Essential Psychology for Environmental Policy Making

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In this article major environmental problems and their different levels and global spheres of impact are surveyed. Environmental exploitation is discussed as an inherent characteristic of free market economies under limited cognitive-motivational inclinations of individual actors. A conceptual modelling of environmental problem solving is presented, which comprises the commons dilemma paradigm as well as a needs-opportunities-abilities (NOA) model of consumer behaviour, a categorization of human needs, a simple taxonomy of behavioural processes, and seven strategies for behaviour change. Six lines of psychological research are identified, ranging from environmental attitudes to environmental policy-decision support systems. An ecological critique of mainstream psychology is summarized and some suggestions are made to resolve this. Conclusions are drawn about needed research, policy making, and international diplomacy.

Cet article examine des problèmes environnementaux importants ainsi que leurs différents niveaux et sphères globales d'impact. L'exploitation environnementale est discutée comme une caractéristique intrinsèque des économies de libre marché avec des tendances cognitives et motivationnelles limitées chez les acteurs individuels. L'article présente une modélisation conceptuelle de résolution d'un problème environnemental qui comprend le paradigme du dilemme des ressources, un modèle besoins-opportunités-habiletés du comportement de consommation, une catégorisation des besoins humains, une taxinomie simple des processus comportementaux ainsi que sept stratégies de changement du comportement. Six voies de recherche psychologique sont identifiées, allant des attitudes environnementales aux systèmes d'appui aux décisions et aux politiques environnementales. Une critique écologique de la psychologie dominante est résumée et des suggestions sont apportées pour résoudre ce problème. Les conclusions identifient les recherches, les politiques et la diplomatie internationale qui sont nécessaires.

Worldwide there is an increasing awareness that growing human populations and expanding human activities are undermining the natural conditions upon which all forms of life depend. The proliferation of human life and its environmental effects take place in a myriad of local settings. Increasing material production and consumption, expanding patterns of mobility and transport, and wasteful technologies for transforming raw materials into products and services are major vehicles of serious environmental problems. In many countries governments are making progress in managing local and regional problems such as air, water, and soil pollution, waste disposal, and environmental nuisance from noise, bad odours, and littering. At the national level environmental problems are more difficult to control, due to the numerosity and variability of causal agents and sources; mass motorised transport being a case in point. At each level, economic competitiveness is an important motive to "look at the neighbours" and to argue that one's own environmental problems can only be resolved if most others agree to cooperate. Thus, there is a need for effective coordinating authorities who have the mandate, the creativity, and the power to design, implement, and enforce optimal environmental policies.

Psychology, the science of human behaviour, is highly relevant for environmental policy formation at any level, but particularly with regard to the more complex environmental problems. People generally cannot handle long-term complexity, they are limited information processors, and they are mentally biased towards the "us, here and now." Unlike what many policy makers believe, it is not "eco-technology" alone nor is it the economic "price mechanism" by itself through which major environmental problems can be resolved. Any serious policy measure will affect human behaviour patterns such that substitutions occur of one product, service, activity, or goal by another. Those substitutions bring along shifts in environmental impacts whereby the original problem may be either alleviated (as one hopes) or aggravated, or significantly changed in character.

The message of this article is sixfold: (1) environmental problems are sociobehavioural problems; (2) psychology has important things to say about the management of environmental problems; (3) psychology's contributions to environmental policy making are most effective in the context of multidisciplinary collaboration; (4) environmental problems around the world violate human security, wellbeing and development; (5) therefore, "environmental

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security'' deserves a high priority on the international political agenda; and (6) international structures facilitating collaboration among environmental psychologists, other environmental scientists, and environmental policy makers need to be strengthened and improved. These messages are bi-directional. On the one hand, psychologists are advised that serious research about environmental problems necessitates "homework'' involving explorations of substantive policy domains and some acquaintance with alternative disciplinary perspectives. On the other hand, environmental policy makers and diplomats are advised to widen their scope and adopt a fundamental sociobehavioural view of environmental problems and to appreciate the limitations and possible counterproductiveness of purely technical or economic strategies for the promotion of environmental security.

The remainder of this article is organised as follows. The development and future requirements of environmental psychology are described. A number of serious obstacles for sustainable development are summarized. Several ways of categorizing environmental problems are presented. Five societal driving factors of large-scale environmental changes are identified, followed by a description of the cognitive and motivational bases of human environmental exploitation. A conceptual modelling of environmental problem solving is unfolded, comprising five ingredients: the "commons dilemma'' paradigm, a needs-opportunies-abilities model of general behaviour determinants, a categorization of basic human needs, a simple taxonomy of behaviour processes, and seven strategies for behaviour change. The conceptual modelling leads to the identification of six lines of psychological research concerning environmental problems. It is argued that the nature of environmental problems makes multidisciplinary collaboration inevitable. Thereafter, an ecological critique of mainstream psychology is summarized and suggestions are made for a (further) ecologization of (environmental) psychology. Finally we consider the question of how environmental psychology can be brought to bear more fruitfully upon policy making and international diplomacy.

DEVELOPMENT OF ENVIRONMENTAL PSYCHOLOGY

Since about 1970 the role of psychology in understanding environmental problems has been less focused. Psychological work on the analysis and management of environmental problems, however, has been rapidly growing and is becoming very important. Significant publications are, among others: Baum and Singer (1983), Bazerman, Messick, Tenbrunsel, and Wade-Benzoni (1997), Buckhout (1972), Darley and Gilbert (1985), Diekmann and Franzen (1995), Eckensberger (1976), Evans (1993), Gardner and Stern (1996), Gärling and Golledge (1993), Geller, Winett, and Everett (1982), Koelega (1989), McKenzie-Mohr and Oskamp (1995), Pawlik (1991), Sjöberg (1989), Stern (1992), Stern and Oskamp (1987), Winter (1996). Indirectly, scholars focusing on "commons dilemmas''—situations where individual and collective interests are in conflict—also contribute significantly to understanding large-scale environmental problems (see, e.g., Dawes, 1980; Hardin, 1968; Liebrand, Messick, & Wilke, 1992; Messick & Brewer, 1983; Olsen, 1971; Vlek, 1996a).

There is some debate about classical environmental psychology—"the study of transactions between individuals and their physical settings'' (Gifford, 1997, p. 1)—versus the newer ecopsychology—". . . which is to bridge our culture's long-standing, historical gulf between the psychological and the ecological, to see the needs of the planet and the person as a continuum'' (Roszak, 1992, p. 14). Reser (1995, p. 252) wonders: "Can environmental psychology . . . encompass ecopsychology . . .? If environmental psychologists do not consider and address the spectrum of issues raised by ecopsychologists . . ., they will have truly lost their way as well as their credibility.'' These two directions may, however, well be seen as two sides of the same coin, although it must be admitted that the more difficult study of aggregate human behaviour effects on natural resources and environmental security has been lagging behind "individualistic'' environmental psychology.

Many environmental problems are, in essence, behavioural, social, and cultural problems at the level of individual households, business companies, industries, and/or government departments. To further exploit psychology's potential in environmental research and policy making it seems necessary (1) to identify and order the most pertinent psychological questions, concepts, models, and methods for research on environmental problems; (2) to demonstrate inside, but in particular outside, psychology that theory-driven applications of psychological methods and procedures may yield significant clarifications of environmental problems and provide a more complete basis for policy making; (3) to create multidisciplinary "think teams'' and research projects comprising sociobehavioural as well as physical-technical perspectives; and (4) to improve communicative relationships between policy makers and environmental scientists, including psychologists. In doing these things, one would enhance environmental policy makers' (and researchers') understanding of the need for *integrated assessment* of environmental problems, and their appreciation of the utility of a multidisciplinary basis for policy making.

Surely such a development of environmental psychology would necessitate reorganizations in both the structure of environmental-scientific research (and education) and in the communicative relationship between researchers and policy makers. To benefit from such developments at the stage of international policy making and diplomacy requires the following further steps: (1) designing and undertaking international (multidisciplinary) research projects; and (2) organizing international meetings of researchers and policy makers who jointly consider the scientific analysis of a given

environmental problem and the design of effective management strategies.

Many psychological concepts, models, and methods are available and have already been fruitfully applied in environmental problem analysis (see, e.g., Gardner & Stern, 1996; Gifford, 1997; Van der Pligt, 1996). However, some systematization and integration of psychological theorizing and methodology seems required to strengthen the grip of both researchers and policy makers on what psychology has to offer.

ENVIRONMENTAL PROBLEMS FOR SUSTAINABLE DEVELOPMENT

In differing parts of the world there are serious threats to food production, drinking-water resources, the availability of arable land, and the quality of urban living environments. These and other environmental deficiencies constitute major hazards for human health and people's quality of life, and they significantly reduce the biodiversity of ecosystems. In Chapter 1 of *State of the world 1992* (Brown et al., 1992) Sandra Postel lists the following worldwide trends as most life-threatening:

1. In overpopulated areas of the northern hemisphere, the protective ozone layer is thinning twice as fast as scientists thought until just a few years ago.
2. Each day at least 140 plant and animal species are condemned to extinction.
3. Atmospheric carbon dioxide levels are 26% higher than in pre-industrial times and their increase is continuing.
4. In 1990 the earth's surface was warmer than in any year since the beginning of meteorological observations; six of the seven warmest years have occurred since 1980.
5. Forests are vanishing worldwide at a rate of some 17 million hectares per year, an area about half the size of Finland.
6. World population is growing by 92 million people per year, which amounts to roughly the current population of Mexico, of whom 88 million people are born in developing countries.

In a special issue of *Futures* devoted to sustainable development, Corson (1994, pp. 206-207) describes the following "unsustainable trends" in human production and consumption:

> Between 1950 and 1990, the world's human population more than doubled (from 2.6 billion to 5.3 billion), domestic livestock population grew 1.8-fold (from 2.3 billion to 4.1 billion), grain consumption rose 2.6-fold, water use nearly tripled, fish consumption grew 4.4-fold, and energy use quintupled. Over the same period, global consumption of wood and copper roughly doubled; steel production quadrupled; economic output nearly quintupled; industrial production grew sevenfold; aluminium output and the use of chemical fertilizers increased roughly 10-fold; world production of organic chemicals, major sources of air and water pollution, rose 20-fold; and global air travel, which causes significant atmospheric pollution, soared nearly 70-fold. On average, resource use per person nearly tripled between 1950 and 1990. This growth, coupled with a doubling of human population, resulted in roughly a sixfold increase in human impact on the global environment during the four decades. Human activity is now altering the Earth's basic life-support systems and cycles, including the atmospheric system and the carbon, nitrogen, sulphur, biologic and hydrologic cycles.

The throughput of energy, materials, and products in various households has grown impressively during the last 50 years. Some pertinent figures for The Netherlands are as follows (see Noorman & Schoot Uiterkamp, 1998). During the period 1950–1990 the Dutch population has increased from 10 to 15 million inhabitants. In the same period, the percentage of Dutch land area (a total of about 34,000 square kilometres) used for buildings, roads, and recreational facilities, increased from 8.4 to 16.1. Around 1950 there existed about 2 million household dwellings; this number had risen to 6 million in 1992. The average annual income, corrected for inflation, of heads of households in 1990 was twice as high as in 1950. Between 1965 and 1992 water consumption in Dutch households increased from 100 to 135 litres per person per day; today about twice as much water is being used for bathing and showering and for textile washing than 30 years ago.

The Dutch ownership and use of motor vehicles—especially passenger cars, but also vans and lorries—has grown very strongly since the 1950s (see Vlek, Hendrickx, & Steg, 1993). In 1960 some 670,000 4-wheeled motor vehicles populated the Dutch roads and streets. In 1980 there were about 4 million and in 1990 about 6 million motor vehicles. The Dutch fleet of motor vehicles is expected to approximate the figure of 10 million in 2010, an average of about 300 motor vehicles per square kilometre of land area. The number of aeroplane takeoffs and landings at Schiphol Amsterdam Airport rose from about 90,000 in 1960 to some 235,000 in 1990. The Schiphol authorities expect that between 1990 and 2010 the number of "passenger movements" will triple from 16 to 50 million annually.

In a survey of OECD countries, Schipper (1997) shows that the number of vehicle kilometres per capita has been steadily rising from 1970 onward in countries like Germany, France, Italy, Sweden, Australia, USA, and Japan. Considering the near future, he notes ". . . that travel is emerging as the primary leader of growth in carbon emissions in the wealthy, industrialized countries. Lifestyle changes driven predominantly by higher incomes—particularly increased automobility—have consistently led to higher carbon emissions, and the trends in the travel sector show no signs of saturation" (p. 59).

Various authors point at "society's consuming passion" (Durning, 1992; Young & Sachs, 1995), which intensifies and spreads out in an insatiable manner. The Dutch sociologist Thoenes (1990, p. 273) saw us—the

industrial "*homo faber*"—as members of an increasingly restless culture having inclinations and undertaking activities

> which should hardly be part of a normal survival package. We are all together forming a society which has proven to be able . . . to transform enormous quantities of raw materials into a universe of products which, in one way or another, people actually need, are supposed to need or will eventually be made to need. The growth of this transformational capacity is astronomical. If we let this continue unbridled, then our culture will burst asunder against a natural environment which is no longer yielding.

The UN Human development report (UNDP, 1998, p. 1) explicitly states that today's consumption patterns need to be changed for tomorrow's human development:

> Consumption clearly contributes to human development when it enlarges the capabilities and enriches the lives of people without adversely affecting the wellbeing of others. It clearly contributes when it is as fair to future generations as it is to the present ones. And it clearly contributes when it encourages lively, creative individuals and communities. . . . Today's consumption is undermining the environmental resource base. It is exacerbating inqualities. And the dynamics of the consumption-poverty-inquality-environment nexus are accelerating. . . . But trend is not destiny, and none of these outcomes is inevitable. Change is needed—and change is possible.

CATEGORISATION OF ENVIRONMENTAL PROBLEMS

Taking a broad view on environmental problems we may usefully distinguish seven levels of risks resulting from environmental exploitation (see Table 1). At the right side of Table 1 key terms are provided to illustrate stressors and risks to human health and environmental qualities. The seven levels serve to distinguish small-scale and large-scale environmental and/or health effects from various human activities. For every scale level we may identify the actor(s) who is (are), or was (were), responsible for *causing* the relevant effects. Also for each level we may think of an appropriate type of actor or organization who or which is, or should be, responsible for *managing* a particular environmental problem and diminishing any harmful effects. Generally, the higher up the scale one gets the more complicated an environmental problem proves to be, due to an increase in the number of causal actors involved, greater uncertainty about environmental processes, and a relative absence or ineffectiveness of institutional agents for resolving the problem.

TABLE 1
Different Levels of Environmental Risk (from Vlek, 1996b)

Level	*Illustrative keywords*
1. Personal	Under-nourishment, smoking, alcohol
2. Indoor	Air quality, noise, radon, vermin
3. Local	Noise, litter, smog, soil pollution
4. Regional	Air and water pollution, dehydration
5. Fluvial	Contaminated rivers, water eutrophication
6. Continental	Acid rain, desertification, greenhouse effects
7. Global	Ozone depletion, climate change, polar melt-down

The seven levels of environmental risks may be distinguished in one or more of five separate spheres of the global environment: the litho- or pedosphere, the hydrosphere, the cryosphere, the atmosphere, and the biosphere, which is dependent on the first four. Figure 1 illustrates this categorization, which has the obvious advantage that analyses and descriptions of environmental exploitation may be clearly aimed and conducted with relevant expertise. All five spheres are suffering from varying impacts of numerous human activities, whereby the number of people, their individual level of affluence, and the environmental impact of each activity roughly determine total (human) environmental impact.

SOCIETAL DRIVING FACTORS OF LARGE-SCALE ENVIRONMENTAL CHANGE

The importance of population size, level of individual affluence, and production technology for environmental exploitation was expressed by Ehrlich and Holdren (1971) in their by now well-known "IPAT formula":

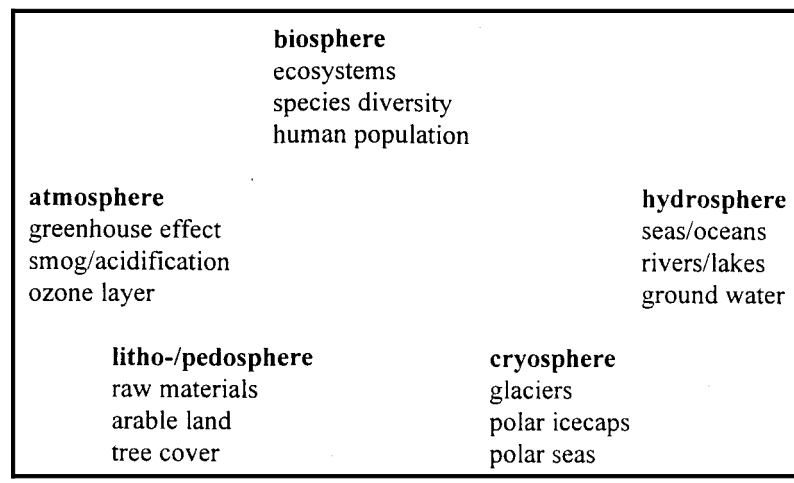

FIG. 1. Five spheres in which environmental changes may be manifested.

$I = P \times A \times T$. Total environmental Impact equals the product of Population size, individual Affluence, and environmental impact of the Technology used for producing one unit of affluence. If we further consider the sociobehavioural causes of population growth, increasing affluence, and developing technology, we hit upon two other driving forces, that is *institutions* as vehicles for constituting and governing human societies, and *culture* as a conglomerate of socially shared beliefs, values, and attitudes.

In a wider perspective, therefore, environmental exploitation may be seen as driven by technological, economic, demographic, institutional, and cultural developments in (Western) society, taking place over a few hundred years, slowly at first but much faster in the second half of the 20th century. This set of general driving forces may be conveniently labelled as the TEDIC-complex. Thus, apart from changes in Technology, Economy (affluence), and Demographic development (population), Institutional and Cultural changes would be essential for bringing about long-term sustainable development. In a similar analysis Stern (1992, p. 296) notes: "Progress requires that psychological concepts of the determination of behavior be integrated with engineering concepts of energy use, economic concepts of decision making, sociological concepts of mobilization, and techniques of policy analysis."

Goodland, Daly, and Kellenberg (1994) have systematically examined the potential for change in the three areas covered by the IPAT formula: (1) limiting population growth, (2) limiting affluence and consumption growth, and (3) reducing the environmental impact of production and consumption technology. As Corson (1994) does, these authors generally agree on a number of policy priorities, which are different in character for high-income and low-income nations of the world. For example, high-income nations are advised to work on "transforming the culture of consumerism . . . into an ethics of sufficiency and environmental sustainability", and on "internalizing environmental costs in energy prices and accelerating the transition to renewable energy sources" (Goodland et al., 1994, p. 153). In contrast, the authors advise low-income nations to give priority to: "accelerating the transition towards population stability . . ., supporting technologies which provide increased employment opportunities for unemployed and underemployed individuals . . ., and improving efforts towards poverty alleviation . . ." (p. 154). Goodland et al. conclude: "Technological change and population stabilization cannot suffice to move the world towards an environmentally sustainable future. Instead, a reduction in per capita consumption in high-income nations and a decrease in environmental throughput are required" (p. 154). From a social science perspective, the potential for change in society's institutions and culture could not be easily assessed, but it certainly needs explicit consideration.

COGNITIVE AND MOTIVATIONAL BASES OF ENVIRONMENTAL EXPLOITATION

The human causes of environmental problems are to be found in the desirability of numerous individual, social, and economic benefits of environmental exploitation. With a view to sustainable development, the question arises to what extent human environmental exploitation is inevitable, what the optimal trade-off between environmental costs and societal benefits would be, and to what degree human groups and organisations are able to perceive and evaluate the environmental costs and social benefits of the various activities they are undertaking. There are motivational and cognitive types of answers to these questions.

Modern societies are confronted by huge discrepancies between the complexity, the uncertainty, and the temporal extension of major environmental costs on the one hand, and the relative simplicity, certainty, and immediacy of social and economic benefits on the other. By their very nature the short-term, concentrated benefits are cognitively more available and can be better appreciated than the long-term, widespread costs; in this connection Björkman (1984) uses the term "proximal cognition." This unevenness tends to make large parts of modern society to be in an "us, here, and now" trap (Vlek & Keren, 1992), which precludes prudent long-term planning and decision making about developments involving major environmental impacts. Such a trap is historically unprecedented, since earlier societies did not have the knowledge and the technical means for such large-scale and multifaceted environmental exploitation as occurs particularly in the second half of the 20th century (although there are specific historical examples of limited man-made environmental catastrophes; see Ponting, 1991).

Environmental exploitation also rests on basic human needs for "existence, relatedness and growth" (Alderfer, 1972). In the industrial consumer society these human motives each have developed into exigent complexes of everyday needs and driving forces. Many people have accommodated themselves to the notion that "existence" involves a whole range of material posessions and consumptive behaviours. "Relatedness" nowadays involves mass events and activities, lively social networks and expansive spatial mobility, and a continuous upward drive in consumption, due to social comparison processes aimed at reducing individuals' perceived relative deprivation. "Growth" has come to be expressed in strong needs for rapid innovation, change, and variety, as if the present is not worth living any more. The psychological needs of "existence, relatedness and growth" not only pertain to individual people, but also to social groups and organizations.

The preceding cognitive-motivational analysis of environmental exploitation implies that environmental problems are sociobehavioural problems, the analysis

and management of which requires a process analysis ranging from initial causes to ultimate consequences. The causes reside in human cognition and motivation and in social institutions and culture. The environmental impacts may seriously affect the quality of ecosystems, the human living environment, and the physicochemical (raw material) basis of economic activities.

PRODUCTION–CONSUMPTION CYCLES IN SOCIAL MARKET ECONOMIES

So far we have only listed distinct general forces that drive society towards unsustainable activities. But unsustainability is not a linear function of developments in T, E, D, I, and C. Actually, these driving forces are characteristics of a complex socioeconomic system in which capital, labour, and raw materials are being used for the production of goods and services to meet the needs and desires of growing numbers of consuming individuals, groups, and organizations. It is inherent in this socioeconomic system that lots of natural space is being occupied, great amounts of "waste" materials are being discarded, and other external effects (like noise, bad odour, and visual limitations) occur, whereby governments play only modest roles in regulating the costs and risks incurred by society and the environment as a whole.

To understand this complex metabolism of society vis-à-vis the natural environment, it is necessary to appreciate the interwovenness of consumption and production. Figure 2[1] represents what may be called the production–consumption cycle, as institutionalized in a social, that is, government-regulated market economy. It reflects the simple truth that consumers and producers need each other for different reasons, and that both parties need some government regulation for which the government in turn needs them, again for different reasons. The relationships among consumers, producers, and government are expressed in flows of money, products, labour, taxes, and subsidies. Main system functions for consumers are feeding, clothing, housing, education, and recreation. Major functions for producers are energy provision, industrial production, agriculture and stock-breeding, product distribution, and services. Inputs from outside the socioeconomic system are formed by various environmental resources such as energy, raw materials, and land. External outputs or derivatives occur in the form of various kinds of waste, mobility, and noise.

Another less simple truth can also be illustrated with Fig. 2. This is the mutual interdependence of producers' *eco-efficiency* and consumers' *sufficiency*. Eco-efficiency is the producer's strategy of reducing the overall environmental effects per unit of production. However, the beneficial effects of eco-efficiency may be undone by further consumption growth and rebound or take-back effects. Hence, eco-efficiency on the producer's side needs a counterpart on the consumer's side. The latter must necessarily be a strategy of sufficient consumption or sufficiency (Durning, 1992), which contrasts with current (highly industrialized) practices of ever-growing, continually maximizing consumption patterns (Reisch & Scherhorn, 1999; Scherhorn, Reisch, & Schrödl, 1997).

For a long time the free market economic system of Western industrialized countries has been very effective in combating human poverty, ignorance, discomfort, and diseases. However, now that it has grown and expanded, this system manifests a self-destructive tendency. This is the inclination of individuals, groups, and organizations continually to optimize their own gains ("here and now") whilst minimizing their losses. As long as gains and losses are defined in personal, financial, and material terms, and not in terms of a broader, collective, and long-term conception of sustainable development, this micro- and meso-level outcome-rationality is yielding a host of environmental and social costs that accumulate into sub-optimal (collectively irrational) conditions for society and the environment as a whole. The Belgian philosopher Vermeersch (1988, p. 29) formulates this conflict of rationalities as follows (translated from the Dutch): ". . . the whole forms a system which rushes on autonomously, and nobody can guarantee that somewhere at the end of the route there is a goal waiting which is still meaningful for people. . . . The aimlessness, the irrationality of the total system is being obfuscated by the utter rationality of the system's separate components." The situation Vermeersch refers to, micro-level rationality versus macro-level irrationality, represents a type of market failure that Kahn (1966) called "the tyranny of small decisions," and which Merton (1936) earlier discussed as unanticipated consequences of purposive social action. The environmental and social consequences of such "social traps" (Platt, 1973) are also discussed by Hirsch (1976).

PSYCHOLOGICAL MODELS AND METHODS FOR ENVIRONMENTAL PROBLEM SOLVING

In a sociobehavioural analysis of environmental problems (or other societal problems for that matter), many psychological concepts, theories, and methods are candidates for fruitful application. In order to appreciate what is most useful and to design an effective approach to a given problem, a definition of environmental problems is required and some systematization of research and policy questions is needed. This will be accomplished with reference to five basic conceptualizations: the commons dilemma paradigm, the NOA model of individual behaviour determinants, a categorization of human needs, a two-by-two taxonomy of behavioural processes, and seven strategies for behaviour change.

[1] Vlek, Reisch, and Scherhorn (1999) provide a more elaborate version of the model illustrated in Fig. 2, which includes the mass media as another actor as well as a self-serving loop of "own" production by consumers (e.g. farmers).

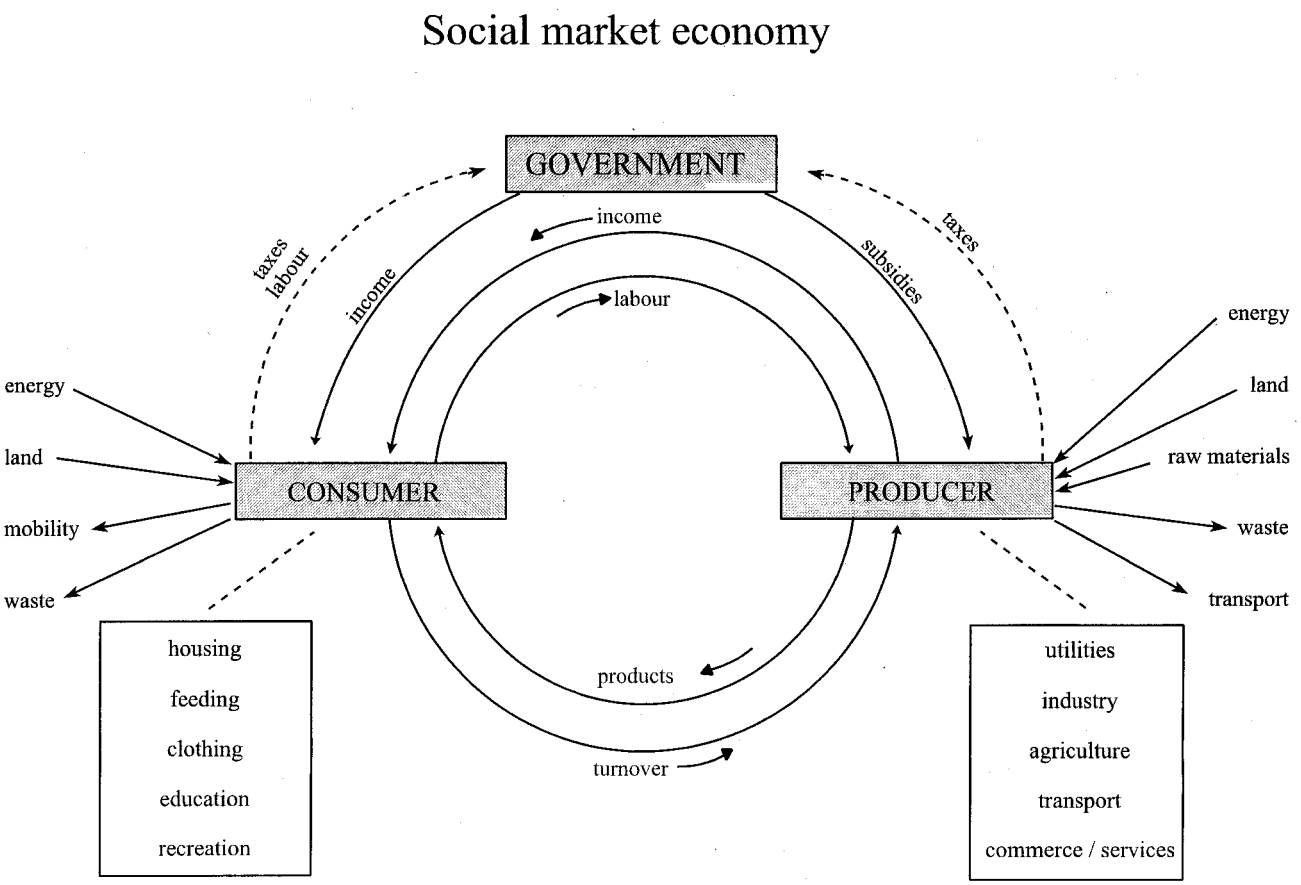

FIG. 2. A social market economy.

The Commons Dilemma Paradigm

The essential characteristic of environmental problems is the inherent conflict between the individual, social, and economic benefits of numerous activities and behaviours on the one hand, and the accumulated, collective environmental costs and risks on the other. This constitutes a "commons" dilemma, often also called a resource or social dilemma, for which there is no definitive solution (see Dawes, 1980; Dawes & Messick, this issue; Ernst, 1998; Gardner & Stern, 1996; Gifford, 1997; Hardin, 1968; Liebrand et al., 1992; Messick & Brewer, 1983; Vlek, 1996a). Societies and their governments face the question of what is the proper, sustainable balance between the numerous individual benefits and the collective costs and risks in a given activity domain. The psychological problem, as indicated before, is that often the benefits ("here and now") are more salient than the costs and risks ("yonder and later").

A commons dilemma is a situation where a collective cost or risk is incurred, taken, or generated through the combined negative external effects of various individuals who act (relatively) independently from one another. Vivid present-day examples of collective risk generation via individual activities are: littering of public places by individuals; loss of natural open space through individual preferences for more spacious household premises; over-harvesting of ocean fish stocks for the survival of individual fishing companies; local and regional air pollution from the use of numerous motor vehicles; and wholesale deforestation of tropical regions for the subsistence of local farmers and cattle-breeders. In many cases, collective risks also increase through the sheer growth in the number of separate actors such as inhabitants, households, and commercial enterprises.

Given that a commons dilemma by definition exceeds the physical, cognitive, and motivational scope of individual actors at the micro-level of society, the basic question is how the collective cost or risk can be validly assessed, effectively communicated, and acceptably managed so as to stay within sustainable limits. Collective risk management is a matter of decision making about risk acceptance and the application of practical strategies for controlling the risk via individual behaviour change. Collective risk management may be most effective if it links up with the diagnosis made about the social processes by which the risk is being generated or enhanced. And it needs monitoring and evaluation, so that information about its effects and side effects is fed back to the contributing actors involved. Thus, understanding commons dilemmas and managing collective risks as generated by individual actions revolves around the nine points of attention listed in Table 2. The table has three parts, to stress the fact that the nine points pertain to three basic tasks, that is, problem diagnosis, decision making, and risk control. The key problems in

TABLE 2
Nine Points of Attention for Understanding and Managing Commons Dilemmas (after Vlek, 1996a)

Problem diagnosis
1. Collective-risk analysis and assessment: description of the risk generation process in terms of actors, factors, mechanisms and effects
2. Risk perception and communication, social risk evaluation, recognition and acknowledgement of risk generation mechanism and structure
3. Analysis, assessment and communication of individual benefits: which, when, where, how important and to whom?

Decision making
4. Deciding about risk acceptance: weighing of collective risk against total individual benefits (diverse decision principles); decision about need for change
5. If "risk unacceptable": specification of risk-reducing behaviour alternatives
6. Setting of collective-risk reduction objectives, their translation into individual-behaviour goals

Risk control
7. Design, deliberation and selection of policy strategies for behaviour change: feasibility, acceptability, and effectiveness
8. Programmatic application of various strategies and incentives for behaviour change; targeting, timing, implementation, and control
9. Monitoring, evaluation and feedback of effects of risk reduction measures and strategies

understanding and managing collective risks in commons dilemmas would seem to be: awareness and appreciation of the collective risk and the individual benefits (diagnosis), weighing of the collective risk against aggregate individual benefits and specifying feasible behaviour alternatives (decision making), and individual behaviour change or restraint, coupled with risk monitoring and feedback about changes in risk (risk control).

The NOA Model of Individual Behaviour Determinants

At the individual level of citizens, households, and business companies, a diagnosis of environmentally relevant behaviour may be conducted in terms of the various Needs, Opportunities, and Abilities (NOAs) of actors to manifest certain production or consumption behaviours. Figure 3 illustrates the NOA model of environmental behaviour (Vlek, Jager, & Steg, 1997). Considering that Needs, Opportunities and Abilities do not operate independently of one another, we include a separate "motivation to perform" (MP) component as well as a "behavioural control" (BC) component in Fig. 3. The MP and BC components mediate between the NOAs and overt behaviour. Needs and opportunities together are determinant of MP, the motivation to perform a given behaviour. Opportunities and abilities together determine BC, the behavioural control over a given activity. The message of Fig. 3 is that changing environmental behaviour requires modifications of either relevant needs and/or relevant opportunities and/or relevant abilities underlying such behaviour, whereby the interplay of needs and opportunities (by way of MP) and the interplay of opportunities and abilities (via BC) should be carefully considered.

A Categorization of Human Needs

Basic needs would seem to be the underlying causes of human behaviour and behaviour change. Without any need there would be no motivation to perform a behaviour, even though behavioural control would be high. Opportunities may present themselves or they may be searched for or designed. Abilities may be acquired, learned, or otherwise developed. But basic needs are more intrinsic and stable during the course of human life. Earlier we discussed Alderfer's (1972) "existence, relatedness and growth" as the motivations for human behaviour. A more recent, extended taxonomy has been provided by Max-Neef (1992), who lists nine essential needs: subsistence, protection, affection, understanding, participation, leasure, creation, identity, and freedom. Max-Neef considers needs as separate from the ways in which they may be satisfied. With respect to the latter he proposes four categories of needs satisfyers: *being* such-and-such, *having* this or that, *doing* certain things, and

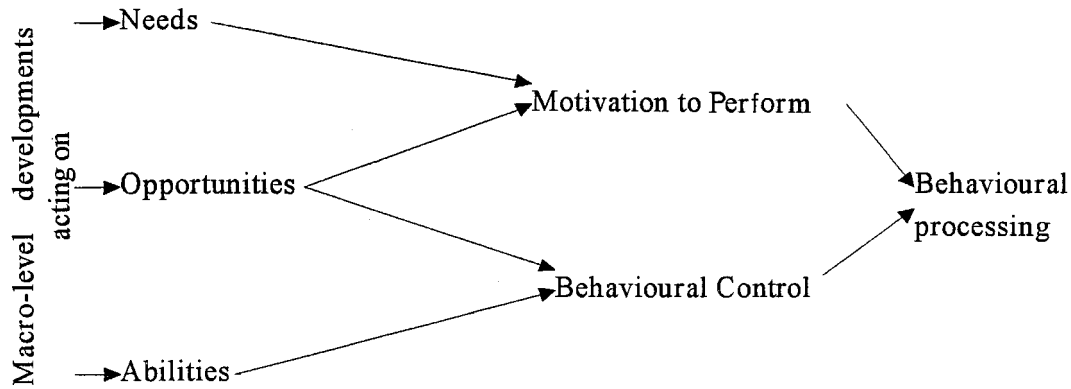

FIG. 3. The needs-opportunities-abilities (NOA) model (after Vlek, Jager, & Steg, 1997).

interacting with others. The obvious question in the present context is to what extent current ways of satisfying given basic needs may be changed (i.e. dematerialized) so as to be less environmentally burdening.

Four Kinds of Behaviour Processes and Theories

A fourth important part of the conceptual modelling of environmental problem solving is a simple taxonomy of behaviour processes possibly underlying unsustainable activities. Behaviours may be categorized following two major dimensions. The first dimension ranges from deliberately chosen behaviour on the one hand, to routine or automatic behaviour on the other. The second dimension ranges from purely individual beliefs and motives to social cognitions and motivations. A two-by-two scheme is depicted in Table 3, where in each quadrant specific determinants and mechanisms of human behaviour are listed. Each theory in Table 3 may be used descriptively, to conduct a diagnostic analysis of the behaviour under consideration. But it may also be used prescriptively, to design goal-directed policy strategies for effective behaviour change. Given the multi-factorial nature of environmental behaviour it seems wise to apply various theories simultaneously, in order to chart prominent behaviour determinants and design combined strategies for behaviour change. Following Table 3, "reasoned behaviour" would best be adressed via the relevant reasoning process of subjects, whereas "automatic behaviour" would best be influenced via modification in the subject's environmental incentive structure. Similarly, "individual behaviour" needs to be approached differently from "social behaviour".

Seven Strategies for Behaviour Change

Commons dilemmas reflect persistent conflicts between many individual (producer and consumer) interests on the one hand and a small number of (large-scale) collective interests on the other. As dilemmas they may be "resolved" only by the achievement of a safer, sustainable balance of individual and collective benefits and risks. The nature and the effectiveness of various solution approaches have been investigated in a great number of laboratory and some field experiments (e.g. Dawes, 1980; Liebrand et al., 1992; Messick & Brewer, 1983). Most of these approaches may be categorized under seven general strategies for social behaviour change (Vlek, 1996a; see also Cook & Berrenberg, 1981; De Young, 1993; Gardner & Stern, 1996) (see Table 4). Strategies 1 (PhAA) and 3 (FES) and certain (physical) forms of strategy 6 (OCh) would initiate so-called structural solutions to a commons dilemma, whose basic nature or type would thereby be altered. Strategies 2 (RaE), 4 (IEC), 5 (SMS), certain other forms of strategy 6 (OCh), and strategy 7 (CVM) would imply cognitive-motivational solutions (Wilke, 1989). Through the last of these, individual players would be induced to behave in a cooperative (collectively rational) manner, while the basic nature and payoff

TABLE 3
Eight Behaviour Theories

Individually Determined	*Socially Determined*
Reasoned Behaviour	
Decision and choice theory (Hogarth, 1987)	Social comparison theory (Masters & Smith, 1987)
Theory of planned behaviour (Ajzen, 1991)[a]	Relative deprivation theory (Masters & Smith, 1987)
Automatic Behaviour	
Classical conditioning theory (Pavlov, 1927)	Social learning theory (Bandura, 1977)
Instrumental learning theory (Skinner, 1953)	Theory of normative conduct (Cialdini, Kallgren, & Reno, 1991)

[a] The theory of planned behaviour (Ajzen, 1991) also incorporates a social component, the subjective (social) norm; hence it partly fits also under "socially determined behaviour."

TABLE 4
Strategies for Risk Management

1. Provision of physical alternatives, (re)arrangements (PhAA)
   [adding/deleting/changing behaviour options, enhancing efficacy]
2. Regulation-and-enforcement (RaE)
   [enacting laws, rules; setting/enforcing standards, norms]
3. Financial-economic stimulation (FES)
   [rewards/fines, taxes, subsidies, posting bonds]
4. Provision of information, education, communication (IEC)
   [about risk generation, types and levels of risk, others' perceptions and intentions, risk reduction strategies]
5. Social modeling and support (SMS)
   [demonstrating cooperative behaviour, others' efficacy]
6. Organizational change (OCh)
   [resource privatization, sanctioning system, leadership institution, organization for self-regulation]
7. Changing values and morality (CVM)
   [appeal to conscience, enhancing "altruism" towards others and future generations, reducing "here and now" selfishness]

structure of the commons dilemma would be maintained. Structural solution strategies are generally more effective, but they are often not available or not easily implemented. Specific cognitive-motivational solution strategies (RaE, IEC, SMS, and some OCh) are more easy to design and apply, but their effectiveness is generally lower; in many cases, however, they are the only thing one could rely on. "Changes in values and morality" (CVM) stands relatively by itself as a cultural solution on which much behaviour change might come to rest.

SIX LINES OF ENVIRONMENTAL-PSYCHOLOGICAL RESEARCH

On the basis of the conceptual modelling in the previous section, we derive six major directions for psychological research about environmental problems. These are briefly described next.

Human Environmental Perceptions, Knowledge, and Evaluations

Environmental perception and evaluation depends on people's basic attitude towards nature (e.g. "anthropocentric" or "ecocentric"). Different cultural perspectives are supposed to be underlying our conceptions of nature (Douglas & Wildawsky, 1982), and our environmental behaviours rest on basic values and beliefs established during childhood education and socialization (Stern, Dietz, & Guagnano, 1995). Our appreciation of nature depends on a handful of basic landscape characteristics such as coherence, legibility, complexity, mystery, presence of water, and degree of human influence (Hartig & Evans, 1993; Kaplan & Kaplan, 1989; Ulrich, 1993). The need for perceived control is an important determiner of differences between city dwellers and rural farmers in their appreciation of Dutch nature-development plans (Van den Berg, Vlek, & Coeterier, 1998). Relatively little research has been devoted to attitudes and behaviours towards different animal species (see Plous, 1993). Perceived climate change is a complex topic whereby global warming and ozone-layer depletion are often confused (Bostrom, Morgan, Fischhoff, & Read, 1994). Improved interaction with nature should increase our awareness that the human species is part of nature.

Environmental Annoyance, Risk Perception, Stress, and Quality of Life

Much research attention has been devoted to this "classical" theme of environmental psychology. Annoyance, task disturbance, and stress from such factors as noise, unusual temperatures, crowding, bad air quality, and visual obstructions have been studied for various different groups of people and in different contexts (Evans & Cohen, 1987; Koelega, 1987). Perception of risks of industrial activities and natural disasters has yielded the conclusion that perceived risk is a multi-attribute concept and that risk acceptance depends on a variety of factors in a person's (or a group's) total decision context (Slovic, 1997; Vlek, 1996b). Quality of life is a relatively new concept in research on environmental change. In the Netherlands at least, an increasing number of people is concerned about the (often visible) decrease in the quality of their living environment as a result of expanding economic activities (Gatersleben & Vlek, 1998; Vlek, Skolnik, & Gatersleben, 1998). In collaboration with colleagues from the health sciences—particularly epidemiology—psychologists assess dose-response curves that could be used in setting standards for acceptable environmental annoyance, risk, and stress.

Cognitive, Motivational, and Social Factors in Environmental Exploitation

This research goes into the determinants of environmentally harmful behaviors (cf. Table 3). Our limited capacity for information processing may be expressed in ignorance and a lack of attention to environmental problems. Absence of regular feedback about environmental effects may lead to gullibility, helplessness, and apathy. Motivational factors are manifested in the relative overweighting of personal needs satisfaction "here and now." Technological optimism may be seen as one expression of people's reluctance to more fundamental changes in lifestyle. Social mechanisms and processes, such as status seeking and lack of trust in others' cooperativeness, perpetuate commons dilemma problems underlying large-scale environmental risks. As discussed earlier (see also Gardner & Stern, 1996), people's wider social and physical context is infrequently the focus of research attention. Winter (1996) reviews various branches of psychology, showing what each branch has to offer (or has not yet offered) to explain human environmental behaviour and to help safeguard sustainable development.

Characterizing Sustainable Behaviours, Lifestyles, and Organizational Cultures

This research deals with the description and feasibility analysis of sustainable behaviour patterns, lifestyles, or company cultures. Again, perspectives from other disciplines are necessary to specify sustainability in terms of aggregate environmental (and economic and social) effects of human behaviours and activities. Psychologists may assess lifestyle and company culture in terms of (a) cognitive-motivational, social, and physical determinants, (b) actual behaviours or activities, and (c) environmental consequences and effects. A psychological feasibility analysis may yield conclusions about the degree to which unsustainable behaviours can be altered and to what extent sustainable lifestyles or company cultures would be acceptable for the people and organizations concerned. Stern, Dietz, Ruttam, Socolow, and

Sweeny (1997) describe unsustainable producer and consumer activities and they give suggestions for sustainable development. Noorman and Schoot Uiterkamp (1998) demonstrate the interdisciplinary collaboration needed to identify sustainable behaviour patterns. In such research, the concept of quality of life is an important dependent variable.

Models and Methods for Changing Unsustainable Behaviour Patterns

Reducing environmental harm and risks in commons dilemma situations hinges upon changes in the behaviours of independent actors at the micro-, meso-, and macro-level of the society involved. For behaviour change to occur there is a need for goal-setting, feasible behaviour alternatives and motivating forces that steer behaviour in the desired (sustainable) direction (cf. Table 2). In a commons dilemma situation, problem awareness, risk-benefit evaluation, and the availability of feasible behaviour options are conditions for realizing behaviour change. Seven general strategies for social behaviour change were presented in Table 4. Their practical use and the conditions under which they yield optimal effects are primary topics for psychological research. But applying instrumental strategies is not enough to change behaviours. People will also want to know why, how, what for, and in what direction they should change. Therefore, ideas and findings from other research lines given earlier will also be needed.

Supporting Environmental Policy Formation and Decision Making

Here one would serve the policy makers' perspectives on the assessment and management of environmental risks. This requires adequate definitions of environmental quality, models for structuring policy decision problems, and methods for capturing experts' judgements. "Contingent valuation" is one developing methodology for evaluating common (environmental) goods (e.g. Cummings, Brookshire, & Schulze, 1986; Hoevenagel, 1994; Ritov & Kahneman, 1997). A long tradition of research on risk perception, rules for risk acceptance, and multi-attribute decision support systems provides useful concepts, models, and methods for handling complex environmental decision problems (Fischhoff, Lichenstein, Slovic, Derby, & Keeney, 1981; Merkhofer, 1987; Otway & Peltu, 1985; Renn, Webler, Rakel, Dienel, & Johnson, 1993; Vlek & Cvetkovich, 1989). Dowlatabadi and Morgan (1993) and Van Lenthe, Hendrickx, Biesiot, and Vlek (1997) provide an analytic decision support system for climate-change policy making. An emerging new theme here is the construction and evaluation of policy scenarios for sustainable development, by various interest groups and members of the public at large. How may these be constructed; how should they be communicated; and how could they best be evaluated?

Distinguishing six lines of psychological research is somewhat arbitrary, because elements of several lines are relevant for understanding and managing a given environmental problem. A comprehensive psychological approach to environmental problem solving must be multi-theoretical and multi-method in character. More complicating still is the need for inputs from other types of scientists, notably physicists, biologists, and economists, whose research would be indispensable for identifying other components of the environmental problem under consideration.

A FUTURE DIRECTION FOR ENVIRONMENTAL PSYCHOLOGY

Recently, various authors have criticized psychology for its inability to study human social and organizational behaviours as the fundamental causes of environmental degradation. Reser's (1995) doubts about the acceptance of ecopsychology were cited earlier. Kidner (1994, p. 362) explains "why psychology is mute about the environmental crisis" as follows:

> My argument is threefold: first, that psychology . . . perpetuates and legitimizes a world view in which the individual is seen as separate from the environment; second, that . . . psychology reproduces an anthropocentric ideology that denudes nonhuman aspects of the natural world of essence and inherent value; and third, that . . . psychology colludes in the denial of those [emotional, spiritual] aspects of Being that are capable of perceiving and protesting against the violence of environmental destruction.

Winter (1996) accuses psychology of actually serving the existing socioeconomic system of Western industrialized countries and stresses the need to develop ecological psychology as "the study of human experience and behavior, in its physical, spiritual and political context, in order to build a sustainable world" (p. 283). Gladwin, Newburry, and Reiskin (1997, pp. 238–240) wonder: "Why is the northern elite mind biased against community, the environment and a sustainable future?" and they identify four principal interrelated origins: "(1) a cognitively bounded biological mind . . ., (2) an obsolete worldview mind . . ., (3) an addicted contemporary mind . . ., and (4) a delusional psychodynamic mind . . . ." They then formulate four sets of hypotheses about the different "minds" and provide a research agenda for investigating the conditions for developing a "sustainable mind." For example, Hypothesis 2 (p. 241) states: "The biomind is adapted for proximity rather than distance"; Hypothesis 10 (p. 248): "The viewmind conceives reality according to individualism rather than communitarianism"; Hypothesis 11 (p. 250): "The contempmind is programmed to favor market efficiency rather than social justice"; and Hypothesis 19 (p. 252): "The psychomind protects the self from anxiety via rationalization rather than accurateness."

Admittedly, psychological research on environmental problems is lagging behind. Environmental psychology so far has indeed been strongly anthropocentric and functionalistic, with its primary focus on environmental effects on human behaviour and wellbeing. But those environmental psychologists who have been studying environmentally harmful behaviours have confronted significant barriers for their societal impact. A natural-science perspective has long dominated environmental policy making. Many policy makers work under a (relatively easy) technological optimism, while downplaying the importance of other driving factors in the TEDIC-complex. Also, policy makers do not understand psychology enough to appreciate its potential contributions. As Gladwin et al. (1997), among others, point out, the "contemporary mind" is set on the free-market ideology of individual enterprise, to the neglect of collective costs and risks in numerous commons dilemma situations.

Psychologists can do much to change this undesirable state of affairs and to enhance their contribution to sustainable development in the environmental, economic, and social sense of this concept. They should acknowledge environmental problem solving as a fully fledged area of application. They need to think and work multi-theoretically and use multiple methods. They have to consider man–environment transactions not only at the level of the individual person, but also at higher levels of social and organizational aggregation. Their more frequent participation in multidisciplinary work is essential. They must meet regularly with policy makers facing specific environmental problems. They should engage more often in international coordinated research. And they should consider human quality of life as their primary dependent variable in the context of sustainable development.

ENVIRONMENTAL PSYCHOLOGY, POLICY FORMATION, AND DIPLOMACY

At the end of the 20th century, national and international policy makers and politicians are confronted with a number of serious problems for sustainable development. Climate change is unfolding while emissions of greenhouse gases are still increasing. Tropical deforestation has not been brought to a halt. Agricultural expansion and practices keep reducing biodiversity. Steady growth of motorized transport leads to expensive investments in road infrastructure, to fossil-fuel consumption, pollution, noise, and public annoyance. A strong worldwide growth of air transport similarly has large-scale environmental effects, locally as well as globally. Of the 450 or so nuclear electric power plants, a significant number are unsafe for technical and/or organizational reasons. Regional wars such as those in Angola, Congo, Irak, and Serbia (Kosovo) have devastating effects on local and regional environmental qualities, including people's immediate living environments. In a recent official declaration (UN/ECE, 1998, p. 281) the European Environment Ministers state: "We recognize that many of the environmental problems of the world have their origin in the UN/ECE region and we reaffirm the special responsibilities of the UN/ECE countries in contributing to solving these problems and our aspiration towards a global leadership role for the UN/ECE countries in pursuing sustainable development." The ministers also stated that international cooperation is essential and that international research and data management in the European countries is still inadequate.

What should be done to enhance psychology's appreciation of environmental policy problems and to increase policy makers' and diplomats' sensitivity to the essential psychology needed for improved environmental management? Some suggestions are the following:

1. psychologists should more frequently confront policy makers and diplomats to define and analyze specific environmental problems, in the company of relevant other scientists;
2. policy makers and diplomats should acknowledge that sustainable development is about long-term environmental, economic, and social qualities of life, and they should therefore adopt a comprehensive framework ranging from technical and economic to institutional and cultural issues;
3. environmental psychologists should engage more often in problem-oriented multidisciplinary research demonstrating to policy makers and diplomats what their relative contribution actually is, and that this may be an essential part of effective policies;
4. policy makers and diplomats should be less sceptical and evasive about social-science analysis and advice concerning environmental problems, and they should be more attentive to the partiality and possible counterproductiveness of simple technical and economic "solutions";
5. environmental psychologists, policy makers, and diplomats alike must adopt the view that an environmental impacts assessment of important human activities should be self-evident: to what extent do the economic and social benefits sought justify the environmental burden involved?

Above all, policy-making bodies and diplomatic organizations should be aware of the widespread ideological bias in favour of the free market system of economic production and consumption. Free market systems involve many things that are not in the public interest, they do not promote social justice, and they work against long-term human (environmental) security. Adequate management of common goods and qualities requires improved government organization and more sophisticated policy formation and decision making. An effective, timely assessment, communication, and management of environmental problems demands a sustainable balancing of individual liberties and collective concerns. Historically, the liberal push towards enhanced individual

freedom has led to excessive environmental exploitation. A commons dilemma analysis yields the conclusion that individual liberties must naturally be subordinated to vital collective interests.

Would not this lead to decreases in many people's Quality of Life (QoL)? That depends very much on the QoL dimensions that are focused on, for instance, health, nature, family, leisure, work, income, beauty, food, work, housing, safety, freedom, equity, or personal development. Ever-growing material wealth does not lead to ever-increasing wellbeing and happiness (cf. Lintott, 1998). Eventual changes in people's QoL profile may be attractive on the average, or people may adapt to and live with them more easily than they had thought. Some of the changes required of Western industralized consumers are simply necessary to allow for improvements in other people's QoL profiles elsewhere in the world. This is one deeper message environmental psychologists could explicate to policy makers and diplomats concerned with long-term human security, nationally and internationally.

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