THE QUALITY OF THE ENVIRONMENT: A REVIEW

IAN BURTON

The first recommendation of the Environmental Pollution Panel of the President's Science Advisory Committee reads: "The public should come to recognize, individual rights to quality of living, as expressed by absence of pollution, as it has come to recognize rights to education, to economic advance, and to public recreation." Most of the Panel's 104 recommendations are more technical, but it seems significant that a group of natural scientists should wish to emphasize so clearly that the problem of environmental quality is political and social as well as technical. Although the Panel gave pride of place to "individual rights to quality of living, as expressed by absence of pollution," it failed to follow with strong recommendations on how these rights are to be secured. For example, on automobiles as a source of air pollution the Panel has five recommendations. These call for (1) recognition of "the special importance of the automobile as a source of pollution problems," (2) "registration before use" of "the addition to motor fuels of substances which are not eliminated by the combustion process," (3) intensification of "surveillance of body burdens of lead and trends of lead in air, water and food," (4) a pilot survey and studies "to assess the significant methods of entry and the accumulation of lead from vehicle exhausts in various soils and plants," and (5) exertion of "every effort to stimulate industry to develop and demonstrate means of powering automobiles and trucks that will not produce noxious effects." The Panel could have further recommended that the California regulations on automobile exhausts be adopted nationally. Instead they advised: "We must follow carefully the results of California's imposition of special regulations, and be prepared to extend those that prove effective to other smog-ridden localities." Such caution might be thought to reflect deference to the sensibilities of the automobile industry. Another way to put it is to say that "imposition of special regulations" to protect "individual rights to quality of living" is scarcely possible unless the public recognizes such rights and demands that they be protected.

Another reason for the Panel's cautious position is the hiatus between the recognition of a right in principle and the detailed specification of what that right entails. This is well exemplified by the general agreement that pollution should be controlled and curtailed and the almost total lack of agreement on appropriate standards. A comparison with the right to education is instructive. This right has long been recognized, but there is almost constant debate about what it entails, and there is continual redefinition not only for some underprivileged minority groups but also for the majority of white middle-class Americans.

Fundamental Issues

The right to a high-quality environment is only just in course of establishment, and the fundamental issues are now being identified. What are the criteria for a good-quality environment? In what ways will opinion continue to change about the desirable characteristics of

\footnote{"Restoring the Quality of Our Environment: Report of the Environmental Pollution Panel of the President's Science Advisory Committee" (Washington, D. C., 1965), p. 16.}

Dr. Burton is an associate professor in the Department of Geography at the University of Toronto, Canada.
environment? Who now has access to a good environment, and who is denied access? Who pays, and who should pay, for preserving or creating good environments? What is an appropriate division of responsibilities between the public and private sectors? How much public money should be spent, and in what ways should it be used? Is there actually danger to public health? Do people really need contact with nature to alleviate the stresses of city life? In what way is environment connected with mental health? How can the benefits of environmental improvements be measured and paid for?

These questions are important, and there is a growing movement to try to provide some answers. One essential point of departure is the need for an agreement on definitions of environments of different kinds. For many specialists working on problems of environmental quality the term "environment" refers to nature or to ecosystems. It covers land, air, water, flora, and fauna and their interactions both "natural" and as managed or modified by man. This is not an adequate definition, however, because the environment may also be taken to include many products of human activity. Automobile exhausts increase the carbon monoxide and sulphur dioxide content of the atmosphere. Human and other wastes change the quality of the water in lakes that are used for recreation. And just as man changes the quality of the environment by his presence in it, so he is in turn penetrated by the environment. Food crops are obviously part of the environment and perhaps remain so after ingestion. The microscopic fauna of the gastrointestinal tract are also presumably part of the environment.

Planners and architects often broaden the definition of environment to include anything physical or tangible and external to man, of whatever origin. Thus buildings and streets constitute a large part of the urban environment, and the size, shape, color, and furnishings of a room are viewed by some as possibly exerting environmental influence on the social activities they surround. If the environment includes (as some would prefer) everything that affects the physical and mental health of the individual, then clearly other persons, their numbers and characteristics, constitute an environment of a social kind. Since social processes are intimately linked with attitudes and states of mind, then environment must extend to include psychic phenomena as well.

The breadth and complexity of the concept of environment are apparent. There is no knowledge or area of specialization that is not intimately concerned with environment. It may be seriously asked, therefore, if the concept is too broad to have any operational value. Like the term "mankind," the term "environment" signifies a concept but does not convey much information. Nevertheless, the concept of environment and the problems it implies have achieved such vogue that universities all over North America are reorganizing to accommodate it. New programs are being established with the word "environmental" being used to describe architecture, archeology, behavior, design, economics, engineering, geology, health, planning, pollution, psychology, and sociology. There seems to be no school of environmental law at present, but it can be only a matter of time before one appears.

Although the academic problems of definition and scope remain unresolved, the current concern with environmental quality has clear justification in that a series of problems exist that are of public interest and are recognized as important political issues, actual or potential. The problems are difficult to resolve and require the cooperation of many experts from different disciplines. The activity in the universities, therefore, is certainly needed from a practical point of view.
Policies and Polemics

The broad social context of the concern about environmental quality has been profounded from a committed viewpoint by social philosophers and moralists such as John Kenneth Galbraith and Paul Goodman. Galbraith was one of the first to draw attention, in 1958, to the contrast between private affluence and public squalor. His statement was quickly followed by reports from Resources for the Future, Inc., which helped to allay fears about the long-run availability of natural-resource commodities and pointed to environmental quality as a problem of considerable emergency and social importance. These views struck a responsive chord in the new Kennedy administration of 1960, and political action was spurred by the controversy aroused by such books as Rachel Carson’s “Silent Spring.” Critics agreed that the case was overstated, but overstatement may have been justified and legitimate way of arousing public concern. New legislation certainly resulted in the first half of the 1960’s on air and water pollution, pesticides, landscape pollution and desecration, and highway beautification. In 1965 a White House Conference on Natural Beauty was held. If the pace of innovation has slowed since then it is not because problems have been solved or are less widely recognized, but because of more pressing preoccupations elsewhere. Once these are settled, a renewed attack on environmental-quality problems seems likely.

The political and legislative action was in some respects ahead of available knowledge and understanding, even though it may have lagged behind public opinion. Public concern continues to be stimulated by polemical statements about the deteriorating environment. Recent examples include Rienow and Rienow’s "Moment in the Sun," a book that protests the neglect of ecological principles. A brief quotation gives the flavor of the authors’ approach: "The redwoods are being slashed into defenseless patches, the mighty Niagara’s roar is cut in half, the Grand Canyon has been measured for hydroelectric harness, the Everglades has been drained—then callously flooded—for commercial advantage and its wildlife rots in the receding slime." In the authors’ view “already we have passed our zenith,” and the moment in the sun will soon pass unless we can control population and accept ”a totally new code of values...[that will] bring us into equilibrium with our environment.” A similar book is Dasmann’s "The Destruction of California," doubtless others will continue to appear.

---

4 Rachel Carson: Silent Spring (Boston, 1962).
Much of this writing is reminiscent of the conservationist school, which is now reorganizing around the theme of environmental quality. The gloomy forebodings and the shrill cries of protest from authors like Rachel Carson and Raymond Dasmann are countered by the proponents of the technological panacea or the "technological fix" as described by Weinberg. In extreme form the technological optimists are, in their way, no less polemical than the environmental pessimists. A recent example is "The Environment Game," by Nigel Calder. This flight of imagination foresees a world populated by nine billion persons in which agriculture will be a thing of the past. People will be living in cities built on sea or ice, and land will be restored to its natural state. Food requirements will be met entirely by manufacturing processes located in the cities, and the encircling wilderness will be crowded with enlightened mankind hunting animals with crossbows for sport. Such social-science fiction is totally unrealistic or uninformed about social and political processes, but it helps to define the opposite end of the spectrum from the position that all is (almost) lost.

Good policies are not likely to emerge from such debates. Morally and ideologically neutral research is needed in which men try to approach the tendentious issues of environmental quality with objectivity and dispassion. Once such a stance has been adopted, broad pronouncements give way to more cautious and reflective opinions; most individuals can speak with authority on only a small segment of the spectrum. The books of a more scientific nature that have appeared in the last few years are therefore commonly multiple-author collections of papers, which, though they frequently lack coherence, provide useful statements.

**ECOLOGY AND ECONOMICS**

One of the more outstanding symposium volumes is "Future Environments of North America," a compilation of the proceedings of a conference held in 1965. The thirty-four papers, together with transcripts of some lively and entertaining discussions, provide fascinating reading, especially on the interrelation between economics and ecology. Two concerns are expressed repeatedly. One is that ecological knowledge is fundamentally weak and is unable to predict satisfactorily the changes in ecosystems that are likely to result from specific human interventions. The same, of course, could be said about much of geography. Could geomorphologists, for example, provide a precise statement of the physiographic consequences of a 15 percent increase in average annual rainfall, which might well be achieved through weather modification? It thus appears that the role of the ecologists often is to give warning about the possibility of serious consequences of human intervention in the environment and to stress the unpredictable and possibly disastrous nature of such consequences without being able to attach any very precise estimate of their probability. The second major concern of the volume is the inadequacy of market-model economic theory to cope with the externalties and intangibles of environmental quality. The latter difficulty continues to attract the attention of economists.

---

A general statement on the economic approach has been prepared by Herfindahl and Kneese,12 of Resources for the Future. Their book is subtitled "An Economic Approach to Some Problems in Using Land, Water, and Air," and in it they make strong claims for economics. They consider, for example, that "the discipline of economics is central to progress on these problems, for it is economics alone that can formulate these problems in the terms to which they must finally be reduced, namely the balancing of our varied desires in these matters against the costs of satisfying them in various degrees." It is hard to take the authors seriously, and perhaps one should not give them that satisfaction. As they well know, it is not possible to reduce these problems to economic terms satisfactorily at the present time, and it may never be possible. Even if it were, a false underlying assumption is implied, namely that what is best in economic terms is necessarily best in all other ways also. In this view man lives and works to serve the economy and not vice versa. Many students of environmental quality, including ecologists, regard their work as an effort to remove such assumptions and value judgments from a dominant position in the American way of life.

The Herfindahl and Kneese book does contain a good nontechnical statement of the problem of externalities. The crux of the matter is the need "to take proper account of all the costs and benefits" when making decisions. There is also a discussion of the physical, chemical, and biological aspects of pollution, useful for the social scientist unfamiliar with BOD and CO₂. The authors' main interest is to see all problems "in the terms to which they must finally be reduced," and in practice this simply means dollars and cents. The most desirable situation imaginable, in their view, would be that the invisible hand of the market mechanism would resolve all the allocation problems without anybody's needing to worry. The fact that it does not is regretted as "market-failure" and as "less-than-perfect operation of the economy." Faced with this rather deplorable situation, economists should attempt to measure all the benefits and costs. "The question in each case is what a rational consumer or producer would be willing to pay in order to avoid the damage that is done by the pollutant in question." Where this is not feasible, analysis is to be made of the "costs and benefits associated with achieving alternative levels of control."

The authors make few suggestions as to how external benefits and costs are to be measured, and when they do introduce one, it lacks conviction. For example, they propose that the external effects of air pollution might be measured by the "commuting costs people are willing to incur to avoid polluted air." Studies of the spatial variation of urban land values and assessments do not suggest that it is possible to hold all other variables constant while the effect of one of them (air quality) is measured. Even if costs incurred to avoid polluted air were measured, this would not necessarily attain the goal of "balancing of our varied desires... against the cost of satisfying them in various degrees." The authors do say that "it is apparent that many items of willingness-to-pay and cost information are unavailable and that obtaining them may be a difficult task, if indeed it is possible at all." Nevertheless, they assert, "we believe that sample surveys possibly could yield useful information on the importance individuals attach to values of this type." Another suggestion is that "studies in environmental perception and social psychology would permit us better to gauge the actual values which different configurations of the urban environment can yield." Sample surveys, environmental perception, and social psychology do not sound much like economics. Such

approaches are entirely appropriate to the complexity of the problem of environmental quality, but the authors maintain that it is "economics alone that can formulate these problems in the terms to which they must finally be reduced." Their own book seems to show that in practice economics is something less than that.

LEGAL SOLUTIONS

A better case might be made for law as being the discipline "alone that can formulate these problems in the terms to which they must finally be reduced." In a particularly lucid essay in a volume on "Environmental Quality in a Growing Economy" Turvey shows some of the limitations of economic analysis. He argues that prescriptions on how much should be done to preserve or improve the quality of the environment and at what cost "cannot be decided on a purely technical basis by an economic calculation," but he acknowledges that "even though an economic calculation of gains and losses is often not sufficient to reach a well based decision, it is nearly always an essential preliminary."

Where an activity has a deleterious effect on its neighbors, as when the fluorine in the smoke emitted from a brickworks causes damage to crops and animals on nearby farms, it may be possible to resolve the conflict by government regulation, in this case regulation of the quality of the emission from the smokestack. The brickworks may attempt to reduce the toxic effects of the smoke by technical means, with or without a government subsidy. Or the owners may agree in a court of law to pay damages or compensation to the farmers. Often this can be arranged by private contract without resort to legal action.

Where external costs are inflicted on many individuals by one another, as when too many cars crowd an expressway, a possible solution is to use the power of taxation. This is already done on toll roads and turnpikes and might be extended to all other roads. Another legal approach to externalities is to internalize the side effects within the compass of larger decision-making units, as when the sanitation authority of a community that discharges its untreated sewage into a river is merged with the water-supply authority of a nearby community that uses the same river (downstream) as its source of supply. In this way the new larger authority is able to take into account the damaging effects of one of its functions on another.

By such legal and institutional means conflicts about environmental quality can be resolved in the absence of a market mechanism and of well-defined property rights. The application of these devices in a democratic society involves considerations of fairness that require legal or political decisions. Such decisions can be equitable only if they recognize the distribution of gains and costs. The fact that a detrimental side effect exists does not automatically mean that an improvement is possible which is better economically. Only rarely would complete elimination of an existing side effect be economical.

The Role of Technology

The problem of choice in legal and institutional solutions is complex, and answers are sometimes reached only after long delays and high legal costs. A long wrangling process can be extremely frustrating, and it has the added disadvantage that the environment may

---


continue to deteriorate in the meantime. Consequently, the urge to seek for quick solutions is strong, and the solution to which many people turn is some technical innovation that will resolve the difficulty easily and perhaps also at low cost. The proceedings of many conferences on pollution contain strong and eloquent pleas for more scientific research directed in part at the development of technical solutions. In many cases technical solutions can be found, and when the complexities of making economic or legal adjustments confront us, experience seems to have shown that applying new technology to the environment is the path of least resistance. The Achilles heel of the technologists’ approach is, of course, that the present problems of environmental quality arise precisely from the application of technological solutions to problems in the past. The new technologies now being developed may in their turn prove to be only palliatives that will pile up greater difficulties to be confronted at a later date.

The advance of science and technology and their application to problems of environmental quality have also been subject to the criticism that the results are not appropriate to the aesthetic, psychological, and physiological needs of man even though these results may be technically sound. Planners and architects have been engaged in some serious self-criticism along these lines, as is illustrated in the American Institute of Planners’ volume “Environment for Man.” The papers in this collection are concerned with the planning and designing of environments that are optimal on a human scale “with man as the measure.” The contributions deal with the physiological, psychological, and sociological impacts of the physical environment from a planning standpoint. Taken together, the views expressed amount to a serious criticism of the way in which city planners and architects have failed to produce environments that are as healthy or as psychically satisfying as they presumably should be. An interesting example is Alexander’s discussion of the way in which people have moved to cities for human contacts and have found the contacts increased in number but empty and unsatisfying in nature. He then proposes some ingenious designs of urban form specifically constructed to promote intimate contact. A valuable survey of the problems raised by this pattern of thought is provided by Dyckman, who emphasizes the planner’s need to draw on environmental and social scientists.

One vital input to the planning process is fundamental knowledge of the processes of interaction between man and environment. “Interactions of Man and His Environment” is a book that provides a useful introduction to the already large literature on the technicalities of human physiological responses. Topics covered include the thermal environment, hearing and vision, and a field described as “atmospheric ecology.” Panel discussions highlight both

---

See, for example, the following: “Proceedings, the National Conference on Water Pollution” (Washington, D. C., 1961); “National Conference on Air Pollution Proceedings” (Washington, D. C., 1963); “Background Papers and Proceedings of the National Conference on Pollution and Our Environment” (4 vols.; Montreal, 1966).


Christopher Alexander: The City as a Mechanism for Sustaining Human Contact, in Environment for Man [see footnote 16 above], pp. 60-102; comments, pp. 102-109.

John W. Dyckman: City Planning and the Treasury of Science, in Environment for Man [see footnote 16 above], pp. 27-52; comments, pp. 52-59.

Burgess H. Jennings and John E. Murphy, eds.: Interactions of Man and His Environment (New York, 1966).
the need to control and improve the environment, with human physiological responses as the criteria, and the new technical possibilities of doing so.

HUMAN BEHAVIOR AND RESPONSE

Probably the most complex aspect of environmental quality, and certainly one of the most neglected, is that of human behavior and response. There is a growing effort in several disciplines to try to approach the problem in a more scientific manner. The "1967 Directory of Behavior and Environmental Design" lists 270 professionals from thirty disciplines who have engaged in research in the integrative field of environmental design and human behavior. There is even the suggestion that a new science of environment is emerging, which will eventually develop professional loyalties of its own and be accorded departmental status in the universities.1

Some of the geographical contributions are reviewed in White's paper on the "Formation and Role of Public Attitudes."2 Approaches used include analysis of interpretations of environment made by writers and artists in the style of Glacken,3 Lowenthal,4 and Tuan;5 public-opinion polls; examination of consumer choices as exemplified by Wollman6 and as proposed by Herfindahl and Kneser;7 study of decision making and choice behavior as exemplified in the work of White, Kates,8 and others; and experimental research.9

"America's Changing Environment," issued by the American Academy of Arts and Sciences,10 contains fifteen papers. In it Nathaniel Wollman describes the recent work of economists as the "new economics of the environment."11 Aaron Wildavsky responds that environment economics contains a lot of politics but not much economics. He prefers to cast the net more broadly and advocates a "new political economy." Throughout the book the emphasis is strongly on qualitative changes in the environment.

The dichotomy between quality and quantity is the central focus of a new publication

---

1 "1967 Directory of Behavior and Environmental Design" (Research and Design Institute, Providence, R. I., 1967).
3 Gilbert F. White: Formation and Role of Public Attitudes, in Environmental Quality in a Growing Economy [see footnote 13 above], pp. 105-127.
8 Op. cit. [see footnote 12 above].
10 Little experimental work has been completed, though Joseph Sonnenfeld and Julian Wolpert have studies in progress using slide tests and game theory respectively.
edited by Ciriacy-Wantrup and Parsons\textsuperscript{28} and containing fourteen papers presented under the auspices of the Chancellor’s Committee on Natural Resources during exploration at Berkeley on how to organize the universities’ interest in natural resources and environmental studies.

The potential results of collaboration between psychologists and geographers are well presented in a special number of the \textit{Journal of Social Issues} devoted to “Man’s Response to the Physical Environment,” edited by Kates and Wohlwill.\textsuperscript{29} Collaborative efforts of this kind will clearly encounter some difficulties, one of which is obtaining a mutually acceptable diagnosis of the problems in mutually acceptable terminology. For example, in his paper on the “Psychological Aspects of Urbanology” Parr\textsuperscript{30} emphasizes the lack of stimulus variation in the urban environment that results from the monotony of the cityscape. In contrast, Wolpert’s paper on “Migration as an Adjustment to Environmental Stress”\textsuperscript{31} describes the urban environment as a source of stress resulting from complexity and overstimulation.

Wohlwill points out that there is not necessarily contradiction in finding both complexity and monotony present simultaneously in the same environment. The extent to which a set of stimuli appear complex or monotonous depends not only on the characteristics of the stimuli themselves but also on attributes of the recipient, including personality. Research by geographers on attitudes and perceptions of the receivers of environmental stimuli is reported in “Environmental Perception and Behavior,” a collection of five papers edited by Lowenthal. In this volume Yi-Fu Tuan\textsuperscript{32} discusses the symbolic significance attributed to deserts and tropical islands. Beck\textsuperscript{33} uses a symbolic test to demonstrate that individuals differ in their “spatial styles,” or the way in which they structure the sense of the relatedness of things in their minds. Apparently one way in which geographers differ from nongeographers is in a more marked preference for well-defined boundaries!

In a study of “The Role of Attitude in Response to Environmental Stress” Lee\textsuperscript{34} uses the word “attitude” almost synonymously with “response.” Thus four attitudes are avoidance, psychological adaptation, physiological adaptation, and constructive behavior. The response of adaptation presents one of the fundamental obstacles to prescriptive findings on environmental quality. Human beings as a species are notoriously adaptive animals. Conditions of environmental quality that initially might be considered intolerable have a habit of

\textsuperscript{28} S. V. Ciriacy-Wantrup and James J. Parsons, eds.: \textit{Natural Resources: Quality and Quantity} (Berkeley and Los Angeles, 1965).


\textsuperscript{30} A. E. Parr: Psychological Aspects of Urbanology, in \textit{Man’s Response to the Physical Environment} [see footnote 28 above], pp. 39-45.

\textsuperscript{31} Julian Wolpert: Migration as an Adjustment to Environmental Stress, in \textit{Man’s Response to the Physical Environment} [see footnote 29 above], pp. 92-102.


\textsuperscript{33} Yi-Fu Tuan: Attitudes toward Environment; Themes and Approaches, in \textit{Environmental Perception and Behavior} [see footnote 31 above], pp. 4-17.

\textsuperscript{34} Robert Beck: Spatial Meaning, and the Properties of the Environment, in \textit{Environmental Perception and Behavior} [see footnote 31 above], pp. 18-41.

\textsuperscript{35} Douglas H. K. Lee: The Role of Attitude in Response to Environmental Stress, in \textit{Man’s Response to the Physical Environment} [see footnote 29 above], pp. 83-91.
becoming quickly accepted and barely noticed. Sonnenfeld\textsuperscript{19} has also been concerned with adaptation to environmental stress; in making a major distinction between natives and nonnatives in a given environment he concludes that natives, with their more limited environmental experience, have greater ability to adapt over time and that "attempts to improve the amount of space and quality of landscape for the native may result in wasted space, expense and effort." People experience different environments as a result of movement or migration and as a result of environmental change at one place. As changes at a place occur more rapidly the difference in adaptability of natives and nonnatives may decline, and as the proportion of nonnatives in the population rises demands for a high-quality environment may also be expected to rise.

PROSPECTS

It seems clear that the current wave of interest in environmental quality will continue for a while longer. Certainly there appears to be no diminution in the magnitude of the problems relating to environmental quality or in the flow of popular and semipopular books urging the public to action.

Public concern is apparently growing, and the research of social scientists adds more than the sum of their findings. Changing our conceptions of the world changes the world itself. There are no simple answers or solutions. "Rights to quality of living, as expressed by absence of pollution" are being recognized by the public, but the price of a high-quality environment is more than eternal vigilance. Quality in environment, as in other things, requires a high degree of self-knowledge. It also requires an ability to observe and measure low degrees of determination in environmental quality and to take action to reverse these before we accept them and cease to notice them.

\textsuperscript{19} Joseph Sonnenfeld: Environmental Perception and Adaptation Level in the Arctic, in Environmental Perception and Behavior (see footnote 35 above), pp. 42–59.