

Human & Ecosystem Health



*Canadian Perspectives,
Canadian Action*



Canadian Public Health Association
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A report of the Canadian Public Health Association
Task Force on the Implications for Human Health of Global Ecological Change.
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Preamble

The Canadian Public Health Association (CPHA) is a national, independent, not-for-profit association representing public health in Canada with links to the international public health community. CPHA's members believe in universal and equitable access to the basic conditions which are necessary to achieve health for all Canadians.

The Association's membership and its Board of Directors have declared "the environment" as a priority for the Canadian Public Health Association for the nineties. This is not a new area of work as CPHA's activities over the previous two decades have focused on occupational and environmental health, review of the environmental impact assessment process and participation in the federal government's green plan consultations.

The Canadian Public Health Association's Occupational and Environmental Health Division was instrumental in bringing global ecological issues and their effects on human health to the attention of Canadian Public Health Association members. In 1990, the Association's membership approved a motion, declaring the Association's concern for environmental quality on a global scale as an issue with public health implications. The membership requested the Association to form a Task Force to prepare a report on the human health implications of global ecological change and to develop recommendations for the Association for further action.

This is the report of that Task Force. The report of the Task Force, *Human and Ecosystem Health: Canadian Perspectives, Canadian Action*, presents a framework for the Canadian Public Health Association's environmental work for the nineties. The paper begins with an introduction to the concept of ecosystem health, the relationship between sustainable development and health and the links between our present values and our present problems. This leads to the proposal of a set of values, more consistent with human and ecosystem health, which underlie this paper.

The report is based on the concept of sustainable development and improved health, at a global and national level. It is not intended to be a definitive review article, which would be heavily referenced, but less readable. Rather, it is an overview of the issues. Key sources, both of a general and a specific nature, are for those who wish to dig deeper.

In the second section, some of the major global ecological changes are reviewed in terms of what we know or suspect may be their effects upon human health, either directly or indirectly. The global changes reviewed include climate change, resource depletion and ecosystem contamination.

The final section lays out a strategic framework for addressing these threats to ecosystem and human health, activities that could be undertaken by CPHA and by public health professionals in their work and as individual citizens. The paper ends with a series of specific recommendations for CPHA that are intended to assist CPHA to play its role as an organization in protecting our planet and our health.

The Canadian Public Health Association is grateful to Task Force members for their volunteer time and dedication in undertaking to prepare this report. A list of members of the Canadian Public Health Association's Task Force on the Implications for Human Health of Global Ecological Change is included at the end of this report.

Introduction

In 1968 our world view changed — literally and forever. Photographs from moon orbit let us see ourselves in true perspective, as invisible inhabitants of a beautiful, fragile planet spinning in the vast black emptiness of space. To be sure, we had been jolted into an awareness of the harm we are doing to our environment by Rachel Carson's *Silent Spring* a few years earlier and would be jolted again, a few years later, by the Club of Rome's report *The Limits to Growth*, but now, for the first time, we could truly both think and see globally. It has been an important change of view; surely no-one who has seen the earth, our home, viewed from space can fail to be moved. The harm that we are doing to this living planet - Gaia - and thus to ourselves, should also move us to sadness, perhaps to anger, but most of all, to action.

This report is written with that hope in mind: that CPHA and its members, public health workers and Canadians in general will be moved to action. Public health is based on the premise that we should anticipate and prevent health problems, protect people from health hazards and promote health and well-being. Now we have to apply these concepts not only in our homes and communities, our town and cities, our provinces and nations, but also at the global level. For now it is not simply human health that is threatened, but the health of our ecosystem, of Gaia herself.

It is the greatest challenge public health has ever faced, and one we have come to - late - but not too late, we hope. There is still time for us to do what we have to do: to join with the environmental movement, with governments and business, with our friends and colleagues, our neighbours and our families. Only by becoming part of the growing global movement to protect and enhance human and ecosystem health can we hope to ensure that generations to come will also be able to see the Earth as we see it - a beautiful, living planet - and to be moved by that sight.

Section 1

Ecosystem and Human Health

Ecologists have come to speak of “ecosystem health” in describing the attributes of a rich, diverse, stable ecosystem. However, human health is indivisible from ecosystem health. Over 100 years ago, the Squamish Chief Seattle spoke movingly of our relationship to the earth, “We are a part of the web of life,” he said, “and whatever we do to the web, we do to ourselves.” If we take this seriously, perhaps we should speak of health as a state of complete physical, mental, social and ecological well-being!

The combination of expanding populations, rising expectations and the globalization of industrialization has had an impact on local ecosystems and bioregions for many years. In the context of inequitable control of world resources and abysmal poverty, these forces now are changing the face of the whole planet. Global warming, ozone depletion, species extinction, deforestation, erosion, desertification and ecotoxicity are changing the balance and the integrity of the world’s natural systems. These natural systems are connected into a vast global ecosystem, our basic life support systems; we ignore damage to this system at our peril.

As Canadians, we both contribute to and suffer from these global problems. Vast as we are, we cannot pull up the drawbridge and isolate ourselves from the effects of global warming and other planet-wide problems. As an industrialized society, we use a disproportionate share of the world’s resources and contribute a disproportionate share of global pollution. We must face up to our responsibility as part of the problem.

The basic premise of this paper is clear: our present way of life threatens the health of our ecosystem and thus threatens human health. As Canadians, we contribute to that harm and stand to suffer the consequences. We have a responsibility — to our fellow humans, to ourselves, to future generations and to other life forms with whom we share the planet — to do our share to rectify the problems. It is particularly important that public health — as a field, a discipline, and as individual organizations and practitioners — play its part in the ultimate application of the philosophy of prevention; preventing further damage to our planet and promoting ecosystem and human health.

1.1

Sustainable Development - A Paradox?

The concept underlying sustainable development is ancient, wise and simple: we should use renewable resources at a rate that ensures their continued existence (sustained yield); we should use non-renewable resources sparingly and recycle whenever possible (conservation); and we should not pollute natural systems to the point where they can no longer cope with the damage inflicted upon them (pollution prevention). These and similar ideas were integrated in a 1980 report by the International Union for the Conservation of Nature and given the collective name “sustainable development”. The term was popularized by the World Commission on Environment and Development in their report, *Our Common Future*. The Commission sought to address the need

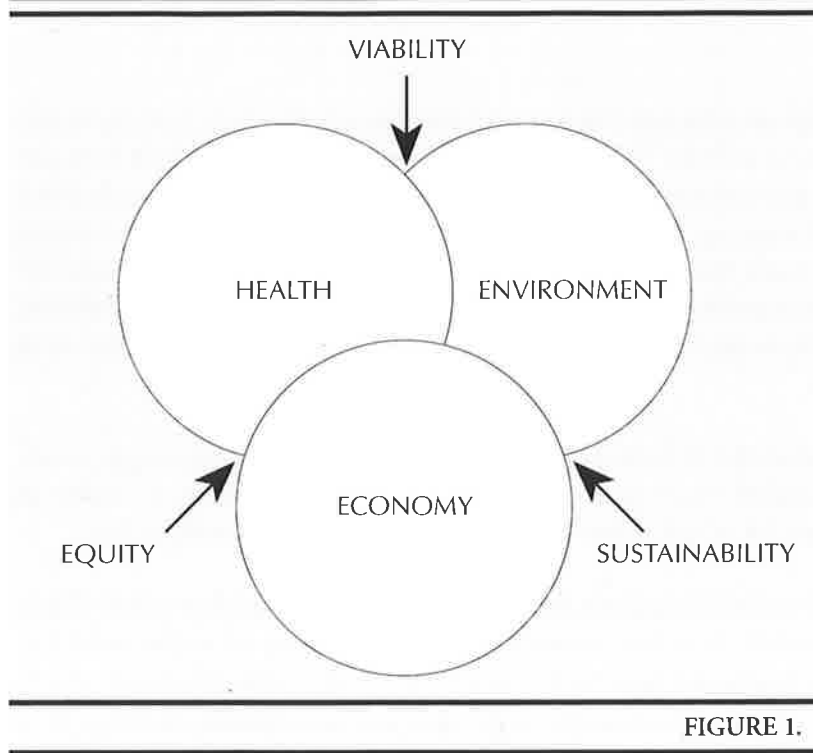


FIGURE 1.

on the one hand for economic growth to enable the four-fifths of the world living in poverty to attain a suitable level of human development and to ensure, on the other hand, that such growth does not harm the environment to the extent that it closes off development opportunities for future generations. Hence, their definition of sustainable development as “development that meets the need of the present without compromising the ability of future generations to meet their own needs”.

There is, however, a potential paradox in this concept. On the one hand, if human health and human potential is to be maximized, we seem to need economic growth. On the other hand, that economic growth may threaten the very ecosystem on which human development, indeed human survival, ultimately depends.

One way to understand this inherent dilemma and the relationship between health, environment and economy, is shown in Figure 1. Health (which, in general, means the full development of human potential) requires both an adequate economy and a viable environment - viable, that is, for humans. But the environment itself requires that economic activity be such that the environment is indefinitely sustainable.

Economic activity also must not destroy the human and social capital or deplete the social resources of our society. In particular, the benefits of economic activity need to be equitably distributed both within and between nations, societies and communities (equity here means fair, not necessarily equal). Raymond Aron has remarked, “*When inequality becomes too great, the idea of community becomes impossible.*” The health consequences of poverty and community breakdown are seen only too clearly in Canada and throughout the world.

Hence, we would do well to redefine sustainable development, from a health perspective, as follows:

Human development and the achievement of human potential require a form of economic activity that is socially and environmentally sustainable in this and future generations.

If we are to achieve health for all, we in public health need to understand and communicate why and in what ways our current economic activity is socially or environmentally unsustainable; what the health consequences are; what alternatives should be considered, developed and implemented; and what the role of the Canadian public health movement is, in Canada and globally.

1.2 Values

The roots of our global crises are to be found in a set of dysfunctional values held by many in our society, indeed by our society as a whole. The health effects that we anticipate will flow in large part from the social, economic, and environmental decline and disruption that result from such global ecological effects as global warming, ozone depletion, ecosystem contamination and resource depletion. These in turn result from the increase in production of materials and wastes, the consumption of resources consequent upon the increasing expectations of a burgeoning population, and the willingness and ability to use powerful technologies to satisfy growing demands. This causal chain is shown in Figure 2.

If we examine some of the values that underline these increasing expectations and growing demands we will find such dysfunctional values as materialism, domination, militarism, a valuing of indefinite growth, selfishness, greed and elitism and the more positive values outlined here.

Changing these and similar underlying values is the fundamental challenge we face as individuals, as an organization and as a society. Therefore it is important to first state some values that we believe are inherent in a public health approach to environmentally and socially sustainable development. (These values are implicit in the text that precedes this section, but they need to be made explicit.)

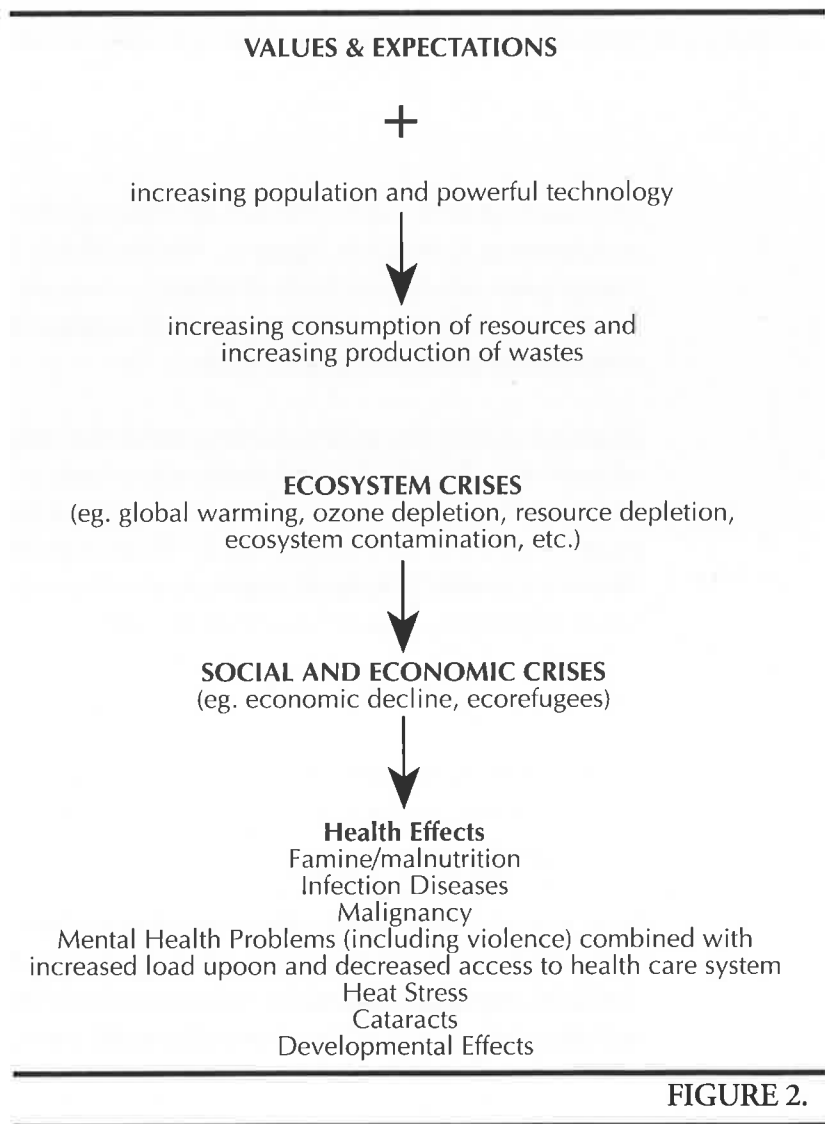


FIGURE 2.

We value:

- a) Human development: the attainment of full human potential by all people is our goal (anthropocentrism).
- b) The web of life: the preservation and enhancement of other life forms and the maintenance of the integrity of the ecosystem has merit in itself in addition to its value to humans (biocentrism).
- c) Future generations: we have a duty to ensure them a quality of life and of environment at least equal to that which we enjoy (sustainability).
- d) An equal opportunity for all to be healthy: basic human needs must be met for everyone and wealth must be distributed fairly (equity).
- e) A form of economic activity that, while environmentally and socially sustainable, ensures that there is enough material and non-material resources for the attainment of full human potential (adequacy).
- f) People's fundamental right to be informed and to participate fully in decisions which affect their lives, health and well-being (participation).

But the end problem comes when one has to make choices among these positive values in order to arrive at the best combination of them. Should we value anthropocentrism over biocentrism, for example, and if so, when and under what circumstances? How do we make compromises between equity and sustainability? How do we ensure that in ensuring the greatest good for the greatest number, we do not harm the minority, trample on their rights or exclude their participation? If we are to apply the utilitarian principle globally, what in our way of life are we prepared to change to ensure the greatest good for the majority who live in developing nations? And perhaps most important, who should make such decisions, and how? We do not have an easy answer to these questions, but we feel that they should be decided in an open and participatory way, and in a manner that protects the interests of future generations and other species. Since we have never done this before, debate is needed to develop these new mechanisms, and soon.

Section 2

Specific Global Ecological Issues and Their Health Effects

2.1 Climate and Atmospheric Change

Global Warming and Climate Change

The greenhouse effect, in which atmospheric gases in the troposphere stabilize the earth's temperature, was first described over 50 years ago. Gases, such as carbon dioxide, oxides of nitrogen, methane and chlorofluorocarbons (CFCs), allow visible and UV radiation from the sun to penetrate to the earth's surface to warm it, but they prevent the release of the reflected infrared radiation back into space. Since accurate recording began, concentrations of the greenhouse gases in the troposphere have increased dramatically, as a result of human activities - in particular the increased worldwide combustion of fossil fuels and exhaust emissions from cars and other vehicles.

Accumulating greenhouse gases are now beginning to raise the global temperature - an estimated 0.5°C to 1°C from 1880 to 1990 - more rapidly in the last 10 years than in the previous century. Most of this temperature rise has been attributed to the increasing levels of carbon dioxide in the troposphere. A temperature rise of up to 4°C in the next 50 to 100 years has been predicted and six of the ten hottest summers since record keeping began occurred in the 1980s. Although global climate models are not well-adapted to predict regional and local climate change in detail, it is likely that grasslands and prairies, such as the U.S. mid-west will get hotter and dry out, so that the self-correcting effects of vegetation on micro-climate is lost. This is one of several feedback loops that would increase the effects of climate change. It is also possible that some feedback loops, such as increased cloudiness over the oceans, might decrease the effects.

The distribution of vegetation is expected to change dramatically in a short period of time, relative to the past rate of change on Earth. Forest canopies will disappear from many temperate zones and be replaced by grassland and savannah. It is unlikely that trees will be able to 'migrate' to cooler climates because soil conditions will not support them. The distribution of weeds, including allergenic ones, is likely to change, as is the distribution of insects harmful to human health.

Despite the uncertainties about climate change at the regional and local levels, it appears that the temperature increase will be largest in the high latitudes of the northern and southern hemispheres. The increase will be much less in equatorial regions at low latitudes. As well, there will be an increased climate variability, so that although overall temperatures will increase, temperature ranges may increase and become less predictable. For example, there could be more heatwaves, monsoons, storms and droughts. In some cases, there could be lower winter temperatures. Thus, climate change will affect different parts of the world in very different ways and no detailed predictions about human health can be made. The health effects of climate change can only be outlined in general terms, although they are likely to be serious, irreversible and long-term.

There are likely to be some direct effects of climate change on human health, but the most important ones, and perhaps those that are the most difficult to deal with, are indirect. The major direct effects will be the need for individuals and populations to adapt to a warmer climate and an increased incidence of heat disorders. As the global temperature rises and the climate changes, many adjustments will be needed at an individual and community level that may require sacrifices in life-style and the quality of life to maintain basic needs. This could include changes in housing, clothing, nutrition, mobility and health services. It may be necessary to limit physical activity as heat stress can cause cardiovascular disturbances and more serious effects. Healthy individuals will acclimatise after several days of heat exposure, but there are sensitive groups whose thermoregularity systems are unlikely to function adequately. These include infants and the elderly. These more sensitive groups may experience increased morbidity and mortality from heat stress. Other direct effects of increasing temperatures are behavioral changes including social intolerance, irritability, and industrial accidents. These may be particularly important where urban 'heat islands' occur.

The indirect effects of climate change are more numerous and complex than the direct effects. They include:

Effects on Food Production

Food production will be severely affected by increased temperatures and decreased soil moisture. Many areas currently devoted to grain crops will become drier and desertified; topsoil may be lost in duststorms. Biological productivity will fall because of water shortages and high temperatures,

despite the increased availability of carbon dioxide. As well, fertile coastal regions currently used for food production could well be flooded. Some crops, such as corn and rice, will only germinate within a narrow temperature range, and most strains of rice grow only in water. However, increasing temperatures and climatic variability and unpredictable rainfall patterns will affect even robust crops, such as wheat. The effects on agriculture will decrease food production and disrupt availability, so that more localised food shortages and famines are likely. These effects will also be felt in Canada, where global warming may disrupt wheat growing.

Vector-Borne Diseases

The range of some vector-borne diseases will probably extend into areas now free of these diseases as temperate zone climates become more hospitable to insects such as anophelene and colicine mosquitoes. This may well include Canada. The diseases involved include malaria, arthropod-borne virus and rickettsial diseases such as viral hemorrhagic fevers, dengue and viral encephalitides, tick-borne diseases such as typhus and lime disease and perhaps bubonic plague. We have effective vaccines and preventive measures against some of these diseases, but not others. Increased pesticide spraying is unlikely to be effective because of growing insect resistance.

Water-Related Effects

An important consequence of global warming will be the rise in sea level caused by ice melting and the expansion of the seawater mass. This, combined with increased climate variability, could threaten to submerge some of the world's largest and more important cities, such as London, New York, Washington, Miami and Shanghai. Canadian cities that are likely to be affected include Vancouver, Halifax and St. John's.

Many sewage treatment plants would be flooded by even a small sea level rise, causing an increase in the contamination of receiving waters, that could in turn lead to increased incidences of bacterial, viral and parasitic infection. It will become increasingly important to secure supplies of drinking water as temperatures increase. This may become more difficult in coastal areas where sea water infiltrates ground water used for drinking water. One-third of the world's population lacks access to safe drinking water and the World Health Organization has estimated that 80% of the world's disease burden is attributable to the lack of sanitation and safe supplies of water. Global ecological changes will aggravate this situation greatly.

Migration

The effects outlined above are likely to result in large-scale human migration. In some instances, people could be displaced by flooding, while in others shortages of food and water will encourage migration. In most cases, migration will not be reversible and will impose significant new economic, social and health demands on the receiving societies, of which Canada will be one.

The stratospheric ozone layer provides protection against the harmful effects of UV radiation. UV-A is the least dangerous form, UV-B penetrates the ozone layer in greater amounts when the ozone layer is attenuated and UV-C is the most dangerous, but is blocked by stratospheric nitrogen oxides and ozone. Ozone concentrations have been recorded since 1956. For the first 20 years they were stable, but since then levels have decreased over Antarctica by at least one-third. Thinning of the ozone layer has also been observed in the northern hemisphere. On average, worldwide, the stratospheric ozone layer has declined by 4% in the last 12 years. The cause of this is the destruction of ozone by CFCs and halons. (Stratospheric ozone depletion should not be confused with increases in tropospheric concentrations of ozone, where it acts as a greenhouse gas or in ground level ozone which can cause respiratory problems).

The human health effects of increased UV radiation include a higher incidence of non-melanoma skin cancer (particularly squamous cell carcinoma and actinic keratitis), malignant melanoma, cataract and retinal degeneration, and impaired immune system function. Impaired immune system function will increase the susceptibility to infections and, possibly, to cancer. Individuals differ in their susceptibility to skin cancer, primarily because of genetically-determined skin pigmentation. Thus, increases in the incidence of skin cancer are likely to occur in populations with lighter-coloured skin. However, even at high latitudes, as in Canada, exposure to sunlight is the main determining factor for non-melanoma skin cancer. It has been estimated that for every 1% reduction in stratospheric ozone levels, there will be an increased incidence of about 2% of basal cell carcinomas and 1.5% for squamous cell carcinomas. But these effects decrease with increasing latitude, particularly above 30°. This implies that residents of the far North may, paradoxically, experience a small increased risk, even though the ozone depletion nearer the poles is greater.

An important indirect effect of ozone depletion and increased UV radiation will be the adverse effects on the biological productivity of single-celled and small organisms, most notably aquatic plankton and benthic organisms. These simple organisms are the lowest level in many food chains. If their biological productivity falls, food chains may be at risk. There is also some evidence indicating that higher levels of UV radiation may reduce the growth of several of our staple food crops.

Long-Range Transportation of Atmospheric Pollutants

Pollutants can be transported in the atmosphere many thousands of miles from their original sources. The best-known example of this phenomenon is acid rain, in which oxides of sulphur and nitrogen from industrial and other sources are transported long distances before being deposited as weak acids. The environmental effects of acid rain include the acidification of lakes and rivers, with consequent effects on freshwater fisheries, metal leaching in soils, effects on trees and other vegetation, and the corrosion of buildings and other structures.

It is now known that other pollutants, including metals and organic chemicals, can also be transported long distances. For example, DDT levels in the Great Lakes have been related to its continued use in Central America for malaria control. This continuing contamination of our ecosystem and food chains can be expected, even if we in Canada clean up our environment.

Although some adverse human health effects have been attributed to acid rain, the precise association is unclear. Bates and Sitzo reported highly significant associations between respiratory-related hospital admissions and levels of sulphur dioxide, ozone and temperature in July and August in southern Ontario, but several other studies have concluded that air pollution is only a minor determinant of respiratory health in children.

2.2

Resource Depletion

Throughout the world, resources are being depleted at alarmingly high rates and in ways that irreversibly affect ecosystem health. On land, virgin areas are ploughed up, even though most of them are marginal, at best. Billions of tonnes of soil are washed or blown away every year and forests are being cut down at a rate that will leave little by the middle of the next century. Fossil fuel extraction, already at record levels, will continue unabated as the developing world seeks to acquire the profligate life-styles of the industrialised countries. The costs of these ever-increasing demands

on the planet are incalculable but it is likely that up to 25% of the species on the planet may become extinct within the next 30 years.

The fundamental problem is that we humans see the earth as nothing but 'resources' for our use. We think we have the right to exploit the planet, however we see fit. As a resource-based economy, we in Canada have been especially guilty of this. No other species acts this way. Instead, we should learn to live lightly on the earth and to respect the natural world around us as having an equal right to exist as we do. The challenge that we face is to use the planet's 'resources' responsibly i.e., at most, at a rate at which they can replace themselves. For non-renewables, it means using them sparingly, if at all, and becoming better at recycling and re-using them to minimize the need for new extraction.

The health effects of depleting some of the major planetary resources are outlined below.

Topsoil and Croplands

The disappearance of topsoil threatens to undermine global agriculture and food production, yet little is being done to prevent the enormous losses. Europe, the continent least affected by erosion, is estimated to be losing about 1 billion tonnes a year, while Asia, the worst affected, could be losing about 25 billion tonnes. If soil erosion is allowed to continue unchecked, all of the new arable land intended to be used by the year 2000 - about 200 million hectares - will do no more than offset productivity lost through erosion. In Canada, cultivation has resulted in the loss of 40-60% of the organic matter originally present in the soil. In addition, soil loss from wind and water erosion can be as much as 50 tonnes per hectare.

In many cases, marginal lands are now being used for agricultural production. These include forests that have to be clear cut and mountainous areas. Soil quality is often poor in these lands and productivity can only be sustained by heavy use of chemical pesticides and fertilisers. Even so, the thin topsoil layer erodes away rapidly, requiring new areas to be brought into production. In addition, most of the world's largest cities are built on fertile land and urban sprawl continues to devour high quality agricultural land.

The health effects of these losses are obvious in terms of lost food production and world hunger. Thus, every year the world's farmers must feed about 93 million more people, despite a loss of about 24 billion tonnes of cropland topsoil every year. Eventually, either the loss of cropland topsoil must be halted or the growth in the world's population will be checked by hunger and starvation. We already consume more than we produce. In 1987, world reserves of grain were sufficient for 101 days, by 1989, this had shrunk to 54 days.

Part of the problem is that about two-thirds of all grain grown in the world goes to feed livestock, to support the meat-rich diets of the industrialized world. Many more people could be fed adequate diets in the developing world if meat consumption in Canada and other industrialized countries was reduced.

Water

At least 70% of the planet's surface is covered with water. The world's oceans stabilize climate, cooling land in the summer and warming it in the winter, and they also serve as a reservoir for dissolved gases and so regulate the composition of the atmosphere. The oceans are home to many life forms, including photosynthesising blue-green algae, plankton and, of course, fish. But the oceans are threatened, not only by many types of pollution but also by over-fishing and industrial

activities. Several fisheries have already collapsed including sardine fishing off California and anchovy fishing off Peru. The Atlantic cod fishery is threatened, as the people of Newfoundland are learning.

Our freshwater supplies are also threatened, largely because we are using them unsustainably. It has been estimated that by 2000, at least 30 countries will experience scarcity. Most freshwater is used for agricultural or industrial purposes. Growing crops in normally dry regions consumes a lot of this valuable resource. Although Canada is blessed with a large proportion of the world's freshwater, it is likely that U.S. proposals for diversions from the Great Lakes will intensify as the need to quench the thirst of American agriculture becomes more urgent.

Fossil Fuels

The vast majority of the energy used on earth comes from fossil fuels. Oil is the world's largest source of energy, but supplies are limited. Since 1979, world consumption has fallen by 14% and it is expected to fall by another 15% by 2000. Coal is the most abundant fossil fuel and the most polluting. Its use is growing at about 3% a year. Natural gas currently provides about 18% of our energy needs, but this is likely to increase as gas replaces oil in several uses. Although there are still adequate supplies of natural gas and it is not as polluting as either oil or coal, it is likely to be used by only the few countries with natural gas resources because it is difficult to transport. If the developing countries are to industrialize and their people are to enjoy a quality of life equivalent to that of Canadians, we will need to increase energy production five fold. Much of this increase may come from coal-burning in countries such as China and India.

The major health effects associated with fossil fuels are from their combustion. Carbon dioxide emissions contribute to the greenhouse effect and sulphur and nitrogen oxides result in increased acid rain. But there is another aspect of their use, especially oil, in industrialised countries. Oil is the primary material needed for the vast petrochemicals industry. This industry produces many of the synthetic organic chemicals that are in common use, including pesticides and textiles. Although world reserves of fossil fuels are large, they are finite. If the developing countries and future generations are to enjoy an adequate standard of living, we will have to reduce our use. As demand increases, and supplies diminish, there could be conflicts about the ownership of fossil fuels, or between producers and consumers. An early example of this is the recent Gulf War.

Biodiversity

We are currently at the beginning of what is probably the most rapid rate of species extinction the planet has ever experienced. It has been estimated that the species extinction rate is about 400 times the natural rate, and that we are losing about one species a day from the 5 - 10 million species thought to exist. Moreover, this rate is increasing. If existing trends continue we will be losing about 100 species a day by 2000. Within the next 60 years at least 25% of all species could have disappeared. Habitat destruction is the major cause, especially in the tropical rain forests.

Many species of wild and semi-domesticated plants are among those being lost. Of the estimated 80,000 edible plants, only about 150 are cultivated on a large scale and about 20 species provide over 90% of our food. These 20 species include potatoes, coffee, soya beans, wheat and rice. As plant breeding delivers ever more inbred and uniform strains, they become increasingly susceptible to pathogens and pests. For example, in 1970, about half of the U.S. corn harvest was threatened by a fungus. Fortunately, a resistant strain was introduced from Mexico before much harm was done.

The health effects of species extinction are enormous. By focusing agriculture production on a few inbred species and allowing others to become extinct, we have made our food supplies extremely vulnerable. Pathogen and pest attacks could easily decimate any of the world's major crops. This could devastate world food supplies and cause severe food shortages. Other effects include the loss of medicinal species. Many plants have medicinal properties, for example, the rosy periwinkle, from Madagascar is the source of two anti-cancer drugs. According to the U.S. National Cancer Institute, tropical forests may contain another 10 plants with strong anti-cancer properties. Perhaps the most serious and least understood effect is that as more species become extinct, the inter-connected web of life is being destroyed. How many extinctions can be tolerated before the web collapses?

Forests

Forests occupy about one-third of the earth's land surface and represent the culmination of ecological successional processes. They have a high biological productivity and contain a greater abundance of species than any other ecological form. Forests are primary sites for photosynthesis and the decay of vegetation into humus and play an important role in the recycling of carbon, nitrogen and oxygen. They can also influence climate. We now consume about 3 billion cubic metres of wood a year, world wide and much more is being cut than is being replaced. Major uses of wood include fuel and pulp and paper. To date, almost half of the world's tropical rain forest has been destroyed and if cutting continues at present rates, another third will disappear in the next forty years.

The effects of forest depletion include the loss of fuel wood, massive soil erosion and the loss of traditional indigenous peoples and their cultures. But perhaps the most important effect will be the destabilizing effect of the burning of tropical forests on the climate. It has been estimated that about one-third of all carbon dioxide emissions are from the burning of tropical forests and, of course, carbon dioxide is the most important greenhouse gas. Thus, the burning of tropical forests is an important contributor to global warming. As well, deforestation is causing an increase in the 'shininess' of the earth's surface - also called the albedo effect. This could eventually disrupt wind and rainfall patterns and convection current in middle latitudes.

2.3

Contaminating the Planet

Chemical contamination has been largely ignored as a global ecological issue. Yet every day we are exposed to a cocktail of chemical contaminants from a variety of sources. North Americans and Europeans are known to have residues of at least half a dozen persistent toxic chemicals in their bodies, and there is no reason to think that this is not true of people living elsewhere.

Contaminants such as PCBs and DDT have been identified in Canadian air, water, soil, plants, fish and wildlife. In some cases, these contaminants have caused serious health effects in fish and wildlife, including population declines, reproductive failure, developmental and behavioral effects, metabolic and biochemical effects and cancer. So are chemical contaminants affecting human health? The answer is almost certainly yes. Physical effects are often difficult to document in human populations except where high dose accidental exposures are involved. This is because we are exposed to a chemical mixture and it is hard to determine which chemicals cause which effects. Many chemicals cause the same health effects, and these effects can also be caused by many non-chemical factors. However, there is unequivocal evidence from laboratory studies that at some doses, most contaminants cause physical health effects. Epidemiological evidence is weaker, but

studies have shown that the babies of women who ate contaminated fish from Lake Michigan had a shorter average gestational periods, a smaller average head circumference and experienced developmental and behavioral deficits. Recent studies on these children, now aged 10, show that they continue to experience adverse behavioral and developmental effects. Other studies have demonstrated relationships between air quality and human health (see earlier section), and drinking water and human health, although evidence for the latter is not strong. There is also evidence that the increased incidence of allergies, asthma and hypersensitivity may be related to chemical contaminants. Chemicals including pesticides, fertilisers and preservatives have also affected traditional methods of agriculture and food production throughout the world. In Canada, the presence of mercury and other contaminants in fish and wildlife have all but destroyed the native way of life in many regions.

It is important to remember, however, that many chemicals also have beneficial effects. For example, the chlorination of drinking water has resulted in dramatic decreases in the incidence of water-borne diseases and food preservatives have allowed many to have access to uncontaminated food.

There are about 70,000 chemicals in common use in North America and the number grows by about 1,000 a year. In most cases, we do not know enough about how they affect human health. We do have relatively good information on a few contaminants, such as PCBs and dioxins, but we know next to nothing about most. In 1984, the U.S. National Research Council published a report on the adequacy of toxicological information. It showed that the best-studied group of chemicals is drugs and drug excipients. For these, there is adequate toxicological information to conduct a health hazard assessment on about 18%. Other proportions are shown on Table 1 which shows that we simply don't know the health effects of the vast majority of the chemicals in use today.

Adequacy of Toxicological Information to Conduct a Health Hazard Assessment

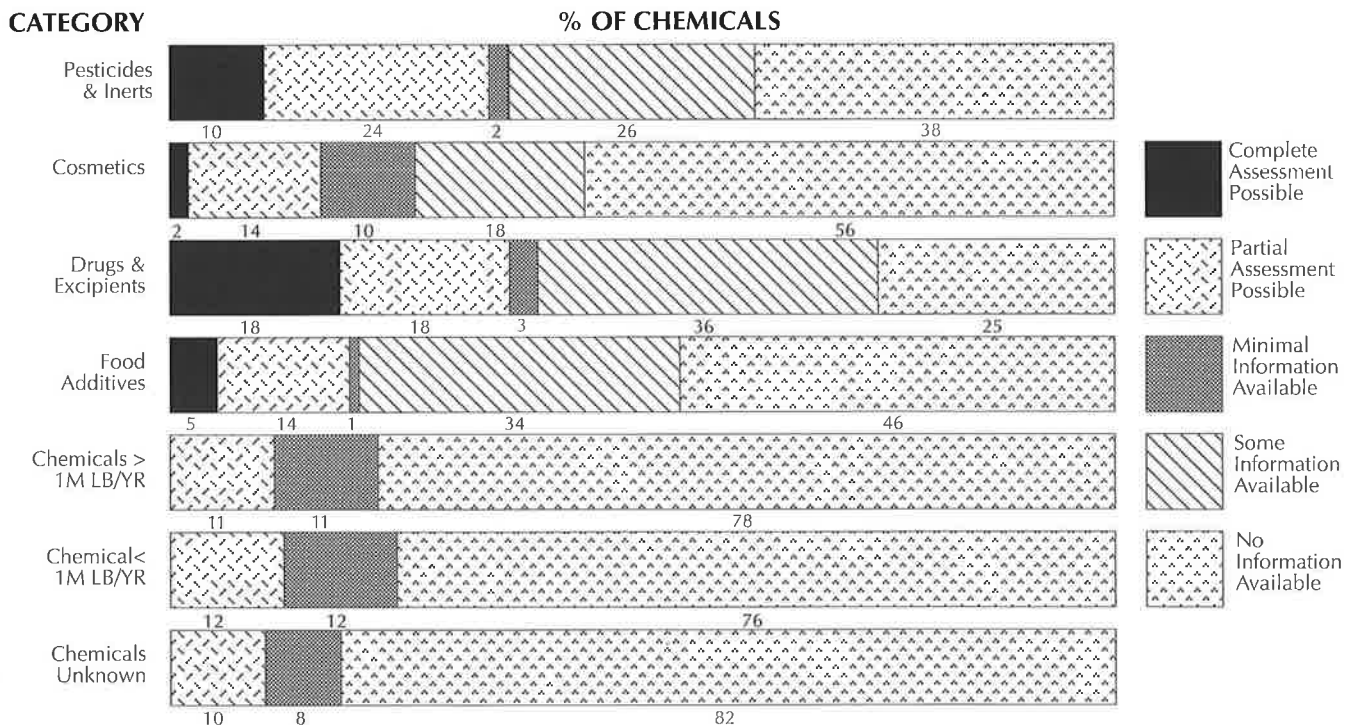


TABLE 1

It is difficult to grasp the extent to which we are contaminating the planet. Catastrophic events, such as Seveso, Bhopal and Love Canal, encourage us to see chemicals contamination as incidents isolated in space and time, rather than as symptoms of global contamination. It is only when we hear that pesticides banned in North America are still being manufactured and exported to developing countries that use them on food crops and in turn export them back to North America, complete with residues of the banned pesticides, or similar incidents, that we realize how persistent toxic chemicals are an international problem. Other such issues include:

- The presence of organochlorine chemicals, including PCBs and DDT, in arctic seals and whales, many thousands of miles from their sources;
- The presence of contaminants in water shared by two or more countries, such as the Great Lakes and the Mediterranean Sea;
- The international 'trade' in household and hazardous wastes; and
- The transboundary movement of emission gases from waste incineration.

Unless we recognise the severity and widespread nature of the problem, attempts to deal with it will be inadequate, piecemeal and doomed to failure. Of course, the use of chemicals has brought enormous advantages to some parts of the world. Where people use chlorinated drinking water, the rates of many infectious diseases are dramatically lowered. Where the use of CFCs permits refrigeration, vaccines, antibodies and, of course, food and milk can be transported and stored. But the widespread use of chemicals as well as improper disposal practices and accidents have resulted in an enormous global legacy of chemical contaminants. Despite international initiatives, such as the Montreal Protocol on CFCs, the global community has not yet recognized the importance of this issue or taken steps to deal with it. A concerted international effort to stop the discharge and release of chemical contaminants and to clean up the global environment is long overdue.

2.4

Implications of Global Ecological Change

In our relentless pursuit of affluence and material well-being, those of us in the industrialized world have forgotten that all human activities are ultimately dependent on the health of the biosphere. We have already profoundly and irreversibly affected the well-being of the planet, and continue to do so at an ever-increasing rate. Since we are not separate from the earth, we too are experiencing the adverse effects of our own actions, mediated by various natural processes. This is one of the basic laws of ecology, first coined by Barry Commoner: "There's no such thing as a free lunch".

All ecological issues are interrelated and this complex interdependency is perhaps the most important lesson that ecology has to teach us. Aboriginal concepts of the environment are much more holistic than our own and we should integrate traditional knowledge into our own knowledge system. For human beings to deal with these ecological issues often requires a largely artificial exercise of compartmentalisation; to cope with all related problems as one is beyond human capacity and understanding. But despite this necessity, the central fact of mutual dependence and relationship is the reality of our situation.

This paper treats global ecological change as if it were a coherent set of problems, it recognises the more complex underlying connections. We live on a finite planet but we have not yet understood

this fundamental truth. If human activities are to become sustainable, there must be a reconciliation between human aspirations for a better life and the ability of the planet to meet them. If we do not ensure that our activities become more sustainable, it is quite likely that global ecological changes will result in catastrophic effects on humanity, including widespread famine, migration and unrest. These effects could stop or reverse current rates of population growth. Militarism throughout the world consumes large amounts of resources that could be used more constructively and sustainably. We should develop better peaceful conflict resolution skills as a means to reduce resource consumption.

It is commonly argued that the 'causes' of global ecological changes are overpopulation and/or our techno-industrial society. To claim this is an over-simplification. The real culprits are human attitudes and values. We all want a reasonable standard of living, to be healthy, to provide for our children and to be provided for when we are old or sick. This is not unreasonable. But the industrialized north has taken more than it needs, it has been greedy and left only the crumbs for the huge numbers in the developing countries. Even worse, we now question the aspirations of developing countries to reach the standards of living that we have come to expect. This could be described as hypocrisy.

Thus, the crisis is not so much a planetary crisis, as a human crisis. There is little doubt that life on earth will continue even if humankind becomes extinct. To transform our ways of living and resolve this crisis is the major issue now confronting our species. Some specific suggestions for a public health response are offered in the next section of this paper but, at a general level, we must learn a new respect for the planet and for each other, taking from the earth only what we need so that there is enough for everyone. Once our physical needs are met, we should strive to discover a greater sense of purpose in our lives beyond the accumulation of wealth and material goods and to appreciate the incredible beauty of the world around us, in the recognition that ultimately, we are all one.

Section 3

A Strategic Public Health Response

In thinking about a public health response to the global ecological issues, we must first reflect on what public health is. At one level, it is a set of values, a philosophy, a way of seeing the world; the public health approach of anticipating and preventing problems and promoting health and well-being is centuries old, has been applied to environmental problems before and is now being taken up by environmentalists and by governments. At another level, public health is a profession (or a group of professionals) and an academic discipline with a set of skills (including research) that can be applied to the tasks of health promotion, health protection and disease prevention. Public health is also an organized structure within local, provincial and national governments and international agencies. Finally, public health is a movement, organized to some extent through Non-Governmental Organizations such as CPHA, but extending out into the broad community, involving citizens from all walks of life.

In the sections that follow, we are addressing public health in all its aspects - as a philosophy, a profession, a discipline, a government agency and a movement. However, as a CPHA Task Force, we have focused our recommendations on what CPHA itself can do, recognizing that CPHA provides a crucial link between practitioners and academics, governments and community, philosophy and action.

3.1

A Framework for Action

Our framework for action suggests that as individual citizens, as practitioners of a profession/discipline and as an Association, public health can involve itself in several ways that are familiar to us all. They are:

- setting an example
- research/knowledge development
- professional education
- public education
- advocacy
- networking/coalition building

3.2

Setting and Example

As individual citizens, we should:

- “live green”, conserve energy and resources, avoid using toxic materials, eat a low-meat diet and in all other respects be as environmentally conscious as possible
- take what measures we can to protect ourselves and our families, e.g. cover-up from the sun

As practitioners, we should:

- ensure our organizations have and adhere to an Environmental Code of Practice
- establish “Green Teams” in our organizations
- give priority to programs that will protect human and ecosystem health
- begin to examine what measures can be taken to prepare for the eventuality of ecological decline
- at a national and international level, take seriously the threat of ecological decline, assess the likelihood of health and social effects, monitor the situation and prepare suitable contingency plan.

As an Association, CPHA should:

- conduct an environmental audit, establish an Environmental Code of Practice and a “Green Team”
- insist that all events and activities in which it is a partner be environmentally responsible

3.3

Professional Education

As individual citizens, we should:

- become informed about the global ecological issues and what we can do about it in our own communities

As practitioners, we should:

- educate our peers, colleagues and public health students about the health implications of the global ecological issues and about the links between ecosystem and human health
- ensure that such education is provided to all health practitioners, not just those in public health

As an Association, CPHA should:

- continue and expand its current work in educating public health practitioners about the links between health and the environment

3.4

Public Education

As individual citizens, we should:

- use every opportunity within our communities to discuss the global ecological crisis and its health implications

As practitioners, we should:

- incorporate information about the crisis and what can be done about it in our ongoing health education activities (e.g. in school health education, ensuring students learn about the links between health and the environment, in food handler courses, indicating how restaurants can save energy and avoid disposables while still meeting hygiene standards; in prenatal and post-natal programs, helping parents make environmentally responsible choices in purchasing child-care items)
- develop specific public education programs about the health dimensions of the global ecological issues and what people can do about it

As an Association, CPHA should:

- communicate its concern to the public, with press releases, media briefings, public service announcements, etc.
- seek to establish a national clearinghouse on health and the environment to facilitate communication and knowledge distribution to both practitioners and the public

3.5

Research/Knowledge Development

While we should not allow lack of full or exact knowledge to be used as an excuse for inaction, we should also recognize the need for better information.

As individual citizens, we should:

- be alert to practices in our local communities that threaten human and ecosystem health
- be alert to evidence of local health effects

As practitioners, we should:

- monitor the health of local ecosystems and human health, looking for evidence of the health effects of the global or local ecological crisis
- conduct research on the links between health and the environment
- develop alternatives to existing practices that will be more beneficial to human and ecosystem health
- collaborate with other researchers in related fields and in other countries

As an Association, CPHA should:

- seek opportunities to contribute to the development of knowledge about the health dimension of the global ecological crisis, in collaboration with other relevant organizations
- encourage and support its members in conducting such research and in becoming involved in further knowledge development activities

3.6

Advocacy

As individual citizens, we should:

- be advocates within our communities for actions that will protect human and ecosystem health and against those activities that imperil it; in particular we should demand of our politicians, at all levels, that they enact policies and develop programs that achieve these aims

As practitioners, we should:

- be advocates for human and ecosystem health within our own organizations
- insist that our own organizations become advocates as well

As an Association, CPHA has a particular responsibility to be the voice of public health at the national level. As such, it should;

- advocate for environmentally healthy public policies at the national and international level
- advocate that its Branches take action at the provincial/territorial level
- seek input to the National Round Table on the Environment and Economy, the Royal Society of Canada's Global Change Program and other relevant national initiatives
- advocate for the spending necessary to support the educational, research and other actions necessary to address the global ecological crisis and its health effects

3.7

Networking/Coalition Building

The global ecological crisis can only be addressed by the efforts of society as a whole. Public health does not have the knowledge, skills and resources needed even to address the health effects on its own, never mind the whole situation.

Accordingly, in everything we do, from education to advocacy, we must establish networks and build coalitions, not only with other health practitioners, but with environmentalists, business, labour, community organization and many others, at all levels from the local to the global.

As individual citizens and as practitioners, we should:

- join an environmental group
- participate in, or help create, such coalitions and networks in our communities, our provinces/territories, nationally and internationally

As an Association, CPHA should:

- establish a coalition with other national health organizations to address the health implications of the global ecological issues and to mobilize and coordinate the health sector in society
- ensure that the international public health movement is mobilized, through the World Federation of Public Health Associations, to present a health perspective on sustainable development globally
- establish close working relations with environmental groups, the business sector, the labour movement and all who are working to protect human and ecosystem health for this and future generations

Section 4

Recommendations

The recommendations that follow are directed specifically to the CPHA, in light of the Terms of Reference for this Task Force.

They should be placed in the context that CPHA has recognized the environment as its first priority for the 1990's.

1.

Environmental Advisory Committee

CPHA should establish an Environmental Advisory Committee to assist the Board of Directors, the Association and the Environment Secretariat. The Environmental Advisory Committee, which would include members of the Environmental and Occupational Health Division, would further develop actions with respect to the causes and consequences of the four major categories of environmental threats identified in this report. In addition, the Committee would review and respond to Canada's Environmental Health Action Plan and monitor progress.

2.

Environment Secretariat

CPHA should establish a CPHA Environment Secretariat, creating a senior position within the organization. CPHA should commit interim resources while it seeks permanent funding.

The Secretariat could carry out, or ensure the carrying out of, the other activities that form part of these recommendations and would in general undertake monitoring, networking, communications, education and advocacy functions intended to promote human and ecosystem health.

3.

Environmental Audit

CPHA should conduct an environmental audit of its own activities, establish an environmental code of practice and implement it.

4.

Resources for Members

CPHA, through the Environment Secretariat, should develop a set of suitable resources that will enable members to undertake actions in their personal and professional lives, such as those mentioned in this report, that will protect and enhance human and ecosystem health.

5.

National Clearing House on Health and the Environment

CPHA should seek resources to establish a National Clearing House on Health and the Environment, as part of its Environment Secretariat. The Clearing House would provide information on health and the environment to the public, public health practitioners (including academics and researchers), environmental groups, the media, government and others requiring such information.

6.**Member Education**

CPHA should educate its membership about the health effects of the global ecological crises, and the role and responsibility of public health practitioners. This education should include:

- Distributing this report and publishing it, in whole or in part, in the *Canadian Journal of Public Health* or in the *CPHA Health Digest*;
- Organizing educational sessions at the Annual Conference;
- Publishing a regular column in the Digest (a role for the Secretariat);
- Organizing special seminars, workshops and conferences on this topic.

7.**Public Education**

CPHA in collaboration with other appropriate organizations, should produce public educational materials (including articles for the media, public service announcements, advisories/warnings) and organize a speakers bureau on the hazard to human health posed by the global ecological issues. Particular attention should be paid to making such information culturally and linguistically accessible at all literacy levels.

8.**Advocacy**

CPHA should advocate for the development of environmentally healthy public policy at all levels of government and should respond to all Federal legislative and other proposals in this area. Such environmentally healthy public policy should include the development of contingency plans for managing anticipated health and environmental problems.

CPHA should advocate for adequate funds to be made available to support the research, education, training and other programs necessary for the global ecological information.

CPHA should not confine itself to advocating to and working with governments alone, but should advocate to and work with other NGOs, the private sector and international agencies, where appropriate.

9.**Coalitions and Partnerships**

CPHA should seek coalitions and partnerships with other national organizations of health practitioners and national environmental organizations in order to address the threats to human health posed by the global ecological crises.

CPHA should seek to work with the National Round Table on Environment and Economy, the Royal Society of Canada, Health and Welfare Canada and Environment Canada, on all aspects of the health dimensions of the global ecological crises.

10.**International Action**

CPHA should ensure that its concerns, with respect to human health and the global ecological issues, are included in its work with other national public health associations, with international public health agencies (including WHO and the World Federation of Public Health Associations) and with international aid agencies, including CIDA.

CPHA should seek a role in the 1992 UN Conference on Environment and Development and in subsequent follow-up activities.

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