconditioned motorcycles which have an engine capacity of less than 150 cubic meters. Similarly, a ban was introduced on the import of cars more than 5 years old.

The MEEW established and implemented regulations several years ago, stating that any new project starting in the country should undertake a full Environmental Impact Assessment (EIA). The Ministry of Transport and Communication (MoTC) has implemented a regulation which states the all the vehicles driving on the roads of the Maldives should have a road-worthiness certificate to reduce the emission rate of vehicles used in the country.

Financial

The MEEW charges a fine from any party starting a project without a detailed EIA, and halts project work until the EIA is completed. The MoTC monitors whether vehicles on the road have a road-worthiness certificate. For vehicles without certification, compensation is charged.

Technology

Recently a pilot project was started by the MEEW to introduce renewable energy as an alternative source of electricity generation to households.

Potential Future Response

- Continue capacity building programmes, including providing graduate or higher-level education on atmospheric chemistry to four staff members of the National Implementing Agency and the National Focal Points.

- Establish an early warning mechanism for transboundary air pollution at the national and regional levels.
- Build capacity to conduct studies on crop impact assessments.
- Place high priority on conducting health impact assessments.
- Conduct public awareness programmes on air pollution.

Nepal

Atmospheric Emissions are 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 urbanization, Valley-centric industrialization and significant increase of vehicular transport in narrow streets. Indoor air pollution in the rural households is a major concern as households consume traditional sources of energy such as firewood, animal dung and litter. In 2002, the then Ministry of Population and Environment HMG/MOPE (now Ministry of Environment Science and Technology (GoN/MOEST)) and DANIDA Environmental Sector Programme Support (ESPS) implemented a long-term air quality monitoring programme in Kathmandu valley and six monitoring stations were placed strategically in the valley.

Response

Legal

1991	Ban on 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 subsides

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 years 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)

Potential Future Response

- Monitoring stations should be increased to have a nation wide spatial data base for various air pollution studies, planning and mitigation measures.
- Road condition should be improved in terms of: black topping, walking lanes, cycling lanes, etc.
- 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 rule for phasing out of 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 general public.

Pakistan

Over the last few years, Pakistan has made rapid strides in economic development. Rapid urbanization, growth in the number of vehicles and levels of industrialization have all inevitably led to greater energy demands, which are reflected in increasing atmospheric emissions. Fossil fuels are the ultimate source of the energy in Pakistan, either directly or via conversion to electrical energy, Suspended Particulate Matter (TSP, PM_{10}, $PM_{2.5}$) in ambient air is the primary issue of concern for Pakistan. The Government has established Environmental Protection Agencies and taken several steps such as phasing out the two-stroke auto rickshaws and introducing CNG buses for mass transit.

Response

Legal

1983	Enactment of Pakistan Environmental Protection Ordinance
	Establishment of the Pakistan Environmental Protection Council
1988-1989	Establishment of Environmental Protection Agencies
1997	Creation of the Pakistan Environmental Protection Act
2000	Environmental Tribunals Procedures and Qualifications Rules
	Draft Hazardous Substances Rules
	Review of IEE/EIA Regulations
	Environmental Laboratories Certification Regulations
2001	Establishment of National Environmental Quality Standards (self-monitoring and reporting by industries) Rules
	Industrial Pollution Charge (Calculation and Collection) Rules
	Environmental Samples Rules

Others

- Phasing out of two-stroke rickshaws.

- Setting up of computerized vehicle tuning centres.
- Introduction of compressed natural gas as vehicular fuel.
- Introduction of CNG buses for mass transit in big cities.
- Tax incentives for installing pollution control devices.
- Issuance of Environmental Protection Orders and/or closure or pollution-causing Industries.
- Imposition of fines on offenders.
- Awareness campaigns.

Potential Future Response

- Pakistan may introduce control technologies focusing on fuel or combustion technique modifications, or alternatively, removing pollutants from flue gases. Pre-combustion control techniques are often the simplest and most cost-effective method of reducing emissions and could involve the use of low pollutant fuels.
- Atmospheric emissions may be reduced through the use of natural gas and nuclear power.
- Combustion modification techniques such as low NOx burners and fluidized bed combustion may be employed to reduce $SO_2$and NOx emissions. However, modern combustion technology is relatively expensive.
- Post-combustion control, which involves the removal of pollutants from flue gases and vehicle exhausts, may be introduced for the purpose of removing SPM from flue gases through gravity settling chambers, cyclones, spray chambers, bag filters and electrostatic precipitators.
- Catalytic converters may be introduced to control motor vehicle pollutants.
- The introduction of new manufacturing processes could also lead to significant reductions in industrial emissions. For example, the use of low temperature hydrometallurgical techniques could reduce the SO_2 emissions associated with traditional metal smelting methods.

- The introduction of simple chimneys and vents for domestic stoves and heaters can greatly improve indoor air quality.

Sri Lanka

Rapid Industrialization in the country and the transport sector contributes to about 60% of the atmospheric emissions in Sri Lanka. An updated Clean Air Action Plan has been prepared by the Ministry of Environment and Natural Resources (MENR) and is awaiting approval by the Government.

Response

Legal

- The National Environmental Act (NEA) of 1980: Section 23J&K prohibit emissions of pollutants into the environment.
- The National Environmental (Protection and Quality) Regulation of 1990: Sri Lanka Standards Institution (SLSI) has prescribed standards for Sulfuric Acid Plants.
- The Environmental Impact Assessment (EIA) Regulation of 1993: Ensures that any new project to be undertaken under the prescribed list undergoes full EIA.
- The National Environmental (Ambient Air quality) Regulation of 1994: Set ambient air quality standards to protect human health.
- The National Environmental (Air Emission, Fuel & Vehicle Importation Standards) Regulation of 2003: Ensures a control on vehicular emissions.

Financial

- Environmental Protection Licensing (EPL) Procedure: Every industry should obtain an EPL to discharge wastes.
- Vehicle Emission Test (VET): Every owner or user of a vehicle should get the clearance from a VET centre.

Technological

- Introduction of dual fuel (Petrol & LPG) vehicles
- Introduction of electric cars
- Euro II emission standards for vehicles
- Installation of emission control equipment for industries.

Potential Future Response

- Enhance the commitment of the Government to contribute to the Malé Declaration for the continuation of activities.
- An early warning unit for transboundary air pollution should be established at the CEA.
- Continue capacity building for assessing impacts of air pollution.
- More emphasis should be given to health and crop impact studies.

Regional Level Efforts to Reduce Atmospheric Emissions

Atmospheric Emissions have become a priority issue in South Asia. The South Asian countries have been taking some preventive and regulatory steps to tackle atmospheric emission problems. One major step in this regard is the adoption of Malé Declaration.

The Malé Declaration process was initiated in March 1998 during a policy dialogue organized by UNEP in collaboration with SEI (the Stockholm Environment Institute) with financial support from the Swedish International Development Cooperation Agency (Sida). Senior government officials of the South Asian region and experts on air pollution attended the policy dialogue. The meeting agreed on a draft declaration on air pollution to be presented to the Environment Ministers during the Governing Council of SACEP.

The Seventh meeting of the Governing Council of SACEP, held in April 1998 in Malé, the Republic of Maldives, adopted the declaration naming it the "Malé Declaration on Control and Prevention of Air Pollution and its likely Transboundary Effects for South Asia". The Malé Declaration states the need for countries to carry forward, or initiate, studies and programmes on air pollution in each country of South Asia. The countries participating in the Malé declaration are seven countries of South Asia – Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka, and also Iran.

The countries have identified National Focal Points (NFPs) and National Implementing Agencies (NIAs). With the help of UNEP RRC.AP at AIT, Bangkok, its partner the South Asia Cooperative Environment Programme (SACEP) in Colombo, Sida(Swedish Donor) and Stockholm Environment Institute (SEI), baseline studies have been completed in all the Malé Declaration Countries.

Monitoring stations have been set up and capacity for monitoring and analysis is also being built. As concerted efforts in partnership not only with governments but also with the stakeholders, NGOs, experts, etc. is required, regional and national consultations are being held with the representatives of all such interests.

Global Level Efforts in Mitigation of Atmospheric Emissions

Two main treaties are undertaken as the Global level initiatives in working the mitigation of atmospheric emissions. These are the Kyoto and Montreal Protocols.

Kyoto Protocol

The Kyoto Protocol to the United Nations Framework Convention on Climate Change is an amendment to the international treaty on climate change, assigning mandatory emission limitations for the reduction of greenhouse gas emissions to the signatory nations. The objective of the protocol is the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

The Kyoto Protocol currently (as of May 2008) has 181 countries and one regional economic integration organisation (the European Economic Community/ EEC) as member parties. Countries that ratify this protocol commit to reduce their emissions of carbon dioxide and five other greenhouse gases, or engage in emissions trading if they maintain or increase emissions of these gases. This treaty expires in 2012. Also international talks began in May 2007 on a future treaty to succeed the current one.

Governments are separated into two general categories: developed countries, referred to as Annex I countries (who have accepted greenhouse gas emission reduction obligations and must submit an annual greenhouse gas inventory); and developing countries, referred to as Non-Annex I countries (who have no greenhouse gas emission reduction obligations but may participate in the Clean Development Mechanism). The South Asian Countries come under the Non- annex I countries.

In the industrial sector, South Asian countries have the opportunity to reduce emissions through energy efficiency measures, streamlining of

renewable energy generation, and installation of carbon capture mechanisms under the Protocol. Such approaches will greatly assist in capturing the pollutants emitted by mining activities, industrial generation, and from refineries and petrochemical industries.

South Asian countries produce energy through coal fired thermal power. This results in large-scale emissions of transboundary pollutants. Under the Kyoto Protocol, investing in clean development approaches in the energy sector will help in bringing down transboundary emissions. Under the land use sector, countries in the sub region have reduced their emissions under the Kyoto Protocol through avoided deforestation and increase in vegetative cover through afforestation, reforestation, grazing land management and cropland management. Reducing excessive waste generation and avoiding open burning of waste through proper disposal will greatly help in reducing pollution. In the transport sector, promotion of public transport, enforcing stringent emission standards, and subsidizing cleaner modes of transport can also be an effective approach towards offsetting emissions.

Montreal Protocol

The Montreal Protocol on Substances that Deplete the Ozone Layer is an international treaty designed to protect the ozone layer by phasing out the production of a number of substances believed to be responsible for ozone depletion. The treaty was opened for signature on September 16, 1987 and entered into force on January 1, 1989. Since then, it has undergone seven revisions. Due to its widespread adoption and implementation it has been hailed as an example of exceptional international cooperation. Mr. Kofi Annan has been quoted as saying it is "Perhaps the single most successful international agreement to date...".

The treaty aims to control the levels of air pollutants which have a significant impact on the depletion of stratospheric ozone. The treaty provides a timetable on which the production of identified ozone depleting substances must be phased out and eventually eliminated. At present, 191 nations have become party to the Montreal Protocol including all the South Asian countries.

Acknowledgement

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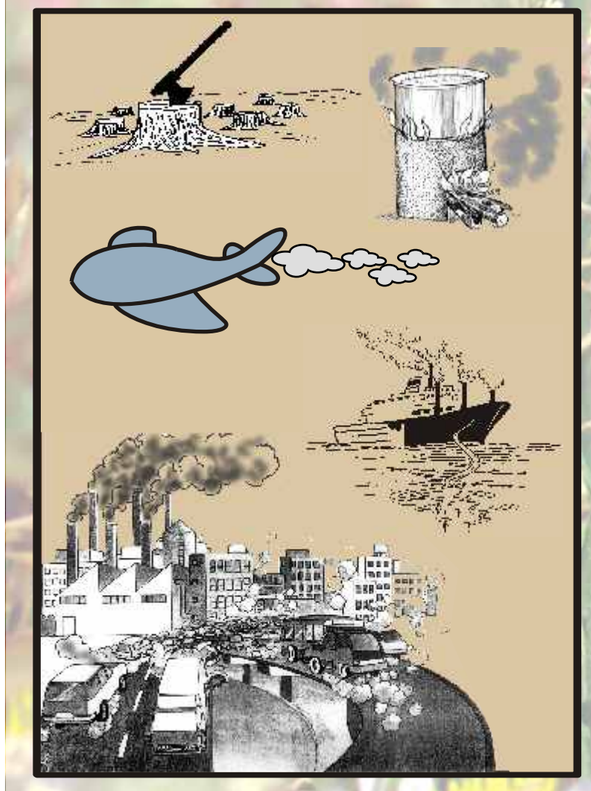
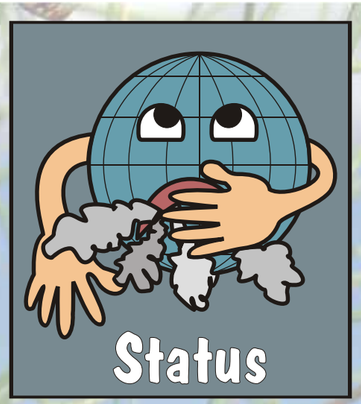
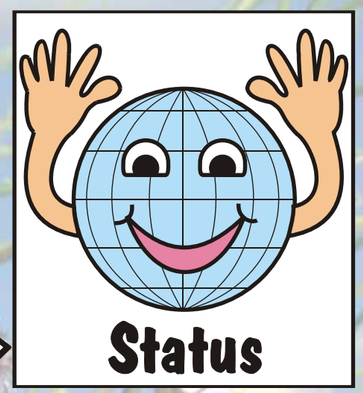
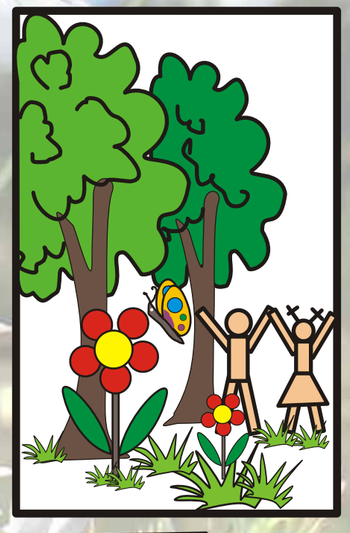


Sources







Impacts

Reduction measures

Kyoto protocol

Malé declaration

Policies

Actions by:

- Government
- NGOs
- Private sector
- Individuals