The Environment, Risk, And Health: Notes Toward A New Conceptual Framework

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There are many schools of thought that relate environmental conditions to human health. The mechanistic way of thinking that underlies toxicology and the biomedical sciences attempts to link specific steps in causation with specific outcomes based on scientific evidence [1,2,3,4]. The stochastic model, based on probabilities, underlies risk assessment [5]. Another model seeks to define codes of human behaviour that affect environmental integrity in the same terms as medical ethics, to create an expanded "global bioethics" [6]. An increasingly influential point of view is that of "deep ecology" as articulated by Arne Naess [7] and popularized by Duvall and Sessions [8], which considers human dependence on environmental integrity in terms of an ethical framework that, if violated by human beings, not only threatens our survival but diminishes our rational humanity [9].

Definitions of Health

Health and the derivative term environmental health are understood differently by different segments of society. Four views are described below:

1) For many practicing clinicians, health remains, conceptually, a baseline state of function that is normal for that individual and to which a person returns between bouts of illness. In an era when the prevalence of disease and disability were high and most people were glad to be alive, that idea of health may have seemed adequate. Today, when most people in society are not obviously diseased or dysfunctional and can expect to live long lives, this definition of health seems inadequate, an expression of a negative state (not being obviously sick) rather than a useful concept of wellness. Thus, health came to mean alive, well, and free of apparent risk factors for future disease.

2) The World Health Organization (WHO) has introduced a new definition of health as being more than the absence of disease or infirmity, but incorporating a complete state of physical, mental, and social well-being. This definition opened a new dimension: health itself could have varying degrees. One could enhance one's degree of health in a positive direction.

3) In 1984, WHO extended this concept by defining health as "the extent to which an individual or group is able…to realize aspirations and satisfy needs and…to change or cope with the environment. Health is therefore seen as a resource for every day life -- not the objective of living." This socially popular third definition of health may make many health professionals uncomfortable. This broader definition logically leads to ever-increasing expectations that may not be satisfied.

4) Society may now be in the throes of a fourth definition of health in modern times, one stimulated by the environmental movement. This definition emphasizes the health of the environment (usually in terms of the integrity of ecological systems and the sustainabiiity of resources) and the appropriate place of responsible human beings in the environment. A healthy person or a healthy society on a sick planet is inconceivable, because all living things are part of an indivisible whole. A healthy society is one that is sustainable, among other characteristics. This definition of health is so broad that it removes the emphasis from human society altogether. It accepts as relevant many matters that are not primary determinants of physical health or that are secondary concerns for human physical health in general: low-level exposure of questionable toxicological significance; the return of air and water resources to states of allegedly pristine quality far in excess of that necessary to protect human communities from illness; the sustainability of the society and the degree of its reliance on resource depletion; and the restructuring of agriculture and food distribution to meet expectations of cultural acceptability that have little to do with objective standards of nutritional value, production, or prevention of spoilage. This fourth concept of health affects perceptions of social values as well as environmental influences in the physical sense.

Definitions of Environmental Health

The words "environmental health" mean different things to different groups:

1) To health professionals, "environmental health" means environmental determinants of health, understood in the traditional public health context as referring to the many potentially toxic exposures, sources of contamination, and physical influences that may directly affect human health.

2) To environmentalists and to many members of the public, however, "environmental health" also means the health of the environment [12]. The principle behind this definition is the integrity of the ecosystem and the quality of the environment. This definition, also called "ecosystem health," is related to human health insofar as the survival of human society and the quality of human life (and therefore health in the broadest terms of the WHO definition) is affected by destabilization of the ecosystem. Those who use this second definition are usually speaking of more general or indirect effects, mediated through the food supply, crowding, chemical influences on health more subtle than direct toxicity, and cultural anomie resulting from a disconnectedness from the natural world.

How These Definitions are Used

The public generally sees both definitions of environmental health as mixed together and both as fundamentally related to social justice and fairness. Just as it is unacceptable for resources to be unfairly distributed, it is offensive to the public's sense of fairness for risks to be inequitably distributed. The environmental movement, particularly in Canada and the U.S., speaks of health as a driving concern for public response to environmental problems. But the understanding of the term environmental health among various groups can be very different. One consequence is that the public health community, which should rightly be perceived as in the forefront of environmental issues, has been marginalized to a considerable extent because the environmental movement is talking about issues not traditionally related to human health. Because of this, public health professionals and environmentalists often find themselves frustrated in communication [12].

This difference in understanding becomes most contentious when health issues are considered as evidence of environmental degradation. Environmentalists may perceive themselves as sounding the alarm on important health issues that illustrate the link between the environment and human health and, therefore, are likely to motivate people to political or social action relating to the environment, although the human health impacts may seem to be negligible when balanced against other human health choices. The Alar issue, involving apples and the risk

of cancer, is a case in point. To health professionals, this issue seemed clearly alarmist and the science behind the pronouncements seemed highly suspect. The concern expressed over the detection of PCBs in human milk and the advice to be given to nursing mothers was another instance [13]. In this case public health authorities were almost unanimous in minimizing the risk, while a vocal environmental group put out advisories to discourage nursing, contrary to public health recommendations.

Managing Risk on a Societal Level

The conceptual framework of risk assessment and risk management is familiar to all who work in environmental health, by either definition. However, this framework is based on an approach to individual hazards which is itself embedded into a much larger framework of how society deals with risks in general. It is worthwhile considering this broader aspect of risk.

Conventional calculations of cost are oriented toward human use [14,15]. Natural systems incur cost in the form of instability, as ecosystems are threatened, resources are extracted and pollutants introduced at a pace and in quantities that outstrip the adjustment capacities of the environment. One way of expressing future instability and the likelihood of damage is by estimating risk, as a description or prediction of how the system will behave in a given situation. Risk assessment methodology is emerging as a valuable analytical tool but has to some degree been oversold. Risk assessment defines the order of magnitude of risk and identifies the components of the problem but it is not an infallibly accurate means of estimating "actual risk" and it is certainly not value free. The environment can be injured but it can also be "risked" in the sense that the system can be changed to allow certain results to happen more freely. That is, the future can be gambled with long or short odds, the structures put in jeopardy even if they are not actually destroyed.

Studies have amply shown that the public is more concerned about some outcomes than others [16]. Top on the list is the risk of cancer. Although it may be true that some of this concern is driven by media attention, it is equally true that any effort in risk assessment or management that neglected cancer would not be credible in the eyes of the public.Thus, the preoccupation of risk assessment with cancer is rational in terms of addressing public concerns.

Controlling Risk

All society is about controlling risk.

Human communities exist to minimize the level of risk from outside aggression, disasters, food shortages, and social isolation. Human institutions exist within the community to protect the society as a whole and the individual and to minimize the level of risk within the community by creating a stable social order, punishing miscreants, distributing food and other goods, encouraging social interaction, providing opportunities for mating and reproduction, and so forth. Thus, controlling risk is best understood not as a function of society but the reason for its existence in the first place.

The most common traditional social mechanism to control risk seems to have been by strengthening the family and extending its reach so that individual members became part of an extended network that could provide help in time of individual need. This system may have broken down in times of collective need, when there was not enough to go around to ensure survival, but kinship ties had the advantage of being explicit, involuntary, and consistent with basic biological instincts. Kinship was also a highly flexible system, operating well from the clan level to its apogee, perhaps, in Chinese society.

The strategies that Western society has used to control risk have primarily been technological means to exert control over the environment. The reorganization of work and distribution patterns has made it possible for individual members of society eventually to obtain the necessities of life, acquire the most basic amenities needed for social integration and psychological comfort, and receive protection from physical threats. Ironically, these technological advancements often work to the disadvantage of the family unit, so that a technologically advanced society becomes increasingly mobile and dependent on technology as the primary means of controlling risk. On one level, the technological solution has been extraordinarily successful, but by creating conditions in which the family could not thrive, it may have weakened the other principal means of risk management in contemporary society.

The modern environmental movement in the West, therefore, is largely a product of a society that has gone as far as it easily could in controlling risks but that now finds itself in a quandary: it cannot stand still. To go backward to an earlier level of technology and social organization, as seems to be happening in some inner cities in North America, is to unravel the cocoon of risk control; once started, who knows where it would end. To stay at the same level of technological development is unsustainable because the demands placed on natural resources and the ecosys-

tem are too great -- unsustainable in environmental terms. International security considerations and fundamental human rights suggest that it would be dangerous to deny any large segment of the world's population the opportunity to develop, but if development is undertaken using only present technology the strain on resources and environmental systems could be disastrous for all societies. To survive, therefore, Western society has little option but to move forward to restructure itself along the principle of sustainable development.

This will force an adaptation of technology to confront the realities of sustainable development. In the past, it was always assumed that technology and economic development would be limited by resource availability. Loading capacity has emerged as the driving issue in sustainable development, however. It now appears more likely that constraints on economic growth will be imposed by limits on loading, or the saturation of the capacity of the environment to absorb the effects of change and human activity.

Strategies for Controlling Risk

There are three levels of risk to health that operate with respect to environmental issues:

1) Occupational medicine and community medicine are primarily concerned with identifying high risk groups and bringing them into line with the general population risk. One seeks to identify the risk factors that cause an excess of disease, to control them, and to bring down the level of risk in the group to that experienced by the population as whole. Examples would be the identification of workers exposed to asbestos or the control of HIV transmission by targeting high-risk groups. The risk experienced by a particular group is compared with the risk they would experience if their special circumstances were taken away and they were to become members of the general population.

2) The public health profession and, to some degree, the environmental movement have been primarily concerned with changing the general level of risk by controlling common exposures, widespread environmental conditions, and aspects of daily life that make the risk levels for everybody -- or at least for large segments of the population -- higher than they have to be. The present level of risk is compared with what could be achieved with some effort. A substantial part of the environmental movement, like the Sanitary Movement of the 19th century, is predicated on the need to "ratchet down" the level of risk a notch or two to provide a safer life for everyone. When a hazard is identified and an avoidable risk is identified, the logic dictates that it be brought under control. This is why the environmental movement often concerns itself with small levels of cancer risk presented by exposure to low concentrations of chemicals. This also leads to a number of paradoxes, as when measures that were introduced to lower risk in the past (such as chlorination of water or preservation of food with chemical additives) are now themselves associated with relatively low health risks. To reduce substantially the risk level presented by these "risk-controlling" technologies may require the introduction of new and sometimes very expensive technologies. There is a real question whether such a reconstruction would be cost-effective in the face of other social priorities related to personal security and environmental integrity.

3) The third issue of risk involves larger scale ecological issues: global climate change, regional environmental disruption, resource depletion, and population growth. At this level the risks do not relate to an individual's experience of an adverse health outcome, but instead reflect the chances of either insidious or cataclysmic disruptions of society, climate, or food supply, leading to widespread suffering and social disintegration. Although the risk of disaster is ever-present, especially at the geographical and economic margins of developed society, the most profound health implications are more likely to be indirect, mediated by economic dislocations, population migration, and social stresses.

Economic Implications

Concern over the implications of global ecological change has become an object lesson of sorts for illustrating the dangers of economic development along present lines [14,17,18]. The market-oriented economy in some analyses provides incentives for the extraction of nonrenewable resources, insufficient penalties for pollution and the consumption of renewable resources in excess of their regenerative capacity, and the extension of trading areas so far beyond local ecological zones that production and consumption are

uncoupled with the carrying capacity of the environment [19,20].

Sustainable Development

Sustainable development is a concept critical to understanding proposed solutions to the problem of large scale ecological degradation and resource depletion in the context of personal freedom and the adaptability of markets 15,18,20]. Briefly, the concept, as elaborated in the Brundtland report [18], involves establishing an economic structure that ideally consumes only as much as the natural environment produces and emits only as much as the natural environment can absorb. This is accomplished by reducing consumption and the scale of economic development, recycling materials, and reusing as much product as possible. This economic structure is sustainable in the sense that it can be sustained from one generation to another. It would differ from traditional peasant societies, which have been the only sustainable economic systems in the past to support large populations through many centuries, in being much more efficient in the use of resources, innovative, and based to a large extent on information management.

There is a cultural dimension, however, to moving toward this type of society [9,20,21]. To accommodate and manage a sustainable economic system, the social structure would also have to change. Some large scale urban centres might be seen as nonsustainable; traditional values that promote stability may be more supportive of sustainability than cosmopolitan,urban, entrepreneurial values. There is a question of whether the environmental heterogeneity and social pluralism of modem urban society, which many people feel tends to promote creativity (and also conflict) could be accommodated in such a system. It is often assumed that most communities under such a regime would be small, resource-efficient, and directly linked (either economically or through information on the state of its base) to a resource base in a way that would maintain some control over the exploitation of resources.

Once the implications of sustainable development are traced through their social ramifications, it becomes clear that nothing less than a thorough restructuring of society would accommodate a sustainable economic structure [21]. Issues of equity and community control over these resources and decision-making with respect to their distribution obviously arise. The concept of sustainable development is closely linked, in the minds of many, with that of community empowerment and a host of related issues related to social justice and cultural expression. There are other, less direct links that take the form of doctrines of religion, anthromorphism [23], and secular beliefs about ethical stewardship of resources as articulated recently in these pages by Van Rensselaer Potter [24].

An Alternative View to Sustainable Development

The earth is no longer a self-correcting natural system; the planet now requires human intervention to stabilize its most basic functions and to reconstruct the degraded systems on which life ultimately depends. Even the remaining wild areas of the world, unexploited by humankind, are in almost every case preserved by human action, in the form of reserves or through juridical restraints on allowable activities. Human activity has destabilized the planet to the point that the romantic "Gaia hypothesis" [23], if it were ever true, now belongs to the past.

The earth has always been a dynamic system, ever changing in the evolution of life and the response to physical forces in the solar system, but over relatively short periods of its history, on the order of millions of years, it has sustained itself within a relatively fixed pattern of climate and life zones. What is different today is that the pace of change, even in the shortest of planetary time frames, has been accelerated by human activity. The planet cannot regulate itself reliably in the face of such rapid change. For better or for worse, human beings have so altered the planetary structure that they must now take even greater control of the situation to prevent further destabilization. This means assuming responsibility for restoring, not just preserving, ecosystems and other lost elements of the planetary fabric [3].

Conversely, the manifestations of ecological problems are all fundamentally interrelated and inseparable from societal values [3,6,17,22].

The material culture of society (expressed in economics) and ethical systems are inextricably intertwined in issues of equity and respect for the natural earth. Because treating the environment respectfully is an effective strategy for sustaining the yield of renewable resources, it is not surprising that most indigenous cultures incorporate religious or philosophical beliefs to the effect that the Earth is a provider, a sentient being, and an ancestor.

A society based on growth, however, separates from this value in the optimistic belief that technological ingenuity and artificial constraints (such as pricing) can protect resources from becoming ultimately inaccessible for human use; since the values are recast in humanistic and anthropocentric

terms, utility for humankind becomes the dominant reason for conserving resources [16,18,19]. In this view, sustainable development is mostly about sustaining yield indefinitely and conserving resources systematically for future exploitation.

A Conflict of World Views

There is at present a conflict within society over which world view will prevail. The "human utility" or "best use" view is much more compatible with the presently dominant, growth-oriented, economically motivated society. Even the notion of resource conservation fits well into this context because it can be translated into serving future markets. The "biocentric" or "highest use" world view is paradoxically much more traditional, but is discordant with present dominant values; one strategy for replacing the dominant values is to appeal to traditional wisdom, intuitive understanding, and quasi-religious symbolism.The present-day environmental movement borrows heavily on these traditional values in an effort to recreate a biocentric ethic as the dominant world view [7,9,14].

It is not clear that the biocentric world view will completely replace the dominant anthropocentric world view in the move toward some form of sustainable development. There is the obvious problem of inertia involved in changing all social institutions more or less simultaneously. There is also the nagging problem that alternative, stable, and biocentric social orders do not necessarily appear very attractive to most of the world's citizens, particularly those only now emerging from traditional village societies. For all of its enormous disadvantages, contemporary urban culture has great advantages in terms of social and material efficiency, individual opportunity, cultural expression, and ingenuity [24]. An endorsement of the alternative view means to some a return to the Middle Ages (an impression heightened by the druidic references in much of the literature of "deep ecology"), with the risk of social stagnation as a price for material stability and ecological responsibility. To societies only now emerging from predominantly peasant and village systems of social organization, the prospect of a return must seem almost chilling. To date, deep ecology has been more successful in articulating a vision of harmonious coexistence with nature on a vastly reduced scale of society than in articulating an alternative vision of a dynamic society in which intellectual and information growth replaces material and economic growth. Perhaps this will come in due time.

Whatever world view eventually pre-dominates -- or if a synthesis occurs -- public belief that large scale changes in the global environment are not inevitable is fundamental to successful environmental reconstruction. There must be a will to change. For such change to take place, it is essential that people believe that change is possible and likely to succeed. This means that the twin enemies of survival are fatalism and pessimism.

The Way Forward

Long-lasting change requires social and cultural change. Through collective action, governments and societies may change the presently destructive course of environmental degradation. The human economic and social systems that depend on environmental exploitation cannot merely be swept aside, but must be replaced by an alternative social order. To succeed -- and to be worthy of succeeding -- this social order must be humane, effective in responding to social needs, equitable in the distribution of goods, and historically stable. This means finding answers for the perennial problems of poverty, development, and social justice [24].

Although there is much to justify a pessimistic view of the world's prospects, we have actually come far in the search for a new way of living. Recent decades have brought a much more detailed view of the environment, rising awareness on the part of people in the developing world, more tolerant values in accepting other cultures, and technological developments that provide tools for constructive application [25].

While human beings are responsible for our present unsustainable situation, there can be no solution without accommodating human needs. Sustainability must incorporate an evolving and opportunity-rich social environment, preferably heterogeneous in character, with urban nodes as well as more rural settings, or it is likely that some future generation will cast it off again as restricted and stultifying [21].

The solution ultimately lies in seeing human society as an integral part of the planet and accepting that human communities must be accommodated in a stable world order [16]. This implies a set of social actions that provide alternatives not only to wasteful resource exploitation by industrialized societies but also to the often intensive resource overutilization by impoverished and less developed societies that leads to soil depletion and deforestation.

Proposed here are key features of that solution:

    * Sharing technological answers when they come available;

    * Establishing a global educational

and communications system that provides access not only to news but to insight and explanation for the behaviour of other peoples;

    * Promoting political evolution away from the nation-state and toward interdependent communities aggregated into stable regional confederations or trading blocs, but preserving local traditions and placing value on local communities;

    * Encouraging personal opportunities that are not resource-intensive, putting the energies of the economic system and the people into community development, health promotion, education, the arts, and popular culture;

    * Shifting the economic system from a basis of sustaining development and production to a basis of sustainable development and selective production, which cannot be achieved by a command economy of the type that so recently failed in the communist bloc;

    * Connecting markets and prices to resource availability in a very direct and explicit way;

    * Ensuring that the true costs of transportation, agriculture, and the distribution of goods are reflected in pricing and that people have sufficient resources, sufficient education, and sufficient choices to respond to these price changes with reduced demand or with the selection of alternatives long before the resource base has become damaged.

Throughout the quest for this solution and the steps embodied in it, the emphasis must not be on partisan political changes but on structural change to make society responsive to these issues and to diffuse responsibility for environmental reconstruction to the lowest possible level. The goal must be not the recreation of a peasant society with uniform social organization and orthodox values, but the development of a new and diffused form of aware and cosmopolitan culture, rich in human opportunities and displacing the need for material exploitation.

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