

# THE ENVIRONMENTAL FACTOR IN DEVELOPMENT PLANNING

by Lynton K. Caldwell

*This paper is an argument for increased attention to environmental considerations in the theory and practice of development planning. Its thesis is that planned change will in all probability fail to improve the condition of man if it proceeds without adequate attention to its affect upon his environment. This proposition may not sound unreasonable, but it will not become intelligible until substance and definition are given to the term "environment"*

## **The environmental concept**

The first thing that must be understood about the term "environment" is that it refers to a relationship. It is in this relative sense, as understood by the ecologist, that the concept of environment is used here. There is no environment except in relation to the thing environed. Environment refers to the total complex of things interrelating with any object or system. In the broadest sense one may (if he can) conceptualize for any object a surrounding matrix of seeming infinitude, the horizons of which are lost in the farthest reaches of reality. In this absolute sense environment is so comprehensive and complex as to be almost without practical or operational value. But it may restrain man's vanity to be reminded of the incomprehensible forces of the physical universe that condition his improbable existence. For man's own purposes it is necessary to bring the concept of environment closer to the reality with which he interacts.

---

Within the context of development planning "environment" refers to the complex of bio-physical-psycho-social factors with which men and societies are directly and continually interacting. Even this *immediate* environment involves such a complex and extended set of relationships that it cannot be dealt with in a practical or operational sense as a totality. Nevertheless, because its multiplicity of aspects do add up to an interrelated whole, the immediate environment of any society cannot be understood for purposes of planning or development unless perceived in relation to the larger totality. Obviously our ability to perceive and understand our environmental complex is severely governed by our human faculties and limited by the imperfection of our knowledge.

Our situation in dealing with elements of our environment in relation to its totality may in some respects be clarified by the analogy of a chess board. Let us suppose that the objectives that man seeks to realize through manipulating the bio-physical aspects of his environment (food, clothing and shelter at the very least) are analogous to winning a game of chess. The rules of the game simulate the so-called rules of nature that govern the environment and that determine the behavior of man. The chessmen are elements in the environment and their collectivity on the board comprises the total relevant environment. Now when a player moves the chessmen, the better he knows the rules of the game the better his chances for winning. As each piece on the board relates directly or potentially to every other piece each move will influence or preclude subsequent moves. The players are also advantaged to the extent that they can see the entire board and are not, for example, playing the game blindfolded. But knowing the rules and seeing the board will be of little avail if a player is inattentive to his own moves and their consequences or to those of his opponent.

This chess board model is of very limited adequacy because of its closed and static character. The environment of man is open and dynamic. The rules governing the game of existence are only partially and imperfectly understood. The number of pieces on the board keep changing and the size and shape of the board also changes. The instructive value of the model lies in making explicit a very simple but fundamental proposition implicit in systems theory and ecology: changes made in any part of an interrelated system not only change interrelations among other parts of the system in arithmetic, geometric or exponential progression, but in so doing alter the character of the system as a whole.

The environmental concept is therefore directed toward interrelationships, rather than toward the actual substance of things. Because human beings are a part of a bio-physical environment with which they are and must be in continual interaction, consideration of environmental factors in development planning may logically begin with the possibilities and limitations that are summarized in the term "nature". This natural environment has been categorized by man in different ways for different purposes—into taxonomic and other classifications developed in the sciences. It is also perceived in terms of natural resources and geographic areas. Components of the natural environment include atmosphere, water, minerals, soils, living organisms, in relationships now commonly described as ecological. Man and his institutions are factors in this complex of natural forces and are abstracted from it in our thinking for obvious reasons of human convenience.

To pose a dichotomy between the bio-physical and psycho-social environments of man is to misconstrue the environmental concept. For practical purposes one may deal with environmental factors that are external to man's social institutions. Nevertheless, concern with factors as remote as distant galaxies or as intangible as elementary

particles may influence man's perception of himself in nature and ultimately affect his values and behavior. Moreover, the sciences of genetics, psychology, bio-chemistry and bio-meteorology are rapidly finding new evidence of the inseparability of human behavior from the forces of the external environment.

An equally thorough misconstruction of the environmental concept dismisses it as unmanageable because it conceivably could include everything. Similar logic could write-off the theory of gravitation. The failure here is to distinguish between a general theory and its practical application. The chess player does not have to consider every conceivable move or strategy in order to win the game. He takes one move at a time and his skill consists in perceiving the combination and sequence of moves most likely to checkmate his opponent. In like manner the development planner does not have to take all of reality into account in dealing comprehensively with environmental problems. His skill lies in identifying and taking account of the particular combination of factors that are relevant to any given problems or set of problems. Thus out of the total environment, he abstracts a particular field of relevance which his knowledge and technique enable him to manage.

Just as the chess player's chances of winning are enhanced in proportion to his understanding of the rules and gambits of the game, so the development planner's strategies for attaining social and economic goals are more likely to be successful in so far as they have taken account of the most relevant and determining environmental factors. The development process inevitably entails some measure of environmental change and that change then becomes a factor potentially influencing further development. It would thus appear that comprehensive knowledge of environmental factors would be considered basic to any planned change in human societies. But examination of development planning and action suggests that governments and enterprises have

---

rarely proceeded on this assumption. On the contrary, the history of national planning reveals an almost universal absence of comprehensive environmental analysis. Why this has been so is a question that we are now ready to consider.

### **The problem analysed**

If the environmental factor in development is as important as this paper implies, why then does it not receive more attention from planners and administrators? It is not possible to answer this question definitively. The problem requires more attention than it has yet received. Nevertheless some elements of the answer seem evident and afford at least a tentative explanation that subsequent inquiry may modify or confirm.

Man's perception of his environment may be analysed in both cultural and psychological terms. As an animal, man tends to accept his environment as "given." He accepts it, adapts to it, for example, through clothing or shelter, and modifies it, for example, through agriculture or urbanization. But he appears to regard it as a challenge to be met, rather than as a complex of factors with which he lives in constant interaction. Compared to a carp or a weasel, man evidences considerable awareness of his environmental circumstances. Through technology he has learned how to modify natural environments to suit his convenience and has greatly extended his ability to get what he wants from nature. He has thus come to think of the environment primarily as a supplier of his wants; he has been slow to perceive the full range of "demands" that the environment may make upon him.

The most obvious demands of the environment are those to which primitive man responded through clothing, fire and an omnivorous diet. A main current of human history has been man's modification of natural environments and, more recently, his contriving of artificial environments to satisfy his needs and aspirations. In recent times

---

the enormous and accelerating expansion of his numbers and technologies has enabled him to achieve correspondingly rapid and radical environmental transformation. Man's historical success in "mastering" the more obvious aspects of his environment have made the "conquest of nature" one of the great epic themes in human culture, particularly in modern industrial civilization. And it is within this psychological-cultural frame of reference that most development planners appear to perceive the environment.

Unfortunately, this one-sided view of environmental relationships fails to correspond with the picture of man-in-nature that has been emerging from the biological and behavioral sciences. But this picture is of very recent origin and is indeed still far from complete. Although research suggests that human capacities may be amenable to more far-reaching controlled modification than has ever seemed possible, there is also growing evidence to indicate that the continuing health and vitality of the human organism is contingent upon a greater number of environmental factors than have been apparent. Some of this new or reinforced knowledge of environmental relationships is already influencing public policy. The growing concern over environmental pollution is a case in point. But the comprehensive, synthesising concepts that are beginning to emerge from ecology and systems theory have not yet altered the inadequate interpretation of man's relationship to nature that is predominant in modern societies.

One explanation of man's self-assurance in his manipulation of the environment is the obvious success that he has attained to date and his relative impunity to the consequences of his errors. In terms of his own needs and purposes man has helped nature improve upon itself. Through the sciences of agriculture, engineering, metallurgy, medicine and many others he has greatly increased the quality and productivity of nature. But this "conquest" of nature has also been enormously destructive. Man's

---

"development" of his environment has been marked by monumental errors some of which have been irremediable. Throughout most of human history man could simply move away from his mistakes. But misused environments often exacted a hidden toll in impoverishment, malnutrition and disease from those who did not or could not depart.

The exponential increase in population and technology by mid-twentieth century has brought human societies to the threshold of situations without historical precedent. The surface of the earth has been partitioned among political jurisdictions that restrict the free movement of peoples. Those resources and locations most readily adaptable to human purposes are under heavy pressure from the competing demands of increasing populations. More than ever in the past, man finds that the conquest of nature has become conflict with the cross-purposes of other men and with his own contradictory demands upon his environment. For many of the resources which the natural environment cannot supply in quantities commensurate with demand, science and technology can supply substitutes. For other resources, however, of which space is the most obvious, the amount available to man is finite.

At present there is a prevalence of reasoned optimism among planners and economists over the prospects for balancing human needs and resources. There is no doubt of the capacity of man to increase enormously his supply of food, clothing and shelter, to reduce the ravages of contagious disease and to lighten the burden of physical labor. There is less certainty however about the demands that innovation in these areas will make upon human social organization and behavior. And there is even less certainty regarding human adaptability to environmental conditions significantly different from those in which the human species evolved.

In some respects the 1963 United Nations Conference on Science and Technology for Less Developed Areas may prove to be a major benchmark in the course

---

of development planning. The data cumulative in the more than 2,000 technical papers that were presented, dramatically illustrate the complexity and interdependence of the development process. But this evidence also demonstrates the highly specialized and compartmentalized character of the attack upon specific development problems. How this vast accumulation of technical knowledge and skill is to be organized into a constructive and coherent process of development is one of two great challenges to development planning today.

The other challenge is one of goals. If the forces of science and technology are to be mobilized for systematic attack upon the problems of human development, to what ends is this development to be directed? For much of the world, scarcity of the bare necessities of life determines the immediate answer. But there is no society at the level of the national state that is so severely deprived that social and cultural values are beyond consideration.

Although such concepts as the "balance of nature" and the interdependence of living organisms are widely accepted, they have not been made operational in the process of national development. The great advances in science and technology have been expressed chiefly through specialized skills that permit rapid and far-reaching change in certain aspects of the environment, but have not provided an adequate method for analysing the interrelating effects of environmental change. The cultural heritage of most of mankind has not been helpful in the formulation attitudes or values that would make the integrative view of the environment easier. Indeed the reverse is often the case. Even the most highly skilled scientist or economist does not necessarily perceive or evaluate his environment in a manner fundamentally different from unscientific man.

The problem may now be restated in the following terms. Contrary to his alleged liberation from domination by nature, man is ultimately limited by the



natural "law" governing his environment. His enormously increased powers and numbers, far from insuring the safety of his societies make in many respects more vulnerable. Nuclear fission is merely one of many forces that may be misused to the destruction of man and his environment. More threatening may be the cumulative effect of hidden dangers that may do irreversible damage to the human environment before their effects are discovered. Present concern over the use of agricultural poisons (pesticides and herbicides) reflects this possibility. But the interdependence of man and his environment although widely perceived in the abstract, has seldom received expression in concrete public policy and action. The crux of the problem is how to make this ecological view of man and his environment operational, to make it an instructive guide to the planning of national development in all of its related aspects.

#### **Utility of the concept**

At this point in the argument, the reader is entitled to ask: Assuming that the concept of an interacting environment can somehow be built into development planning, what difference would it make? What practical value would it serve? And how do you know that insufficient attention is being given to environmental factors in development planning? The answer to these questions needs two preliminary qualifications. The first is that the answer could be bettered if research on environmental interactions were to be greatly extended in depth and breadth. The idea of a coordinated multi-disciplinary attack upon man-environment relationships as they are involved in public policy-making is only beginning to be seriously implemented in the universities and has yet to capture the enthusiasm of foundations and other allocators of research funds. The second qualification is that persons who have decided that coordinative public planning cannot possibly improve the lot of man could hardly be convinced of

---

the utility of the environmental concept. For a fundamental implication of the environmental concept is that a series of carefully considered public policies and controls would be necessary to guide man's actions in relation to his environment.

Turning first to the evidence of insufficient attention to environmental factor, it is a curious fact that prima facie support for the argument is the very lack of evidence of environmental analysis in most so-called development plans. One cannot generalize safely regarding all of the forms and processes of development planning. But it can be shown that there is a strong tendency in development planning toward a heavily economic and technological bias. No comparable trend toward ecological thinking is in evidence. In the absence of such thinking, uni-dimensional economic or technological planning has often led to disastrous errors in the not so distant past. Millions of soggy, saline acres in the Indus basin, miscarried agricultural settlement scheme in East Africa, endemic poverty in Appalachia illustrate costly mishandling of man-environment relationship that adequate and timely ecological analysis might have prevented. To say that attention to environmental factors is insufficient, is to make a value judgment, not a statement of scientific fact. There is no measuring stick available to show clearly the meaning of sufficient. But as with food, and many other things in life, it is possible to know when one does not have enough, without knowing just what quantity enough really represents.

As to the utility of an operational environmental concept, its greatest value could be its tendency to force a comprehensive consideration of development goals. To look at development plans comprehensively or organismically enable one to see trends and relationship that would not appear in a restricted or atomistic view. Both viewpoints are needed, but it is the more comprehensive that reveals, in panorama, the condition of society and the general direction of its development. If, in planning for

---

national development, examination is made of the broadest practicable range of cause-effect relationship, of environmental interaction and their probable, it will be difficult to avoid consideration of a broad range of development alternatives. The necessity of evaluation that cannot take place without some formulation or projection of ultimate goals.

The doctrine that society should systematically create powerful instruments for change and development through industrial and scientific technology, but should leave the ends of social evolution to random chance, seem paradoxical and perverse. The risks and difficulties of social goal-setting are great. But when man began to take a hand in his own cultural evolution he committed himself to some share of responsibility for the outcome of his development. The price of freedom in any meaningful sense has always been responsibility; and the freedom of human societies from the impassive forces of natural selection can be bought only by continuing maintenance of conditions that make this freedom possible. Maintenance of the biophysical environmental base upon which human welfare depends is one of those conditions

The foregoing line of reasoning introduces a second utility of the environmental concept to development planning. It is useful in avoiding the unnecessary foreclosing of future opportunities through narrowly conceived or short-run development. In their eagerness to "catch-up" with the more highly developed industrial economies, there is danger of new nations repeating many of the disastrous experiences of nineteenth century industrialization. But their burden of risk is much greater. The expectations of their peoples tend to be more volatile and more political in expression than those of nineteenth century working-classes. Democratic and socialist ideologies evolved in the course of the industrial revolution have preceded and, in fact have called forth, development planning and industrialization. Rising and often unrealistic

organized popular expectations have placed enormous pressure on political leadership for rapid results. Ill-conceived and exploitive development plans have often followed from the political necessity to "do something."

The greatly enlarged ability of modern technology to make rapid and radical environmental change implies an ability to make equally great errors or successes. The course of planned development has often been marked by the unnecessary destruction of natural or cultural assets. Extermination of wildlife, damaging changes in ground water, siltation of waterways, impairment of scenic values, commitment to maintenance of costly and uneconomical public works, are a few of the all too frequent concomitants of development efforts. Ambitious schemes of drainage, irrigation, land clearing and resettlement are characteristic environment-shaping elements in many development plans. Few of these have been the result of sound and comprehensive ecological planning. In consequence, their net result has often been negative even when measured by economic factors to the exclusion of less tangible considerations.

A third utility of an operational concept of environmental interaction would therefore be its aid in avoiding serious ecological errors, not only those that permanently fore-close lines of possible development, but those that can be corrected at considerable social and economic cost. Comprehensive environmental analysis is therefore a useful and indeed a necessary concomitant of a system of national social accounts. Its value lies precisely in bringing into the weighing of social choices considerations that would not arise in a narrowly quantitative evaluation of national assets.

This value suggests a fourth utility that overlaps previously suggested. This is the help that an operational concept of the environment would give to modern societies as the growing complexity of their activities and innovations constantly enlarges the number of uncertainties with which they are compelled to reckon. Primitive man did not need to concern himself with the possible effects of seeding the ionosphere

with copper needles, but the very survival of contemporary man could depend upon an accurate appraisal of the consequences of such an act.

The accelerating expansion of science and technology also expands the boundaries of that part of reality that constitutes the practical environment of man. As man enters into interaction with an increasing number of interrelating elements in the physical world and outer space his practical environment expands. With the expansion of knowledge that makes technological development possible, there is paradoxically an enlargement of the awareness of ignorance. The greater the possibilities of human interaction with the environment the more numerous the things that need to be known, not only to further expand knowledge, but to the wise use of existing knowledge and skills. To identify factors that appear to be gaining importance in man's environment would, therefore, seem to be one of the useful functions of development planning.

### **New order of synthesis**

It may be argued that, in attempting comprehensive national planning or goal setting, human society is going well beyond what it is equipped to do. A case can be made that there is neither sufficient knowledge, technique nor consensus to enable society to plan or direct its development. If correct, this would imply that man cannot effectively control the complex and dynamic social order that his ingenuity has created. This may prove true, but it would seem no less rational and certainly more hopeful to have this incapacity demonstrated by historical experience than to concede it before the evidence is fully in. And the evidence of human capacity foresight, for dealing operationally with complex data, for discovering new levels of agreement and integration is by no means fully explored.

A more convincing case can be made for the necessity of a new order of synthesis growing out of interplay among the so-called natural, social and policy

---

sciences. This synthesis is in fact an extension of the science of the ecology and hopefully will enable us to deal in concrete and operational terms with environmental concepts that at present have mainly an admonitory or explanatory value. A widespread and persuasive exposition of this synthesis will be necessary to displace the traditional myths of the conquest of nature and the endless bounty of mother earth. Neither of these historical concepts postulates any responsibility on the part of man for guiding his own conduct in accordance with the "laws" that ultimately govern existence.

On the time-scale of emergent evolution man is a very recent arrival on the planet and his ascent to a dominant position among living things has been relatively swift. There can be no certainty regarding the duration of his dominance, for there is no assurance of safety in either knowledge or numbers. Something may have happened a million years ago in outer space that could seal man's fate tomorrow. But given the predicament in which man finds himself, he may as well make the most rewarding use of the full range of his opportunities. For, in addition to the arguments of science and logic there is a philosophical or, more precisely, an ethical argument for an approach to human development that is consistent with the laws that govern existence and which man must obey or suffer the penalties for violation. This may indeed be the strongest argument for attention to the environmental factors in the development process !

---