

Philippines

Health and Environment

The Vital Link

EXECUTIVE SUMMARY

**Environmental Health Service
Department of Health**

in collaboration with the

**College of Public Health
University of the Philippines (Manila)**

and the

International Development Research Centre (IDRC), Canada

**December 2001
Manila, Philippines**

**PHILIPPINES HEALTH AND ENVIRONMENT
THE VITAL LINK
EXECUTIVE SUMMARY**

A Component of the Health and Environment
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PREFACE

To protect the public from emerging health hazards and risks caused by environmental deterioration, manifested by increased multiplicity in pollution levels, the Environmental Health Service of the Department of Health, in collaboration with the University of the Philippines-College of Public Health and the International Development Research Centre (IDRC)-Canada, conceived the Health and Environment Policy Impact Project (HEPIP), Phils. The project's primary objective is to develop a document on Philippine environmental health that will guide policy makers at all levels, ensuring the integration of health, environment, and economic development issues into the policy formulation process.

The HEPIP has three components: the Environmental Health Risk Perception Survey (RPS); the Intersectoral Consultations and secondary data collection for the preparation of the Philippine environmental health document.

The Philippine Health and Environment - Vital Link document was prepared to link the results of the various HEPIP components. This is composed of nine chapters - all concerned with health and environment in the Philippine context, which is the vital link for healthier world and better quality of life.

This report presents the executive summary of the main document: *The Philippine Health and Environment - The Vital Link*. It intends to provide the reader a condensed version of all the pertinent environmental issues and their health implications discussed in the main document.

Finally, the various challenges towards a healthy and safe environment are set forth to guide policy-making bodies and key decision-makers from both government and private sectors in formulating policy decisions and actions.



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As the Philippines moves towards the goal of becoming an industrialized country, certain inevitable environmental changes are emerging, threatening the health of many Filipinos. Despite notable improvements in health as well as economic measures in the past decades, the unintentional impacts of these environmental changes are becoming major health challenges. Thus, a better understanding and greater awareness of the intimate connection between environment and health will be beneficial.

This report summarizes major health challenges and highlights the intimate links between environment and people's health. Greater cognizance of the vital links between health and environment can serve as guide to our decision makers and policy makers in anticipating the potential adverse environmental and health consequences of rapid economic growth, and the appropriate preventive and mitigating measures necessary to address these changes.

1.0 THE STATE OF ENVIRONMENTAL HEALTH IN THE PHILIPPINES

In the past years, significant changes in Philippine health measures such as life expectancy at birth and infant mortality rate have been reported. These changes have been attributed to multi agencies' (government and non government) concerted efforts in the provision of essential basic services. Health data reveal that the Filipinos' average life expectancy at birth has gradually improved from 59 to 68.9 years, for both sexes, in the past 40 years (1960-2000)(NSCB, 2001). However, a comparison with some of our neighboring Asian countries, reveals that the country lags behind Japan, Singapore and Malaysia in this area (DOH, 1998a; SEAMIC, 1998). Considerable improvements in infants' survival, a sensitive indicator of health situation of communities, has also been observed. The rate of babies dying before reaching their first birthday has gradually declined from 105 per 1000

livebirths in 1953 to 17 per 1000 livebirths in 1997.

Changing Health Burden

These notable achievements in health measures, however, are being threatened by changing environmental health risks as industrialization and rapid urbanization occur. There is an apparent emergence of "modern" environmental hazards (such as toxic industrial wastes, use of organic substances, vehicular and industrial emissions). Moreover, "traditional" hazards such as lack of access to safe water supply, adequate sanitation, decent housing, persist. Thus, Filipinos are now faced with the burden of both infectious or communicable diseases, which are closely linked to "traditional" hazards, and increasingly, of chronic non-communicable diseases associated with "modern" hazards. This present health picture is otherwise termed as the *double burden of disease*. As is the case in developing and even developed countries, the burden is likely to be more pressing among the poorest, who have very limited resources to safeguard themselves from various environmental health threats.

Factors Influencing Our Environmental Health Situation

There is a number of social, economic and demographic factors which determine the environmental health profile of a country. These factors include population growth, economic development, population movement, poverty, education, lifestyle choices, and existing environmental health policies in the country (WHO, 1998).

From 1953 to 1993, the Philippine *population* grew by an average of about 2.8 percent a year as infant death rates declined and life expectancy increased. During the same period, an average of about two persons were added to the population each minute, which translated into an average of 1.1 million more Filipinos each year (*Figure 1.1*).



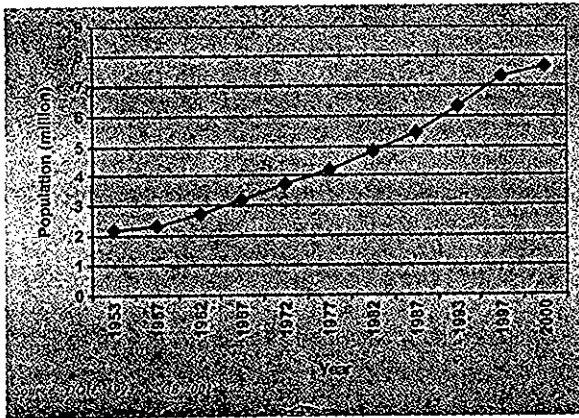


Figure 1.1 Trends in Philippine Population, 1951-2000

In 2000, population growth slowed down to 2.02 percent using 1995 as the baseline, resulting in a total population of about 76.5 million Filipinos and making the country one of the most populated in the world. (Population Reference Bureau, 1998).

An expanding population can have serious environmental and health implication as it poses a serious threat to the remaining resources of the country that may be unable to cope with the growing needs of the population. The poor, in particular, will find it more difficult to acquire basic needs, such as water, food, shelter, and sanitation that are all essential for healthy living.

Rapid *population growth* can, likewise, lead to increased human activities. The continual conversion of agricultural land to give way to residential and commercial areas, the excessive extraction of natural resources for commerce and energy production, and the increase in construction of development projects in various regions of the country can contribute to substantial environmental damages. Consequently, direct and indirect health effects may ensue unless appropriate environmental safeguards are implemented.

The increasing migration to urban areas puts further pressure on our existing resources in these

areas. In 1995, more than half (54.2 percent) or a total of about 37.1 million Filipinos lived in the urban areas. With an estimated increase to 74.3 percent, or about 76.2 million, by 2025, the rapid urban population growth is fast becoming a major threat to the cities' environment and health situation (Figure 1.2).

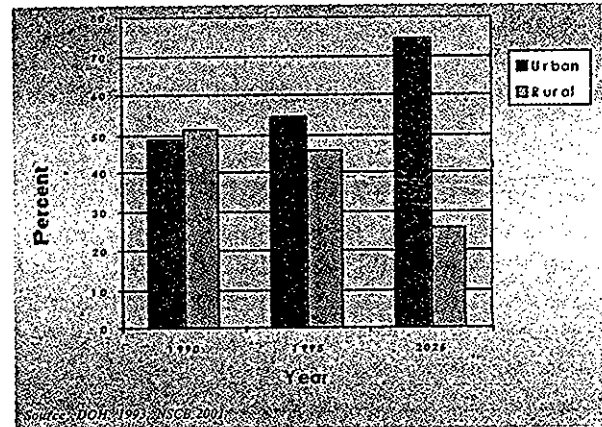


Figure 1.2 Urban-Rural Distribution, Philippines, 1990-1995-2025

Education, specifically of mothers who are most often the chief care providers in the family, is another critical determinant of health. It has been reported that maternal education even for 1 to 3 years can decrease child mortality by up to 15 percent (WRI, 1998). Improving the mothers' understanding of environmental health threats can enable them to readily handle the consequences of these threats.

A recent survey in the Philippines shows that majority of the female population have formal education. However, better education (defined in terms of duration of attendance in school) was reported in the urban area. Metro Manila has the highest median schooling duration of 9 years. The other regions have an average of 5 to 6 years, while ARMM has the lowest median schooling duration, with an average of 2.5 to 3 years (NSO, DOH, MI, 1999).

Another major factor that adversely influences environmental and health quality is *poverty*. In 1997,



almost a third (32.1 percent) of families or 4.5 million families live in poverty. (Figure 1.3). Poverty incidence is higher in the rural areas (44 percent) than in the urban areas (18.5 percent).

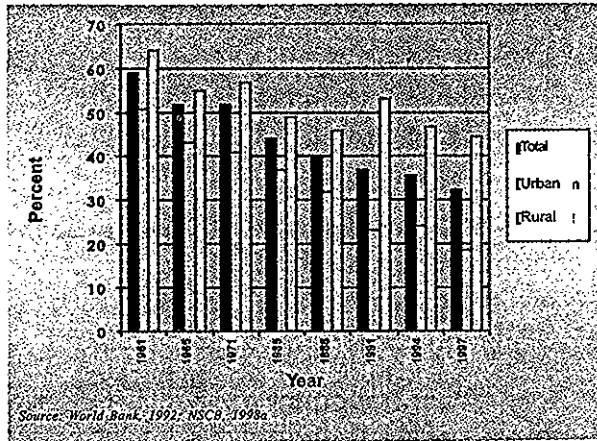


Figure 1.3 Poverty Incidence Philippines, 1961-97

Among the regions, ARMM has the highest poverty rate reported, with more than half of the urban and rural population living below poverty line, followed closely by the rural areas of CAR (55 percent), Region XII (54.6 percent), Region X (55.2 percent), and Region V (55 percent). On the other hand, poverty rates were noted to be lowest in the National Capital Region (NCR) and in the urban areas of Region III (14 percent), Region IV (15.7 percent), and Cordillera Autonomous Region (CAR) (14 percent) (NSCB, 1998b).

Health risks are higher among those who reside in overcrowded areas with poor garbage collection and drainage systems, and more among those who lack access to safe water supply and sanitation facilities. A considerable number lack the rudiments for good hygiene. Indeed, more than 9 million (13.2 percent) have no access to safe water supply and about 19 million (26.3 percent) lack access to sanitation facilities (NSO, MI, DOH, 1999). The danger of accidents also becomes more pronounced for those who live close to dumpsites or factories.

Also relevant to our current environmental health situation is the employment rate of the labor force. In July 1998, the labor force participation rate reached a total of 62.8 percent in the urban area and 67 percent in the rural area. On the other hand, the unemployment rate averaged 11.7 percent and 6.5 percent in the urban and rural areas, respectively (DOLEBLES, 1998).

Most critical to the health of the population is the provision and access to health care services. Although improvement in health measures has been achieved in the past decades, reports reveal that public expenditure on health remains relatively below the standard set for developing countries. In 1999, the public expenditure on health was only about 3.4 percent of the gross national product (GNP) as compared to the WHO standard of 5 percent of GNP (DOH, 1999a).

1.1 FOCUSING ON THE LINKS BETWEEN ENVIRONMENT AND HEALTH

The growing degradation of our environment poses great challenges on the health and well-being of millions of Filipinos. Potential health threatening consequences stem not only from unsolved traditional environmental problems (e.g., inadequacy of access to safe water and sanitation, on food safety, housing, solid waste management, presence of insect and animal vectors). They also come from exposures to modern hazards such as harmful and persistent chemicals (e.g., PCBs, heavy metals, other toxic materials), vehicular emissions, and changing lifestyles.

Along with the changing nature of environmental threats are the changes in disease patterns. The number of cases of chronic non-communicable diseases is beginning to grow, while the incidence of infectious diseases, which used to dominate disease occurrences in the country, is gradually declining. (Figure 1.4). (DOH, 1997e).

However, the exact contribution of environmental factors to causation of sickness and deaths

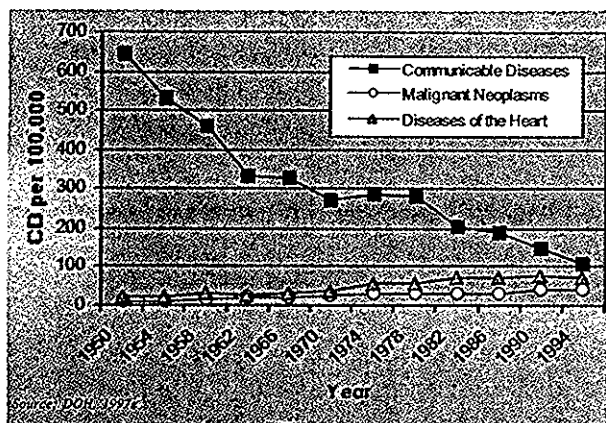


Figure 1.4 Trends of Communicable and Non-communicable Diseases. Philippines, 1950-1994

with a cluster of environmental conditions such as sanitation conditions inside and outside the household, as well as overcrowding in households. Other infectious diseases that can result from poor environmental conditions include diarrheal diseases, hepatitis A, cholera, typhoid fever, and the debilitating intestinal parasitism.

Skin diseases have also been linked to inadequate access to safe water and poor sanitation condition especially inside the household. Vector-borne diseases like malaria, dengue hemorrhagic fever and schistosomiasis, are likewise a health consideration, its transmission being dependent on environmental factors that favor the multiplication of disease vectors such as mosquitoes and snails.

remains difficult to determine, especially in our country where assessments directly associating environment-related hazards with health impacts are still scarce.

Another important concern is the growing number of chronic *non-communicable diseases* linked with modern environmental hazards. The increasing use of industrial and agricultural chemicals, the unabated emission from motor vehicles and industries, cigarette smoke, the use of biomass fuel for cooking, the indiscriminate dumping of untreated or inadequately treated industrial and domestic wastes, agricultural run off tainted with chemical pesticides and fertilizers, and the utilization of organic (persistent) chemicals are some of the significant contributors to environmental contamination that can damage health.

Infectious diseases, nonetheless, remain as the leading cause of morbidity in the country. Diarrhea, which in 1999 accounted for about 1 million cases, or a rate of 1190 per 100 000 population, was the leading cause of sickness that year, followed by bronchitis, pneumonia and influenza. (Figure 1.5) (DOH, 1999a).

A DOH report in 1997 reveals that 6 out of 10 of the leading causes of deaths in the country are identified as non-communicable diseases. These include diseases of the heart and vascular system, malignant neoplasm (cancers), accidents, chronic obstructive pulmonary diseases (asthma, chronic bronchitis, emphysema), other diseases of the pulmonary system, and complications from diabetes mellitus (Figure 1.6).

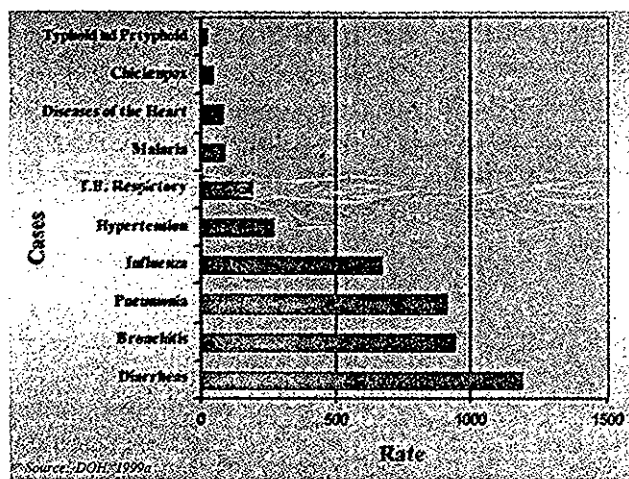


Figure 1.5 Ten Leading Causes of Morbidity. Philippines, 1999 (Rate/100,000 population)

1.2 HEALTH BURDEN OF CHANGING ENVIRONMENTAL CONDITIONS

Respiratory infections caused by biological agents (e.g., bacteria, viruses) are closely associated

Exposure to various environmental pollutants takes its toll on the health and productivity of



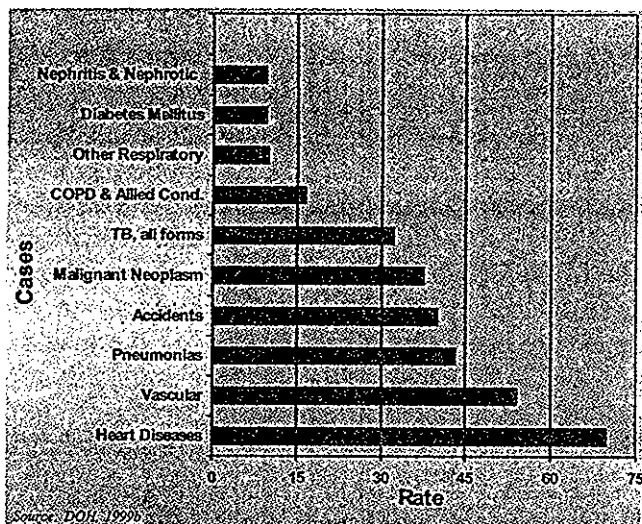


Figure 1.6 Ten Leading Causes of Morbidity, Philippines, 1999 (Rate/100,000 population)

Table 1.1 Various Environmental Pollutants and Their Potential Impacts on Health

Environmental Problem	Effect on Health (worldwide)	Effect on Productivity (worldwide)
Water pollution and Water scarcity	More than 2 million deaths and billions of illnesses a year attributable to pollution, poor household hygiene and added health risks caused by water scarcity	Declining fisheries; rural household time and municipal costs of providing safe water; aquifer depletion leading to irreversible compaction; constraint on economic activity because of water shortages
Air pollution	Many acute and chronic health impacts; Excessive urban particulate matter levels are responsible for 300 000-700 000 premature deaths annually and for half of childhood chronic coughing; 400 million-700 million people, mainly women and children in poor rural areas, affected by smoky indoor air	Restrictions on vehicle and industrial activity during critical periods; effect of acid rain on forests and water bodies
Solid and Hazardous Wastes	Diseases spread by rotting garbage and blocked drains. Risks from hazardous wastes typically local but often acute	Pollution of groundwater resources
Soil degradation	Reduced nutrition for poor farmers on depleted soils; greater susceptibility to drought	Field productivity losses in range of 0.5-1.5 percent of GNP common on tropical soils; offsite siltation of reservoirs, river-transport channels, and other hydrologic investments
Deforestation	Localized flooding, leading to death and disease	Loss of sustainable logging potential and of erosion prevention, watershed stability, and carbon sequestration provided by forests
Loss of biodiversity	Potential loss of new drugs	Reduction of ecosystem adaptability and loss of genetic sources
Atmospheric changes	Possible shifts in vector-borne diseases; risks from climatic natural disasters; diseases attributable to ozone depletion (perhaps 300 000 additional cases of skin cancer a year worldwide; 1.7 million cases of cataracts)	Sea-rise damage to coastal investments; regional changes in agricultural productivity; disruption of marine food chain

Source: World Bank Report 1993

the population. As shown in Table 1.1, environmental degradation brings about a range of adverse health effects (World Bank Report, 1993).

Moreover, environmental pollution can result to health burden in terms of Days of Healthy Life Lost (DHLL) – that is, days that could have been spent productively and comfortably by individuals who suffered or died prematurely. DHLL has four components: days of life lost due to premature deaths, days lost due to condition that cause deaths, days lost due to chronic disability that do not cause deaths, and days lost due to acute phase of the disease.

An estimation of DHLL in 1990 due to environmental pollution is summarized in Table 1.2.

The estimation was determined from health studies conducted on target population in the country. The pollution-related diseases enumerated were taken from available national health surveillance data on the most common diseases. These diseases included bronchitis, heart diseases, IQ decline in children due to lead exposure, diarrhea, typhoid, H-fever, and hepatitis A, among others (DOH, 1996a).

Economic cost

The population's health burden from environmental pollution also entails considerable economic cost. An estimation of the economic cost (i.e. present value of lost future earnings) resulting from premature deaths due to pollution exposure in 1990, reached



Table 1.2 Days of Healthy Life Lost (DHLL) Due to Environmental Pollution, 1990

Bronchitis due to dust	294 million DHLL
Heart Disease	47 million DHLL
Diarrhea due to less than Level III water supply and No Toilet	54 million DHLL
Lead exposure	average 5 points IQ loss among all children
Premature mortality from pollution Bronchitis, Diarrhea Heart Disease	184000 years of life lost

Source: DOH 1996a

a total of 2 to 4 percent of our gross domestic product (GDP). This, however, is a conservative estimate because it only included members of the workforce. The cost of treatment of pollution-related diseases of the general population and the losses due to the decline in IQ of children from lead exposure were not accounted in the estimation.

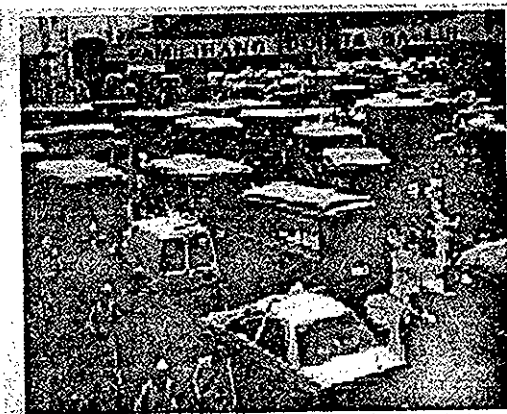
Similarly, a 1997 Environmental and Natural Resources Accounting Project (ENRAP) report on the health burden caused by air and water pollution on our country's workforce shows that in 1995, a total of about 508 million pesos (expressed at constant 1988 prices) were spent by the government to cover for the selected water pollution related diseases (e.g. typhoid, paratyphoid, diarrhea, acute poliomyelitis, infectious hepatitis, and schistosomiasis). On the other hand, in the NCR alone, air pollution related diseases due to exposure to particulate matter and lead, in particular, cost about 1.5 billion pesos (DENR, 1997).

Overall, 2.5 billion pesos (expressed at constant 1988 prices) were spent by the government for selected water and air related diseases. Considered in this estimation were the foregone earnings due to premature deaths, foregone earnings due to morbidity, and the cost of medications.

2.0 AIR POLLUTION AND OUR HEALTH

Today, one of the environmental problems of the country that requires urgent attention is air pollution. Increasing emissions from motor vehicles (mobile sources), industries, and power stations (stationary sources), as well as road dusts, agricultural burning, and households' burning of garbage (area sources) are becoming a serious concern because of the considerable cost they can impose on health, on the quality of life, and the productivity of affected individuals. Exposure to contaminated air may have unfavorable effects on our health depending on the concentration of pollutants, duration of exposure, and the state of health of an individual. With other factors that may influence the outcome of the study controlled (e.g., cigarette smoking), a 1993 study by Dockery et al reveals that deaths from heart and lung diseases in 6 cities in the United States were 37 percent higher in the most polluted areas than in the least polluted ones (WHO, 1997a). The children, the elderly, those suffering from respiratory and heart diseases, and the smokers are the ones most susceptible to the ill effects of air pollution.

Mobile Sources. According to the Department of Transportation and Communication (DOTC) and the Land Transportation Office (LTO), there were 3,701,173 registered motor vehicles in the Philippines as of 2000, about 40 percent of which were found in the National Capital Region (DOTC-LTO, 2001).



Traffic congestion increases the concentration of air pollutants



Environmental Health Service
Department Of Health

The large number of vehicles plying the streets is cause for concern since besides the fact that many are poorly maintained, thus contributing to air pollution, traffic problems arise as many of the roads are not designed to accommodate the corresponding increase in vehicular volume over time. Traffic congestion further aggravates air pollution since vehicles in low gear release more pollutants than fast moving ones. (Nadakavukaren A., 1995).



Poorly maintained vehicle engines also contribute to air pollution

The kind of air pollutants emitted by motor vehicles depends on the type and quality of fuel used and the efficiency of engines to burn fuel. As shown in Table 2.1, combustion of fuels can produce and release a variety of pollutants.

Table 2.1 Major Pollutants Emitted by Burning of Fuel

Type of Fuel	Major Pollutants
Gasoline	Volatile Organic Compounds (VOC) Carbon Monoxide Lead (Pb) Hydrocarbons (HC)
Diesel	Particulate matter (PM) Sulfur oxide (SO _x) Nitrogen oxide (NO _x)
Biomass (wood, charcoal, saw dust)	Particulate matter (PM) Carbon Monoxide (CO) Nitrogen Oxide (NO _x) Sulfur oxide (SO _x) Hydrocarbons (benzene, phenol, cresol, toluene polyaromatic Aldehydes Acenophthylene

Source: WB, 1993

Gasoline-fueled vehicles emit major pollutants such as carbon monoxide (CO), lead, hydrocarbons, and volatile organic compounds while diesel-fueled vehicles give off particulate matter (PM), sulfur oxides (SO_x), and nitrogen oxides (NO_x).

The amount of consumption of diesel, also used by industries and power plants, is indicative of the amount of major pollutants generated, such as PM and oxides of sulfur and nitrogen. In 1997 alone, diesel consumption reached a total of about 44,155,000 barrels, more than twice the consumption of premium, regular, and unleaded gasoline combined (DOTC-LTO, 1998).

Furthermore, the forecast of petroleum demand for diesel fuel is about thrice the projected demand for gasoline within 13 years, from 1998 to 2010. Given the high annual growth rate of 10 percent of registered vehicles and the consequent growth in fuel consumption, air emissions will likewise increase in the next decade if control measures against air pollution are not put in place soon.

The use of gasoline largely contributes to the emission of lead, another important air pollutant. Tetraethyl lead is added to gasoline to improve performance of internal combustion engines. The combustion of leaded gasoline releases lead into the air. Some of it is eventually deposited on the top layer of the soil. When such fine dust is disturbed by passing vehicles or by street sweepers and carried by the wind, it may enter the indoor environment.

Lead in the soil is a potential environmental problem because it can contribute to overall lead exposure through inhalation, and ingestion of contaminated food and water supply. People living in urban areas, especially in residential areas near major thoroughfares, are at risk. Children who play close to traffic routes are known to passively ingest dust through hand to mouth route at a much greater rate than adults

In urban areas like Metro Manila, where there is less ground cover and more open soil by the road-



side, the average daily ingestion of soil by children is likely to be much higher (DOH, 1996a).

Results of the baseline health profile of communities located in Metro Manila airshed conducted by the Department of Health in 1999-2000 show that the level of exposure to lead by 24.6 percent (N= 51) of 6-10 years old children exceeds the WHO recommended limit for lead (20 μ g/dl).

Although lead in gasoline has been phased out in Metro Manila since April 2000, it is recommended that blood lead levels of the said age group be continuously monitored as lead persists in the environment for many years and accumulates over time. Detoxification is recommended when lead levels exceed 10 μ g/dl and clinical symptoms manifest among these children (DOH, 2001).



Oil-fueled power plants in Metro Manila is a significant source of sulfure dioxide

Stationary Sources. These sources of air pollutants include power stations (e.g., electric power plants that burn coal and oil) and industries (e.g., steel mills, metal smelters, oil refineries and pulp and paper mills).

Estimates made in the Vehicular Emission Control Planning in Metro Manila report (ADB, 1993) show that the amount of air pollutants being emitted

from three power stations in Metro Manila using fuel with 3 percent sulfur content is generally lower than that emitted by motor vehicles. Carbon dioxide emissions from the power stations is only 0.15 percent of those coming from motor vehicles; nitrogen oxides, about 13 percent of those from motor vehicles; and total suspended particulates (TSP), 40 percent of those from motor vehicles. It should be noted, however, that power stations emit 35 times more sulfur dioxide than motor vehicles (Figure 2.1), indicating power generating plants as a major source of sulfur dioxide. (DENR, 1996a).

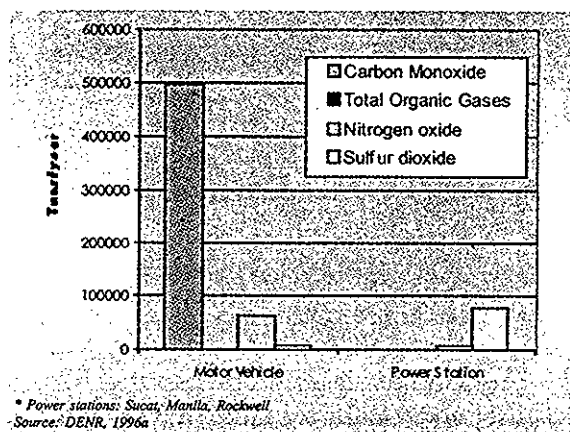


Figure 2.1 Estimates of Emission from Motor Vehicles and Power Stations* in Metro Manila

Area Sources. The major contributors to area-source emissions are road dusts, burning of agricultural wastes, "smoking" of fruit trees, and burning of wastes.

During any kind of combustion, a variety of pollutants such as gases, smoke, and particulates, is emitted into the air in combination with heat. Depending on the kind of materials being burned, pollutants released by combustion can cause health problems ranging from mild eye irritation, to serious health problems like difficulty of breathing, asphyxiation, exacerbation of asthma, or death (Waldbott, 1973; WHO, 1997a). Carbon monoxide is the most abundant type of pollutant released dur-



ing combustion. Extremely high levels of this compound can be found in the surrounding area when burning is done (Waldbott, 1973).

Peak levels of certain air pollutants may occur occasionally. Studies have shown that in Metro Manila, concentration of particulate matter can reach about 10 times more than the acceptable level of $150\mu\text{g}/\text{m}^3$ at the height of New Year celebrations.

Indoor Air Pollution. Equally a cause for concern is the air quality inside our homes. In developing countries, the highest air pollution concentration actually occurs in the indoor environment (WHO, 1997a). In fact, indoor air pollution poses a great health risk to people than outdoor air pollution as the levels of these air contaminants are often higher inside confined spaces, such as homes, for example, where people spend most of their time.

Smoking cigarettes and using kerosene, liquid petroleum gas (LPG), and biomass fuel (e.g. wood and charcoal) for cooking and lighting purposes are the common sources of harmful indoor air pollutants. Other contributors to indoor air pollution include household cleaning products, paints, solvents, thinners, wood varnish, aerosol sprays, insecticides and pesticides, fungi and molds (Health and Welfare Canada, 1992; WHO, 1997a).

Indeed the use of biomass fuels, particularly in rural areas and in urban poor communities, contributes significantly to indoor air pollution. It emits pollutants almost similar to those found in vehicular and industrial emissions that use fuel. Exposure to biomass smoke poses risks to women and children especially. The inhaled smoke, which is equivalent to smoking several packs of cigarettes a day, can result in respiratory diseases (WB, 1993).

The use of LPG and kerosene as cooking fuel, on the other hand, has been reported to emit less pollution than the use of biomass fuel (WRI, 1998). However, it can also contribute to the level of indoor

air pollution. For instance, the use of gas stoves may result in higher levels of nitrogen dioxide inside homes (WHO, 1997a). A 1997 report reveals that the consumption of LPG and kerosene products in the country has been increasing and the forecast demand for LPG products in 2010 will be 3 times higher than the demand for kerosene.

In studies conducted in different countries, a close association has been established between indoor air pollutants, particularly smoke from cooking stoves, and the occurrence of respiratory problems among children and adults. The aggravation of health problem of persons with existing heart problems has also been reported. Acute respiratory infections (ARI) have been identified as most damaging, affecting more people especially children less than 5 years old (WRI, 1998).

In the Philippines, the risks of poor pulmonary function test is 16 times higher for members of households using wood or charcoal as cooking fuel than those using liquefied petroleum gas or kerosene. (Torres, Subida, 1996)

Studies on health effects of indoor air quality have shown that the risk factors in developing acute lower respiratory tract infections among infants include the level of particulate matter less than 10 microns, the number of smoking household member, and infants that are not breastfed (Torres, E and Subida, R, 1996).

2.1 HEALTH EFFECTS OF INHALING POLLUTED AIR

The effect of air pollution on people's health is usually so subtle that a cause - effect relationship is difficult to demonstrate. Also, a person's coping mechanism varies depending on the individual's reaction to a particular pollutant. Factors that would influence a person's response to air pollution are the concentration of the air pollutant, duration of exposure of the person to the pollutant, and the person's state of health and nutrition. Figure 2.2 illustrates how one can become affected by these air pollutants.



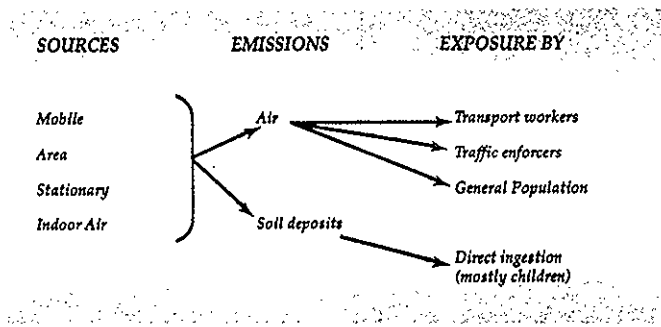


Figure 2.2 Exposure Pathways to Air Pollutants

Although the poor air quality in Metro Manila is satisfactorily above the levels considered safe by the World Health Organization (WHO), as well as the Philippine Air Quality Guidelines, it has nonetheless serious implications. Pollutants are constantly inhaled into the lungs and absorbed into the blood stream, particularly by urban residents. This exposure to air pollutants produces harmful effects on the respiratory system, resulting in different kinds of lung diseases (e.g. bronchitis, bronchial asthma, chronic obstructive lung disease, emphysema, etc.). As a result of chronic exposure to polluted air, the permanently damaged lungs become more vulnerable to infection (WHO, 1990a). Effects could be similarly seen on other organs like the heart and blood vessels, causing high blood pressure, heart disease, and the like.

Children, the elderly, and those suffering from respiratory and heart diseases are sensitive to the action of these pollutants. Smokers are also susceptible to the ill effects of air pollutants.

Particulate Matter (PM). The size of the particles is important because the smaller the particle size, the greater is its potential to cause serious health damage (Health and Welfare Canada, 1992; WHO, 1990a). Studies have shown that fine particles less than 10 microns pose a particularly great risk to health. They are likely to be more harmful than larger particles since they can settle deep into the lungs (Subida and Torres, 1994). Effects of PM_{10} on the lungs will eventually lead to heart failure

(WHO, 1997a). On the other hand, a 10 micrograms per cubic meter increase of PM_{10} in the air has been associated with a one percent increase in cardiovascular deaths (WHO, 1997a). The children, the elderly, smokers, as well as persons who are already suffering from asthma or heart disease are the ones that are most at risk when exposed to high concentrations of particulate matter (Health and Welfare Canada, 1992).

A study to assess the impact of vehicular emissions on vulnerable population in Metro Manila shows that the lung function of Metro Manila school children is more compromised than those of rural school children (Subida, R and Torres, E, 1994).

Likewise, a study made in six U.S. cities shows that air pollution is positively associated with death from heart and lung diseases. The presence of air pollutants such as fine particulates and sulfates is strongly associated with the deaths of the study population (Dockery et al, 1993)

Hundreds of millions of adult women in developing countries are exposed to extremely high levels of airborne particulates when cooking on stoves using biomass fuel.

Source: WHO, 1997a

Airborne Lead(Pb). In humans, lead can result in a wide range of biological effects depending upon the level and duration of exposure. Child exposure to lead, even at low levels previously considered normal, can cause damaging effects on the brain and the central nervous system, affecting the child's intellectual and physical development (DOH, 1996a). Every 10 microgram per deciliter increase in blood lead levels is associated with a one to five point decrease in the IQ of exposed children (Goyer, R., 1996).

The seriousness of these adverse effects is further underscored by the United States Environ-



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mental Protection Agency (EPA) studies which indicate that, other factors controlled, a one point reduction in IQ is associated with a 0.9 percent reduction in lifetime earnings (Segundo, 1997).

Every ten microgram per deciliter increase in blood lead levels is associated with a one to five point decrease in the IQ of exposed children.

Source: Goyer, R. 1996

As well, a study done in 1993 shows that of the 515 Metro Manila children tested (414 of whom were schoolchildren and 101 street child vendors), 80 percent of the them exhibited blood lead levels higher than the United States-Center for Disease Control (US-CDC) acceptable standard of 10 micrograms per deciliter. More than 90 percent of the street child vendors were, in fact, found to have levels above the recommended biological limit. These dangerously elevated levels of lead in the blood samples of the children are alarming since the harmful health effects would manifest only after several years (Subida and Torres, 1994).

Lead is known to cause various ailments, both in adults and in children. Young children, particularly boys between 7 and 11 years, are prone to aggressive behavior, delinquency, and attention disorders when exposed to lead; in adults, lead exposure causes increased blood pressure and hypertension (Needleham, HL, et al, 1996).

Sulfur oxides (SO_x). The burning of wood, coal, and petroleum products generates sulfur oxides. Sulfur oxide per se is not dangerous, but it easily reacts with water vapor to form other sulfur compounds such as sulfuric acid, and sulfates, causing respiratory ailments. (Nadakavukaren, 1995). High levels of SO₂ have been related to respiratory problems, including decrease in lung function and increase in the number of hospital admissions and

deaths due to acute exposure to this pollutant (Health and Welfare Canada, 1992).

Nitrogen oxides (NO_x). Although nitrogen oxides are a naturally occurring gas, they are also found in poorly ventilated homes using biomass fuels, kerosene and gas stoves (Waldbott, 1973), and in vehicular emissions. The two most important forms of this gas, nitrous oxide (NO) and nitrogen dioxide (NO₂), in the presence of other pollutants such as hydrocarbons and sunlight, undergo photochemical reactions and result in the formation of secondary pollutants, such as ozone, nitrogen dioxide, and other oxidants. These oxides of nitrogen cause respiratory symptoms ranging from mild irritation, burning and pain in the throat and chest, to severe coughing and shortness of breath, particularly in persons who have asthma or bronchitis. Children are more sensitive to the damaging effects of chronic exposure to nitrogen oxides (Waldbott, 1973; Health and Welfare Canada, 1992).

As evidenced by an incident that occurred in London in the early 1950s, severe air pollution can lead to seriously damaging effects including death. About 4,000 people died as a result of increased air pollutants – that is, nitrous oxide combining with other airborne combustion product – released from the widespread use of dirty fuels.

2.2 BURDEN OF MORBIDITY AND MORTALITY DUE TO AIR POLLUTION

Dust-related diseases. As previously discussed, PM10 levels have exceeded the Philippine Air Quality Guidelines. In 1996, a study was done on the impact of this pollutant on mortality from respiratory and cardiovascular diseases among the population at risk (e.g. transport workers, street vendors, schoolchildren) and the general urban population. Table 2.2 shows that the burden of mortality from dust-related diseases, like bronchitis and hypertension, is greater for the more exposed groups than other urban dwellers (DOH, 1996a).



Table 2.2 Excess Mortality Attributable to Urban Air Pollution

Population at Risk	Excess Mortality from Air Pollution (%)	
	Respiratory	Cardiovascular
General population (MM)	28	13
Jeepney driver	105	47
Bus Driver	57	25
Schoolchildren	54	-
Street vendors	62	-

Source: DOH, 1996a

I.Q. decline of children from lead exposure.

The elevated blood lead levels among Metro Manila children are also of public health significance. The effects of lead exposure are said to contribute to poor scholastic performance and may have a hand in the overall school dropout rate. It is important to emphasize then that lead could adversely affect a child's developing brain, including behavior and learning abilities. Unfortunately, these factors have a lifelong impact (DOH, 1996a).

3.0 WATER POLLUTION AND OUR HEALTH

Another major problem affecting many Filipinos today has to do with water supply and sanitation. The lack of access to safe water and sanitary facilities are significant threats to the environment and health of an estimated 9.6 million Filipinos (13.2 percent) who still do not have access to safe water, and the 14 million (19 percent) who lack access to sanitary facilities (NSO, DOH, MI, 1999).

With the growing wave of industrial activities, increasing number of settlements, household wastewater discharges, use of organic (persistent) pesticides and agricultural run off tainted with these harmful chemicals, and the increasing use of other organic substances, the threats on the contamination

of our ground and surface waters are gradually mounting. A 1995 report reveals that agriculture and industrial wastewater contributes to about 40 percent of total water pollution, while domestic wastewater accounts for about 60 percent. Industrial waste may be generated from some industries such as food and beverage manufacturing, livestock production, mining and quarrying. On the other hand, the residues of chemical fertilizers and pesticides, when used heavily, are washed and carried by run off water, polluting nearby bodies of water such as lakes and streams, or may seep into the soil, contaminating the groundwater.

3.1 BIOLOGICAL CONTAMINANTS IN WATER

Inadequate essential basic services such as lack of access to safe water and sanitary facilities compounded by the growing problem on water pollution can bring about seriously damaging effects on health. These factors are considered major contributors to the estimated yearly average of 814,182 cases of diarrheal diseases from 1983 to 1993 (an average rate of 1,346 per 100,000 pop) and to the deaths of more than 9,375 Filipinos (an average rate of 16.4 per 100,000 pop) during the said period. These diseases and deaths could have been prevented had adequate services been made available.

Similarly, between 1983 and 1993, a yearly average of 15,954 Filipinos (a rate of 27 per 100,000 pop) suffered from typhoid/paratyphoid fever, and a yearly average of 1,154 (a rate of 2 per 100,000 pop) died from it. As well, hepatitis A, cholera, and leptospirosis are some of the water-related diseases which continue to threaten the health of many Filipinos.

Findings of the Evaluation of Drinking Water and Sanitation Decade in the Philippines in 1992 elucidates the potential adverse health outcomes related to water. The report reveals that as opposed to using a household own water source, using a pub-



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lic or neighbor's water supply increases the risk by 25 percent and skin disease by 71 percent. Likewise, living in a household without its own water supply increases the risk of diarrheal disease and skin disease by 76 percent, while living in a household without its own toilet increases the risk of diarrheal disease by 42 percent and skin disease by 28 percent.

3.2 CHEMICAL CONTAMINANTS IN WATER

The health threats of rapid industrialization and the intensification of agricultural production and their accompanying environmental pollution problems have been mounting in recent years. The adverse health effects resulting from natural and human-made contamination of water are a serious concern.

Nitrates. Human exposure to nitrates has been associated with adverse health effects, especially among infants. Nitrates, when ingested, may be converted to nitrite by non-harmful bacteria present in the mouth and intestines. Nitrite combines with hemoglobin, the oxygen carrier in the blood, to form methemoglobin. This results in reduced oxygen supply in the red blood cells, causing bluish discoloration of babies known as Blue Baby Syndrome that may lead to death (WHO, 1990b). Among adults, exposure to high level of nitrates may increase the risk of developing cancers. The magnitude of the risks, however, is still being determined (WRI, 1998; WHO, 1990b).

Pesticides. The growing use of pesticides is another threat to human health because of the potential contamination of our groundwater sources. Of greater concern are some organic pesticides which, because of their persistence in water or soil, pose significant risks even to future generations.

Some pesticides have been reported to have immediate or long-term effects on health. Exposure to these chemicals may result in a range of health effects that include headache, nausea, blurring of vi-

sion, poisoning, male sterility, and impairment of immune system (body system responsible in fighting against infections). The severity of the health effect depends on the toxicity of the pesticide one is exposed to, the duration of exposure, and the health condition of the person exposed. Another serious health effect believed to be associated with the use of these chemicals is cancer.

Chlorine. It has recently been suggested that chlorine, the water disinfectant commonly used to ensure safety of water from harmful microorganisms, may be related to the development of cancer among long-time users of chlorine treated water.

However, careful assessment of the risks of illnesses and deaths associated with harmful microorganisms in water have been found to be greater than the risks of cancer that may develop from chlorination by-products in drinking water. A World Health Organization report revealed that there is a 100 to 1000 times greater risk of getting sick or dying from disease-causing microorganisms in drinking water than the risk of developing cancer from chlorination (WHO, 1997a).

3.3 HEALTH AND ECONOMIC COST OF DAMAGES FROM WATER POLLUTION

The burden on healthy life and the economic cost associated with water and sanitation related diseases are also high. In 1990, an estimated 54 million DHLL was attributed to diarrheal diseases and deaths due to exposure to water pollution.

In economic terms, a conservative estimate of the total cost of the health damages associated with water pollution reached a total of about 508 million pesos (expressed at constant 1988 prices) in 1995 alone. This cost included the foregone earnings due to morbidity, foregone earnings due to mortality, and the total cost of medications for water pollution-related diseases such as diarrhea, typhoid/ paratyphoid, infectious hepatitis, acute poliomyelitis, and schistosomiasis.



4.0 SOIL DEGRADATION, FOOD CONTAMINATION AND OUR HEALTH

Another important environmental problem that equally endangers our health is soil degradation and food contamination. *Soil erosion* is the most serious type of soil degradation because it directly influences food production, which subsequently affects human nutrition. A 1993 report reveals that soil lost to severe erosion reached approximately 5.2 million hectares, while 8.5 million hectares were moderately eroded and 8.8 million hectares were only slightly eroded. Mindanao was found to have the largest area of severe erosion, with 2.4 million hectares or about 46 percent. On the other hand, Luzon area was reported to have the greatest area of moderate to slight erosion (DENR, 1996c).

A major factor that aggravates the present erosion rate is *deforestation*. In the 1950s, our forest cover was about three-fourths of the country. However, the persistence of deforestation diminished the forest to half by the 1970s, and to about one-fourth by 1988 (Gamalinda et al, 1993). As of 1994, only about 5.6 million hectares of commercial forests and 800,000 hectares of virgin forests still remained (DENR, 1996c).

Acidification, another form of soil degradation, may result either from natural occurrences or from human activities. A decrease in soil pH levels less than 4.5 was reported to have adverse effects on soil such as decrease in crop yield, soil fertility, and normal function of the crop roots (UNEP, 1993). Likewise, *soil salinization* may also lead to reduction in crop yields or make the land unsuitable for planting (UNEP, 1993).

Soil degradation due to *chemical and biological contamination* may result from traditional environmental hazards (e.g., inadequate access to safe water, sanitary facilities) and modern environmental hazards (e.g., increasing use of harmful types of pesticides, fertilizers, and the industries' dumping

of improperly treated or untreated solid and liquid wastes into the soil). Biological soil contamination, in particular, may occur as a result of practices such as the use of manure as fertilizer by farmers in some regions of the country and the improper disposal of human wastes. Leakage of underground sewerage pipes is another possible source of soil and groundwater biological contamination.

At present, the safety and quality of our food supply also faces threats posed by infectious biological agents and harmful chemical contamination, which may occur at any stage of food production—cultivation, harvest, transport, storage, packaging, marketing—to household preparation, storage, and handling.

Biological agents, such as *bacteria, viruses, parasites*, have been known to contaminate food more commonly than the chemicals. Chemical food contaminants, on the other hand, may also reach our food through natural or anthropogenic means. In the past years, there have been some chemical substances used that when emitted or discharged, can persist in the air, soil and water bodies for many decades, enter the food chain and accumulate in the tissues of higher animals as they move up the food chain. This poses a serious risk to public health because of the chemicals' potential to reach toxic levels by the time the chemicals reach the animals at the higher food chain level, and consequently the people.

4.1 BIOLOGICAL CONTAMINANTS IN FOOD

Biological agents, such as *bacteria, viruses, parasites*, have been known to contaminate food more commonly than chemicals. Biological contamination of food is likely to occur in several ways: poor personal hygiene (e.g., when an infected person fails to wash hands before handling, preparing, and serving food); poor environmental sanitation; night soil used as fertilizer on crops which may be eaten raw; through vectors such as flies, cockroaches, or rats



carrying infective microorganisms which may come in contact with uncovered foods; and improper excreta disposal. The common disease-causing organisms include *Shigella*, *Salmonella*, Hepatitis A, Cholera, and parasitic worms like ascaris, hookworm, whipworm, beef and pork tapeworms, and parasite of fresh water crabs.

Transmission of these biological agents can be prevented through improvements in the provision of safe water supplies and sanitary toilet facilities, personal hygiene, and standards in food hygiene, among others. These preventive measures would need to be accompanied by effective health education programs of food handlers on personal hygiene and safe food preparation (Smith et al, 1990).

Toxin-producing microorganisms. In contrast to the microorganisms mentioned earlier, there are certain microorganisms that may contaminate food items and produce toxins that are harmful to humans. Examples of these are *Staphylococcus aureus* and *Clostridium botulinum*.

Staphylococcus aureus are present in infected skin cuts, boils, and other skin lesions. Food handlers with infected wounds can transmit the microorganisms to food. When the contaminated food is stored at room temperature for several hours, the microorganism multiplies and produces toxin, which cannot be destroyed by heating (Benenson, 1997; Moeller, 1992).

Spores of *Clostridium botulinum* microorganism are commonly found in soil and agricultural products, in marine sediments, and in intestines of marine fish. These organisms produce a poison that is not destroyed by ordinary boiling and is very potent and deadly even in small amounts.

4.2 CHEMICAL CONTAMINANTS IN FOOD

Chemicals in food may either occur naturally or as a result of human activities. The common

sources of naturally occurring chemical substances are fungi, fish, cassava and mushrooms. In some instances, chemical substances such as fertilizers, pesticides, antibiotics, growth hormone, and food additives are artificially added to improve crop yield or to increase profit. Heavy metals such as lead, mercury, and cadmium, which all come from industries, can also contaminate food.

Naturally occurring toxins. Chemical toxins may also be naturally present in food. Some mushrooms, nuts, and fish may naturally contain toxins that can cause severe illness or even death when eaten.

Of growing public health concern is the unusual increase in the number of dinoflagellates, producing a reddish discoloration of water bodies known as "red tide". This phenomenon generally occurs after a sudden downpour following the dry season, resulting in surface water run-off towards bodies of water. This condition seems to render seawater rich with nutrients that can create a favorable environment for dinoflagellate proliferation. About 30 species of this microorganism contain neurotoxins (poison harmful to the nervous system) that may be acquired by seashells such as mussels, clams, oysters, and scallops. Unfortunately, the toxin cannot be destroyed even by heat during cooking and has no known antidote (Warren et al, 1984).

Food Additives. Food additives are chemical substances used to enhance the appearance and improve the nutritive value, taste, color, or shelf life of food products. However, some additives have been shown to be toxic or carcinogenic, or both (Clark et al, 1981; WHO, 1997a). Sodium nitrite, for instance, is applied on meat products to give them a reddish color and to prevent spoilage or prevent botulism, a bacterial type of poisoning that may result in illness or even death. Studies have shown that nitrite can react with other chemicals in food, producing nitrosoamines, a cancer causing substance (Nadakavukaren, 1995).



Results of a survey conducted in 1992 by the Department of Health to assess the nitrate and nitrite content in "tocino" show that about 15 percent of the samples exceeded the allowable level of nitrate of 500 ppm. Likewise, 5 percent of the samples exceeded the allowable level of nitrite of 200 ppm. A special program to control the levels of nitrate and nitrite usage for curing meat products was recommended and tocino makers were educated on health consequences of using too much preservatives (Santos et al, 1996).

Drugs in Animals. The quality of some meat and dairy products is also threatened by some cattle and hog raisers' practice of using drugs like antibiotics or growth hormone on animals to prevent animal diseases or to enhance milk production. Most of the antibiotics used are broad spectrum, such as penicillin and tetracycline (Moeller, 1992). Persons who consume these meat and dairy products, and are allergic to such antibiotics, may experience allergic reactions. This unscrupulous practice may also favor the development of antibiotic-resistance on strains of infectious microorganisms (Moeller, 1992). The National Meat Inspection Commission of the Department of Agriculture is currently conducting studies on the levels of antibiotic residues in meat products.

In 1994, the use of growth hormones to improve milk production of cows was investigated in the United States. The study reveals that dairy farmers inject their cows with genetically engineered growth hormone every two weeks to increase milk production up to five percent. Although the United States Food and Drug Administration (US-FDA) approved this drug for this purpose, some experts believe that this practice will probably increase cows' stress and udder infections. Farmers will then use more antibiotics and other drugs to combat cows' diseases, resulting in increased chemical residues in cow's milk. However, the US-FDA has guaranteed consumers that proper safeguards, such as monitoring of antibiotic residues and bacteria in milk supplies, are being implemented (Nadakavukaren, 1995).

Other chemicals in food. The addition of hazardous substances to food products to make them

look fresh is another threat to food quality. Local reports on the application of *formalin* on vegetables, or shoe/cloth dye, commonly known as *jobos*, on fish sold in markets are allegedly being practiced by some food dealers and vendors to enhance food appearance and increase their profits. These unlawful practices can also pose serious risks to human health.

Exposure to *mercury* occurs largely through consumption of mercury-contaminated foods. Once inside the body, mercury is distributed to the different organs of the body, particularly the brain, liver, and kidneys. Likewise, methylmercury easily crosses the placenta and damage the developing fetus (WHO, 1976; Ministry of Public Works and Government Services Canada, 1998). Human exposure to either the inorganic or organic forms of mercury compounds gives rise to characteristically different manifestations. In particular, the organic form (methylmercury) has been shown to have serious health effects particularly on the nervous system (WHO, 1991; Moeller, 1992).

For instance, among some members of the indigenous communities of Canada who consumed large amounts of fish and wildlife contaminated with methyl mercury, the most notable health finding is the development of progressive nervous system disorders (Ministry of Public Works and Government Services Canada, 1998). Children born to mothers who have been exposed to high levels of mercury while they were pregnant have been reported to suffer from a number of damages ranging from mental retardation, delayed walking and speech development, hearing impairment, deafness, to cerebral palsy.

Cadmium is another cumulative toxin whose health effects are revealed only after several years of low dose exposure. A good example occurred in the early 1940s in west central Japan where a mining industry discharged cadmium into the Jinzu river, contaminating the rice fields 50 kilometers downstream from the mining area. Upon investigation, high levels of cadmium were found in the rice grains. Ingestion of this contaminated rice by the community residents resulted in cadmium poisoning also called Itai-itai disease, a severely painful bone disease (WHO,



1992a; WHO, 1994). Accumulation of cadmium also causes kidney damage, subsequently impairing calcium absorption, and may lead to bone disease (WHO, 1994).

Furthermore, exposures to *arsenic* have also been found to give rise to various health effects. Acute health effects, which include nausea, vomiting, diarrhea, abdominal pain, and dizziness, usually manifest 1 to 2 weeks after exposure. This may also lead to death as a result of serious damage to the kidneys, liver, and heart (Lippmann, 1992). Long term effects may involve many organ systems, and may also cause skin problems. These manifestations are usually seen in populations living in areas where soil and water concentrations of arsenic are high (Lippmann, 1992).

Studies conducted to determine the health impacts of *aluminum* reveal that in very high concentrations, it can cause damage to the nervous system. Following exposure, some of the changes reported include deterioration of mental performance, behavioral changes, loss of short term memory, poor long term memory among elderly persons, and impairment of visual and motor coordination.

Increased body load of aluminum has also been associated with nervous system toxicity, particularly Alzheimer disease, a degenerative brain condition. However, this relationship has not yet been clearly established and requires further studies (Lippmann, 1992).

Chemical poisoning also occurs by ingesting food contaminated with heavy metals. These include mercury, cadmium, arsenic, and aluminum among others.

Street-vended Foods. Food cooked, sold, and even served by street and market vendors has become popular, making it a part of the diet of a number of Filipino households (Figure 4.1). However, its increasing popularity poses serious health threats because street foods may serve as vehicles for transmission of diarrheal diseases like typhoid fever, hepatitis A and cholera (Alonsabe, 1994).

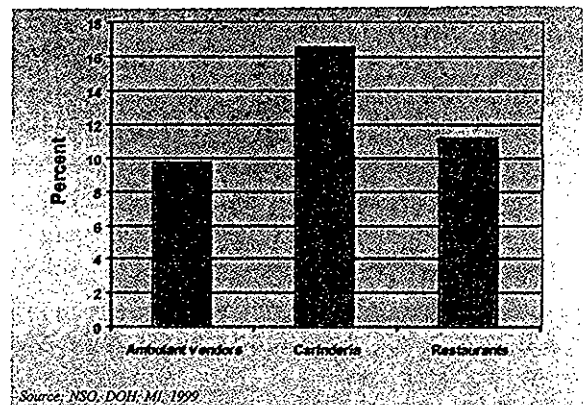


Figure 4.1 Percentage Distribution of Households Buying "Cooked-Food" from Various Sources, 1998

As shown in the National Demographic and Health Survey conducted in 1998, about 37.5 percent or 4,650 households buy cooked food from sources like street stalls or carinderias, kitchenettes, and restaurants.

4.3 HEALTH EFFECTS OF FOOD CONTAMINATION

Biological and chemical contaminants in food pose serious threats to human health. Health effects may range from mild to life threatening diseases (WHO, 1997a). In general, illness from ingestion of food contaminated with microorganisms manifests within a few minutes to several weeks from the time of ingestion. On the other hand, illness from inges-

tion of chemically contaminated food usually manifests after several years. This is of particular public health concern because low levels of some hazardous chemicals with varying toxicities can persist in the environment and gain access to the food chain. Once ingested, these chemicals eventually accumulate in human tissues. There are circumstances, however, when acute poisonings happen because of accidental exposures to chemicals (WHO, 1997a).

5.0 CHANGING LIFESTYLES AND THEIR IMPACTS ON OUR HEALTH

As the Philippines strives for socio-economic development newer threats to public health are emerging on top of existing traditional health problems and concerns. These threats primarily arise from changes in individual lifestyles which are often associated with modern day living and culture. Such lifestyle changes significantly contributing to the health profile of the country include the following:

- the increasing prevalence of cigarette smoking and tobacco use;
- alcohol consumption and substance abuse;
- changes in food preferences and eating habits;
- decreased physical activity;
- changing sexual behavior and practices; and
- risk-taking behavior and increasingly stressful living.

Individuals have the responsibility to make important health-related choices concerning their lifestyle as the choices they make, taken collectively, directly affect their lives and the lives of other people as well. Individuals who opt to adopt an unhealthy lifestyle do risk developing cardiovascular diseases, chronic lung diseases, diabetes mellitus, cancer, injuries or accidents, and other debilitating diseases.

The Philippines is now in epidemiological transition. Our public health profile, which has been characterized by traditional infectious and communicable diseases, is changing as the burden coming

from both modern day environmental health problems and non-communicable diseases such as cancer, hypertension, and other degenerative diseases emerges. This changing profile as illustrated in Figure 5.1, shows a decreasing trend in communicable diseases from the period 1947 to 1994, and an increasing trend in non-communicable diseases, such as heart diseases and cancer. The mortality rate of diseases of the heart quadrupled from 18.3 per 100,000 population in 1947 to 69.8 per 100,000 population in 1997. Likewise malignant neoplasm or cancer increased fivefold, from 7.4 to 37.5 per 100,000 population in the same period (DOH, 1997e).

5.1 UNHEALTHY DIET PREFERENCES

Changes in dietary preferences and eating habits have been noted over the years. Possible contributory factors include:

- the preponderance of fast food centers in urban areas with the majority serving high fat and high salt dishes (WHO, 1997b);
- the increasing demand on time specially among urban workers resulting in greater consumption of processed and ready-to-eat meals;
- foods high in fat and salt, refined sugars and low in fresh fruits and vegetables;
- deviation from the traditional home cooked and well balanced meals; and
- migration to urban areas where increased food cost, in addition to declining purchasing power, has led to consumption of less nutritious foods (e.g. instant noodles)

A 1993 survey conducted by the Food and Nutrition Research Institute of the Department of Science and Technology shows that the salt content of an average Filipino diet is as much as seven (7) grams per day, nearing the upper limit of normal



salt intake. Major contributors to high dietary salt intake include the addition of monosodium glutamate and salty condiments (e.g. table salt, fish sauce, shrimp paste).

Such preferences contribute significantly to the increase in the incidence of diet-related chronic diseases such as heart disease, hypertension, stroke, certain types of cancer, and diabetes. In rapidly industrializing countries, these diet-related diseases would most likely affect the affluent and productive sectors of the population (Latham, 1997).

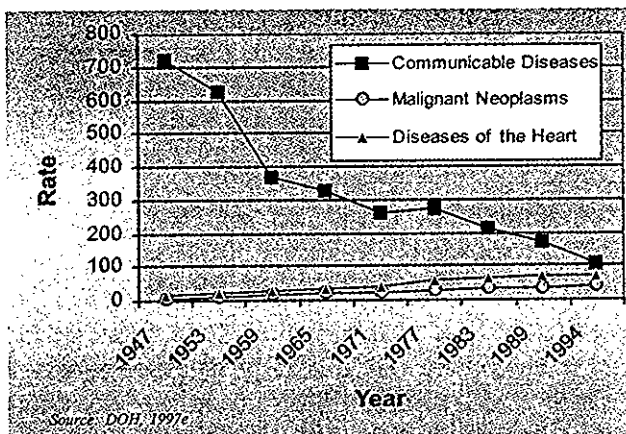


Figure 5.1 Mortality Trend: Communicable Disease, Malignant Neoplasms, Heart Disease in the Philippines, 1983-1993 (Rate/100,000 population)

5.2 ALCOHOL ABUSE

A tolerant society, effective marketing of alcohol products, and an increasingly stressful life have led to rising alcohol consumption over the years. A rising trend in alcohol consumption per capita has been reported in a number of countries. This consumption trend raises serious concern among public health and safety professionals and groups because of the risk of accidents or deaths due to drunk driving and development of alcohol-related diseases (WB, 1993). It must be noted that available data on alcohol consumption may be an incomplete picture because homemade production and consumption of alcohol were often not considered.

In the Philippines, drinking alcoholic beverages has been reported to be prevalent. In fact, a 1998 report by Dans et al reveals that about half of the population have a history of drinking alcoholic beverages. In addition, about 83 percent of the male population drink alcoholic beverages as compared to 21 percent of the female population. Majority, however, are responsible drinkers.

Heavy alcohol consumption affects the major organs of the body and can lead to a variety of chronic diseases. The liver is the primary impact organ that receives the greatest damage from repeated exposure to the toxic effects of alcohol and its metabolic products. Other organs that may be affected include the brain and the gastrointestinal tract (Ngelangel et al, 1997).

After years of excessive alcohol drinking, an alcoholic has increased risk of suffering from liver cirrhosis, which may lead to liver failure and eventually death. Other health effects include cancers of the liver, stomach, or esophagus, mental disorders, and malnutrition. (Ngelangel et al., 1997; WHO, 1996).

5.3 TOBACCO USE

Despite the dangers that cigarette smoking poses on health, the trend in consumption has been steadily increasing in developing countries since the 1970s. Cigarette consumption in our country steadily increased from the 1970s and 1980s, but stabilized and declined in the early 1990s. As shown in the 1997 National Smoking Prevalence survey, almost half (47 percent) of Filipinos aged 18 years and above were smokers, while more than a fifth (22.7 percent) were aged 17 and below (WHO, 1997c).

The 1989 study conducted by Lung Center of the Philippines revealed similar results. About 46 percent of the population are smokers, majority of whom reported peer pressure as the primary reason why they started smoking (Lung Center of the Philippines, 1989). Lung cancer, cancer of the mouth,

heart disease, and respiratory diseases are some of the threatening disease conditions closely associated with smoking.

The most unprotected passive smoker is the unborn child of a smoking mother

Source: WHO, 1998; Nadakavukaren, 1995; WHO, 1997c

A pregnant woman who smokes endangers not only her health but also the health of her unborn child (Nadakavukaren, 1995; WHO, 1997c). When a pregnant mother smokes, nicotine, carbon monoxide and other toxic ingredients present in cigarette smoke enter her bloodstream and passes on to the body of her unborn child (Nadakavukaren, 1995; WHO, 1997c). Numerous studies have shown that babies born to mothers who smoked heavily during pregnancy are on the average 2,100 grams lighter than babies born to non-smoking mothers (Nadakavukaren, 1995; Lankinen 1994; WHO, 1997c).

This effect on the weight of babies, as a result of maternal smoking, is a concern because low birth weight is a major risk factor for infant deaths (Nadakavukaren, 1995). In addition, such children register lower I.Q. test results, experience difficulties in reading, mathematics comprehension, and have short attention span compared to children who were not exposed to environmental tobacco smoke. Smoking during pregnancy is also blamed for miscarriages and premature births (Nadakavukaren, 1995).

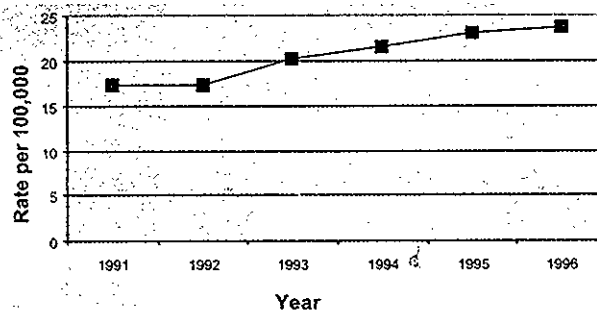
5.4 RISK-TAKING BEHAVIORS AND INJURIES

Violence and accidents may result from the risk-taking behaviors of an individual or groups of people. The Philippines have higher risk for inju-

ries from these behaviors because of hazardous living environment at home, the community where a person lives and conditions at work, coupled by the fatalistic attitude of many Filipinos. The risk is further magnified by poor and unsafe transportation system, unsafe and hazardous workplaces; and poor access to health care.

Accidents consistently remain one of the leading causes of morbidity and mortality in the country. In 1994 there were 211,288 recorded accidents with a rate of 307.9 cases per 100,000 population, making it the fifth leading cause of morbidity. The highest rates of accidents were recorded in Regions 2, 3 and 12. Among the provinces, Nueva Vizcaya, Batanes, Bataan, Cagayan, and Agusan del Norte recorded the highest rates of accidents. (DOH, 1999b).

The 1996 Philippine Health Statistics Report showed that accidents were the 6th highest cause of mortality in the Philippines with the rate of 23.7 per 100,000 populations. The 1996 rate is higher compared to the 5 year (1991-1995) year average which is only 19.9 per 100,000. Figure 5.2 show the death rate due to accidents per 100,000 from 1991-1996.



Source: DOH, 1996c

Figure 5.2 Death Rate due to Accidents per 100,000 Population. Philippine Health Statistics (1991-1996)

Most accidents are motor vehicle accidents commonly occurring in Metro Manila and its connecting expressways.



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Accidents, poisonings and violence comprise 8.8 percent (n=16,554) of total deaths for 1996 with a death rate of 23.7 per 100,000 populations. This can be broken down to: homicide and injuries inflicted by other persons (17 per 100,000), motor vehicle traffic accidents (7.2 per 100,000), drowning, suffocation and foreign bodies (common among 0-4 years old)(4.1 per 100,000), head injuries excluding skull fracture (2.6 per 100,000). Similar to the WHO report, males (81 percent) are more affected compared to females (19 percent).

Addressing the Issue of Violence and Accidents in the Philippines

It is apparent that addressing the issue of violence needs a multi-dimensional approach requiring the full participation of all sectors of the community from government, private sector, NGOs, Academe, and down to the family and household level. Issues that needs to be addressed include:

- 1) Alcohol and drugs problem in the Philippines
- 2) Transportation safety which includes addressing the weaknesses of the driver, the problems of ageing vehicles on the road, and the difficult driving conditions brought about by poor road conditions, lack of roads, and traffic.
- 3) Health and safety in the workplace
- 4) Preponderance of guns and other fire arms
- 5) Life stress
- 6) Medical resources for the prevention and control of injuries including treatment and rehabilitation
- 7) Community information and awareness campaigns to address the above issues
- 8) Improved monitoring, recording and reporting of violence and accidents
- 9) Strict implementation of existing laws and regulations on violence and accident prevention and control.

6.0 EMERGING ENVIRONMENTAL PROBLEMS AND THEIR POTENTIAL HEALTH IMPACTS

The rapid developments of the past century have significantly affected human health largely due a number of environmental changes, some of which include the "modern hazards." The presence of some of these hazards in the environment can be primarily attributed to the thousands of chemicals that are in use, emitted, or improperly disposed; the introduction of new industrial and agricultural technologies; and the increasing human activities that lack safeguards for health and environment. As a result, harmful contaminants in air, water, soil/land, and notable changes in climate, have ensued.

6.1 CHEMICALS AND HEALTH

The invention of a wide range of synthetic chemicals has found many uses in industries and households. However, there are certain chemicals that pose significant global and environmental threats as well as human health threats. Unfortunately, some of these most toxic chemicals already restricted in some developed countries are still being manufactured and sold to developing countries (WRI, 1998). Increasing evidence on the potential human health effects of certain chemicals, particularly the persistent organic pollutants and heavy metals, have aroused the interests of many people, especially the scientists and environment and health specialists.

Persistent Organic Pollutants. Persistent Organic Pollutants (POPs) are toxic chemicals that are mostly products and byproducts of industrial activities.

Studies have shown that the notable effects of POPs on health are as follows: disruption of the body's hormonal system, decreased breast milk production, poor intellectual development, behavioral changes, dysfunction of the immune system, decrease in sperm count and cancer in different body sites.



Heavy metals. As earlier discussed, heavy metals such as lead, mercury, cadmium, arsenic and aluminum also pose serious health threats.

6.2 SOLID WASTE AND HEALTH

Solid waste and its management are a major concern of our country, especially in highly urbanizing areas. The growing daily volume of solid waste or garbage, refuse, and other solid materials discarded due to lack of apparent value, combined with the rapidly increasing population and expanding industrial activities, poses considerable threats to our health and the environment.



Uncollected wastes dumped on the sidewalk pose a threat to health and safety.

In Metro Manila alone, with a total population of 10.492 million (2000 population), more than 6,000 tons of wastes are generated daily. Only about 73 percent or 3,500 tons of these wastes are collected daily. Of the total amount of waste, about 74 percent or an estimated 4,000 tons come from households, while the others come from food establishments, markets, and institutions, among other sources.

Another major concern of public health authorities is the disposal of biomedical wastes, which are primarily generated by health care facilities (hospitals, medical, dental, maternity, lying-in clinics), blood banks, drug manufacturers, medical labora-

tories, nursing homes, research institutions, veterinary facilities, autopsy laboratories, medical schools, or even households where health care is being provided (WHO, 1997a, DOH, 1995).

Of the biomedical wastes being generated, greater concern is focused on wastes that can transmit deadly infectious diseases. These wastes include hospital wastes such as blood, body organs, syringes, and needles used on infectious individuals. To safeguard public health, the policy on proper solid waste collection and disposal is being implemented. Included in the policy is the segregation of pathological and infectious wastes from the noninfectious, and their disposal with the use of color-coded plastic containers. Red colored bags are for sharps and pressurized containers; orange colored bags are for radioactive wastes; yellow with black bands are for chemical wastes, and black colored bags are for non-biodegradable general wastes. The green and black plastic bags are collected and disposed in sanitary landfills, while the other bags are disposed through special procedures.

A 1995 nationwide survey of 45 Department of Health hospitals shows that 62 percent of these hospitals have waste management committees. However, only 18 percent of these hospitals have a separate budget for hospital waste management. Moreover, all the hospitals generate less than 5,000 kg of general wastes and less than 1,000 kg of infectious/pathologic wastes per month. In-house collection of these wastes is done two to three times a day, although wastes of 20 percent of the hospitals are collected only once a day. Majority of the hospitals (77 percent) use carts as a means of in-house collection and transportation system. The most commonly used personal protective equipment by the hospital waste collectors are masks and gloves. About a third (78 percent) practice segregation, coding and labeling of the hospital wastes, utilizing color coded cans or bags, while roughly 27 percent practice recycling of bottles, papers, and cartons. Majority (80 percent) of the hospitals pre-treat their infectious wastes with chemical disinfectants prior to their final disposal.



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About half of the hospitals have facilities for temporary waste storage prior to its final disposal. It is the municipal/city collectors who are responsible in the waste collection task. However, 22 percent of the hospitals network with incinerators of other hospitals for the disposal of their infectious/pathological wastes (DOH 1995).

A similar study was conducted in 1997 where the waste management practice of 146 private and government hospitals in Metro Manila was determined. Only 40 percent have an existing hospital waste management committee and 38 percent have separate budgets for hospital waste management. Wastes segregation is practiced in most of the hospitals (87 percent) with the use of colored plastic bags.

The improper disposal of solid wastes poses potential threats directly or indirectly to the health of many individuals particularly the scavengers who rake open dumping areas for recyclable materials. Accumulation of uncollected solid wastes leads to waste decaying, which creates a condition conducive to the growth of infectious agents such as bacteria and parasites, and the creation of a breeding ground for disease carriers such as flies, cockroaches, rodents, and others. (Health and Welfare Canada, 1992; WHO, 1997a)

Aside from the nuisance brought about by the obnoxious odors emitted, improper solid wastes disposal could also lead to the leaching of toxic substances into the soil, surface water, and ground water which serves as local source of drinking water supply. Open dumpsites may produce carbon dioxide and methane, resulting in chemical reactions, instantaneous burning, or explosions (Health and Welfare Canada, 1992).

Furthermore, solid wastes that clog the street drainage because of improper disposal may result in flooding during rainy days and favor the breeding of mosquitoes that harbor diseases like malaria, dengue, schistosomiasis, and filariasis. Likewise, wastes dumped into water bodies may cause the con-

tamination of aquatic food supply with various disease agents or toxic chemical substances.

Particularly at risk here are waste collectors, especially those who do not wear protective gears like gloves, masks, boots, and coveralls, communities living near dumpsites, and scavengers and their families who reside within the disposal sites. Because scavengers may come in contact with high concentrations of chemicals, infectious wastes, disease carrying insects, and sharp materials, they may acquire infectious diseases like hepatitis B, hepatitis C, AIDS, staphylococcal or streptococcal infection, tetanus, or pneumonia from the infected dust waste, or even leishmaniasis from rodents and rabies from bites of stray animals.

6.3 CLIMATE CHANGE AND HEALTH

The past century has been an era of significant economic and social progress. Rapid urbanization has brought considerable improvements in the quality of human life. However, they have also brought with it changes in global climate that have a wide range of effects on both the environment and human health.

Thinning of the Ozone Layer. The ability of the ozone layer to absorb harmful ultraviolet rays is important to human health and the environment. When this ozone shield is destroyed, more hazardous ultraviolet rays reach the earth and this radiation can have long-term harmful effects on human health, food production, marine life, and the climate system (Lemonick, 1992; Garcia, 1997).

Cataract. Excess UV-B radiation levels can damage the lens of the eyes and may eventually result in cataracts or even blindness if left untreated. Cataract incidence has been estimated to increase by 0.6 to 0.8 percent for every 1 percent depletion of the stratospheric ozone layer (WRI, 1998).

Skin cancer. UV rays may cause skin cancers, including the deadly type of skin cancer called mela-



noma. Scientists predict that there will be an estimated 15 to 20 percent increase in the incidence of skin cancer among fair-skinned individuals who are exposed to UV-B rays. This projected estimate, however, does not take into consideration certain factors such as individual susceptibility and personal protective measures taken by individuals to lessen their exposure to sunlight (WRI, 1998).

Alteration of Global Climate. Although there is vast scientific evidence that global climate change is greatly influenced by human-made activities, there are still many uncertainties in forecasting climate change (Koza, 1998; WRI, 1998).

Among these climate changes are extreme weather events such as El Niño and La Niña phenomena, heat waves, and rising of sea levels.

Increase in Vector-borne Diseases. Increasing amount of rainfall and rising temperature will likewise favor the multiplication and dispersion of disease-causing vectors and microorganisms resulting in an increase in the transmission of vector-borne diseases like malaria, dengue fever, and encephalitis. Warmer temperatures shorten the length of development of the disease-causing microorganism inside the mosquito. Furthermore, a warmer temperature hastens the mosquito's metabolism, thereby influencing their nutritional requirements. This in turn results in increases in their biting rate, which subsequently increases their egg production. Higher temperature, on the other hand, creates a favorable environment for mosquitoes to expand their flight range to higher elevations and in wider areas. (McMichael et al, 1996; WRI, 1998).

Similarly, the transmission of schistosomiasis disease could also be influenced by climate change as change in water temperature alters the life cycle of the disease-carrying vector, *Oncomelania* species snail (WRI, 1998).

Increase in Water-borne Diseases. Computer models on climate change forecast that variation in rainfall patterns and sea level rise could also affect the

population's groundwater supply and sanitation, and thus may increase occurrences of typhoid, cholera, and other water-borne diseases. Occurrence of these water-borne diseases may result from flooding in low-lying areas, and consequently, the contamination of the drinking water supply (WRI, 1998).

7.0 CHALLENGES TO CHANGE TOWARDS A HEALTHY AND SAFE ENVIRONMENT

The different environmental health issues and concerns presented in the previous sections are increasing in magnitude and complexity over time. The consequent health risks are defeating our gains from developmental efforts. It is apparent that environmental health problems have already taken their toll as a result of insufficient safeguards in the past. Inadequate water supply and sanitation, unsafe use of chemicals, and improper waste management have increased the incidence of diarrhea, respiratory infections, heart diseases, and cancers among others.

In 1990, an estimated 11 to 42 percent of the diseases from all causes were attributable to environmental pollution, translating into 456 million DHLL. In economic terms, an estimate of 2 to 4 percent of our Gross Domestic Product was lost due to loss of future earnings brought about by premature deaths caused by environment-related diseases (DOH, 1996a).

Indeed, because development, environment, and health, are closely interwoven, an integration of strategies and approaches not only by the health sector but by development sectors, government and non government agencies, is essential. Health should not be the sole responsibility of the health sector. Concerted efforts by different sectors provide a clear path towards reduction of environmental health risks leading to improvement of health. Encouraging the adoption of efficient and least polluting technologies will ensure the quality of our natural resources and protection of public health.



Faced with these environmental health challenges, a summary of recommendations for actions by the various government and non-government agencies are presented in the following section.

7.1 PRIORITIZE MORE URGENT ENVIRONMENTAL HEALTH PROBLEMS

Millions of Filipinos are suffering or have died prematurely because of environment-related health risk factors like inadequate safe water and sanitation, contaminants such as dust (PM_{10}) and lead present in the air, smoke from wood and charcoal used for cooking, soil contaminated with harmful chemicals, and food tainted with pesticides or harmful food additives. These environmental health problems have resulted in a huge economic loss to our country, amounting to about 2 billion (expressed at constant 1988 prices) in 1995 in terms of treatment cost and foregone earnings due to illness and premature death from water and air pollution related health problems alone. Therefore, prompt action to address urgent environmental problems would greatly benefit our health and the economy.

7.2 INVEST IN HUMAN RESOURCES

There is a dearth of environmental health specialists particularly in the local government. Better skills are necessary for the successful implementation of various government programs in health and environment. Needs analysis is essential in order to identify specific skills gap. Likewise, providing the appropriate training is necessary in order to hone and strengthen technical skills in monitoring, analyzing, and formulating policies, conducting research, and implementing environmental health programs and projects.

7.3 ASSESS THE CURRENT ENVIRONMENTAL AND HEALTH POLICIES

As a result of the country's rapid development, some policies need to be reviewed so that new

provisions can address emerging environmental issues and their life threatening health consequences could be integrated. There is a growing concern regarding the poor enforcement and monitoring of environmental regulations by government agencies. This may create distrust in the government's capacity and commitment to protect the environment and public health. It is therefore necessary to assess existing regulations, laws, and policies in terms of its relevance, extent of implementation, overlapping or conflicting provisions and the overall impacts on the quality of our environment and health.

7.4 INFORM AND DISSEMINATE INFORMATION

Information dissemination of reliable and regularly updated environmental health data, conveyed in easily understandable terms, is essential for the people to be able to take on the responsibility for their own health or even become facilitators of change. Availability of accurate, reliable information on the quality of air, water, soil, and drinking water, with corresponding health impacts and advisories to interested groups or individuals whether from private or government sectors, could enhance the implementation of environment and health protection programs by gaining their support. This approach can help stimulate the people to partake in decision making, strengthen linkages between government sectors, communities, and other sectors of society, and increase their knowledge of environment and health matters. An environmental health information system can also serve as a network to help people, even from distant regions, gain access to information. Dissemination of correct environment and health data through tri media should be undertaken.

7.5 STRENGTHEN INTERSECTORAL COORDINATION

Since health concerns often cut across the normal bounds of sectoral responsibilities, there is a



need for an integrated approach to address health and environmental problems. Concerted efforts and resources among government agencies could more effectively curb environmental health-related diseases and enhance plans, approaches, or strategies to resolve potential conflicts. The Inter Agency Committee on Environmental Health (IACEH), one of the country's environmental management frameworks, consists of government agencies that act jointly towards the sustainability of our environmental resources and the protection of public health. There is, however, a need to strengthen the regional IACEH.

7.6 INVOLVE THE LOCAL PEOPLE

The active participation of local communities is essential in dealing with environmental health problems. Their involvement in planning, implementation, monitoring, and evaluation of environmental health programs and community plans would enhance the sustainability of the activities and the affirmation of the communities' support for the said programs/projects.

When the values of the local officials, community members, people's organization, and non governmental organizations are considered at an early phase, local conflicts particularly when controversial development projects are introduced, can be prevented or minimized. Capability building of local communities can likewise be beneficial when local agencies are given the responsibility to plan programs and implement policies. However, on the basis of existing socio-economic conditions, active involvement of the communities can only be feasible if national government agencies can provide adequate human and monetary resources, as well as training in environment management.

7.7 ADDRESS KNOWLEDGE GAPS

Basic data on environmental quality, as well as exposure assessment studies that will provide a clear understanding of the relationship between

human exposure and the adverse environmental health conditions are necessary. There is scarcity of local quantitative data linking environmental agent and health effects, as well as research geared towards appropriate technology. A databank system to collect and store these vital information that will help set sound policies, decision making, planning, and evaluation is necessary. Various research conducted by different agencies should be integrated and made accessible to both public and private sectors. Similarly, access to reference laboratories equipped with complete facilities is necessary for the conduct of essential research and continuous environmental quality monitoring. Potential areas for research include the following:

- Policy research on developing an integrated framework to operationalize concepts of environmental sustainability, economic and community development for health protection. The study may develop or evaluate strategies and mechanisms to facilitate more active participation of NGOs, the private sector, and academe in government efforts at different levels.
- Development of a model for environmental health risk assessment at the local level. With the implementation of the Local Government Code, planning and implementation of environmental health interventions at the local level is crucial.
- Policy research on strengthening and integration of health impact assessment into the existing environmental impact assessment system. Although there are efforts toward this end at the national level, strategies for integration at the regional, provincial, and municipal levels are not in place.
- Development of a model for waste minimization for the industrial sector and at the community level.
- Benefit-cost analysis of environmental and health promotion and protection programs and projects.



- Environmental health risks perception surveys to determine community insights and values on a particular environment and health concern.
- Conduct of National Environmental Health Survey as regards to specific environmental health concerns (i.e., air pollution and health, water and sanitation, etc.)
- Development of appropriate and reliable environmental health indicators and biomarkers of exposure that will be useful in health planning, implementation, and priority setting for action. Current environmental health indicators used (e.g., access to water supply and sanitation services, morbidity/ mortality figures for diseases like diarrhea, cholera, etc.) should be expanded to consider the changing patterns of environmental health risks.
- Epidemiological studies that aim to identify the relative association between environmental exposures and health outcome. Results of these studies can be used to improve information for policy formulation and implementation, as well as for health or environmental action.
- Studies to assess the relevance and appropriateness of existing environment and health policies.

The health and environmental challenges ahead are huge and daunting. But if we all work together for environmental quality, human health, and sustainable development, we all stand to gain. Moreover, we will be able to pass on to future generations a healthy and safe environment.



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