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Environmental Health and Society

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INTRODUCTION

Although often portrayed as separate issues, environmental and health issues are intimately related. Examples of this interconnection are abundant and a cursory look at a newspaper on any given day will reveal stories covering a wide range of problems involving the interrelationship of health and the environment. To review just a few, you may find stories on: the closing of public beaches due to high bacterial levels; smog and air pollution leading to breathing problems for urban dwellers; boil water alerts for rural dwellers; U.V. warnings urging people not to stay out in the sun too long because of the thinning ozone layer; chemical contamination of water supplies due to industrial accidents; the onset of disease outbreaks caused by microbes spread through the air, water, soil, or food chain; and so on.

In this chapter, we will investigate how many environmental health issues can only be analyzed if the social and political economic contexts in which these issues are embedded are understood first. Toward this end, we will begin with a very brief historical account of the rise of modern environmental concern and see how this is related to many of the health issues that we confront today. To further our sociological understanding in this direction we will then consider how many environmental health issues may be theoretically understood in terms of one of the basic foundational precepts of environmental sociology, namely the "tragedy of the commons." In particular, such a perspective will highlight the important relationship between the state, industry, and society in the origin and management of environmental health risks. This will be followed by a brief examination of how environmental health regulations are established via two conventional approaches – epidemiology and toxicological risk assessment. Finally, we shall see how the management of environmental health risks is a political process and how those who advocate for a clean, safe, and healthy environment often employ the notion of the "precautionary principle" by actively pursuing and lobbying for alternative ways to establish environmental health regulations through social movement activities such as those found in the Environmental Justice movement and Popular Epidemiology.

PUBLIC CONCERN ABOUT THE ENVIRONMENT AND HEALTH

Arguably, one of the most significant influences that inspired the modern-day environmental movement was the 1962 publication of *Silent Spring*. In this book, former marine biologist Rachel Carson describes in compelling detail the devastating environmental and health impacts of the synthetically produced chemical DDT. Indiscriminately used soon after the Second World War for the control of a wide range of insect pests (notably mosquitoes involved in malaria transmission), Carson compiled scientific evidence that indicated that DDT was widespread in the environment and in the food chain. She also wrote of the harmful effects of this pervasive chemical. What perhaps enabled the book to resonate so widely with the general public was Carson's depiction of a future scenario that was quite feasible and supported by the scientific findings of the day. In the preface, entitled "A Fable for Tomorrow," Carson vividly describes a typical American town that becomes enveloped by an eery silence. The previously vibrant town has become a barren desolate landscape in which no signs of nature or life, from the songs of birds, to the splashing of fish and frogs, to even the playful voices of children could be heard – all silenced by the insidious effects of synthetic chemicals in the environment. The publication of *Silent Spring* inspired numerous political and social reactions as environmental movements arose to protect the environment from chemical contamination and to demand the need to regulate industry. In response, the chemical industry formalized their own efforts to counter the claims made by the burgeoning environmental movement, and the tensions between environmental and industrial interests soon became entrenched.

Just as *Silent Spring* helped contribute to a new public awareness that human health was threatened by unchecked human intervention in nature, another major event that contributed to the adoption of this new type of consciousness was the famous photograph of the planet Earth taken from outer space during the first lunar landing in 1969. With this photograph, for the first time, we, as human beings, were able to view our home from a unique vantage point, outside our usual terms of reference. The depiction of our "big blue marble" suspended in the vast emptiness of space brought into vivid focus the finite and fragile qualities of the physical/material basis that supports our lives and with that, the realization of the need to preserve that "life support system" (or **carrying capacity**) through environmental protectionism (WCED, 1987). With this came the acute realization that the Earth (i.e., the environment) had to be protected if human health and well-being were to be maintained.

The emphasis on the urgent need to protect the environment was further bolstered by the release of the Limits to Growth report in 1972. Prepared by Massachusetts Institute of Technology (MIT) researchers, and commissioned by a group of European industrialists, business advisers, and civil servants collectively known as the Club of Rome, the report presented different future scenarios based on the results of inputting a large number of different variables into a computer model. Using data from 1900–1970 and extrapolating to the year 2100, the report concluded that industrial growth could not keep going the way it was presently going, because that would lead to societal collapse based on major food shortages, the depletion of natural resources, and an excessive amount of pollution and chemical contamination. The release of this report, as well as the oil crisis in 1972, served to heighten public awareness of the environmental issues

throughout the seventies. It was also during this period that we saw the rise of various environmental acts, legislation, and government bodies such as the federal and provincial Ministries of Environment.

More than a decade later, another influential report was released, this time by the United Nations World Commission on Environment and Development. Entitled *Our Common Future*, this report introduced the influential notion of sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (1987, p. 8). In trying to address the tensions between industry and environmentalists that was coming to a boil over the course of the previous decades, the notion of sustainable developed proffered a possible solution by formally attempting to bridge together concerns about environmental protection with continued industrial growth. The urgency to adopt such an approach became even more compelling shortly thereafter as evidence mounted for two environmental problems of a worldwide scope, both of which could be attributed to industrial activities of the modern day – the thinning ozone layer due to **CFCs** and global warming due to **greenhouse gases**.

THE TRAGEDY OF THE COMMONS

The view that the life-supporting capabilities of the Earth were being threatened by increasing impacts of human activities, particularly industrial activities, has been referred to as a neo-Malthusian perspective. Writing in the early 1800s, Robert Thomas Malthus presented an analysis in which he argued that since the human population grows geometrically (i.e., exponentially), while natural resources grow linearly, at some point soon, population growth will outpace the growth of food needed to feed the ever increasing number of people. He then came to the gloomy conclusion that, as a result, human misery will be an inevitable part of life in the future because the Earth will no longer be able to provide subsistence for the population.

A similar type of argumentation was developed much later by Garret Hardin in an influential article published in the journal *Science* in 1968. In this article, Hardin essentially argues that serious problems arise because the sustainability of the commons – that is, that which is owned equally by everyone in the community, such as common land, the air we breathe, and the water we drink – is threatened because of what Hardin describes as the inherent human drive to maximize utility based on rational but selfish considerations. Let us consider Hardin's argument through the example of a common area in which a number of sheep owned by different individuals can freely graze. Here, the commons is the grazing land that is owned by all. Let us assume for the sake of simplicity that each individual shepherdess owns an equal number of lambs. At some point, an equilibrium will be reached when the amount of grass consumed by the sheep will be exactly the amount that can grow back to feed the sheep (i.e., be replenished so as to sustain the integrity of the commons). However, one shepherdess may feel that by adding an additional animal to her personal herd she will be able to make more money for herself, and only herself (based on the assumption of maximum utility and rational self-interest). This individual does realize that adding this additional animal will result in overgrazing, whereby the commons is threatened as the sustainable equilibrium is disrupted (a negative consequence). But, at the same time, she realizes that this negative

consequence will be shared with all the other shepherdesses in the community. From a rational self-interest point of view, she has much to gain individually because the profits of having the extra animal in her personal herd will fall to her and her alone. The costs/consequences, on the other hand, will be shared with all others in the community. In a sense, this individual is getting a *free ride* – she is profiting at other people's expense. Now, what will happen if all the other shepherdesses think like this? A significant problem will arise because the common land will quickly be destroyed. The moral here then is very similar to the fable in which a greedy individual, in his quest to secure more and more golden eggs, literally kills the goose that lays the golden eggs, thereby destroying the source of golden eggs once and for all. In a similar light, the *over-exploitation* of the Earth's resource will undermine the ability of the Earth to maintain its life-support functions, which we as human beings depend upon for our survival.

In more formalistic language, the environmental costs that are shared by community are known as **externalities** because they are treated as if they are external to the system. Let us now consider a more familiar example with reference to the industrial capitalist system. Say that an industrial capitalist is producing some commodity, but a by-product of the manufacturing process is a toxic particulate that leaves the factory through a smoke stack. These dangerous chemicals are then carried through the air and are deposited in the surrounding air, water, and soil, as well as in the lungs of people residing close to the factory. Who assumes the costs of the environmental clean up of the water, air, and soil, and the health costs of those made ill by the toxic chemicals? Who assumes the economic benefits of manufacturing commodities but not the costs of the environmental cleanup? The capitalists argue that these externalities are somebody else's problem, not theirs. So, if the pollution they produce makes people outside the factory sick, then the government should do something about cleaning up the pollution, and the government should pay for the medical bills of the sick people through the welfare state.

In this example, the commons is represented by the surrounding air, water, and soil, and the costs of the environmental consequences of polluting the commons are shared by the community (and/or the state as will be discussed momentarily). In other words, the costs of industrial manufacture are externalized. The same is true for the associated health care costs. The industrial capitalist thus receives a *free ride* because the profits of industrial manufacturing accrue to the private industrialist, but the costs of the contaminated commons are *externalized* onto the general public (and the state). Currently, environmental economists have developed various techniques to "internalize" these costs in an attempt to end the free ride (for example, tradable pollution permits, the polluter pays principle, tax disincentives, etc.) but a discussion of these goes beyond the scope of the present chapter.

For the sake of clarification, note that our previous example involving the grazing of common land involved a *subtraction* of natural resources from the commons (i.e., grasslands), whereas the latter example deals with an unwanted *addition* to the commons (i.e., pollution); but in either case, we are dealing with externalities that destroy the commons and the free rider problem. It should also be noted that externalities may take many different forms, such as the costs of cleanup and treatment of sewage, household garbage, nuclear waste, various synthetic chemicals, and so on – all of which, it should be recalled, have important consequences for human health. Second, as will now be

discussed, societal attempts to deal with externalities quickly become political issues involving environmental health issues associated with risk management and environmental justice.

A TOXIC CULTURE

Ulrich Beck (1992) contends that we live in a "risk society" where the *unanticipated* side effects or *unintended* consequences and externalities of the industrialization process are brought to the political forefront. Beck argues that in the past (from the Second World War to around the seventies) there was tacit societal tolerance for the production of negative externalities, because such consequences were rationalized and justified as the "costs of progress," and therefore accepted within the logic of the political economic context of the day. In contrast, with the contemporary proliferation of **environmental risks** of potentially global impact, such approval has increasingly become politically problematic, and the logic of risk production has become questioned by the general public.

The need to confront the externalities of the industrial age is especially noteworthy with respect to chronic toxicity, where harmful health effects occur because of low-dose exposures over long periods. Studies have shown that today, virtually every living human being to some degree carries what is known as a toxic body burden. **Body burden** refers to the **bioaccumulation** of toxic substances in the body (Steingraber, 1997). Such substances enter the body through various routes – inhalation, ingestion, and skin absorption – and through various sources – food, air, water, and soil. Many of the chemicals that persist in the body are fat soluble and as such, body fat is considered an especially sensitive indicator of exposure to environmental contaminants – particularly those referred to as **Persistent Organic Pollutants (POPs)**. Since human breast milk is about three percent fat, POPs tends to concentrate here and it has been found that 99 percent of the breast milk sampled in the United States contained one such class of chemicals – poly-chloro-biphenyls (PCBs) – which were widely used in the recent past as coolants in electrical transformers (Milly & Leiss, 1997). In fact, studies have shown that about one of every four samples taken from mothers contained PCB concentrations exceeding the legal limit (2.5 parts per million); significantly, commercial formula is pulled from the shelves when it contains levels above 2.5 parts per million (Steingraber, 1997). Or, to put it another way: roughly 25 percent of all U.S. breast milk was too contaminated to be bottled and sold as a food commodity. Moreover, the highest levels of PCBs in fat and milk were found amongst those living in the Arctic regions where the chemical is carried by wind currents and concentrates in the food chain through bioaccumulation (NRTEE, 2001). The extremely high concentrations of PCBs in the Indigenous peoples of the North also raise questions of environmental equity: why should this group of individuals, who had and have little to do with industrial production in the South, have to bear the environmental health externalities of the South? This is just one example of living in what is referred to as a toxic culture.

Hofrichter (2000) defines a toxic culture as one in which social arrangements encourage and excuse the deterioration of the environment and human health. The emergence of a toxic culture is based on an unquestioned production of hazardous substances as well as the presence of dangerous technologies, substandard housing, chronic stress, and

exploitative working conditions. How did such circumstances come to prevail? Let us attempt to seek answers to this question by considering the relationship between industries, the state, and the environment and health movements – particularly with respect to the issue of how environmental health regulations are established.

ENVIRONMENTAL HEALTH REGULATIONS

Environmental health regulations specify the legally permitted amount of dangerous chemicals that industry may dispose of in the commons, or the amount to which people may be exposed. These regulations are specified in various Acts such as: the Canadian Environmental Protection Act, the Pest Control Products Act, the Food and Drugs Act, the Hazardous Products Act, the Fertilizers Act, the Fisheries Act, and the Feeds Act, as well as the occupational health and safety acts of various provinces. The regulations themselves are determined through the activities of government ministries such as Environment Canada, Health Canada, or the Pesticide Management Regulatory Agency which is made up of experts from these two ministries, in addition to Agriculture Canada and Natural Resources Canada. The specific regulation for each chemical (or class of chemical) is based on the results obtained from epidemiological or toxicological risk assessment analyses (a third method, the **clinical control trial** is used exclusively for drugs, whereas the former methods are used for toxic substances). Each of these methods poses certain problems when used to establish environmental health regulations, not the least of which, as we shall see, is the political dimension involved in what at first sight appears to be a purely technical process.

EPIDEMIOLOGY

Epidemiology may be generally defined as the study of the incidents and distribution of disease/illness in the population; as such, it relies somewhat heavily on the analysis of statistics, particularly the frequencies related to particular health outcomes and exposures. Epidemiological techniques involve observational studies of humans to gather and analyze data in order to determine whether a particular health outcome arises due to exposure to certain factors – often called risk factors. Risk factors may include concentrations of various environmental carcinogens (in the case of establishing environmental health regulations), as well as other influences such as cardiovascular risk factors (e.g., cholesterol, body fat) or certain risk behaviours (smoking, alcohol consumption).

One of the most common measures used in certain types of epidemiological studies is known as **Relative Risk**, and it is defined as the ratio of the risk of developing the disease amongst those exposed compared to the risk of the developing the disease amongst those not exposed.

Despite the various successes of conventional epidemiology, the use of epidemiological analysis in studying environmental health problems has met with resistance by some members of the environmental health community (Needleman, 1997; Tesh, 2000; Wing, 2000). The main reason is that from a technical standpoint, the Relative Risks obtained are often low for environmental exposures – typically less than two – and they do not often attain statistical significance (that is, from a statistical perspective, the obtained Relative Risk figure could be the result of chance) (Pekkanen & Pearce, 2001). Low Relative Risks

are then used by certain industrial and state interests to dismiss the need to investigate environmental health problems. Critics argue, however, that low Relative Risks are obtained because of the nature of environmental health problems. That is, *involuntary* exposure to toxic chemicals, such as the situation amongst residents living in a highly industrialized area, occurs over long periods of time, while the exposures themselves occur at low concentrations. Furthermore, this type of prolonged, low concentration exposure tends to vary between individuals within a given area, thereby lowering the calculated Relative Risks. Such situations are very different from *acute exposure* circumstances, such as a chemical explosion in a factory, that are normally studied by epidemiologists.

TOXICOLOGICAL RISK ASSESSMENT

Toxicological risk assessment is perhaps more widely used than epidemiology for the establishment of environmental health regulations and is applied to various products and processes, including: pharmaceuticals, consumer products, cosmetics, biological agents, radiation, industrial chemicals, food additives, pesticide residues, and air, water, and soil pollutants.

The conventional method followed in conducting risk assessments is given by a framework presented in the U.S. National Research Council's (1983) *Risk Assessment in the Federal Government: Managing the Process* (commonly referred to as the "Red Book"). The heart of the framework for the establishment of environmental health regulations may be considered the phase known as dose-response assessment. Here the goal is to obtain a mathematical equation that expresses the relationship between exposure – which is defined in terms of the amount exposed or the *dose* – and the number of cases where adverse effects develop (this is the *response*).

The data for the Dose-Response equation comes from laboratory experiments where different groups of animals are exposed to different doses; after a certain period of time, the animals are examined to detect the presence of cancerous tumours (or other adverse health effects). Notably, the animals are exposed to very high doses of the substance in order to ensure that that an adverse effect develops within the given time allotted for the experiment. In relation to cancer in particular, the *latency period* – the period between exposure and onset of the disease – may be quite long (for some forms of cancer in humans it may be between 10–30 years; e.g., lung cancer). This, however, results in the need to mathematically extrapolate from the high doses that were administered to the test animals to the low doses that human beings are usually exposed to in the environment, which in turn introduces an uncertainty in the applicability of the results to the human situation. To help compensate for this uncertainty in high to low dose, as well as the uncertainties due to the different metabolic processes and lifespan of animals versus humans, a safety factor is introduced when establishing a regulatory level. The mathematical analysis of the dose-response relationship is done to identify a threshold dose-exposure level where adverse effects manifest only once this threshold level is exceeded. In other words, an ostensibly "safe" level of exposure is determined, and this level is used to establish the regulation (with the safety factor incorporated).

Although epidemiology and risk assessment appear to be purely technical, and therefore politically neutral exercises, they are not. Part of this lack of neutrality has to do with the working assumptions adopted in researching a particular case. Consequently,

the results of the risk assessment can be manipulated by taking out certain factors from consideration or putting others in, thereby biasing the results toward a particular conclusion favoured by political or industrial interests. For example, although one risk assessment revealed that there were certain health impacts from a herbicide (dacthal) found in Oregon drinking water, a subsequent risk assessment was conducted by the U.S. Environmental Protection Agency to eliminate a certain factor in the model – a factor that took into account the fact that children would be drinking the water (as opposed to only adults). When this factor was eliminated, the results of the risk assessment revealed no health impacts (O'Brien, 2000).

RISK MANAGEMENT

Risk Management deals with the social aspects of establishing environmental health regulations, especially the process through which a regulatory agency sets the standards and decides what action to take based on the results of the risk assessment and epidemiological analyses. These types of decisions are often quite difficult and contentious because good risk management practice requires the combining of technical information about risk with political, economic, legal, ethical, and other considerations (Leiss & Chociolko, 1993).

In setting environmental health regulations, the state agency (for example, Environment Canada or Health Canada), as part of the government, finds itself caught between several competing interests and must make an immediate decision on the basis of a great deal of technical uncertainty – a situation referred to as the **regulator's dilemma** (Bodansky, 1991). On the one hand, the government feels that it has to ensure the protection of the public health and environment as demanded by environmental groups and many members of the general public. On the other hand, the political elites often have a long-standing arrangement with industrial elites (Clement, 1975) in terms of tax and environmental concessions of various sorts. When it comes to question of the level at which a particular regulatory standard should be set, industry and the environmentalists often have very divergent views. Industries do not normally support the introduction of stringent environmental standards because they will have to change their industrial processes/practices and invest in environmental technologies to meet these standards; and they consider these actions (and the costs associated with them) as unnecessary and a threat to their profitability and survival. Recall that under the present industrial capitalist system, the industrial capitalist is getting somewhat of a "free ride" when it comes to polluting the commons and they would like to maintain that situation, but the imposition of strict environmental regulations begins to erode this "free ride." On the other hand, environmental health activists believe that the standards should be made more stringent in order to protect the environment and public health. Hence, the competing pressures – industry for lax or no standards at all versus the environmental lobby's pressure for stricter standards. Under such competing forces, the government is faced with what is referred to by Habermas (1975) as a "**legitimation crisis.**" That is, the government is put in a difficult position where it may not be seen as legitimate and will therefore not be able to establish sufficient commitment or sense of authority to govern. In the case of environmental health regulations, if the government appears to favour industry too much, it will lose its legitimacy in the eyes of the public and will therefore likely face a difficult time retaining power over the next election. If the

state is seen to favour the environmental lobby too much, it will lose the financial backing of industry (see also Poulantazas (1980) on the "**relative autonomy of the state**" for a more general discussion of the role of the state in society).

Despite certain reservations, private industry does generally support the use of risk assessment in establishing regulations – especially, as we will see, in light of the other possibilities. One reason that risk assessment finds industrial support is that risk assessment, by essentially directing attention to the question of *how much* of a chemical is allowed to enter the commons, in effect permits a certain level of environmental contamination. This diverts attention away from questions such as the necessity of producing toxic substances in the first place; this diversion also tends to include dismissing the need to consider more massive changes to the industrial process to eliminate toxic by-products altogether through preventive engineering and the redesign of the industrial process. Second, risk assessment gives the impression that industry is being "scientific" about environmental health issues and if regulatory disputes occur, industry is in a position to hire their own counter-experts to critique the risk assessments done by government. Furthermore, disputes and legal appeals over the government risk assessment may go on for many years, thus allowing industry to carry on business as usual in the meantime.

THE PRINCIPLE OF PRECAUTIONARY ACTION

The principle of precautionary action (or more commonly, the precautionary principle) refers to the idea that if an activity or substance is suspected to threaten human health or the environment, precautionary measures should be taken, *even if* a cause-effect relationship has not yet been scientifically established (Raffensperger & Tickner, 1999). The logic is one based on the sentiment that it is better to "be safe than sorry." In a real sense, the precautionary principle captures the rationale behind sustainable development because the latter involves a future orientation – that is, that no harm come to future generations because of any actions taken today. As such, sustainable development, like the precautionary principle, is based on the notion of foreseeing and forestalling environmental health problems with an emphasis on the anticipation of environment and health problems, and taking action before the problems occur. So, for example, based on correlational evidence, if there is some suspicion that exposure to a particular substance leads to cancer, even if a cause-effect relationship has not yet been established, the substance should be banned on the basis of the rationale of the precautionary principle (similar arguments have been made for genetically modified food, genetic engineering, nanotechnologies, global warming, the loss of biodiversity, and so on).

Advocates of the precautionary principle contend that a major failing of conventional risk management processes is that currently the burden of proof is on those who wish to stop or prevent some environmental health risk producing activity or product, rather than on those who promote it (Tesh, 2000). They argue that with the adoption of the precautionary approach, there needs to be a shift in the onus of proof from those affected by the risks to those producing the alleged risks. That is, with the precautionary principle, those who are developing the technology or chemical substance must be the ones who prove that there is no reasonable threat to environment and health. They should be the ones who are to prove that the emissions, chemical, or technology are "harmless." And it is only if they can demonstrate this to the public should approval go

ahead for the manufacture of the product in question. In this light, it should not be up to the government or environmental groups to prove that there is harm.

Critics of the precautionary principle argue that in implementing the precautionary principle, one may unnecessarily forgo the benefits of the substance, product, activity, etc. because there may in fact be no cause-effect relationship. Thus, the benefits are said to be lost for no good reason. However, in considering such an argument what should be kept in mind is the free-rider phenomenon, as well as who receives the benefits and who bears the risks. In this light, the management of risk via risk assessment processes should not be thought of as simply a politically neutral technical process.

ALTERNATIVES ASSESSMENT

One way to incorporate the precautionary principle in risk management and environmental health policy is through alternatives assessment (O'Brien, 1999). Proponents of alternatives assessment argue that the guiding logic of risk assessment is misguided because it does not ask the "right" question; rather it is obsessed with the question of how much (i.e., what dose) is acceptable to the public. The question of how much suspected poison is acceptable precludes any consideration of the option that no suspected poison is at all acceptable.

With alternatives assessment the fundamental questions to be asked are: "Is this potentially hazardous activity necessary?" and "What less hazardous options are available?" The focus then changes from issues related to "What amount of risks are acceptable?" to "What options do we have for avoiding risks altogether?" Once identified by lay individuals and experts, the alternatives can be ranked by all stakeholders according to short and long term environmental criteria; then, after the alternatives are ranked, only those alternatives that reveal more, rather than less; precaution should be seriously considered, in particular the identification of those options in which the toxic chemical or risk producing activity is neither produced nor pursued. Examples of alternatives assessment include: the consideration of alternative methods of providing a service or manufacturing a product in which no toxic by-products are produced, such as alternative ways of dry-cleaning (in which halogenated solvents are not used or alternative technologies based on environmentally friendly engineering practices such as Design For Environment are used) (Graedel & Allenby, 1996). Other options include Industrial Ecology (Shrivastava, 1995) and Preventive Engineering (Vanderburg, 2000), where technology substitutions in the manufacturing process are incorporated to eliminate externalities altogether (e.g., pollution prevention technologies) or the by-products that are produced (i.e., externalities) are reincorporated into the industrial cycle as inputs for other processes. The organic farming movement provides another illustration of alternatives assessment. By considering alternatives to chemical pesticides and fertilizers, including such techniques as crop rotation, tilling, mulching, and cover crops, accepting some losses due to pests, breeding plants for pest resistance, and restoring the biological health of soils, organic farming represents a less toxic alternative.

THE ENVIRONMENTAL JUSTICE MOVEMENT

An integral element of the toxic culture is the fact that environmental risks are unevenly distributed within society – they are disproportionately found in areas occupied by

minorities and the poor. In a landmark study, Robert Bullard (1990) found a statistically significant correlation between the location of toxic landfill sites and African-American neighbourhoods in Houston. That is, African-Americans were disproportionately exposed to negative environmental health impacts. This led to charges of environmental racism, that is, that environmental laws, regulations, and enforcement (including land use decisions) were seen to be discriminatory because they target communities on the basis of minority status by allowing polluting industries to be preferentially established in those areas. Since then, however, historical studies of siting decisions have led to the conclusion that sites may or may not have been selected because of racial prejudice alone, but also because of other factors, such as social class. Thus, a site may have been chosen to host a hazards-producing facility because: (1) the area was economically depressed and those in the area would be more willing to accept a potentially hazardous facility for the jobs and tax revenues for the town it promised; or (2) the people in the area were, or were perceived to be, politically less able to resist siting (Anderson et al., 1994). Regardless of the reasons, the outcome is one of an uneven distribution of environmental health risks. The need to address such inequities gave rise to what has become known as the *environmental justice movement* which has drawn attention to the racial and social class disparities in environmental health (Bryant & Mohai, 1992).

The victims of these environmental decisions feel that the government is favouring economic growth over protection of its citizens. This they see as an *injustice*, and they feel that the government is taking advantage of the local community's lack of resources to pursue economic growth at their expense. The environmental justice movement has emerged as a response to such injustice. As the movement has matured, it has expanded its mandate to consider how environmental health problems are connected to concerns of *social justice* (Szasz, 1994). As such, environmental hazards, economic impoverishment, and racial discrimination are not considered separate in the environmental justice movement. Further, in the context of the environmental justice movement, the concept of the "environment" has expanded in scope to include all life conditions in which people live, work, and play. The notion of environmental justice has therefore come to incorporate *all* life and death issues, including joblessness, abusive police practices, lack of health care, decent housing, and equitable education. And by drawing upon the assistance of labour unions, tenants' associations, and civil rights and community groups, the environmental justice movement has been involved with a diversity of issues such as: the problems of hazardous wastes, groundwater contamination, industrial pollution, and workplace safety. For example, lead is known to cause neurological problems and learning disabilities in children, and children living in low-income and inner city public housing have been found to suffer the most from lead poisoning (Mielke, 1999). The environmental justice movement would conceive of poisoning from lead in the paint of older homes or the lead present in the soils of homes in high traffic areas, not only as environmental health issues, but also as educational and housing issues.

POPULAR EPIDEMIOLOGY

Popular epidemiology is a form of participatory inquiry into the community environmental health problems that arose as a response to environmental justice concerns. It involves not only lay efforts to uncover these problems, but the organized political

reaction as well. Popular epidemiology can be seen in such recent films as *Erin Brokovitch* and *A Civil Action*, both of which depict the active involvement of lay individuals in identifying a local chemical contamination problem that was the result of an **environmental corporate crime** (Cable & Benson, 1993; Capek, 1993; Ali, 2002a, b). These films also reveal the role of popular epidemiology in legal arguments made in what have come to be known as **toxic tort** cases.

Popular epidemiological efforts arose as responses to the perceived limitations of traditional epidemiology, risk assessment, and public health regulatory activities – notably, the tendency to exclude the concerns of victims and lay individuals in dealing with environmental health issues. In this light, risk assessment and conventional epidemiology are seen as being elitist, technocratic, and undemocratic. Popular epidemiology is therefore a social movement that calls for greater public participation in environmental health issues, including in-depth collaboration between members of the grassroots environmental groups and the technical experts (such as public health officials), as well the adoption of strategies involving politics and the courts in order to address the health/disease problem (Brown & Mikkelsen, 1990).

Typically, the popular epidemiology movement is initiated by members of the community who start to make lay observations concerning health effects in their area. For example, in the case of chemical contamination in Woburn, Massachusetts (which was the case covered in the film *A Civil Action*), Ann Anderson noticed that when she was taking her son for leukemia treatment in the local hospital, there were other children in the waiting room suffering from the same disease. In talking with other parents in the waiting room, she started to suspect that there might be some common underlying cause for this cancer. Further discussions with neighbours about the poor quality of water in the area (that led to bad taste, foul smells, and the discolouring of household laundry) led to a hypothesized connection between contaminated water and leukemia. To investigate her hypothesis, Anderson, with the help of the local minister, started to map out who in the neighbourhood had cancer and they found that a cluster of cancer cases was clearly evident.

Armed with this lay research, community members approached government officials (usually public health officers) to look for answers but were often rebuked and given little support with their research being dismissed as being "unscientific." Consequently, victims feel violated on two levels. First, because of the contamination itself, and second, because their sense of social justice is violated by the social reaction to their problems. In response, community members organize their efforts by forming a local grassroots group that engages in various activities such as: writing letters to regulatory agencies, demanding public hearings on the issue, staging demonstrations at the regulatory offices, picketing in front of the companies suspected of contaminating the area, and organizing rallies, protests, and marches to convince and educate others of the environmental injustices being committed.

As the movement has matured, popular epidemiology has been extended to encompass a critique of public policy, scientific discourse, and the limits of medical research itself, particularly the tendency of conventional epidemiological approaches to separate biophysical factors (i.e., exposure – disease) from social factors that need to be considered in the more effective analysis of environmental health problems. Along with this critique comes a conscious refocusing on the structural basis of the causes of health problems in the community, and the unequal distribution of environmental health risk,

particularly in reference to traditional epidemiology's tendency to account for patterns of health problems in terms of lifestyle rather than community exposures to environmental hazards (Novotony, 1998).

CONCLUSION

The production of externalities, such as toxic pollution, POPs, CFCs, and greenhouse gases, threaten the ability of our planet to sustain human life in general and maintain human health in particular. By destroying the air we need to breathe, the water we need to drink, the atmosphere we need to protect us from harmful radiation, and the soil we need to grow food, we can see that environmental and health issues are in actuality two sides of the same coin.

Public recognition of the social origin of environmental health risks (and especially the role of the free rider problem in the production of such risks) has led to the politicization of such issues in modern times; we now are starting to realize that such problems are of such great importance to our overall survival that they can no longer be ignored. The establishment of environmental regulations and the management of environmental risks exemplify initial attempts to deal with these risks. More recently, other attempts, such as the implementation of the precautionary principle in public policy and opportunities for social movement activities to be involved in risk management activities, have been pursued – particularly in relation to issues involving the unequal distribution of environmental health risks. In particular, such attempts bring to the fore the complexity of dealing with environmental health problems, as evidenced by the fact that the primary stakeholders dealing with such problems are numerous – industry, the state, the public, and social movement actors. Further, such attempts highlight the fact that in order to address environmental health problems effectively, a technical solution is not enough; the social context must be also considered.

In the future, we will undoubtedly face new health problems such as: **endocrine disruption** (Colborn et al., 1997; Krimsky, 2000), **new and emerging diseases** (Ali, 2004; Levy & Fischetti, 2003; Garrett, 1994), and **multiple chemical sensitivity** (Kroll-Smith & Floyd, 1997). The environment plays a critical role in all of these. As such, it is clear that the environment should no longer be thought of as a "luxury issue" marginalized to the lower echelon of the political agenda. Rather, the environment should now be recognized as an issue intimately connected to both public health and human survival. That is, the protection of the environment is equivalent to the protection of human health, and for this reason alone the environmental issue should be placed closer to the top of the political agenda.

STUDY QUESTIONS

1. *Explain how environmental issues and health issues are two sides of the same coin.*
2. *Explain how the concepts of the toxic culture and the risk society can be used in the study of environmental health problems. In your answer, pay particular attention to the relationship between industry, the state, and the public.*
3. *Discuss how the precautionary principle can be used to critique the ways in which environmental health regulations are currently established. How can the precautionary principle be used to develop alternative approaches to the establishment of such regulations?*

4. *Discuss the ways in which social movements, such as the Environmental Justice Movement and Popular Epidemiology, have linked environmental health issues to larger issues related to social justice and a broader critique of industrial capitalist society.*
5. *Ulrich Beck notes the following:*

> *The environmental problem is by no means a problem of the world surrounding us. It is a crisis of industrial society itself, deeply rooted in the foundations of its institutions and with considerable political resonance. Threats are produced industrially, externalized economically, individualized juridically, legitimized scientifically, and minimized politically. (1995, p. 140)*

Develop an argument for or against the above statement with reference to the management of environmental health risks in contemporary society.

GLOSSARY

bioaccumulation the process through which the concentration of synthetic chemicals in the body increases over time because of environmental exposures (see also body burden).

body burden the sum total of all synthetic chemicals in the body due to environmental exposures from all routes of entry (inhalation, ingestion, and dermal absorption) and all sources (food, air, water, workplace, home, and so on). For example, 177 different organo-chlorine residues can be found in the body of an average middle-aged North American male (Steingraber, 1997).

carrying capacity the carrying capacity represents the critical limit or threshold potential for the earth to support the human population. In other words, it is a measure of the maximum level of stress that the Earth's ecosystems can withstand in order to continue as a stable life-sustaining system in equilibrium.

CFCs chlorofluorocarbons (CFCs) are a group of synthetic chemicals containing atoms of carbon, chlorine, and fluorine. They are used in aerosol sprays, blowing agents for foams and packing materials, solvents, and in refrigerants. They have been found to be chemically active in the atmosphere and thereby implicated in the process of ozone layer depletion. CFCs were banned by the 1987 Montreal Protocol.

clinical control trials research experiments in which people are divided into two groups – an experimental group that is given a drug or treatment, and a control group that is given an inactive substance (called a placebo). The two groups are then compared to determine statistically whether the drug or treatment is effective in treating the disease or ailment.

endocrine disruption refers to certain synthetic chemicals (i.e., endocrine disruptors) in the environment that interfere with the normal functioning of the hormonal systems of the body. Notably, endocrine disruptors in extremely minute concentrations are known to have negative effects on the hormonal systems. That is, low levels of exposure may lead to greater adverse health effects than high doses.

environmental corporate crime an environmental problem results from the disruption of an ecosystem, while an environmental corporate crime occurs when this disruption is the direct result of a company or corporation engaging in some illegal production process or activity. One example is midnight dumping, where a company will

arrange for a truck to come to a factory to pick up drums of toxic waste that are subsequently dumped on some remote site in the middle of the night.

environmental risks threats to human health that arise from, or are transmitted through the air, water, soil, and/or food chains.

externalities formally, an externality results when a decision (for example, to pollute the atmosphere) causes costs or benefits to individuals or groups other than the person making the decision. In other words, the decision-maker does not bear all of the costs or reap all of the gains from his or her action.

greenhouse gases the greenhouse effect is an atmospheric phenomenon that is caused by the addition of greenhouse gases into the atmosphere, thus causing global warming. Greenhouse gases include (as water vapour): carbon dioxide (from the burning of fossil fuels and deforestation), CFCs, and methane.

legitimation crisis a legitimation crisis occurs when the general public questions a particular social institution as being just and valid. Consequently, there is a lack of sufficient commitment on the part of members to a particular social institution for that organization to function effectively. Notably, governments that lack legitimation often rely on repression to continue their rule (which is very inefficient).

multiple chemical sensitivity a syndrome that results from chronic low level exposure to synthetic chemicals, particularly those in the living and working environments such as: pesticides, perfumes and other scented products, fuels, food additives, carpets, building materials, and so on. Symptoms include: difficulty breathing, sleeping, and/or concentrating; memory loss; migraines; nausea; abdominal pain; chronic fatigue; aching joints and muscles; and irritated eyes, nose, ears, throat, and/or skin. The doses that are alleged to cause this syndrome are so low according to conventional toxicological measures, that the medical profession denies the existence of this syndrome as such; thus, this syndrome is a contested disease that is surrounded by a great deal of controversy between those affected and the medical profession.

new and emerging diseases refers to those infectious diseases that have newly appeared in a population or that have been known for some time but are rapidly increasing in incidence or in geographic range. Examples of emerging infectious diseases include: HIV/AIDS, SARS, Lyme disease, *E. coli* O157:H7, hantavirus, Ebola, the Marburg virus, and Lassa Fever.

persistent organic pollutants (POPs) chemical substances that persist in the environment and bioaccumulate through the food web (see bioaccumulation and body burden). In particular, they are known to be carried by wind currents to remote locations where they accumulate in the environment.

regulator's dilemma environmental regulators often need to take action to either prevent or avoid the potential for damage to the environment and human health in the face of considerable uncertainty, an unquantifiable degree of ignorance, and inherent indeterminacies. Thus, the dilemma they face is to make a regulatory decision without sufficient information.

relative autonomy of the state a perspective which assumes that the state functions in a limited but independent way to maintain and stabilize capitalist society. If the

state is seen to cater to industrial interests then it will lose legitimacy in the eyes of the voting public; if it caters too strongly to the interests of the environmental lobby, it risks losing the financial support of industry. In establishing environmental health regulations, the state therefore tries to balance these competing interests while at the same time ensuring the continued functioning of capitalist society.

Relative Risk mathematically, the Relative Risk is a ratio of two risks. From the 2 x 2 Disease-Exposure Table below we can define two types of risk based on the number of people in each of the cell categories.

	Disease Develops	Disease Does Not Develop
Exposed to Chemical in the Environment	a	b
Not Exposed to Chemical in the Environment	c	d

Risk of the disease in those exposed: a/(a+b)

Risk of the disease in those not exposed: c/(c+d)

The Relative Risk is the ratio of the above two risks: $\frac{a/(a+b)}{c/(c+d)}$

If the calculated Relative Risk is greater than one, this suggests that the exposure is associated with a certain disease or health outcome (although a statistical test still would need to be completed to determine whether this association was unlikely to occur purely by chance). Thus, for example, a Relative Risk of two suggests that exposure leads to twice the risk for those exposed compared to those not exposed. If the Relative Risk is equal to one, then there is no association between exposure and the disease/health outcome at all; that is, exposure does not create any additional risk. Finally, if the Relative Risk is less than one, this implies that exposure has a protective effect, meaning that exposure leads to a decreased risk of getting the disease – this is the sort of result that drug manufacturers would like to attain in their clinical control trials. As examples, consider the Relative Risk for smoking and lung cancer is 10.7; for smoking and gastric ulcers it is four.

toxic tort a tort is an injury to a person's bodily integrity, financial situation, or other interest caused by another person's negligence or carelessness. A toxic tort is a tort caused by contact with a harmful substance.

REFERENCES

Ali, S.H. (2002a). Disaster and the political economy of recycling: Toxic fire in an industrial city. *Social Problems, 49*(2), 129–149.

Ali, S.H. (2002b). Dealing with toxicity in the risk society: The case of the Hamilton plastimet fire. *The Canadian Review of Sociology and Anthropology, 39*(1), 29–48.

Ali, S.H. (2004). A socio-ecological autopsy of the *E. coli* O157:H7 outbreak in Walkerton, Ontario, Canada. *Social Science and Medicine, 58*(12), 2601–2612.

Anderton, D.L., Anderson, A.B., Oakes, J.M., & Fraser, M.R. (1994). Environmental equity: The demographics of dumping. *Demography, 31*(2), 229–48.

Beck, U. (1992). *The risk society: Towards a new modernity*. London: Sage.
Beck, U. (1995). *Ecological enlightenment: Essays on the politics of the risk society*. Trans. M. Ritter. New Jersey: Humanities Press.
Bodansky, D. (1991). Scientific uncertainty and the Precautionary Principle. *Environment, 33*(7), 4–5 & 43–44.
Brown, P., & Mikkelsen, E.J. (1997). *No safe place: Toxic waste and leukemia, and community action*. Berkeley: University of California Press.
Bryant, B., & Mohai, P. (1992). *Race and the incidence of environmental hazards*. Boulder, CO: Westview Press.
Bullard, R. (1990). *Dumping in Dixie: Race, class and environmental quality*. Boulder, CO: Westview Press.
Cable, S., & Benson, M. (1993). Acting locally: Environmental injustice and the emergence of grass-roots environmental organizations. *Social Problems, 40*(4), 464–477.
Capek, S. (1993). The "environmental justice" frame: A conceptual discussion and an application. *Social Problems, 40*(1), 5–24.
Carson, R. (1962). *Silent spring*. Boston: Houghton Mifflin.
Clement. W. (1975). *The Canadian corporate elite: An analysis of economic power*. Toronto: McClelland and Stewart.
Colborn, T., Dumanoski, D., & Myers, J.P. (1997). *Our stolen future: Are we threatening our fertility, intelligence and survival? – A scientific detective story*. New York: Penguin.
Garrett, L. (1994). *The coming plague: Newly emerging diseases in a world out of balance*. New York: Penguin.
Gibbs, L. (2002). Citizen activism for environmental health: The growth of a powerful new grassroots health movement. *Annals of the American Academy of Political and Social Science, 584*, 97–109.
Graedel, T.E., & Allenby, B.R. (1996). *Design for environment*. New Jersey: Prentice Hall.
Habermas, J. (1975). *The legitimation crisis*. Translated by Thomas McCarthy. London: Heinemann.
Hardin, G. (1968). The tragedy of the commons. *Science, 162*, 1243–1248.
Hofrichter, R. (2000). *Reclaiming the environmental debate: The politics of health in a toxic culture*. Cambridge, MA: The MIT Press.
Krimsky, S. (2000). *Environmental endocrine hypothesis and public policy*. In S. Kroll-Smith, P. Brown, & V.J. Gunter (Eds.), *Illness and the environment: A reader in contested medicine* (pp. 95–107). New York: New York University Press.
Kroll-Smith, H.H. (1997). *Bodies in protest: Environmental illness and the struggle over medical knowledge*. New York: New York University Press.
Leiss, W., & Chociolko, C. (1993). *Risk and responsibility*. Montreal: McGill-Queen's University Press.
Levy, E., & Fischetti, M. (2003). *The new killer diseases: How the alarming evolution of germs threatens us all*. New York: Three Rivers Press.
Mielke, H.W. (1999). Lead in the inner cities. *American Scientist, 86*, 62.
Milly, P., & Leiss, W. (1997). Mother's milk: Communicating the risks of PCBs in Canada and the Far North. In D. Powell & W. Leiss (Eds.), *Mad cows and mother's milk: The perils of poor risk communication* (pp. 182–209). Kingston: McGill-Queen's University Press.
Needleman, C. (1997). Applied epidemiology and environmental health: Emerging controversies. *American Journal of Infection Control, 25*(3), 262–274.
Novotony, P. (1998). Popular epidemiology and the struggle for community health in the environmental justice movement. In D. Faber (Ed.), *The struggle for ecological democracy: Environmental justice movements in the United States* (pp. 137–158). New York: Guilford Press.
NRTEE (National Round Table on the Environment and Economy). (2001). *Managing potentially toxic substances in Canada*. Ottawa: Renouf Publishing.
O' Brien, M.H. (2000). When harm is not necessary: Risk assessment as diversion. In R. Hofrichter (Ed.), *Reclaiming the environmental debate: The politics of health in a toxic culture* (pp. 113–133). Cambridge, MA: MIT Press.
O' Brien, M. (1999). Alternatives assessment: Part of operationalizing and institutionalizing the precautionary principle. In C. Raffsensperger & J. Tickner (Eds.), *Protecting public health and the environment: Implementing the precautionary principle* (pp. 207–219). Washington, DC: Island Press.
Pekkanen, J., & Pearce, N. (2001). Environmental epidemiology: Challenges and opportunities. *Environmental Health Perspectives, 109*(1), 1–5.
Poulantzas, N. (1980). *State, power, socialism*. London: New Left Books.
Raffensperger, C., & Tickner, J. (1999). *Protecting public health and the environment: Implementing the precautionary principle*. Washington, DC: Island Press.
Shrivastava, P. (1995). Ecocentric management for a risk society. *Academy of Management Review, 20*(1), 118–137.
Steingraber, S. (1997). *Living downstream: A scientist's personal investigation of cancer and the environment*. New York: Vintage Books.
Szasz, A. (1994). *Ecopopulism: Toxic waste and the movement for environmental justice*. Minneapolis: University of Minnesota Press.
Tesh, S.N. (2000). *Uncertain hazards: Environmental activists and scientific proof*. Ithaca, NY: Cornell University Press.
U.S. National Research Council. (1983). *Risk assessment in the federal government: Managing the process*. Washington, DC: The National Academies Press.
Vanderburg, W.H. (2000). *The labyrinth of technology: A perspective technology and economic strategy as a way out*. Toronto: University of Toronto Press.
WCED (World Commission on Environment and Development). (1987). *Our common future*. Oxford: Oxford University Press.
Wing, S. (2000). Limits of epidemiology. In S. Kroll-Smith, P. Brown, & V.J. Gunter (Eds.), *Illness and the environment: A reader in contested medicine* (pp. 29–45). New York: New York University Press.