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CASE 4

INTRODUCTION TO PUBLIC HEALTH

DETERMINANTS OF HEALTH

Econology: integrating health and sustainable development. Part One: theory and background

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SUMMARY

Environmental sustainability is rapidly becoming the most critical public health issue. Prevailing notions of health in environmental decision-making do not embody concepts inherent in health promotion and the new public health. Health promotion emphasizes the importance of income and power equity, and social support/connectedness (health–economy relationship), alongside direct and indirect human health threats posed by environmental toxins (health–environment relationship). Health promotion also acknowledges the inherent limitations of scientific research, and the need for value-based decision-making in the absence of definitive information. Twelve principles are developed from brief reviews of the health–environment–economy relationships. While fear for personal health underpins increasing public concern over environmental degradation, persons with expertise or a constituency in public health are not members of any of Canada's federal and provincial Round Tables on Environment and Economy. Health promotion professionals should not wait to be invited to participate in sustainable development debates; they should invite themselves. Their discipline specific roots in epidemiology and clinical public health practice will significantly enrich the vocabulary of the debate. Their current a-disciplinary generalism may allow them to function as effective and necessary cross-discipline translators.

Key words: health and economy; health and environment; sustainable development

INTRODUCTION

This article comprises two parts. Part One reviews basic concepts inherent in sustainable development, and explores their health implications using three sets of relationships: health and environment, health and economy, economy and environment. Part Two explores the fit between the new public health and sustainable development criteria, and describes 12 principles that can be used to guide sustainable development decision-making, such that the fullness of human health is nurtured.

John Maynard Keynes once wrote that 'Words ought to be a little wild, for they are the assault of thoughts upon the unthinking.' The language of both health promotion (the new public health) and sustainable development are certainly 'wild', and perhaps suffer from the effort of integrating knowledge and information from a variety of disciplines. A few starting definitions are in order.

Health is derived from the Old English 'haelth', from which we have three entwined concepts: 'hello', whole and health. Health is thus intrinsically holistic, and we violate its richness when we focus only on biomedically defined conditions (morbidity and mortality). Health is inherently a social phenomenon, embodying the quality of our relationships with one another. (The root of 'health' doubles as a social greeting in many other languages as well as in English.) While health and disease are often considered to exist on a continuum, persons with chronic diseases or poor health behaviours often regard themselves as being in excellent health. (Toronto Comunity Health Survey, 1988; Blaxter, 1990) This indicates that, while related, health and disease are not contiguous. This fact is recognized within a health

promotion paradigm, but not within a health protection paradigm. The latter paradigm, which predominates in environment–health decision-making, is based upon reductionist methodologies that assess morbidity and mortality risks. While providing important information, this paradigm must be broadened to incorporate and give inherent validity to individual and community experiences of health that are qualitative and subjective.

Sustainable development is '. . . development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (World Commission on Environment and Development, 1987). At face value, this definition adequately captures the environmental imperative to cease exhausting natural resources. But it is a vague definition, open to multiple interpretations. According to Daly and Cobb (1989), sustainable development 'should refer to the qualitative change of a physically nongrowing economic system in dynamic equilibrium with the environment.' In simpler terms, sustainable development recognizes that the earth is not growing. Sustainable economic activities develop the sufficiency and quality of our relationship with planetary ecosystems. Sustainable development is not something that can be tagged onto existing economic practices; it requires learning how to live and produce in dramatically different ways, particularly for First World citizens (Trainer, 1990).

Econology is a neologism that combines economy and ecology. Economy ('oikonomos') describes the management of the house, the house being the planet and the human social systems (cultures, modes of production) that depend upon the planet's resources. It shares the same root as ecology, which in turn describes the science of the house, the 'rules' of interdependence that bind planetary ecosystems into a whole. Econology is 'the science or rules of managing the house', or the principles of sustainable development. The reason for a neologism, to paraphrase Foss and Rothernberg (1988, p. 290), is that our reductionist, determinist language militates against joining together what 17th century Cartesian dualism and 19th century industrialization rent asunder.[a] Ecology and economy still tend to be seen as separate systems; witness the phenomenon of 'environmental blackmail', in which economic development and jobs are viewed as competing with environmental protection (Kazis and Grossman, 1982).

The role of health in sustainable development decision-making

Although Canada was the first country to initiate WCED-recommended Round Tables on Environment and Economy, none of its federal and provincial Round Tables include members with specific interest, expertise or a constituency in health. Sustainable development is still largely a matter of balancing environmental protection with sustained economic growth. Environment Canada's sustainable development framework, *Into the Mainstream*, refers to health only insofar as 'a healthy environment is required for a healthy economy' (Environment Canada, 1988). Repeated opinion polls show that Canadians are willing to pay higher taxes and higher commodity prices if it would protect the environment, and base their desire for environmental protection on fears for their personal health. Health thus has a potential moral and community level currency in prodding economic decision-making that is environmentally sustainable. The new public health, by emphasizing the psychosocial, cultural and economic dimensions of health, can significantly enrich the vocabulary of sustainable development decision-making.

The co-option of sustainable development

Sustainable development is often interpreted by politicians and economists to mean continued economic growth with the added challenge that this growth no longer imperil the environment. To many, this is a contradiction, a variation of 'trickle-down' theories of wealth and equity common to the 1960s' various 'wars' on poverty. (Kneen, 1989) The Bruntland report is partially to blame for this perception by accepting a global economic 'growth imperative' so long as growth is sustainable (MacNeill, 1989). Sustainable growth is an ecological oxymoron; ecosystems do not grow indefinitely (Daly and Cobb, 1989). According to the President of the Royal Society of Canada, sustainable development as sustainable growth is little more than 'an excuse to carry on our current practices' (McLaren, 1989).

The notion that sustainable development is having our cake (a healthy, resource replenished planet) while eating it, too (economic growth, increased purchasing parity, no decline in consumer goods or choices) is pervasive. Green products fertilize this belief. One Canadian grocery chain vaunts its 20 or so green products (about 0.1% of the stores' total merchandise) in

advertisements that claim 'You can write to government or industry, but frankly it won't make a difference. The only way you can make your voice heard for the environment is to buy our green products.' While most of these products represent a less toxic alternative, there is an absurd meta-message that we can consume our way into a healthier environment. Despite the pressure, consumer purchasing can apply to corporate practice, lobbying government and industry are also necessary and effective means of promoting healthier public and private sector behaviours.[b]

More seriously, a Canadian task force on greenhouse gas emissions concluded that 1988 emission levels could only be maintained by 2005 and not reduced by the international target of 20%. In the name of sustainable development, the task force's mandate was that emission cuts be made 'without any loss of economic benefit, without reducing real income, without affecting our standard of living.' (Federal, Provincial, Territorial Task Force on Energy and the Environment, 1989).

The rhetoric of sustainable development placates many into the belief that a green economy can be achieved without pain, or that our environmental debt is more acceptable than our fiscal debt (McInnes, 1989). The public health field over the past century has learned that meaningful health gains are not made without some hardship. Our dominant biomedical model, with its promise of a quick, painless cure for most maladies, is quite ineffective against the chronic afflictions of heart disease and cancer. Only the public health prevention model offers some success, and it is a complex, socially 'painful' model: changing lifestyles, changing public policies (e.g. anti-tobacco legislation, nutrition policies), and, more recently, attempting to change social conditions supportive of 'dis-ease' (poverty, isolation, the sundry '-isms' of structural and interpersonal prejudices that reinforce self-blame).

Illich characterized the third level of 'iatrogenesis' (medically induced illness) as cultural, our collective inability to accept the 'healing qualities' of pain (Illich, 1976). Sustainable development decision-making that embraces the learnings of public health will also embrace as healing the necessity of painful personal and social dislocations, the amount of pain being equivalent to the degree to which we have personally benefited by past, non-sustainable economic practices.

The sustainable hierarchy

A fundamental question of any reasonably large-scale economic activity is: Does the product it produces, or the process by which it is fashioned:

- replenish the planet?
- replace what is taken?
- reduce energy consumption and the production/consumption of toxics?
- reuse (or allow for the reuse of) constituent materials? or
- recycle (or allow for the recycling of) constituent materials?

Any given activity may have attributes of all of the above, but the five Rs are listed as a hierarchy because planetary, and hence human, sustainability depends on our abilities to replenish and replace.

Replenish means that the activity puts more into the planet (energy, renewable resources) than it takes out. We have depleted our natural capital to such an extent that it can scarcely sustain our current levels of economic activity. Neither can we expect population growth to ease suddenly; simply to maintain a 'steady-state' of human demands on environmental capital we must now replace more than we take.

Replace is at the core of most government definitions of sustainable development. It is not a new idea. In 1915, Canada's Commission on Conservation noted that 'each generation is entitled to the interest on the natural capital, but the principal should be handed on unimpaired.' (cited in Keating, 1989) Since we have failed remarkably to do so, replenishing of some form is required or we would find ourselves damned by our past even as we 'steady-state' our present.

Reducing our use of natural capital is often considered the base of environmentalism. It is, insofar as individual actions are concerned. First world citizens must consume less, and differently. As Rees (1989) put it, 'the family's second car may represent capital that was not ploughed back into silviculture, soils management and waste control,' or, for that matter, into international efforts to re-balance global inequities in resource allocation, and the population growth these inequities foster. The global epigram for the 1990s may well be 'live much more simply, so that others might simply live.' Reducing our use of natural capital is also imperative with respect to non-renewable resources (e.g. minerals) which cannot be humanly replenished or replaced.

Reusing materials is one method of reduction, as in recycling. Both are very low-tiered options, particularly recycling. As with green products, however, recycling is often promoted by politicians and industry as a major strategy for environmental protection,[c] primarily because recycling is an individually premised option, and not one that deals with systemic problems of production and consumption.

A BASIC HEALTH–ECONOMY–ENVIRONMENT FRAMEWORK

Hancock (1989) in a background conference paper provided a simple framework for discussing the interrelations of health–environment–economy.[d] He positioned health and environment above economy since 'economic activity must be subservient to the need for health for all and a secure environment (while it also) underpins our health and well-being and our environmental security'. Figure 1 re-casts Hancock's inverted triangle of relationships as a simple circle flowing in both directions.

In general, our understanding of the links between health and environment has depended on epidemiology, toxicology, clinical (animal) controlled trials and molecular biology. Our understanding of the links between environment and economy has relied principally on economic theory, and the natural and applied sciences. (Although economic theory is, strictly speaking, a social science, it has successfully aspired to the status of a natural science and is alone among the social sciences to be granted a Nobel prize.) Our understanding of the links between health and economy have found greatest expression in political economy, sociology, social psychology and social epidemiology. This is not an exhaustive or necessarily exclusive listing, but it indicates that there is no singular way into understanding these relationships. Also, while the grammar (the scientific foundation arguments) of many of these disciplines is converging, many disciplines remain committed to certain assumptions about knowledge, scientific fact and causality. Their languages are very different.

Interdisciplinary work will only partially mitigate the problems inherent in discipline specific enquiries. Each discipline engages in a largely unconscious process of abstracting reality. These abstractions must be made self-conscious if we are to develop a sustainable economy (Daly and Cobb, 1989), which may require the 'non-discipline' of multisectoral workers whose major task is to translate across existing disciplines (Nelson, 1989).

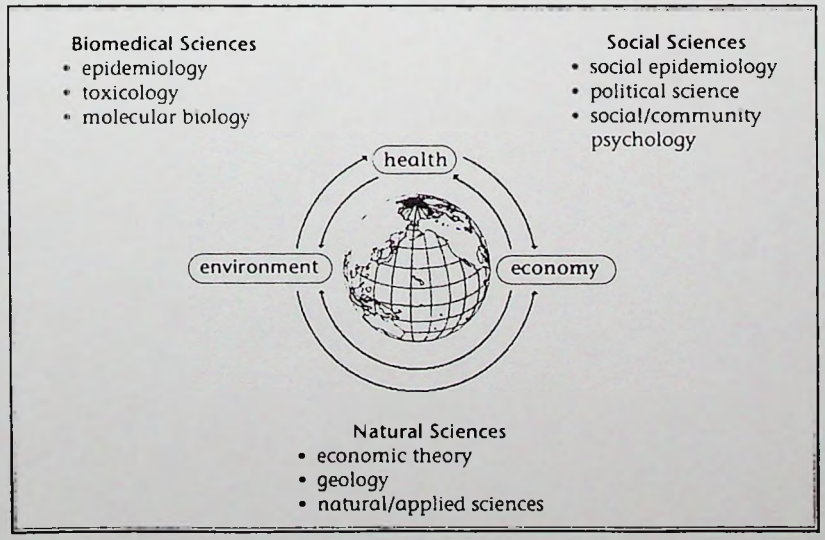

Fig. 1

Our institutional forms of organization, built upon and reinforcing professional disciplines, are also major barriers. There is often interministerial jurisdictional conflict. Government treasury, energy and economic development departments are generally more powerful than environment, health or welfare departments. This conflict begs for a series of publicly debated, legislated principles that can be used to cut across the narrowly expressed concerns of different government ministries.

Health and environment

Assessing health and environment relations usually means determining disease risk to humans from environmental toxics. This can take three different forms (Figure 2).

- Estimated effects of large-scale environmental changes (greenhouse effect, foodstock reductions).
- Implied effects using biological markers (health effects in other species in our immediate environment) or experimental studies (animal research on carcinogenic, mutagenic, immunotoxic, teratogenic or acute effects; or bioassay studies).
- Direct evidence of toxic effects (acute and chronic) on humans.

Large-scale planetary changes are the most important and problematic. Some indicators are available, for example, the global population affected by drought and flooding doubled during the 1960s and there are now more environmental than political refugees. The effects of enhanced global-warming, however, cannot be quantified with any precision, and will only be known as they are experienced. Biological and ecosystem change differs from linear forms of mechanical change (Foss and Rothenberg, 1988; Broecker, 1987). Whereas mechanical change is generally smooth, ecosystem change may come in sudden jumps. After a long period of near-equilibrium, or homeostasis (which essentially describes the 'health' of an ecosystem), a slight rise in global temperature, a small decrease in stratospheric ozone or a fractional net increase in toxic contamination of groundwater may cause a massive disruption ('disease') within the ecosystem with rapid and catastrophic consequences for human life. A simple analogue is the chemistry experiment, in which one liquid is titrated into another. The clear, receiving liquid (the ecosystem) can incorporate hundreds of drops of the new substance (CO_2, CFCs, etc.) without demonstrating any system-wide change. It remains clear. But a point is reached in which a single drop turns the receiving liquid milky; the

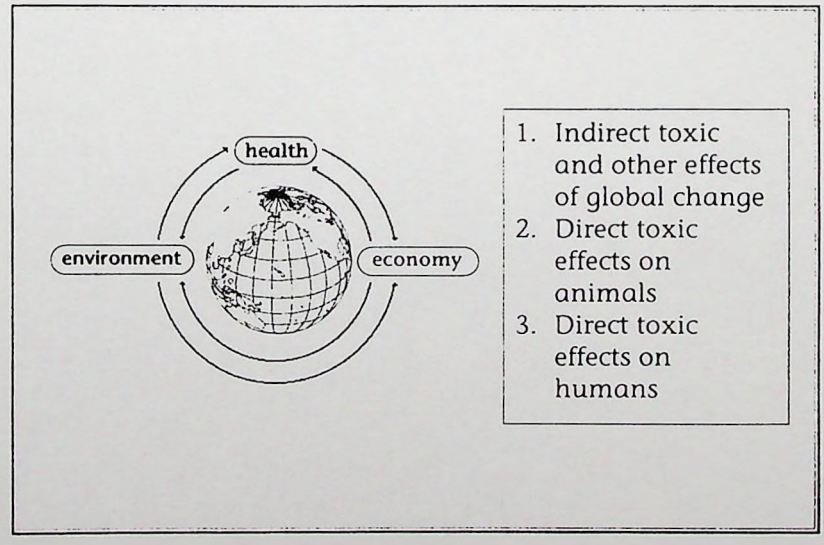

Fig. 2

Table 1

Probable Disease Effects, Enhanced Global Warming

- *increased* mortality (young, frail, elderly) due to high heat
- *increased* infectious disease mortality due to flooding of sewage vectors, increased insect vectors
- *increased* genetic damage, cancers, neurological, immunotoxic and reproductive damage due to flooding of toxic waste dumps
- *increased* skin cancers and immune system damage due to increased UV radiation, due to ozone-depleting greenhouse gases
- *increased* overall mortality due to desertification and flooding of agricultural gases

entire system is fundamentally and irrevocably altered. A new system is created.

We know theoretically that this analogue holds for the planet. We do not know the point at which the planetary ecosystem will demonstrate such a 'quantal' shift. We are also confounded by the lag-time phenomenon well known to epidemiology. The time-scale of the planetary ecosystem is much longer than for test-tubes or humans. It may take decades before the perturbations of enhanced global-warming are indisputably recognized. Unfortunately, by the time we recognize system-wide changes, the momentum of enhanced greenhouse gas build-up will be irreversible. (This is sometimes called 'the Titanic effect'; the momentum of the ship prevented it from avoiding the iceberg even when it was known that a collision was inevitable.)

We are literally staring up from the bottom of our planetary test-tube watching large, lazy drops of toxic emissions roll towards us, uncertain of which one will turn our ecosystem 'milky', and not knowing if this new ecosystem will be capable of supporting human life.

In contrast to the intrinsic uncertainty of ecosystem change (Rees, 1990), biological and bioassay markers offer evidence that comes closer to fulfilling the certainty criteria of mainstream science. One researcher scraped industrial pollutants off the bottom of a creek which contained fish suffering cancerous tumors; he placed this effluent on healthy fish, and produced the identical cancers (cited in Labonté and Davies, 1986). Beluga whales in the Canadian St Lawrence River have decreased in number from over 5000 at the beginning of this century to fewer than 400 today. Most Belugas suffer from cancers, birth defects, skin disorders and other life-crippling diseases. When their carcasses wash ashore they are so contaminated with toxic pollu-

Table 2

Human Health Effects of Environmental Damage

Problem	*Effect*
ground level ozone accumulation	chronic lung disease
atmospheric ozone depletion	basal/squamous cell carcinomas, cataracts and immune system dysfunction
SO_2/ground level ozone emissions	respiratory morbidity and mortality
SO_2/emissions	colon and female breast cancer
steelwork, petrochemical plant processes/emissions	various cancers

tants flowing from the Great Lakes, or from primary industrial plants operating near the river, that they are declared hazardous substances. Direct inference to human health is moot; however, cancer and birth defect rates increase as one moves west to east along the Great Lakes towards the St Lawrence River, and are highest amongst residents living on the river shores upon which the belugas beach themselves in death (Israelson, 1987 cited in Small *et al*., 1988). Another study found that children of women who ate a diet high in Great Lakes fish during pregnancy are suffering higher rates of growth retardation and learning disorders. The same effects are found in laboratory animals fed a high Great Lakes fish diet.[6]

Despite the ethical and practical necessity of using biological markers as human proxies, many policy-makers are reluctant to restrict economic practices unless some direct human evidence is also available. That evidence is slowly accumulating, for example, ground level ozone accumulation and chronic lung disease; atmospheric ozone depletion and basal/squamous cell carcinomas, cataracts and immune system dysfunction (Grant, 1988); sulphur dioxide/ground level ozone emissions and respiratory morbidity and mortality (Bates, 1990); sulphur dioxide and colon and female breast cancer (Gorham *et al*., 1989); steelwork and petrochemical plants and cancer, notably leukaemias; and magnetic fields emanating from electromagnetic transmission lines and certain cancers, especially amongst children (Small *et al*., 1988).[1]

Much of the data remain equivocal, and there is little neutral ground in assessing the risk of toxics exposure. Apart from trauma or acute disease, scientific methods are inadequate to capture the reality of multiple exposures to multiple and often ubiquitous toxics that occur within a social context that creates its own health risks (poverty, isolation, unemployment, unhealthy lifestyles, etc.). It is extremely difficult to determine exposure levels, except in animal experimental situations. There is really no longer an unexposed control group. Many toxics produce the same effects, a single toxic may produce multiple effects, and many effects caused by specific toxics are also caused by other chemicals or non-chemical events. This renders unicausal determinism somewhat specious.[8]

We lack toxicological data on both acute and chronic effects of over 80% of the 45 000–100 000 odd industrial chemicals in common use; data on chronic effects are particularly limited. Toxicologists disagree over interpretation of the heuristically high doses to which test animals are exposed, the inter-species

significance of the results, and of the extrapolation models/assumptions used for imputing human health risks.

The net result is that there are very few quantitative data upon which policy-makers can rely. Unfortunately, this results in policy inertia. The chairman of the Canadian Petrochemical Association expressed relief when the 1990–91 Canadian federal budget did not include a fossil fuel ('entropy') tax, by contending that 'politics is too far ahead of the science on these issues'. Hancock (1989) argues that 'our decision-making must be informed by science, to the extent that we have or can plausibly expect to have scientific evidence; but where that evidence is unlikely to be forthcoming, our decision-making must be informed by our values, chief among which is the need to err on the side of caution'. This point can be stated even more strongly: for scientific data to contribute in a meaningful way to sustainable development decision-making, they must exist within a policy framework comprised of value-based principles for decision-making.

This position can be criticized as biasing scientific enquiry, or turning science into acts to 'prove' predetermined judgements. This is not the intent of advocating for the integration of science within value-based principles but, rather, a recognition that public policy already is determined more by values than by data. These values are usually unconsciously held, not made public and not appraised alongside the information science can provide. Moreover, all scientific enquiry proceeds from values (e.g. the decision to study one 'problem' rather than another, and how that 'problem' is defined) even if researchers do not recognize this fact (Ratcliffe and Gonzalez-Del-Valle, 1988).

As Rees (1990) summed it up, 'Environment-related decisions will be based more on political judgement calls than objective technical ar...'

Economy and health

The predominant economic argument goes that we can be healthy only in a healthy economy; continued economic growth is a prerequisite for individual well-being. Historically, life expectancy and infant mortality rates (the biomedical bellwether indicators of population health) have improved as per capita GNP levels have risen (Daly and Cobb, 1989; Hertzman, 1989). The best bellwether indicators today belong to Japan and Sweden, respectively, both 'full employment' economies. Conversely, life expectancies declined in certain parts of the Soviet Union and Poland, Czechoslovakia and Hungary during the 1970s, a period of gross economic stagnation.

Improvements in industrialized nations' GNP, however, usually come at the expense of poorer countries. Economic adjustments conditional for refinancing of the $1.3 trillion Third World debt has led to export cash-cropping and less food self-sufficiency, higher unemployment, lower wages, poorer housing, less health care and less educational services in many poor countries. UNICEF (1989) directly attributes 500 000 infant deaths a year to these economic policies, and estimates that, in 1988, there was net capital outflow of $60 billion from poor to rich countries. Much of this capital outflow represents interest payments on the debt, and much of this debt was incurred for economic development that accrued benefits principally to First World investors and a very small proportion of the indebted country's populace. One estimate is that only 6% of Brazil's $121 billion debt went to development that improved the quality of life for Brazilians; 14% was lent to transnational corporations for mega-project development, 17% disappeared into Swiss bank accounts, 34% was incurred due to lower export and higher import prices arising from debt refinancing provisions, and 28% constituted interest rate increases on the debt (Tomlinson, 1989).

These economic policies are distinct from those of environmentally unsustainable mega-projects (e.g. the Polonoroeste Colonization Project in Brazil; the Botswana Beef Production Project) which, according to oft-quoted World Bank president, Barber Conable, are becoming a thing of the past. These practices embody an unsustainable environment–health relationship. Economic reforms imposed by the World Bank and the IMF produce an unsustainable economy–health relationship which, in turn, ... excessive ...iculture, wood-fuel burning, over-grazing and below subsistence poverty that fuels population growth.

Despite the growing income gaps between rich and poor nations the net health gap between rich and poor nations is actually shrinking. Some attribute this trend to the 'invisible hand' of industrial development, to which McKeown (1976) attributed the decline in 19th century infectious disease rates in industrializing England. There is some evidence to support this claim. But just as the bulk of 19th century infectious disease decline was achieved through a series of intentional health and social reforms, to which aggregate

economic growth was the context rather than the cause (Szreter, 1988), so, too, have recent health achievements in the Third World resulted from specific interventions: potable water, oral rehydration therapy, immunization.[h]

The same phenomenon exists for First World countries such as the US, although here the effect is in the other direction. US infant mortality rates in the early 1980s rose in 11 states and many inner city neighbourhoods. This rise, associated generally with the economic downturn and increased poverty of the 1982 recession, was directly attributed to intentional cutbacks in welfare payments and nutritional supplement programs (Miller, 1985; Brown, 1987). Aggregate economic change was the background; specific policies (welfare reductions) was the 'cause'.

'Health without wealth' challenges the simplistic rendering of lifespan as a function of GNP, or other 'trickle down' measures of economic health. Many Third World countries with low GNPs have much better health indicators than countries with high GNPs, and have sustained these benefits as their enlarged cohort of surviving babies grew to be adults. Even the US, which has the highest per capita GNP, ranks low amongst OECD nations in its health indicators. The reason is simple: GNP says nothing of economic distributive justice, how the income or wealth generated by a nation's economy is shared by its people. GNP measures economic value, but is not a reasonable measure of economic welfare (Daly and Cobb, 1989). Moreover, the association between GNP growth and improved population health may be spurious or, at least, has a ceiling (Shirlow, 1990). Female life expectancy flattens once per capita GNP (1985) reaches $3000 — a mere 1/5th of the US 1985 per capita GNP!

Steady-state economists have long criticized the use of GNP for its failures to encompass the underground economy, to credit social expenditures as wealth-creating (albeit indirectly through healthier, more productive people), to deduct environmental or disease-producing activities, and to internalize fully the costs of production externalities (Victor, 1989; Ekins, 1986; Robertson, 1988, cited in Hancock, 1989). This criticism has not become a part of popular culture. Rather, the business sector continues to argue for continued GNP growth, lower social spending and other indicators of economic 'welfare'. This thinking becomes popular myth. Developing alternatives to the GNP and similar economic indicators as measures of social well-being is another requisite to sustainable development decision-making (Figure 3).[i]

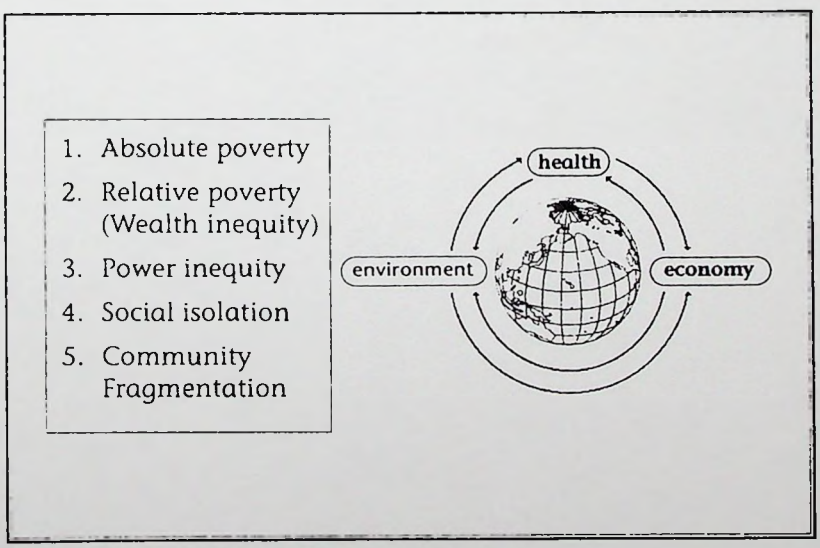

Fig. 3

The relationship between economy and health in first world countries is best captured using socio-economic status (SES), since SES measures (income, occupation, education) essentially define one's relationship to the economy. Transnationally, those OECD countries having the greatest after-tax income equality (the best gini coefficient for income) have the best bellwether health indicators (Wilkinson, 1986). This effect is independent of the absolute level of income. Inequalities in income distribution, and what they represent in terms of the experience of power, may be more important to health and welfare than income itself. The health gains in Japan over the past two decades (Japan ranks first on life expectancy and infant survival) are attributed partly to its economic growth and relatively equitable income distribution, and are as great as Britain might achieve if it 'abolished heart disease and most cancers' (Marmot and Smith, 1989).

The SES/health gradient generally holds across time, geography, relative income increases and population-level improvements in health. Neo-conservative economists attribute differentials such as these to a 'selection process'. The sick are unemployable and economically unproductive, hence they are also poor. Several longitudinal studies refute this explanation, finding that a drop in income predicts poorer health after controlling for such health-related behaviours as smoking or exercise (Hirdes, 1986). Canadian men in the bottom 5% in earnings in the two decades before retirement, as another example, are twice as likely to die before 70 compared with men in the top 5% of earnings (Wolfson, 1989).

Even more compelling evidence is offered by the Whitehall study of British civil servants (cited in Wilkinson, 1986). This study found more than 3-fold differences in mortality between the lowest and highest grades in the male civil service. None of the employees was living in poverty and all had good job security. They all worked in the same location (London) and were not exposed to industrial hazards. For nearly every cause of death, there was a clear relationship between civil service grade and mortality. Another British study (Marmot and Theorell, 1988) concluded that work conditions, and in particular the freedom to make decisions, are the basis for the strong association between social class and heart disease; and that 'above a threshold of poverty, position on the social hierarchy may be a more important determinant of health and disease than material conditions.'

Economic and workplace organization become as important criteria for suitable development as what is produced, emitted and consumed by the act of work. Gardell's research into occupational stress and well-being found that of all workplace factors influencing health, the degree of worker decision-making was the most powerful (Gustavesen, 1988). Social interaction at work was also rated as more important than remuneration in a study of Canadian workers (Canadian Mental Health Association, 1985).

Similar findings emerge from research on social support/community connectedness and health. There are two ways in which this connectedness seems to predict health: the quantity of one's social/community networks, and the quality of support these networks provide (Cohen and Wills, 1985). Among the key elements of health-enhancing social support are proximity (people are near to us) and symmetry (the relationship tends towards equality in power). These findings have implications for the health–economy relationship that go well beyond usual environmental assessment parameters. Industrial economies are well known for breaking apart traditional extended families which for centuries provided much of the social support that researchers are busy studying today. (The sexism in many of these extended families and what it did for women is another matter.) This has been a general trend and is unlikely to be reversed. But social support and health findings imply that economic decision-making must embody some accounting for how it will foster (or at least not destroy) community social networks of support.

The collapse of certain resource sectors may be unavoidable and even desirable for environmental sustainability. Such collapses lead to the demise of many resource-based rural communities. Assuming that environmental sustainability can be assured, these collapses can be partly offset by changes in regional economic policies that embody community sustainability principles in the planning stages. Up-front capital reserves before resource extraction can allow the community to create economic activities beyond the lifespan of the resource, or to relocate and retrain workers and their families. It could also be requisite that, before any resource extraction is permitted to proceed, an economic diversification and job re-training strategy is articulated and capitalized. (Such requirements would represent an internalization of external social costs. Internalization of externalities is discussed in greater detail

below and in Figure 4.) Regrettably, the trend in Canada is towards the opposite. Resource workers in the Maritimes once qualified for paid job retraining programs that, among other things, saw them construct community theatres, rebuild community wharves and perform other community sustaining activities. These programs now will only support job re-training in a primary resource occupation — despite the fact that these resource industries can no longer support the unemployed labour force. This is not a community sustaining policy, and it is arguably environmentally unsustainable by encouraging terminal resource depletion.

Finally, low levels of social support in First World countries tend to be greatest amongst poorer people (Auslander, 1988; Ruberman *et al.*, 1984; Berkman 1986). This finding speaks to a process through which low-income or low-status people internalize their 'real' powerlessness, creating a psychological 'surplus powerlessness' (Lerner, 1986). This powerlessness (both real and 'surplus') fosters apathy and cynicism which, in turn, promotes isolation and withdrawal, a de-construction of community. Economic activities that increase real powerlessness (through low-income jobs, isolation, restricted choices, community dislocations and so on) are unsustainable in human health terms.

Environment and economy

Environment Canada's deputation to the World Commission on Environment and Development (Environment Canada, 1986) noted simply that 'we can no longer sell off and pollute the capital on which our lives and livelihoods are based'. Whereas in past generations this capital could be exploited either regionally or nationally without apparent loss or damage, 80% of the world's economic growth has taken place since 1950 (Keating, 1989). This phenomenal growth has extracted energy and resources and produced global toxics beyond the resilient adaptability of the planetary ecosystem. Most of this growth has occurred within a few industrialized countries. We are now witnessing global industrialization, and it is those very industrial activities that extract the greatest and pollute the most that are expanding most rapidly in Second and Third World countries.

Industrial and post-industrial economic activities have been predicted on two powerful myths, the first being that of technological beneficence. Mass media regularly imply that the pollution caused by economic activity can be resolved by technology, just as biomedicine will (eventually) cure all cancers. There has been a beneficial boom for pollution control and clean-up industries in recent years; some 3000 Canadian

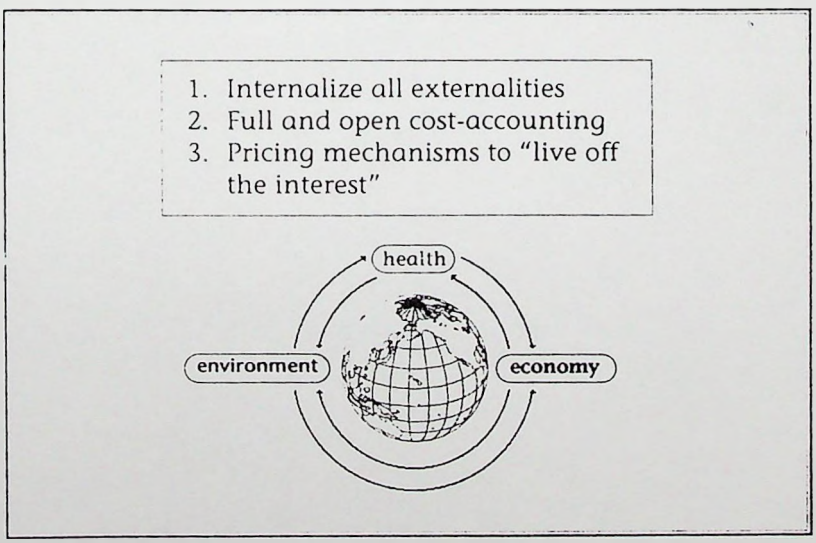

Fig. 4

firms employing 200 000 workers are estimated to contribute between $7 and $10 billion to the economy (Hansen, 1990). But clean-up industries, and to a lesser extent pollution control technologies, represent a downstream strategy. Just as the escalating costs of disease treatment cannot be sustained indefinitely as a health strategy, technologically driven pollution clean-ups may be unworkable over the longer, economic term. If nothing else, we continue to produce new synthetic chemicals at a rate outstripping our capacity to assess their health or ecosystem impact, to say nothing of our relatively paltry knowledge of those already in our midst (Keating, 1989; Labonté and Davies, 1986).

Our second economic myth is that of the necessity of continuous economic growth, which, as Ekins (1986) points out, is 'as if economists had never heard of cancer'. The problem may not be with 'growth' *per se* (which is a characteristic of all living organisms and the systems they create and exist within) but with how economists, business leaders and politicians consider economic growth. If economic growth means increasing the scale of economic activities, it is unsustainable. If economic growth is used in a more biological sense, that of changing, maturing and developing, it may be sustainable (Daly and Cobb, 1989). The Ontario Round Table on Environment and Economy describes this as an attitudinal shift, from economic growth as 'quantity' (more = better) to economic growth as 'quality' (doing better with less) (Ontario Round Table on Environment and Economy, 1990). Daly and Cobb (1989) describe it as a shift from economy as 'chrematistics' ('the manipulation of property and wealth so as to maximize short-term exchange value to the owner') to economy as 'oikonomia' ('the management of the household so as to increase its value to all members of the household over the long run.'). Chrematistics characterizes neoclassical economic theory and current political decision-making. Oikonomia differs from chrematistics by taking a long-run view, considering costs and benefits to the whole community, and focusing on 'concrete use value and the limited accumulation thereof, rather than on abstract exchange value and its impetus towards unlimited accumulation.' (Daly and Cobb, 1989).

The value of integrating economic–environment–health decision-making lies primarily with what the latter two might say about the unsustainability or pathology of chrematistic economic practice. This does not mean that economic theory is secondary to environment and health. Indeed, market theory and practice offers a language for valuing human activities and natural resources that is strategically important in sustainable development decision-making. This language can be criticized for 'reifying' social relationships and, unamended by community or humanistic values, leading to human self-alienation (Marcuse, 1964). Nevertheless, it offers a means of beginning to transform unsustainable to sustainable economics. As Victor (1989) points out, a good economic analysis should identify market failures to take full accounting of 'the value people attach to improvements in environmental quality... These market failures may be much easier to respond to (change) than fundamental, ethical challenges to our existing values.'

Victor's comments reflect a key principle of the 'new economics' (Ekins, 1986) and of sustainable development (Daly and Cobb, 1989; Keating, 1989), that all 'externalities' must be fully costed and internalized into the prices of commodity production. An 'externality' occurs when economic activity affects the welfare of persons not directly involved in that activity, where directly means that the effect is not mediated through any market mechanism and thus lacks a price (Daly and Cobb, 1989). For example, consumers in market economies currently enter supply–demand relationships with producers in which most of the external costs of the product do not appear in the price, but are hidden in environmental degradation and socio-economic inequities. In the short-term, the producer benefits by essentially depleting social and natural capital that is collectively 'owned' and collectively indebted. This increases economic inequities through public clean-up costs. In the long-term, the producer is failing to renew the very capital upon which his or her enterprise is based.

Internalizing externalities is sometimes referred to as full-cost accounting, which requires that we cost (price) the natural capital that economic activity uses, and estimate the remediation costs of negative natural and social environmental changes arising from economic activity. When natural capital remains external to economic accounting, it is exploited and depleted to the point that massive government inputs are required to stave off the collapse of whole economic sectors. This has certainly been the case with Canadian fisheries and forestry; concern now exists over the immediate future of the Atlantic

fishbanks. Canada's failure to internalize the costs of water to business and residences has also been cited as a major factor in its 'abuse' of this resource. Doubling residential water taxes would not only decrease consumption, but also generate sufficient revenue to overhaul antiquated water treatment and sewage disposal systems. Increasing water costs to business would also lead to a decrease in consumption, without a decline in economic productivity, and create capital that might be used to develop better toxic treatment facilities (Sustainable Development, 1989).

Full-cost accounting requires that inventories of renewable and non-renewable resources be developed and maintained. It also requires more political judgement calls, since it is reasonably simple to cost localized effects (e.g. preventing or mitigating occupational health risks, replacing renewable resources such as trees) but difficult to cost pervasive effects (e.g. long-range transport of air pollutants, social and health impacts of the enhanced greenhouse effect, future costs associated with depletion of non-renewable resources). How full-cost accounting might be integrated into the market system is also subject to intense debate. Socialists and social democrats historically have urged government intervention and tax measures to adjust for social inequities arising from market economics. Certainly, government intervention through legislation and trade agreements will be necessary to begin the process of full-cost accounting.

However, taxation policies may be an inefficient and inequitable means of internalizing externalities (Daly and Cobb, 1989). First, most taxes are regressive and place greater burden upon the poor. Second, introducing a third party (the government) into the market relationship between producer and consumer does not provide a direct incentive to the producer to use his or her natural resources wisely, since the costs of unwise use will have been 'socialized' through general taxation measures.

It is beyond the scope of this article to review in any detail the many suggestions advanced to achieve full-cost accounting. Because full-cost accounting is compatible with market economies and with entrepreneurial practices, it offers a significant 'breakthrough' in the current conflict between economy and environment, noted earlier in this article. Full-cost accounting, however, is an insufficient economic strategy to ensure a sustainable environment–health relationship. The market is efficient in allocating resources, when there is enough collective action to 'maintain competition, restrain self-interest and deal with public goods and externalities.' (Daly and Cobb, 1989). But the market cannot address the fundamental question of economic scale, that is, it cannot and will not tell us when our economic activities have reached the limit of our planetary ecosystem. Nor can the market deal with the question of equitable distribution of goods and services.

Internalizing externalities, whether through market forces or government taxation ('tied tax') policies, will increase socio-economic inequities within and between nations. These inequities are not sustainable in human health and community terms, and indirectly reinforce unsustainable environment–economy practices. Some form of government taxation and fiscal policy will be necessary to mitigate this problem.

In closing Part One of this article three basic political imperatives can be stated.

- The scale of human economic activity must be decreased.
- Population growth must cease.
- Equity within and between nations must be enhanced.

NOTES

(a) It is important to acknowledge that both capitalism and socialism are premised on abstracting the environment as something external to economic production. This abstraction attains absurdity in certain economic theories that maintain that capital (the built environment and the wealth created by human economic activities) can always substitute for natural resources or, as influential neoconservative economist, George Gilder, once wrote, '(We) must overcome the materialistic fallacy, the illusion that resources and capital are essentially things which can run out, rather than products of the human will and imagination which in freedom are inexhaustible' (cited in Daly and Cobb, 1989, p. 109). Similarly, the Canadian government has projected various social, economic and environmental impacts of population growth to the year 2036, largely arising from increased immigration. These projections reveal a slight increase in per capita GDP (gross domestic product), a quadrupling in the overall scale of the economy and a loss of 5/6ths of the nation's remaining forests (Health and Welfare, Canada, 1990). This enormous finding

is glossed over in the observation that 'the larger the economy, the more stress we can expect to place on the environment, even though we should have more resources for dealing with that stress.' However, no amount of human resources or capital can compensate for the loss of the 'source and sink' functions of Canadian forests!

(b) Many Canadian green products have been endorsed by environmental non-governmental organizations (NGOs) with portions of sales revenues from these products being donated to environmental NGOs. Greenpeace, however, refuses to compromise on the issue of green product endorsement. It refuses to endorse them. Indeed, so uncompromising is its environmental advocacy that the Canadian government refuses to give it charitable tax status. Nevertheless, it is Canada's largest environmental organization, with over 200 000 members; this represents a 4-fold membership increase in the past 2 years alone.

One of the concerns of sustainable development in practice is that it may neutralize the political effectiveness of marginality. In other words, consensus decision-making (a premise of environment and economy Round Tables in Canada, and presumed by most reformers to be an inherently positive value) might only work when politically marginal communities have gone through a developmental process of opposition to and conflict with more powerful communities, that is, they prod and goad policy discourse from the self-righteous position of 'marginality' (Labonté, 1990). Within environmental circles, Greenpeace (despite its membership) is 'marginal', until recently given more to singular, rather than coalition-style, direct actions. It is to environmental change what the Alinsky model of community organization is to social policy change: confrontational and power-brokering, using the size of its membership and its provocative actions as chips in the game of politics. Yet, without this 'vanguard' pressure, the 'chips' taken to consensus making Round Tables by other, more reform-minded environmentalists may be fewer and less potent (Keating, 1989).

(c) In Ontario, start-up costs for curbside recycling programs are covered by the soft drink industry. This came about through a political agreement to reduce the quotas for refundable-deposit glass bottles, which are environmentally 'friendlier' but less profitable to the industry. Ongoing costs for curbside recycling must be borne by municipalities. The sale of recyclables was presumed to cover these costs, but the market glut of recyclables has driven down prices. Municipalities are left bearing the burden of an ill-conceived system designed to increase the monopoly of large bottlers, while consumers feel environmentally friendly about their unsustainable level of consumption.

(d) The term, ecosystem, is preferable to environment. Environment literally means that which surrounds or encircles. This reduces discussion of the health–environment fit to 'the combination of external or extrinsic physical conditions that affect and influence the growth and development of organisms', as the word environment is defined by the American Heritage Dictionary. So defined, the environment is that which exists beyond humans rather than that which contains humans. This concept of environment is consistent with a health protection paradigm, and the reductionist scientific method of assessing, estimating and managing the risk of 'external' toxics. Political, cultural and other social phenomena are recognized more as confounds that must be accounted for, than as inherent factors in the health–environment relationship.

The concept, ecosystem, in contrast, implies a systems approach to understanding relationships. An ecosystem is comprised of multiple systems, including human systems (social, cultural, economic). The stability (autopoeisis) of human systems is dependent upon the stability (autopoeisis) of the ecosystem at its planetary level (the Gaia hypothesis). Accepting this systems approach, an open-pit mine both analogizes and directly represents an open-body wound; as we practise thinking in this way, we may be less likely to rationalize biocidal acts in the future. Also, an ecosystem approach is more compatible with the health promotion paradigm, in which the interrelationships of physical, social, economic and spiritual domains are considered basic to health.

For simplicity's sake, I will continue to use the word 'environment' for 'ecosystem' throughout the remainder of this article.

(e) Katherine Davies, Ecosystems Consulting, Ottawa; personal communication, (1990). This particular study used what are called 'subtle' health effects, i.e. neurological damage producing behavioural changes. Immune system change is another subtle effect. At present, the health protection paradigm (risk assessment, estimation and management) tends to use gross markers,

such as cancers or birth defects. Given the synergistic nature of toxic exposure and the concept of a human body's 'total carrying capacity' many researchers are now arguing for greater use of subtle effects. These effects may signal greater risk for gross effects and, in the case of neurological damage, may have more profound social impacts than frank morbidity or mortality. 'Total carrying capacity' is a notion that combines principles of biological loading and systems theory with ecotoxicity: that at a certain point, exposure to a tiny amount of a particular toxic 'loads' the body's complex interacting subsystems (immune, circulatory, endocrine, etc.), causing a system-wide disruption magnitudes greater than what one might otherwise expect from an experimentally induced exposure to that toxic (Foss and Rothenberg, 1988; Hall and Chant, 1979).

(f) The relationship between cancer and exposure to magnetic fields from transmission lines is particularly controversial. In general, there is agreement that something seems to be happening, but no firm evidence of exactly what.

(g) Foss and Rothenberg (1988) argue that unicausal determinism is no longer scientifically tenable. Conflicting research results based on this paradigm should not be surprising. Differing results may reflect differences in study design or methodological error. More importantly, however, they may arise simply because 'different qualitative and quantitative mixes of the agent, host and environment may result in the same (or different) clinical and pathological disease under different circumstances'.

(h) By net health gap, I mean IMR, under five mortality and life expectancy at birth. The quality of life is another matter. Moreover, this shrinking of the health gap is occurring alongside [illegible] world economic policies that continue to immiserate many Third World countries, and in which a minority of elites hold power. Surviving infant cohorts strain ever harder against the persisting poverty of adulthood. Population grows; environmental stresses worsen. This devastation will not be alleviated by public health reforms, but only by specific international agreements that ensure more equitable global allocation of resources. The market, despite its advantages over central planning, is blind to the issue of equity.

(i) A great deal of work is now being undertaken on alternative indicators. Given the arguments in this article, I would propose that a Sustainable Development Indicator incorporate four dimensions: a measure of environmental damage and resource use, a measure of human health, a measure of economic distributive justice and a measure of population. Such an indicator might look like the following:

sum of per capita energy use (kg coal equivalent), CO_2, NO_x, SO_2 and particulate emissions
divided by
Physical Quality of Life Index (which combines literacy, infant mortality and life expectancy at age one)
multiplied by
1/the gini coefficient for income
multiplied by
births and immigrations/deaths and emigrations

In keeping with important numbers being good news when they are low (e.g. inflation rate, unemployment rate, interest rate), the smaller the Sustainable Development Indicator the more likely we will sustain our social and physical ecosystems. Such an indicator is easy to compute using existing databases, and can readily assume the same newspaper prominence as the GNP, one of the few figures that is 'better' when 'bigger', although that, of course, is an arguable point.

A much more comprehensive discussion of alternative economic welfare indicators can be found in Daly and Cobb (1989) Appendix 1.

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CASE 4

DEV-14.

INTRODUCTION TO PUBLIC HEALTH

Econology: integrating health and sustainable development

Part two: guiding principles for decision-making

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SUMMARY

Part One of this article explored three relationships (health–environment, health–economy and economy–environment) inherent in integrating health and sustainable development. Information about these relationships (and in some instances the lack of information or intrinsic uncertainty in the relationship) give rise to a number of principles that can be used to guide sustainable development decision-making. The 12 principles developed in this article are not exhaustive, but do capture the essential imperatives emanating from each of the three key relationships. The 12 principles, which comprise a mutually reinforcing packaged set, are: the necessity of principle-based decision-making, the inclusiveness of information, shrinking global inequities, shrinking national inequities, empowering equally, producing fairly and healthily, sustaining communities, replenishing and replacing, internalizing all costs, sustaining diversities, nurturing the intangibles, and planning across the generations. An interpretive commentary accompanies each principle. The article concludes with a discussion of the role of health promotion professionals in sustainable development policy debates and program developments.

Key words: health and environment; sustainable development; health and economy

INTRODUCTION

Part One of this article identified environmental sustainability as the most critical emerging public health issue. The concept of sustainable development ('development that meets the needs of the present without compromising the ability of future generations to meet their own needs', World Commission on Environment and Development, 1987) is becoming central to political and economic discourse in most countries, and in international fora. As with many broadly stated concepts, interpretation and policy implementation of sustainable development has taken many forms, sometimes contradictory and often with the erroneous premise that minor changes in environmental protection policies or 'green' consumerism can permit continued economic expansion with negligible ecosystem impacts.

Health has been embedded in the concept of sustainable development since its inception. Until recently, however, the health sector, and more specifically the public health sector, has not been actively engaged in decision-making or policy-setting discussions on sustainable development. Three unique patterns of relationships emerge when health is placed alongside the two major dimensions of sustainable development, the environment and economy.

Sustainable Development

Environment and economy

The health–environment relationship is described by research on the human health impact of environmental hazards. Traditional public health has focused on protecting individuals from environmental hazards; this comprises one set of health–environment relations. The obvious shift herein is from toxins (biological hazards) to toxics (chemical hazards). However,

data on the human health effects of toxics is rarely unequivocal and largely absent. Environmental protection policy must begin to use biological markers (health effects in other species and experimental animal research) as proxy human measures where human data are equivocal or absent, and must begin to study subtle effects (e.g. immunotoxic, developmental) as well as gross effects (e.g. cancer, reproductive failures). At a paradigmatic-shift level, public health must also shift its emphasis from protecting humans from environmental hazards, to protecting the environment from human hazards. The most threatening, and least quantifiable or certain, threats to human health are those relating to global ecosystem change, notably the enhanced greenhouse effect.

The health–economy relationship pertains to the well documented relationship between poverty and disease. Less well known is research linking improved health status to social support systems, psychosocial emotional states and relatively flat income or power hierarchies. When human health in its broadest sense becomes the endpoint for sustainable development decision-making, 'trickle-down' theories of wealth creation and continuous economic growth become far less important than the equitable distribution of wealth related resources within a community or nation. Indeed, the most powerful amendment public health can make to the concept of sustainable development is the fundamental relationship between social justice, environmental protection and economic development.

The final relationship, that of economy–environment, represents both a value shift from what Daly and Cobb (1989) describe as 'chrematistics' ('the manipulation of property and wealth so as to maximize short-term exchange value to the owner') to 'oikonomia' ('the management of the household so as to increase its value to all members of the household over the long run'); and a correction in market economics so that 'externalities' such as the costs of pollution control and resource renewal are internalized in commodity prices, thus sending consumers a true price of consumption while generating the revenues necessary to invest in environmental protection.

Respectively, these three relationships can be captured by the imperatives to consume less, share more equitably and account more accurately.

It is possible now to articulate a set of principles for sustainable development that give full expression to human health and its social and environmental underpinnings. Before doing so, it is useful to clarify the importance and the function of principles.

Principles are normative and ethical. They reflect basic assumptions and values. Principles may derive from empirical knowledge about the world and human societies, but they do not depend upon such knowledge. Principles are usually general and humanistic in articulation. This 'parenthood' quality is both their strength and their weakness. A degree of unity amongst conflicting social groups is often created through a process of developing principles or 'shared value statements', (Gray, 1989). Community groups and coalitions often unite around principles. Principles, however, are blunt instruments for policy development. They represent the beginning of a social change process, and not a completion. Significant disagreements over the most appropriate economic and political strategies to achieve the intent of principles are likely to occur. Principles must therefore be translated into policy, legislation and regulation, if they are significantly to alter economic practice. At the same time, clearly stated and agreed upon principles possessing some degree of political and economic specificity are considered requisite to multi-party conflict resolution (Gray, 1989, pp. 8–9).

The principles offered below are intended to provide ethical and health-biased guidelines for addressing the most fundamental question: When conflicts arise within the environment–health–economy triad, what values will guide the process of conflict resolution? These principles are not given in any order of importance, nor are they separate from each other. One might increase intranational equity while worsening transnational inequities and increasing pollution, or vice versa. Neither situation is sustainable, nor healthy. The principles are a packaged set.

Principle 1: The necessity of principle-based decision-making

Principles are fundamental to the process of sustainable development decision-making. Scientific data can only inform, but neither predict nor dictate, sustainable development decision-making.

Comment

Greater support for scientific research into the health implications of sustainable development is

required. Nevertheless, decisions on global-scale environmental effects (greenhouse gas emissions, stratospheric ozone depletion, loss of carbon sink capacity and increased appropriation of net primary product) cannot await scientific certainty. The Ontario Round Table on Environment and Economy (ORTEE) states its first principle as 'anticipate and prevent'. (1990) One can prevent what is known. To anticipate, however, is to make best guesses about what might happen, and to act upon those guesses.

Principle 2: Inclusiveness of information

Scientifically generated data should encompass as broad a pattern of complex relations as possible: environment–health (risk assessments); economy–health (equity assessments); environment–economy (full-cost accounting). It should not be restricted to only one set of relationships.

Comment

With respect to environment–economy relationships, an ecosystems approach is required, and not one that separately assesses environmental impacts on air, water, flora, fauna, etc. An ecosystems approach accepts 'the tyranny of tininess' (that very small toxic emissions or system-wide perturbations may be sufficient to create profound and health damaging changes) and the need to integrate 'total carrying capacity' for ecosystems and humans into risk assessments. Whenever disputes over data interpretation arise, particularly concerning environment–health effects, the most health-conservative findings or models should be used, that is, any benefit of scientific doubt should be given to human health.

Principle 3: Shrinking global inequities

Sustainable development, globally, requires that a proposed activity increase global equity, that is, it lessen the wealth (income) gap between nations.

Comment

The Third World debt is the global economy's current greatest threat to sustainable development. It was largely incurred for the benefit of few. It must be forgiven or postponed, and not simply through debt–equity swaps such as rainforest preservation which, by themselves, are inadequate to meet the population growth and resource depletion crises faced by most poor nations. This is a radical suggestion, though not without precedent. (It also begs an interesting question: what is more important, the health of the species and sustainability of the planetary ecosystem, or colourful pieces of paper with the faces of dead politicians and rulers?) At the very least, the implications of monetary policy on environmental sustainability must be made explicit.

There are several ways in which this principle can be implemented. In the case of transnational projects, international agreements could require the retention and reinvestment within the poor country of more earned income than is repatriated. In the case of strictly national projects within a rich country, this might be achieved through a combination of national taxation policies and untied foreign aid, or specific trading and sharing policies for poor countries related to the project's goods or production technology. A requisite to new national project development, as an example, may be a specific agreement to transfer at low or no cost any new and sustainable technological achievement to poorer countries, possibly through an international agency such as a World Round Table on Environment and Economy. One suggestion would have each nation pay a carbon tax based on consumption, with revenues collected by an international body and used, in part, to fund clean technology transfer to poorer countries. This would amount to an 'ecological redistribution of income' from rich to poor, given the vastly greater per capita carbon consumption of rich nations (Flavin, 1990).

Lowering First World trade barriers to products from Second and Third World countries may also assist in increasing global equity, but only if the exporting country is committed to the principles that follow. Also, the environmental and occupational conditions under which the products are manufactured should equal those required for First World production. Increased foreign aid to Second and Third World countries could be dedicated to supporting these countries in achieving this equity in sustainable development.

These are tenuous, interim suggestions only. Daly and Cobb (1989), among others, have argued cogently that only nationally self-sufficient economies can be 'managed' (by market dynamics and government policy) to be sustainable. While rejecting both free trade and national self-sufficiency in their extreme, they point out that current economic policy tends unsustainably towards the former. Emphasis should be placed not on international trade, but on intranational, bioregional market development. This approach

would foster, rather than remove, trade barriers. Daly and Cobb argue that free trade, by allowing capital to move wherever labour is cheapest, lowers living standards for most of the world's workers, creating a global 'rush towards poverty'. This stimulates unsustainable economic activities in rich countries in order to compete with the cheap labour productivity of poor countries. Most of this poor country industrialism, in turn, takes place in demarcated zones cut off from the rest of the nation, and contributes to national economic welfare only to the extent that it creates a modicum of employment and earns foreign currency with which some of the nation's debt interest can be repaid.

Principle 4: Shrinking national inequities

Sustainable development, nationally, requires that a proposed activity increase national equity, that is, it lessen the wealth (income) gap between have and have-not citizens.

Comment

This principle might be achieved through taxation policies (e.g. negative income tax), and equity oriented development permits. Some Canadian municipalities now require new office or condominium developments to create a specified number of affordable housing units as a development permit requirement. These costs are internalized into the price of office rental or condominium sale, representing an indirect income transfer from the corporate sector and upper-incomed groups to the relatively poor. This principle might also be achieved through various forms of employment equity policies (regarding the hiring of women, ethnic minorities, disabled workers, and so on) and legislation supporting more equitable forms of remuneration.

Taxation and other fiscal policy instruments will need to be used to offset the income inequities that will arise as full-cost accounting of environmental resource use is achieved.

Principle 5: Empowering equally

Sustainable development, both globally and nationally, requires that a proposed activity increase equity in power.

Comment

Power is not quite the same as wealth, although the two are certainly related. Empowerment requires an increase in access to decision-making by less powerful individuals, groups and communities. This might be achieved through provision of resources (economic, technical, organizational) to such groups to assist them in participating in the decision-making on the proposed activity. It takes as fundamental the participation by all interested parties and requires regular environmental audits and reporting by the private and public sectors, including reports of international activities.

Principle 6: Producing fairly, healthily

Sustainable development requires that each proposed activity increase worker control and workplace democracy relative to past practices.

Comment

Increasing workplace democracy may include, but is not restricted to, unionization of the labour force; specific agreements regarding health and safety measures that comply with, or exceed, legislated minimums; worker–ownership agreements; voting worker representation on management boards and committees; and the existence of workplace policies reflecting Emery's six basic criteria for healthful work (cited in Levi, 1983).

- The job should be reasonably demanding in terms other than sheer endurance, and should provide variety.
- The worker should be able to learn on the job, and to go on learning.
- The job should include some area of decision-making that the worker can call his or her own.
- There should be some degree of social support and recognition in the workplace.
- The worker should be able to relate what he or she does or produces to social life (that is, feel that his or her labour contributes to improved social welfare).
- The worker should feel that the job leads to some sort of desirable future, at a personal and collective level.

Principle 7: Sustaining communities

Sustainable development requires that each proposed activity create, sustain or re-create 'community'. This means that the activity, at a minimum, must address how it will:

- increase opportunities for social interaction and development of social networks;
- diversify the community's economic base;
- increase proximity between production, consumption and disposal;
- support a more active, democratic participa-

tion of community citizens in political and economic decision-making, including that pertaining to the proposed project.

Comment

This principle, together with principles 3 through 6, comprise a social contract between capital (business, economy) and community. This principle also requires novel methodologies to capture community perceptions and future scenarios that draw heavily on participatory learning theories, ethnographic research and sociology.

The notion of increasing proximity between what is produced, consumed and disposed is sometimes dismissed as urging a return to pre-industrial, agrarian forms of economic and social organization. This is not so. Rather, the need to increase proximity recognizes the absolute necessity of decreasing fossil fuel use and greenhouse gas emissions. This requires a dramatic decline in the scale of transport, and in the energy inputs for food production. (Increased proximity in food production and consumption also increases human health directly by increasing freshness and decreasing agrichemical use and red meat consumption.) Sale (1986) points out that a community of less than 10 000 is capable of producing for itself all of its requirements, including most modern comforts. Cities introduce a larger scale of community (Jacobs, 1960) and many policy suggestions and strategies for urban ecological sustainability and self-reliance exist (Gordon, 1990). Relatively self-sufficient communities form the base of relatively self-sufficient nation-states.

Principle 8: Replenishing and replacing

Sustainable development locates a proposed activity along a hierarchy that asks if the product the activity produces, or the process by which it is fashioned:

- replenishes the planet, putting in more resources (i.e. 'carbon sink') than it extracts?
- replaces what is taken, achieving a steady-state economy–environment systems relation?
- reduces energy and renewable/non-renewable resource consumption, and reduces the production/consumption of toxics?
- reuses (or allows for the reuse of) constituent materials ('resources')?
- recycles (or allows for the recycling of) constituent materials?

This is a hierarchy of sustainable development. Human sustainability is commensurate with any given activity's ability to address higher tiered concerns. Any proposed activity that does not, at a minimum, replace what it takes (the notion of 'living off the interest') is not, by definition, environmentally sustainable.

Comment

Implementation of this principle includes a 'best available' precept, in which the best available technologies, legislation, regulations and standards, conditions, enforcement practices and policies internationally are incorporated into proposed activity decision-making.

Principle 9: Internalizing all the costs

Sustainable development requires that each proposed activity employ full-cost accounting, and internalize all of its externalities to the fullest extent that these externalities can be estimated.

Comment

Externalities are effects that create costs outside of the market-mediated relationship between producer and consumer, e.g. replacement of natural resources, clean-up of pollution. The costs of these externalities are to be borne by the proposer(s) of the activity. Since full-cost accounting is a novel activity and subject to debate over value estimates, preference should be given to those estimates most conservative in terms of human health and environmental integrity. Full-cost accounting must take place in public, and be accompanied by an 'open-book' policy by government and industry.

Principle 10: Sustaining diversities

Sustainable development requires that each proposed activity respects, by not actively or passively decreasing, ecosystem (including genetic stock) and human system (cultural) diversity.

Comment

Environmental impact assessments may provide the scientific data regarding ecosystem diversity; human system diversity requires that such assessments and decision-making fora incorporate and utilize other forms of cultural knowledge. Social impact assessments offer some potential to do so, although such assessments tend to be positivist and to accept a priori certain impact categories which reflect certain cultural biases (Rickson and

Chu, 1990). How problems are defined and economic activities selected, and the relationship between information and political decision-making, may be more important issues than impact assessments *per se*.

Principle 11: Nurturing the intangibles

Sustainable development requires that each proposed activity include statements about how it will nurture the intangible quality of life for the citizens affected by it.

Comment

There are many things besides a healthy planet and a healthy body that create the self-actualizing experience of human well-being. These things might include aesthetic experiences, feelings of history or continuity in one's family or community, cultural identification, respect for and feelings of oneness with nature, and other spiritual phenomena. The ORTEE noted in one of its guiding principles that 'nature represents the spiritual essence of many Ontarians'. This intangible requires 'the notion that the environment is an entity unto itself . . . be considered in reaching any settlement . . . where perspectives, lifestyles and value systems . . . differ'.

As intangibles are identified they become tangible, but never in quite the same way as events that can be represented by data. (An intangible may exist, but may simply be 'hard to precisely define or identify', as the American Heritage Dictionary defines the word.) These intangibles will vary across cultures and communities.

Principle 12: Planning across the generations

Sustainable development requires that each proposed activity state how it will ensure equity to future generations, that is, how it will maintain the natural capital and the sustainability of human cultures. It demands that economic activity extend the notion of full-cost accounting across time, as well as across the resource base.

The Iroquois Nation (an indigenous polity existing before European settlement of Canada) adopted a principle for making important tribal decisions: how will this improve our people now, and for the next seven generations?

CONCLUSION: THE ROLE OF HEALTH PROMOTION PROFESSIONALS

Many Canadian health organizations are now participating in sustainable development debates. The Canadian Public Health Association, a voluntary professional organization, recently cosponsored consultations on the Canadian federal government's 'Green Plan'. The Ontario Public Health Association, a provincial level voluntary professional organization, is an intervenor in environmental hearings reviewing a 22 year energy plan for over 9 million Canadians. Ontario Hydro, the energy plan's proponent, failed to estimate human health outcomes and to project risk estimates of toxic emissions in its environmental analysis. The OPHA, with the International Institute of Concern for Public Health, intends to create a human health analysis (at both the individual and population level) for the energy options presented by the crown corporation, and for those not considered (more massive conservation efforts, decentralized smaller scale generation, renewables such as solar, wind and geothermal). A recent decision to open up half of the province of Alberta's forests to 'development' has met with staunch health opposition. Until the advent of new pulp technologies, Alberta's aspen forests were regarded as unproductive 'weeds', their economic value as a carbon sink absorbing greenhouse gases to this day going unrecognized. Almost half the province's population, including the Alberta Medical Association, is opposed to the pulp forestry plan, fearing that the six new kraft-style pulp mills would pose unacceptable human health risks.

Health professionals should not wait to be invited into sustainable development discussions. They must invite themselves. As they do so, they should consider that, just as principles are only as [illegible] the actions they generate and the decisions they inform, increased public health participation in sustainable development fora will only be as good as the degree to which health professionals are clear about their unique contributions. These contributions can be summed as:

- the limitations of scientific data, and the ethics of decision-making when epidemiological data are equivocal;
- a broad construction of health, particularly the role of political/economic equity in creating individual and population health;
- the limitations of 'lifestyle' (individual) based strategies;
- the concept of empowerment, its relationship to personal and community health, and its

implication for sustainable development decision-making processes.

Health promotion has emerged in recent years as an attempt to synthesize the relative interplay of biomedical, behavioural and socio-environmental systems in creating health or disease. It represents to the health sector what sustainable development represents to the environment–economy sectors: an effort to articulate value-based strategies that sustain humans. The Ottawa Charter for Health Promotion (WHO, 1986) identifies several strategies that health promotion must address: reorient health services, develop personal skills, build healthy public policy, create supportive environments and strengthen community action. These can be, and have been, applied to sustainable development; they have also raised political challenges that any sustainable development decision-making process must face.

Reorienting health services speaks to the need to develop more effective and efficient community-based systems of health care. Large health care institutions, predicated on a narrow biomedical model of disease, often lose the human quality of caring in their relationships with ill people. There is also declining marginal utility in disease treatment, and the amount of public revenue that currently goes into health care services may now be unsustainable. In Ontario health care institutions consume 35% of government budgets. Ontario's Ministry of Health, currently spends as much on subsidized prescription drugs (largely for elderly persons who are hazardously overmedicated) as it does on the entire Ministry of the Environment. Stated somewhat differently, the annualized costs of reducing acid aerosol emissions by 60% by 1994 at Ontario's four largest point sources equals less than 5% of the province's expenditures on health care.

In this context, continuing health care expenditures represent unsustainable wealth consumption. To borrow from Rees (1989), what may be most important about a nuclear resonance imaging device is that its costs represent a failure to invest limited public revenue in health creating, and environmentally sustaining, activities.

Developing personal skills can be narrowly construed as promoting healthy lifestyles. However, it is being more broadly interpreted by many health promotion practitioners as encouraging skills in community organizing, policy advocacy, political decision-making and other forms of participatory democracy that constitute the larger personal responsibility of citizenship. (Hancock, 1989; Labonté, 1989) It intersects nicely with the rhetoric of broader community participation in sustainable development decision-making. Because health promotion and sustainable development share several key concerns, disciplines and overlapping sectors, initiatives under these two rubrics should be deliberately reinforcing to avoid overwhelming 'communities' with action agendas that trip over one another and dissipate citizen energies.

Developing healthy public policies means incorporating human health criteria into all policy sectors. It is a new public health truism that individual and community well-being are determined more by social, environmental and economic systems than by health care provision. Policies in such sectors as transportation, energy, economy, food and agriculture, waste management and urban design can either increase or decrease human health, just as they are either sustainable or not. Health promotion and sustainable development policies intersect in many areas. A low meat, low cholesterol, high fibre diet now recommended as a means of preventing cardiovascular disease and, perhaps, cancer, requires far less land per capita than do current diets in western industrialized countries. Health concerns are also driving increases in more sustainable, organic forms of agriculture that use fewer toxic petrochemical inputs. Decreasing urban car use and fossil fuel consumption by making bicycle commuting easier also promotes personal fitness. Using high density decentralized cores in new town planning and urban redevelopment enhances opportunities for social interaction, allows for more proximate food production, decreases per capita energy use and allows for easier access to natural settings. And so on[1].

The danger in the concept of healthy public policy is that it might imperialize existing forms of environmental decision-making, and risk further confusion rather than more concerted professional actions. The Australian state of Victoria recently introduced legislation requiring health impact statements of 'any activity which may constitute a danger to human health'. There is some concern that these assessments may compete with existing, more stringent and legally binding environmental impact assessments. It is likely of greater strategic value for public health

advocates to expand the parameters of existing environment–economy decision-making fora (such as environmental assessment procedures) to encompass a rigorously broad, social model of health, than to create cumbersome parallel structures.

Creating supportive environments essentially means ensuring that human social organizations enhance well-being. Health promotion professionals have learned, for example, that personal behaviour choices are far easier to sustain if they are supported by an individual's immediate social network (family, friends, groups) and by the broader community (e.g. workplace supports for smoking cessation, healthier cafeteria foods). Choices are never simply 'personal'. One significant lesson from health promotion has been the importance of public policies in stimulating personal change. Legislated workplace smoking bans are associated with markedly greater smoking cessation and maintenance rates; the carrot without the stick is simply a dangling vegetable.

Creating supportive environments also presumes the existence of a positive experience of community, something that many sociologists argue has been seriously eroded by 20th century industrial capitalism. (Marcuse, 1974; Ollman, 1975; Milofsky, 1988) The final strategy, 'strengthening community action', is conceived as addressing this fact. It derives from the rich international literature on community development and community organizing, and is fundamentally about the re-creation of community. Much has been written on this subject (e.g. Kendrick *et al.*, 1983; Labonté, 1986; Milofsky, 1988; Lamoureux *et al.*, 1989); it is beyond this article's scope to review critically the implications of this strategy.

These ideas have become driving forces behind the several hundred healthy city/healthy community projects worldwide. Several of the Canadian healthy community projects are specifically addressing physical and social environmental considerations. In Sherbrooke, Quebec, pesticide use in parks and open spaces was reduced by 50% in one year and is now being phased out entirely. Sherbrooke is also sponsoring 'urban reforestation' projects, on the fundamental community organizing premise that activities must be immediate, short-term (respecting volunteer time) and do-able. In Rouyn-Noranda, Quebec, a community forum decided to establish a waste recycling program and demand dramatic reductions in waste emissions from the copper refinery that dominates its local economy. Dartmouth, Nova Scotia, initiated a paper recyling program. Edmonton and Toronto have both established local food policy councils. The Edmonton Food Policy Council is researching food issues affecting low income people in Edmonton. The Toronto Food Policy Council is exploring issues ranging from pesticides and additives in food, to the effects of packaging materials and food irradiation on the quality of food, to policies to eliminate hunger, to research on how our 'food culture' of advertising, marketing and fast foods contributes to such health problems as cancer and heart disease. Another Sherbrooke, Quebec, project is seeking to integrate housing concerns for the elderly into urban planning and development proposals. In the long-term, new architectures for healthy aging will be developed; in the short-term, parks (summertime public places) will become more accessible for older persons with the addition of comfortable chairs, shade trees and playing tables.

Community development successes in health promotion (partly exemplified by many health city/healthy community projects) speak to a point salient to sustainable development decision-making. Not only must actions accompany words; local actions are required. It is not accidental that, in Canada, healthy community projects have worked best in smaller localities. When people can truly meet their neighbours 'a-Round-a-Table', human sustainability (social interaction, social support, value-based decision-making) can break through institutional or structural inertia. Citizens can see, speak with and feel less intimidated by their municipal politicians and business leaders. They can also see directly the results of their participation in decision-making political processes.

There is, however, an important caveat to this finding: that of localizing global problems, and mystifying macro-level systems of power and decision-making. Local decision-making may be a vital countervailing to the disempowering aspects of state-centralism, but most economic decision-making is national and transnational in nature. Local decision-making at present can only be within narrow parameters at best, and is unlikely to include substantial control over economic resources. As Lester Brown (1989) of the Worldwatch Institute commented in his 1989 State of the World report, 'Small may be beautiful, but it may also be insignificant'. Daly and Cobb

(1989) are more direct: Political decision-making must exist at the level of economic decision-making. Until economic decision-making is redirected towards more localized communities, and from thence outwards towards the nation-state, political decision-making perforce must remain centralized.

Unless local actions are integrated with advocacy and political action strategies directed towards higher level government policies, our drive for decentralized decision-making and community development may unwittingly 'privatize', by rendering local, what are much larger issues. We risk mystifying the actual exercise of political power, just as green products mystify the sustainable limits of consumption. Local actions and green products are starting points only, and represent the community organizing rule 'to begin where the people are'. But where people are is not necessarily where they should be. The environmental motto to 'Think globally, act locally' may well need amending to 'Start locally, act globally'.

Empowerment, the ability to exercise choice, increasingly informs the individual and community work of health promotion professionals. It does not lack for problems of definition or co-optation, but it speaks to an emergent knowledge that the very act of organizing to alter conditions of relative powerlessness enhances individual health. 'Empower' is usually used transitively, as in we (health professionals) need to empower others (poor, marginalized individuals or groups). Empower is also a reflexive verb: the most enduring power (choice) is that which is taken, not that which is given. Health promotion professionals possess a power not yet seized, one that builds upon a discipline specific credibility while capitalizing on the relative lack of boundaries defining health promotion.

Health promotion utilizes the traditional discipline theory and methodology of epidemiology and clinical (direct-service) practice. Public health professionals ('new' or 'old') are often organized in voluntary associations. These associations can bring the collective knowledge of the traditional disciplines to sustainable development decision-making. They can also engage in direct forms of advocacy and coalition-building or participation. Similar actions can be initiated, albeit with greater restriction, within employing organizations (Labonté, 1987).

But to a considerable extent, health promotion is inherently multi-disciplinary, or a-disciplinary. It incorporates theory and practice from disciplines as diverse as social marketing, education, sociology, psychology, social work, anthropology, ecology, statistics, administration/management, to name only a few. The same might be said for the 'new' public health which, by focusing on the determinants of health, lyzes itself from the discipline boundaries of medicine and traditional infectious disease control. Few other professionals participating in sustainable development debates share this vague yet liberating generalism.

The most potent role of health promotion professionals in sustainable development decision-making, then, may be that of a cross-discipline interpreter. Using the metaphor of health, which shares its etymology with 'hello' and 'whole', the interpreter does not colonize the other disciplines or sectors with public health imperatives so much as seeks and seeds the commonalities, while raising to the conscious level the conflicts.

NOTES

1. There is one ready conflict between sustainable development and health: energy-efficient closed buildings. The 'sick building' syndrome is now well documented. When contemplating this trade-off (energy conservation is ultimately more vital than minimizing infectious disease spread or migraines) it is important to consider that most sick building problems arise from faulty temperature and humidity control, and the recirculation of internal and external toxics (outside smog; inside tobacco smoke, carpet fumes, office work-related chemicals, etc.) The problem may not lie with energy efficiency so much as with the organization, materials and products of work done in the closed building.
2. This article is based on an address to 'Integrating Health and Environment' conference, Institute of Applied Environmental Research, Griffith University, Canberra, Australia, April 1990.

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