

Human Health Hazards in Relation to Environmental Damage : A Review

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Abstract: Environmental damage is the deterioration of the environment through depletion of resources such as air, water and soil; the destruction of ecosystems and the extinction of wildlife. It is defined as any change or disturbance to the environment perceived to be deleterious or undesirable. Environmental damage is one of the ten threats officially cautioned by the High Level Threat Panel of the United Nations The World Resources Institute (WRI), UNEP (the United Nations Environment Programme), UNDP (the United Nations Development Programme) and the World Bank have made public an important report on health and the environment worldwide on May 1, 1998 (Johnson et al., 1998). Environmental damage from hydroelectric, mining, energy and forestry projects, chemical pollution from industry, nuclear energy and weapons testing, toxic waste mismanagement, depletion of the ozone layer and global warming, to name a few pressing environmental problems, have created serious human health hazards. The impact of environmental damage and contamination confirms what people have long understood - that human health and well-being is intimately connected to the well-being of the natural environment and all other life forms.

Key words: Environmental Contaminants, Global Warming, Health Hazards.

1. Introduction

While environmental damage affects everyone, it has a particularly adverse impact on those people whose lives remain closely tied to the land and who depend largely on country food. Environmental damage affects the health and well-being of peoples in three central ways. Industry and resource development projects release environmental contaminants which pose hazards to human health into the air, water and soil. The availability and purity of traditional foods and medicines are diminished as a result of industrial contamination and the disruption of wildlife habitat. The ensuing erosion of traditional ways of life dependent on the purity of the land, the water and all living things, constitutes an assault on people's mental and spiritual health and deepens the processes of cultural disruption.

2. Environmental Contaminants

Environmental contamination has been a long-standing concern for First Nations people since the early 1960s, when symptoms of mild mercury poisoning from contaminated fish were recorded in the Ojibway communities of Grassy Narrows and White dog as a result of methyl mercury released into the water system through effluents from pulp and paper operations in northwestern Ontario (LaDuke, 1992). A contaminant is a substance that is found in a place where it should not be... depending on what it is and the amount present, it may be harmful (DIAND, 1997). Contaminants generally mean chemicals and can constitute health hazards because of persistence, toxicity levels or mobility. "Point" sources of chemicals include industrial discharges, waste incinerators, sewage treatment plants, and solid waste disposal sites. "Non-point" sources include runoff from land treated with pesticides,

fertilizers or herbicides, car exhaust, contaminated sediments, storm water runoff, atmospheric deposits and domestic sewage (Health Canada, 1995). Contaminants have entered into our air, water and soil, affecting wildlife and entering the food chain. people, particularly those who are more closely tied to the land and whose diet depends on traditional foods, are thought to be at a higher risk of exposure to contaminants.

3. Some Major Environmental Contaminants:

Persistent Organic Pollutants (POPs) include two major types: **Organochlorines** (OCs) as well as **Polycyclic Aromatic**

Hydrocarbons (PAHs). **Organochlorines** (OCs) are almost always human-made. Chlorine gas is an extremely reactive and poisonous substance that rarely occurs in nature, but bonds quickly with organic matter to form a new class of chemicals called Organochlorines. Over 11,000 different OCs are manufactured today, used in products ranging from pesticides such as **DDT** and **Chlordane** and insecticides such as **Toxaphene** and **Mirex**, to plastics, toothpaste, mouthwash and solvents. Their production and use produces thousands more unwanted organochlorine by-products. OCs also include industrial chemicals such as PCBs and industrial waste products such as **Dioxin**, which results from the manufacture of polyvinyl chloride or PVC, as well as Furans. They may be present in old electrical transformers or may be formed when burning garbage. DDT, Chlordane, PCBs and Toxaphene are banned substances in Canada. OC contaminants are a global problem because of their persistent and continuous circulation. Major loading of OCs and mercury between 1950 and the 1970 are still affecting the Great Lakes Basin today, home to 63 First Nations communities, although

concentrations of some chemicals decreased in the mid and late 1970s, after bans or use restrictions were imposed. OCs deposit to a greater degree in colder regions, accounting for their unexpectedly high concentrations observed in the air, sea water, plankton, wildlife, and people in the Arctic region (Maugh, T. H., 1978).

Polycyclic Aromatic Hydrocarbons (PAHs) are derived from the incomplete combustion of fossil fuels producing asphalt, coal tar and creosote, a wood preservative. As a group, they are common water contaminants but are not quite as persistent and mobile as the OCs. PAHs are not thought to constitute a major human health concern in the Arctic. Ozone Depletion is a thinning of the ozone layer, the blanket of ozone gas that shields us from the sun's damaging ultraviolet (UV) radiation. It results from chlorofluorocarbons (CFCs), chemicals used in refrigerator and freezer coils, aerosols, as well as automobile and commercial air conditioners, being released into the atmosphere. Although a global problem, the depletion of the ozone layer is the worst over the polar regions, (*Air Care*, 1988).

Gradual global climatic warming is caused by a build-up of greenhouse gases from increased carbon dioxide emissions from fossil fuels burned by cars, industry and power plants as well as from CFCs, methane and nitrous oxides released into the atmosphere. Warmer temperatures could dramatically alter ecosystems in all regions of Canada and bring a range of problems such as droughts, flooding, forest fires, insect infestations and melting permafrost.

The greenhouse effect is thought to be potentially self-reinforcing in the Arctic.

Acid Rain occurs when pollutants such as nitrogen oxides and sulphur dioxide from power plant emissions, metal smelting, motor vehicles and industry, combine with water in the atmosphere to form droplets of very weak acid. Acid rain, an air and water pollutant, damages lakes, threatens wildlife and affects air quality. Acid rain hotspots include the Great Lakes region, Quebec, eastern Canada and northern Alberta, due to chemical emissions from the Athabasca oil sands project (*Air Care*, 1997).

Heavy Metals: Lead, Mercury, and Cadmium are toxic heavy metals that are naturally present in rocks and soils. Metal mining and smelting can result in additional human-made releases of mercury and cadmium (Nordberg, F. G. 1976).

Mercury exists in three forms: as pure metallic mercury; in inorganic compounds such as mercuric chloride; and in organic compounds such as methylmercury, which is the most toxic. Methylmercury is released into the water system as part of the decomposition process when large

quantities of vegetation are submerged and begin to rot; an unintended consequence of the construction of dams for hydroelectric power. It accumulates in the food chain over many years, concentrating in fish and making them unfit for human consumption. The consumption of contaminated fish is the major source of human exposure to mercury. Monitoring of mercury levels of First Nations people has been ongoing for the last 25 years in a number of communities, including Akwesasne and the Cree communities in the James Bay region (James Bay Mercury Committee, 1995).

Lead exposure was present in diverse forms such as food, drinking water, air, soil dust and consumer products. In the last 20 years, the virtual elimination of leaded gasoline, the use of lead free solder in North American canned goods and the decrease of lead contents in paints have reduced the threat of lead exposure. A significant source of direct and indirect lead exposure for First Nations communities still exists in the form of lead shot used in hunting, particularly of birds and waterfowl. Lead poisoning from gasoline sniffing is a problem in remote northern communities where leaded gasoline is still available (Moore, M. R., et al., (1977).

Cadmium is a toxic heavy metal used primarily in electroplating and in nickel-cadmium batteries. It is also produced from zinc and lead mining and smelting. Cadmium levels in the environment are thought to be increasing because of its widespread industrial use. Everyone is exposed to cadmium through the air they breathe, the water they drink and the food they eat. Smoking is the main source of cadmium for smokers (Friberg, L., et al., 1974 & S. EPA, 1978).

Radionuclides are radioactive elements that are naturally present in rocks and soil but they also may be man-made. The largest source of exposure to Radionuclides in northern Canada are natural sources such as Lead-210, and Polonium-210 that are present in the lichen-caribou food chain. Strontium-90 and Cesium-137 are man-made and were released into the environment by atmospheric testing of nuclear weapons prior to the 1960s. Contamination levels have dropped considerably since atmospheric testing was banned. Other sources of exposure include the dumping of nuclear waste, the sinking of nuclear submarines, nuclear accidents such as Chernobyl and the discharges from nuclear waste processing plants in Europe. Uranium mining can cause the release of radioactive Uranium-235 and Uranium-238. Poor sanitation systems, contaminated drinking water and unsafe disposal of waste and refuse also constitute hazards to human health. A 1995 DIAND study indicated that 24% of the water systems and 20 per cent of the sanitation systems in First Nations communities are substandard. First Nations people, particularly children, have a significantly higher incidence of water-borne diseases compared to the general population. Contaminated water is a major factor in the

spread of infectious disease, such as cryptosporidiosis and shigellosis, particularly where the source of contamination is human waste. Pesticides sprayed on land around rivers or lakes can carry contaminants into the water while chemical fertilizers such as nitrates, used in agriculture, dissolve into surface water and ground water and affect water supplies (Medical Services Branch, 1987).

4. Contaminants: Possible Health Effects at High Levels

Ozone Depletion Increased UV exposure is linked to skin cancer, premature skin aging and cataracts.

Acid Rain May contribute to respiratory illness and reduced lung function

PCBs Cancer-causing agent, affects reproduction and immune system, neurotoxicological effects, toxic to liver in animal studies. Extremely high amounts in a poisoning incident in Japan affected infant birth weight and development.

DDT Probable cancer-causing agent, disrupts hormone metabolism, affects nervous, immune and reproductive systems, based on animal studies and reports of exposed farm workers

Toxaphene Possible cancer-causing agent, effects on liver and kidney. Based on animal studies only.

Dioxins and Furans The most toxic is 2, 3, 7, 8-TCDD. In animal studies, acute exposure causes chloracne, weight loss, thymus gland effects and death. Long term exposure causes liver damage, weight loss, affects immune system and reproduction, disrupts hormone metabolism and normal development. Accidental humans exposure in Seveso, Italy and in Vietnam has caused chloracne.

Cadmium Kidney damage, anemia and heart disease due to chronic exposure in the workplace, based on human studies.

Lead Affects nervous system & development in humans. Children in New York and other developed and developing nations exposed to high levels have obtained lower IQ scores.

Mercury Early symptoms of mercury poisoning include tingling hands and feet, while later signs include tunnel vision, slurred speech and balance problems. Very high amounts may result in nervous system damage and death, based on accidental poisoning of humans in Iraq.

Radionuclides Known to cause cancer in humans. Based on studies of populations exposed to extremely high levels, i.e., atomic bomb and Chernobyl incident survivors.

Source: CINE Newsletter 3, 1, Winter 1997: 9; DIAND:1997; James Bay Mercury Committee, 1995:16; E.A.G.L.E. Project Factsheets, 8-15; Levin:1988:33-34.

5. Environmental Contaminants and Human Health

Health damage to wildlife, vegetation and crops have prompted concern about the health effects of contaminants in humans. While there are approximately two million chemicals being used worldwide, there are few studies of their long-term effects on human health, particularly concerning the effects of PCBs, dioxins, pesticides, and lead in combination with each other or how they interact with other factors in human health, such as poor nutrition. There are difficulties involved in studying the long term health effects of environmental contaminants on people. In contrast to occupationally exposed groups such as miners or victims of acute toxic exposure from a spill accident, community exposure tends to be relatively low level and over a long period of time so that the health effects of contaminants may not be detectable for 10 to 15 years (Stephen, L., 1988).

The most toxic effects have been seen in laboratory animals or in incidents where people have been exposed to very high levels of contaminants. Contaminant Safety Guidelines are set by Health Canada as well as by provincial ministries. They are established by finding out what levels are safe in animals and then lowering them further by a safety factor (from 10 to 1,000 depending on the amount of knowledge on the substances) to protect humans.

However, Contaminant Safety Guidelines are based on animal studies and it is difficult to state precisely what would happen to humans if exposed to these same levels. The same guidelines must be followed in India to prevent mental and physical disorders.

6. Effects of Contaminants on Child Health and Development

Safety Guidelines levels for contaminant intake are even lower for pregnant and nursing women, and in particular for children, who are at greater risk from the effects of contaminants as they respond differently to pollution than adults. Jerry, Dinko & Patrick, 1980).

- Contaminants pass through the placenta and can affect the way basic cells of organs, the nervous system and other bodily functions separate or develop.
- Contaminants can affect brain, organ and immune system development as children grow and mature. Children's lungs also are more affected by contaminants since they breathe more quickly and more deeply than adults do.

- Children have a higher exposure rate to water-borne pollutants as they consume more than twice as much fluids as adults do and pollutants are more easily absorbed in their bodies. Their cells contain twice as much water.
- Children are more susceptible to contaminants in food because they take in four times the amount of food per kilogram of body weight that adults do, are more likely to be exposed to impurities in food, and their absorption of foods is greater than is the case with adults. Contaminants such as ingested metals can damage them more.
- Children's bodies potentially take in more contaminants and can't eliminate them as effectively as adults as their excretion systems are less developed.
- Children spend more time playing outdoors and are exposed to air-borne contaminants.

7. The Cultural and Social Effects of Environmental Damage

An important health effect of environmental damage and contamination in the food chain has meant a growing tendency to replace wild meat and other country food with store bought products that are less nutritious. Dietary change is linked to higher rates of obesity, diabetes, high blood pressure, heart disease and dental decay, and the trend toward a higher incidence of chronic disease is in turn deepened by changes in local ecosystems that alter lifestyles, lowering levels of physical activity and fitness among First Nations and Inuit peoples.

Moreover, these changes to traditional diet and traditional ways of obtaining food and preparing it result in a loss of traditional ways of life, cultural heritage and cultural identity. The loss of control over important resources such as fishing means loss of control over the environment and people's very lives. Cultural disruption, as Matthew Coon-Come observes, is causing community and family breakdown, reflected in a host of growing social problems such as alienation, family violence, alcoholism, substance abuse and suicide. Ultimately, environmental damage strikes at the spiritual core of First Nations cultures - rupturing the special spiritual bond that peoples have with the land.

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