Urban pollution

Ponniah, W. D.

1998

Ponniah, W. D. (1998). Urban pollution. In AMIC Workshop on Management of Environmental Information Resources for Journalists : Singapore, Nov 9-14, 1998. Singapore: Asian Media Information and Communication Centre.

https://hdl.handle.net/10356/87124

Paper No. 8

AMIC / ADB TRAINING

for

JOURNALISTS on MANAGEMENT of ENVIRONMENTAL INFORMATION RESOURCES

RIVER VIEW HOTEL, SINGAPORE,

9 – 14 NOV. 1998

URBAN POLLUTION

by

Dr. W. D. Ponniah

Environmental Consultant

URBAN POLLUTION

I. Introduction

The atmosphere protects the earth from the sun's harmful ultra-violet rays, provides a moderate and stable climate and allows functioning of biogeochemical cycles that are vital for human and other living species. However, increased human activities accompanied by rapid industrial expansion, rising energy consumption and deforestation, have been putting immense pressure on the earth's atmosphere in recent years. In the Asia and Pacific region, the persistent and growing problem of air pollution, particularly in urban areas of the region and the increasing threat of acid rain illustrate the degree to which human activities have affected natural processes. New evidence on the accelerated dehydration of the earth's protective ozone layer demonstrates that air pollution can also produce global effects with serious implications and predictions of global climate change and sea-level rise through the green-house effect bringing into focus the most threatening aspects of the cumulative effects of fair pollution.

With expanding economic activity and consumption of consumer items, quantities of municipal solid waste are increasing rapidly in many countries of the region. In addition, the expansion and diversification of chemical-using industry has further enhanced management problems by adding large quantities of industrial and hazardous wastes in the region.

II. Urban Air Pollution

The rapid growth of cities has, together with associated industry and transport systems, resulted in an equally rapid increase in urban air pollution in the Asia-Pacific region. Air pollution is principally generated by fossil fuel combustion in the energy, industrial and transportation sectors. Use of poor quality fuel (eg. Coal with high sulphur content and leaded gasoline), inefficient methods of energy production and use, poor condition of automobiles and roads, traffic congestion and inappropriate mining methods in developing countries are major causes of increasing airborne emission of sulphur dioxide, oxides of nitrogen, suspended particulate matter (SPM), lead, carbon monoxide and ozone.

Air quality is worsening in virtually all Asian cities. Data from air quality monitoring studies provide evidence that the ambient concentration of SPM is increasing in every monitored city and generally exceeds WHO guidelines. However, the lead, sulphur dioxide and oxides of nitrogen emissions are not as uniform. Lead emissions are improving in Kuala Lumpur, following the introduction of unleaded gasoline. The trend for sulphur dioxide differs by city but is getting worse in some of the East-Asian cities.

The issue of air pollution is becoming serious especially in "megacities" of the region. Megacities are defined as those urban areas that have more than 10 million people or will have more than 10 million by the year 2000 as estimated by the United Nations.

Another form of air pollution that is particularly serious in urban as well as rural areas of developing countries of the region is indoor air pollution. This is mainly caused by the widespread use of biomass fuel such as wood and animal residue for cooking and heating. Biomass smoke contains numerous hazardous substances such as SPM, nitrous oxide, sulphur dioxide and carbon monoxide. The use of confined and unventilated burning spaces further increases the harmful effects of these emissions. Due to these inappropriate burning practices, even a relatively superior cooking fuel like coal produces significant pollution.

The industrial sector is one of the most dynamic sectors of the economy and plays an essential role in economic development and the alleviation of poverty. If environmental considerations are not effectively integrated into the design of industrial processes, severe problems can result. Industry consumes 37 per cent of the world's energy and emits 50 per cent of the world's carbon dioxide, 90 per cent of world's sulphur oxides and nearly all of the toxic chemicals. Concentrations of heavy industry have caused severe local environmental damage and global environmental threats such as global warming and stratospheric ozone depletion. Recently however, the severity of some of the local impacts of industry and the high cost of remediation, once environmental damage has occurred, has led to a dramatic change in these attitudes.

In Indonesia, air pollution caused by industrial sources has become an issue of serious concern. It has been reported that Jakarta, which was recently categorised as one of the most polluted cities of Asia, receives 15 per cent of total SPM, 16 per cent a oxides of nitrogen and 63 per cent of sulphur dioxide loading from industrial sources. In Surabaya, another industrial city of Indonesia, industrial sector shares of these pollutants are 28 per cent, 43 per cent and 88 per cent respectively.

In Thailand as elsewhere, air pollution generated by industries largely originates from energy consumption. In 1991, Thai industries emitted some 13.2 million tons of carbon dioxide, 208,500 tons of sulphur dioxide 70,000 tons of oxides of nitrogen and 351,000 tons of suspended particulate matter. In Thailand, the major industrial sectors causing air pollution are non-metal industry, food processing pulp and paper and the textile industry.

III. Transboundary Air Pollution

A. Haze

Smoke haze had affected South East Asian countries during the dry seasons in 1991, 1994 and 1997. Last year's haze was the worst ever. Some thousands of hectares of land were burned by plantation, forcestry and traditional farmers. Slash and burn is the cheapest way of clearing land and is also the traditional method.

From July to October 1997, ASEAN countries in particular Brunei Darussalam, Indonesia, Malaysia and Singapore, were badly affected by smoke haze caused by land and forest fires. So bad was the haze that some airports had to be closed in Sarawak and a state of emergency declared. Other parts of Malaysia were declared disaster areas. In Indonesia, a plane crashed because of poor visibility and there were reports in Malaysia of road accidents. People suffering from asthma had respiratory problems. The Philippines and Thailand were affected to a lesser degree. The severity and extent of the smoke haze pollution was unprecedented, affecting millions of people across the region. According to the World Wildlife Fund, as of October 1997, at least 29 orangutans were killed by the smoke, not mentioning the destruction of other wild fauna.

B. Acid Rain

The combustion of fossil fuels releases sulphur dioxide and oxides of nitrogen into the atmosphere as gases and / or absorbed onto small particles. The primary sources are coal fired power plants, automobile engines and the smelting of ores. Pollutants such as oxides of nitrogen and sulphur will further combine with water vapour in clouds to form weak nitric and sulphuric acid solutions respectively.

There are both local and regional impacts from sulphur dioxide and oxides of nitrogen emissions. For example, corrosion of the historic Taj Mahal in Agra, India in the result of the atmospheric pollution from local industries. In other Asian countries like the People's Republic of China, acid rain has seriously corroded metal structures & concrete works in cities where sulphur dioxide emissions are high. In other cases, sulphur and nitrogen oxide emissions are carried hundreds of miles and kill trees as well as acidify soils, lakes and water bodies, adversely affecting their life support systems. Emissions of sulphur dioxide and oxides of nitrogen can be carried from Southeast China to Vietnam and across Southeast Asia.

c. **Response to urban and transboundary air pollution**

Various measures have been taken at national and regional levels to curb the problems of urban air pollution and acid rain. For example, in urban areas, regulatory measures such as emission standards have been adopted to maintain ambient air quality. Among developed countries, Japan, Australia and New Zealand have achieved a certain degree of success while among rapidly industrializing countries, the Republic of Korea, Singapore and Malaysia have improved their urban air quality significantly by resorting to regulatory measures. For many developing countries the major bottlenecks in the adoption of regulatory instruments for controlling urban air pollution seems to be a lack of monitoring capacities, manpower & financial resources.

Most of the policy options that appear effective in combatting the rising urban air pollution call for the replacement of old stocks of automobiles and industrial machines which are highly inefficient. This task, however, often incurs substantial initial costs which may be beyond the financial capacity of many developing countries.

As regards haze the ASEAN Ministers had, in June 1995, agreed on an ASEAN Co-operation Plan on Transboundary Pollution. The Co-operative Plan contains broad policies and strategies to deal with transboundary pollution. In the light of the latest haze experience, the ASEAN Environment Ministers agreed on a Regional Haze Action Plan which sets out co-operative measures needed amongst ASEAN member countries to address the problem of smoke haze in the region arising from land and forest fires. This Regional Haze Action Plan was adopted at the ASEAN Environment Ministers meeting in Singapore in December 1997.

IV Stratospheric Ozone Depletion

Ozone in the stratosphere lies 12 to 50 kilometres above the surface of the earth, forming a protective layer or mantle which shields the earth from the sun's harmful radiation. It has been proven that the ozone layer in being depleted by man-made chemicals known as chlorofluorocarbons or CFCs. Bromine compounds and halons used in fire extinguishing equipment also plays a role in the thinning of the ozone layer. An irony of the situation is that CFCs were introduced after intense scientific testing had demonstrated that they were harmless to human health.

It is estimated that in the Asia and Pacific region, approximately 100,000 metric tonnes of these chemicals are used each year which is about 25 per cent of the global total. Japan is the world's second largest producer and consumer following the United States. Indonesia, Malaysia, the Philippines and Thailand all produce or consume significant amounts of CFCs but in much smaller quantities than the US or Japan. Growing economics, rising living standards and lack of technological capability to produce alternatives to CFCs are all resulting in an increased production of chlorofluorocarbons and halons, particularly in the developing parts of the region.

A. Response to Ozone Depletion

Ozone depletion has a number of consequences for human health and agriculture. These include increased rates of skin cancer and eye cataracts, weakening of immune systems, damage to crops, reduction in primary producers (plantiton) in the ocean and increased air pollution.

The international community has taken quick action to address depletion of the ozone layer. The Vienna Convention for the Protection of the Ozone Layer was adopted in 1985. This was followed two years later by the Montreal Protocol on Substances that Deplete the Ozone layer. This protocol called for the restriction of production and consumption of CFCs and halons to 1986 levels by 1994 and then to 50 per cent of 1986 levels by 1999 and scheduled a phase out of most uses of ozone depleting substances by the year 2000. Some applications have longer phase out schedules, with the last deadline for complete phase out being 2015.

V. Climate Change and Sea Level Rise

Climate change, the increase in average temperatures or "Global Warming" and associated sea level rise pose distinct and serious threats to the countries of the Asia-Pacific region. Human induced climate change takes place because of the "Greenhouse Effect", a process by which gases in the Earth's atmosphere notably water vapour, carbon dioxide and methane (greenhouse gases) allow the bulk of the energy in visible light from the sun to pass through the atmosphere to the ground, but prevent some of the heat generated when sunlight strikes the ground from radiating back to space.

Greenhouse gases (GHG) are emitted through a number of human activities which include energy production and use, land use changes (most notably deforestation) livestock raising and disposal of livestock wastes, CFC production and use, cement production, disposal of human sewage and municipal solid wastes, fertilizer use and rice cultivation. Each inhabited region of the globe is responsible for emissions but the extent of these emissions has varied and continues to vary substantially among regions.

Although the actual magnitude of the potential warming due to greenhouse gas is still subject to some debate, studies have projected an increase of between 1 0c and 3.5 oc by the end of the next century. The predicted global warning would cause an expansion of ocean waters and some melting of glaciers and ice caps resulting in sea level rise.

Various scenarios have been proposed for sea level rise. One estimate of sea level rise is 50 centimetres over the next century. It could be as high as 1 meter or as low as 15 centimetres. A sea level rise of 1 metre will displace tens of millions of people in the low lying deltaic areas of Bangladesh, Egypt and China. Although climate change and its associate sea level rise may already be affecting the region, the major impact of these changes will be felt in the future.

A. Response to Climate Change and Sea Level Rise

In response to the potential threats to society and the earth's environment posed by sea level rise and climate change, the bulk of the regional activity of the global level has involved greenhouse gas inventories and identification and costing of emissions reductions, rather than impacts.

The Framework Convention on Climate Change, which was signed by 155 countries at the UN Conference on Environment and Development in 1992 and which entered into force in March 1994, has as it ultimate objective:

> "To achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."

As follow-up to the UNFCCC, various activities have been conducted at global, regional and national levels to develop strategies for stabilizing GHG concentrations. Also, various national

studies in climate change have been conducted in a number of counties. For example, in Vietnam a vulnerability assessment study was conducted whilst country studies were undertaken in the Philippines, Indonesia and Thailand.

IV. SOLID WASTES

With expanding economic activity and consumption of consumer items, quantities of municipal solid waste are increasing rapidly in many countries of the region. In addition, the expansion and diversification of chemical-using industry has further enhanced waste management problems by adding large quantities of industrial and hazardous wastes in the region.

Industrial wastes in the Asia-Pacific region encompasses a wide range of materials of varying environmental toxicity, but typically includes general rubbish, packaging materials, waste from food processing, acids and alkaline substances, oils, solvents, resins, paints and sludges.

A. Municipal solid Wastes

Major sources of municipal solid waste (MSW), are refuse from households, offices, shops, hotels and schools and other institutions. Their major components are food waste, paper, plastic, rags, metals, as well as small quantities of hazardous waste such as electric bulbs, batteries, pesticides, automotive parts, discarded medicines and paint.

Among the various sub-regions of Asia and the Pacific, East Asia has a large share in the generation of MSW. Broad calculations indicate that its share would increase to 60 per cent by the year 2010 due to a large population base and expected growth rate of GDP. It has been estimated that 30 to 50 per cent of MSW generated within urban centres in many countries remains uncollected. Waste accumulated on streets and open spaces, contributes to serious environmental and public health problems. Uncollected refuse often finds its way into urban drainage systems and / or rivers and streams which become blocked and polluted. Waste from slum areas in many cities is often left uncollected, exacerbating the already acute problems of sanitation and environmental health.

In many cities in the region, the municipal government and sanitary districts have primary responsibility for the collection of MSW but often lack the capabilities to manage this waste. The local authorities in most cases have little control over collection crews who simply dump their collected waste on vacant land within or on the outskirts of the city.

Around 25 per cent of the refuse in various cities of Indonesia like Jakarta, Bandung and Surabaya is collected as often as once a day is some areas by both public and private sectors. In Malaysia, 90 per cent of urban solid wastes is collected by municipal crews and private contractors. In Singapore, refuse collection is carried out by government and private waste contractors. The government provides daily collection services to domestic households and trade premises while the private waste contractors collect refuse from mainly industrial premises, commercial and shopping complexes and construction sites. However, new public housing blocks are designed to have centralised refuse chutes.

Of the estimated 3,673 tonnes a day of waste generated in Metro Manila, the Philippines, government operators collect about 71 per cent and private collectors about 14 per cent. Vehicles of both the government and contractor experience frequent breakdowns due to their age, results in inadequate refuse collection. In Thailand, both public and private services for MSW collection are provided. About 70 per cent of the waste generated in three Thai cities including Bangkok, Songkla and Nakhon Ratchasima are collected regularly. The remaining waste is left in areas inaccessible to collection trucks or thrown into canals and rivers. The solid waste collection system in other cities of Thailand is inadequate and inefficient.
Dumping is commonly practised in the region. These sites present significant environmental risks to local inhabitants, ecosystems and communities of scavengers.

Many municipal councils have adopted sanitary landfills, although he competition for land in the vicinity of many urban areas is a constraint on the construction of suitable waste disposal sites. In Singapore, the Lorong Halus landfill, the last on the main island, will be closed soon and refuse will have to be shipped by barge to the new $840 million off shore landfill at Pulau

Semakau which will g into operation next year. The Singapore Government is also studying recycling programmes that could work in housing estates.

Incineration is widely used in Singapore and a new $1 billion refuse incinerator is being built at Tuas South to handle about 3,000 tones of refuse a day, making it one of the largest in the world. Incineration reduces the amount of waste finally requiring disposal to landfill.

B. Hazardous Wastes

Hazardous waste poses considerable potential risks to human health and the environment, particularly given the potential for their accumulation in ecosystems and concentration in the food chain. With many countries within the region having recently undergone rapid industrial development or on the verge of doing so, hazardous waste management must be seen as a cornerstone of any environmental policy initiative.

The toxic and hazardous pollutants released from industry include heavy metals, cyanides, pesticides, paints, oils, solvents and other harmful chemicals. For some toxic substances such as heavy metals, the safe level has been exceeded. When toxic substances accumulate in the environment and in food chains, they can disrupt biological processes. Their impacts can also be found in polluted ground and surface water and in contaminated land and refuse dumps. The growing contamination of ground and surface water with toxic chemicals released from industries has been an issue of major concern in the region.

In Malaysia currently, there are no specific comprehemive hazardous waste treatment and disposal facilities. However, there are many refuse disposal sites all over the country which also cater for industrial waste disposal although the majority are unsuitable for the disposal of hazardous wastes. Due to an absence of disposal facilities, many industries are storing their waste both raw and partially treated, within factory compounds, warehouses or temporary storage sites.

In the Philippines, there are no centralised facilities for hazardous waste treatment and disposal. Typically, wastes are buried at the site where they are generated, or collected, then disposed of at municipal dumps, in drains, or on open land. Ocean disposal of hazardous waste is also practised.

In Indonesia, hazardous waste is becoming a serious concern as a result of the country's industrialisation. A study on the generation of hazardous wastes in the Jabotabek region showed that the existing disposal practices of hazardous wastes in the region were inadequate and inefficient. In response to this, the west Java centralised waste treatment facility has been developed by an international waste management firm in a joint venture with a large Indonesian company.

In Thailand, a central treatment facility for textile and electroplating wastes was constructed in Bangkok by the Thai government in 1987. Having built this facility with government funds, collection and operation were contracted out to the private sector. Currently, development of hazardous waste incinerators is being planned at both Bangkok and Chiang Mai.

c. Biomedical Waste

Biomedical waste is defined as waste which consists of human or animal tissues, blood or other body fluids , excretions, drugs or other pharmaceutical products. Typical sources a biomedical wastes include medical, nursing, dental, veterinary, pharmaceutical or similar establishments.

Unless rendered safe, these wastes can prove hazardous to any person coming into contact with them and in certain instances an exposed person may pick up an infections disease. In addition to their infections characteristics, the highly variable and inconsistent nature of biomedical waste streams has increased, public concern in the region about storage, treatment, transportation and ultimate disposal.

The countries of the region generate substantial quantities of biomedical wastes. In the majority of areas, there are no separate methods adopted for the management of these wastes and they are merely collected along with the general municipal waste stream. Such practices pose significant health risks to waste collectors and disposal site personnel and also to the informal sector waste pickers who are exposed to a severe risk of infection. Incineration of biomedical wastes is practised in some countries of the region including Singapore.

D. Traffic in Hazardous waste

Traffic in Hazardous Waste, particularly from developed to developing countries where controls or standards are less strict is a serious problem facing the region.

The growing concern over the health and environmental implications of the waste traffic led to the Basel Convention on the control of the Transboundary Movement of Hazardous Waste and their Disposal which was adopted in 1989. This treaty aims to ensure that any waste that is moved across national boundaries is moved to disposed of in the most environmentally sound way possible .

Most of the Asia-Pacific countries have banned the import of hazardous waste. Parliamentarians from six ASEAN countries met in Kuala Lumpur, Malaysia in 1993 and urged their respective governments to "prohibit import and transboundary movement of all hazardous wastes into the ASEAN countries".

However, the major constraints for controlling illegal traffic in hazardous wastes are the absence of effective laws and rules and where legislation is in place, the extreme difficulty in monitoring waste movement.

V. Conclusion

Major threats to the atmosphere in the Asia and Pacific region emanate from increasing intensity of urban air pollution, acid rain, ozone depletion in temperate latitudes and potential, global climate change. Urban air pollution has been exacerbated by conditions that typically occur as countries become industralized.

The threat posed by acid rain has also increased in the region. At least two-thirds of acid rain emissions in Asia come from coal-fired power plants and industrial sources and the rest from residential heating and cooking.

The impact of the diminishing ozone layer is already evident in the Pacific through increased skin cancer rates and decreasing phytophankton productivity. Moreover, fisheries may be adversely affected by increasing UV radiation. Coral reefs and mangrove ecosystems which are important habitats for fish and many other marine organisms have been observed to be stressed or even die due to high UV radiation and temperature increase.

Increases in the level of carbon dioxide and certain pollutants have been shown to cause global warning which may lead to a major long-term impact on atmosphere and climate. The consequences of sea level rise will be inundation of coastal areas (river deltas being especially vulnerable), saltwater intrusion into fresh water supplies and an increased threat of storm surges. Estimated wetland losses in the region are 35 to over 90 per cent. A 0.25 metre rise in sea level could destroy about half of Asia's remaining coastal wetlands.

In many countries of the region, waste management (in particular waste disposal) projects are not considered a national priority. Inadequate funding, legislation and enforcement by local authorities have constrained waste management programmes in many countries.

Waste management is a precondition for sound public health and well-being, better environment and sustainable development. Proper management of wastes in essential to ensuring the security of natural resources, minimizing environmental health impacts and the risk of disease transmission as well as preserving the quality of the environment in the Asia-Pacific region. However, the development of environmentally sound, technologically feasible and financially viable waste management systems should be the ultimate goal of the region.

References

ESCAP, state of the Environment in Asia and the Pacific, 1995, Bangkok.

UNEP, Global Environment Outlook, 1997, Nairobi.

WNEP, Our Planet, Magazine for Sustainable Development, Vol. 2, No , 1990; Vol. 2, No 4, 1990; Vol. 7, No 5, 1996; Vol. 8, No 6, 1997; Vol. No 2, 197; Vol. 9, No 3, 1997