J. ENVIRONMENTAL SYSTEMS, Vol. 11(2), 1981-82

THE MAN-HABITAT SYSTEM AND MULTI-USE PROJECTS: DESCRIPTION AND REPRESENTATION*

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ABSTRACT

The development of a country is habitually subject to the growth of industry and the exploitation of natural resources. Development operations, however, are generally accompanied by environmental and social impacts. In their care to minimize the repercussions of managed operations on resources, and to preserve the diversity of individual choices for future generations, decisionmakers must be capable of applying a process of global rationalization in their activities.

Following a simplified description of man habitat systems, and related intermediary systems, this article outlines certain social, economic and environmental aspects which should be considered in objective decisionmaking. The ideal equilibrium can only be arrived at by taking into account the relative values attributed to each of these aspects by society. Following a discussion of the concepts involved in single-use and multi-use projects, interrelations between the economic, social and environmental components are presented.

INTRODUCTION

For millenia, mankind has lived in harmony with its environment. Human survival depended directly on the quality of habitat and the intensity of man-habitat exchanges. This interplay of environmental supply and demand formed a system in dynamic equilibrium, one which had been regulated altogether inconsciently through a whole series of systemic laws [1, 2], and principles that until now remained poorly perceived by man (see Figure 1).

*This research was made possible through a grant (No. A3711) from the National Research Council of Canada.

doi: 10.2190/WTMU-VHGD-LD26-8A59
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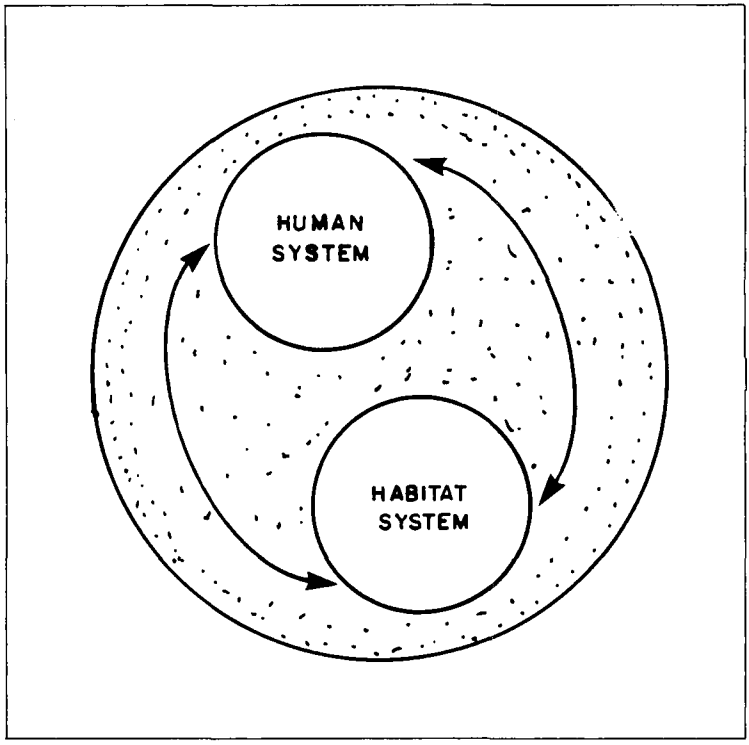

Figure 1. Ancestral biospheric suprasystem.

The dynamic character of man-habitat exchanges permitted mankind to develop a certain sophistication in its relations with the environment. This sophistication is reflected, among other ways, in the advent of techniques encouraging fewer [3] and fewer direct relations between man and his habitat. It is for this reason that contemporary man no longer sees, or no longer wishes to see, the ties which unite him with his habitat. All of his exchanges with the environment are now filtered by technology (see Figure 2). Today, direct man-habitat exchanges practically assume a folkloric character (sport fishing and hunting, gardening, etc.).

This evolution of man through technology has permitted him to self-develop, but also, unfortunately, to "self-immediocratize." [4] And this "immediocratization" of man through technology has led him to considerably modify his scale of values, bringing him often to place socio-economic values over environmental and moral values [5]. This mutation of values has been quick to provoke a menace to the equilibrium of the man-habitat suprasystem [6,7]. Despite the fact that man-habitat relations are increasingly indirect as a result of technology, mankind cannot survive in disequilibrium with its suprasystem.

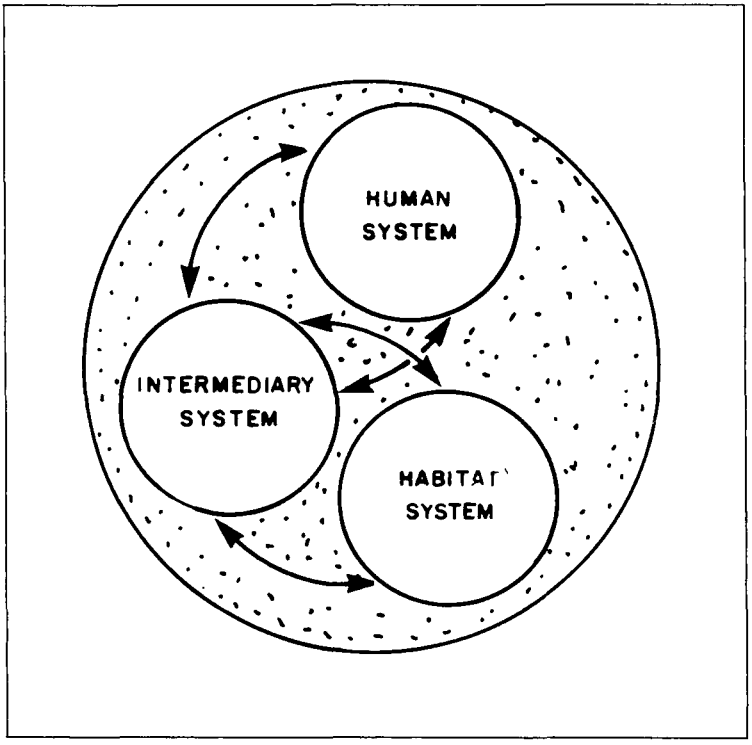

Figure 2. Contemporary biospheric suprasystem.

Thus, it is of vital importance to the survival of humanity that the elementary laws governing this systemic man-habitat equilibrium are respected in the conduct of good project management and administration.

DESCRIPTION OF THE MAN-HABITAT SUPRASYSTEM

The administration of territory and resources involves numerous levels of decision. At each decisional level, a body of impacts arise for each implicated system. The nature or amplitude of the impacts depends uniquely on the level of evaluation applied. It is no less true that for each of the decisional levels identified, one can find repercussions of the human and habitat systems, as well as the intermediary system (sophistication system) (see Figure 3). This means that for each decision taken at different levels of administration and management, repercussions systematically exist for each of the systems. These repercussions can be classed as social, economic and environmental impact [8], and it is only to the extent that these three aspects are accounted for throughout the evaluation process that one can hope for an objective decision.

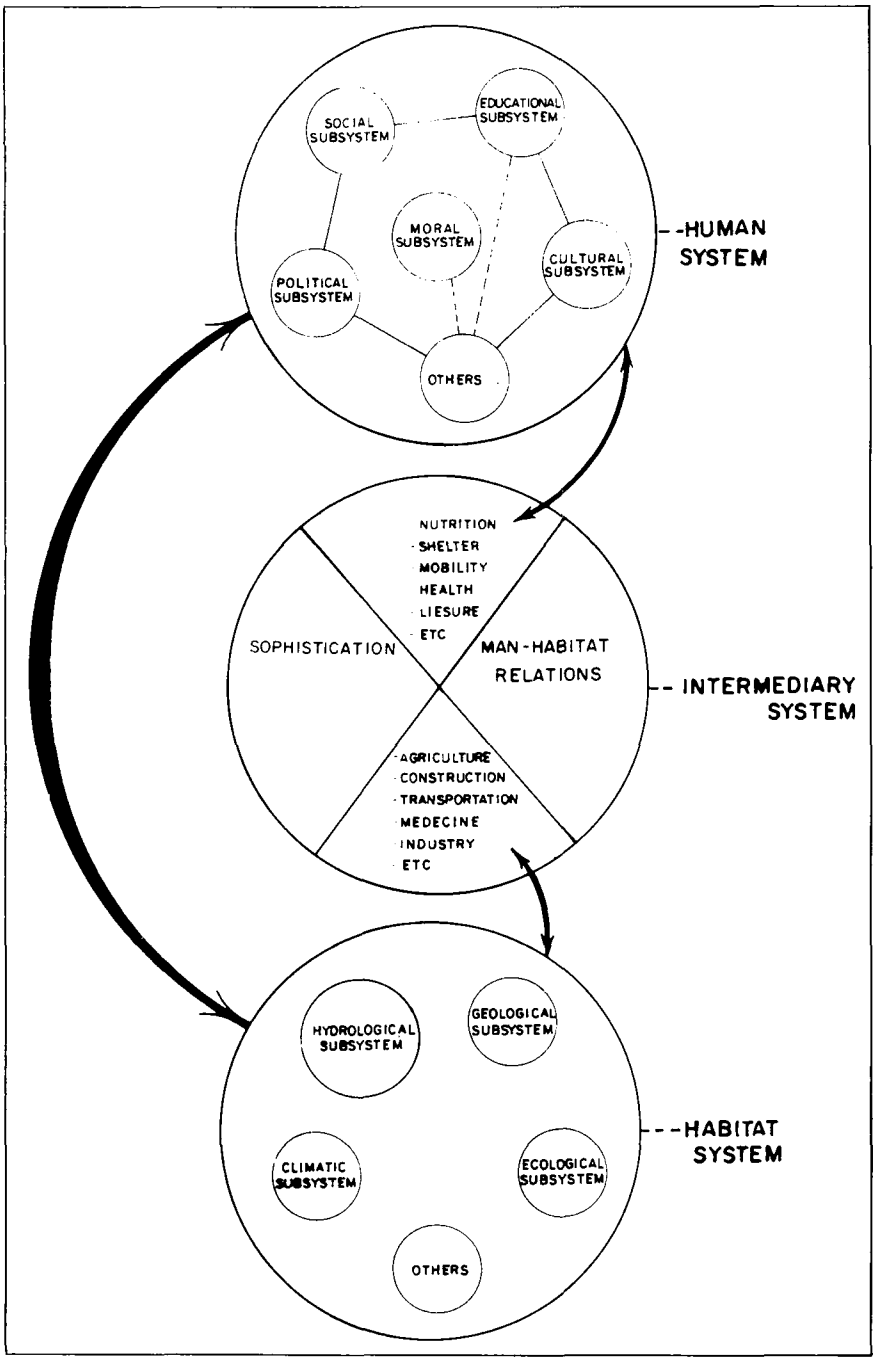

Figure 3. Suprasystem.

The Social Aspect

In order to evaluate the social aspect of a decision made in territorial administration, repercussions must be revealed at the level of different human subsystems (politic, social, cultural, etc.). This aspect of the decision has long been neglected during the evaluation of projects, a highly deplorable situation [9], when one considers that management efforts at the territorial level are thought to be oriented towards one common goal: to conserve and improve the quality of life while assuring the safe-keeping of the species through respect for the environment. This would signify that at any decisional level of an intervention, assurances must be made that implicated parties from near and far are informed about the project [10]. Moreover, these parties must be consulted about eventually being invited to participate in the decision [11]. Evidently, this philosophy of information, consultation and participation still proves to be revolutionary in the management of public goods [12]. This does not prevent it from presenting a highly logical alternative to the traditional management mode where a team of politicians which have been elected for a limited mandate can, from within this mandate, mortgage an entire people, in an environmental and economic sense, for many generations to come. This can be labeled an abuse of power, one capable of being corrected to the extent that evaluations of social impact, at all levels of administration, are occasioned by the decision [13, 14].

The Economic Aspect

The traditional importance which has always been accorded to the economic aspects of decisionmaking should not be dispelled by a systemic approach. Rather, a more global view must surpass the simple cost-benefit analysis of tradition [15] which, of course, remains strongly justifiable at certain administrative levels.

As De Rosnay points out in his systemic analysis "Le Macroscope" [16], the economic function of human society, taken in its largest sense, is equivalent to the production of goods which permit the satisfaction of human needs. This has led man to produce goods in ever greater quantity and on an ever increasing scale, and this through the inevitable exhaustion of environmental reserves (territory, resources, energy). The perpetual insatisfaction of human "economic" needs (homo economicus) can be explained perhaps by the very meaning of economic man, which makes him appear to be an empty being without a soul, driven by rudimentary motives, and capable solely of adapting himself to market forces. If one considers moreover that artificial systems (created by man) tend to exclude nature and ignore the irreversible value of energetic flux for the reproduction of work, decisionmakers must be careful not to swear by the economic aspect alone at the time decisions are taken [17]. The fact that economic systems are artificial systems which constantly stimulate the

sophistication of man-habitat relations cannot be lost from view. It can neither be forgotten that all economic development is indissociable from the exploitation and domination of the habitat system, which is physically moderated by a multitude of contingencies (laws, norms and principles).

No matter which evolutionary theory one chooses (determinism, fatalism or other), it remains no less true that man can orchestrate the sophistication of his man-habitat relations in the hope of "optimizing" or "maximizing" them according to his own will.

The Environmental Aspect

Evaluation of the environmental aspect of man-habitat relations presents evidence of the multiple impacts on habitat occasioned by the sophistication of these relations through the intermediary system. The role of the evaluation is first *to identify* [18], at the level of each subsystem (habitat), the impacts relative to a given intervention [19]. This step of the evaluation is a priority and demands a multitude of scientific knowledge that is often of widely varying origin yet at the same time very interdependent on each other. Systems for evaluating environmental impacts are often reproached for being too complicated, or taking too many notions into account at once. The expert in impact evaluation, however, cannot permit himself to neglect one relation in his work, given the interaction between all the subsystems that are open one to another. The fact of ignoring one relation can mean putting a system in peril and this practice can become a threat to the survival of mankind in short order [20].

ATTITUDE CHANGE

Throughout the history of industrial and technological society, the economic component has been that to progress the most rapidly. This progression is explained by the needs and aspirations of the population which relate uniquely to primary necessities and material security. It contrasts markedly with the level of concern devoted to the social and environmental components. It is perhaps with respect to air and water resources that the environmental component has been the most sacrificed to the drive of the economic component [21–25]. Economic activity and associated urban development operate for the most part by reason of a presence of natural resources, in particular, water.

The past few years have, however, born witness to a consciousness raising of the population. Greater concern is now expressed about ever growing threats of disequilibrium in the environmental system. This awakening is translated as well by the emergence of numerous campaigns of sensitization and action against pollution [26]. This new mentality of "conservationist" tendency brings about direct impacts on leaders, politicians, administrators, etc., who must from now

on account for the body of environmental repercussions provoked by their decisions in matters of territorial intervention.

This new philosophy has already been accepted in the United States with the implementation of NEPA (National Environmental Policy Act) in 1969 (Public law 91-900). This law obliges all federally-funded of regulated public and private organizations implicated in the undertaking of projects of potential influence on the state of the natural habitat to study the possible and probable impacts of their actions on the environment. Canada has also devoted some effort in this direction by decision of the Cabinet [27], where the Ministers decided that all Ministries and federal government agencies must take questions of environment into consideration at each step in the study and execution of all new projects, programs or activities undertaken by ministries, federal agencies, or other groups using federal credits or fixed capital. No law, however, has been passed in this direction.

Several factors contribute to motivating this change in attitude. One of them is an ever increasing feeling of individual frustration and alienation in the face of decisional processes [10]. Added to this is the ever higher level of education and the consciousness raising and aspirations of the public, as stimulated by informational sources. These are the reasons for introducing the social and environmental aspects as elements necessary to aid decisionmaking.

Nevertheless, this practice has often demonstrated a competition between economic and environmental evaluations [28]. Within an economic system, in the event that the profitability of an action is in doubt, chances are usually not taken, especially if the action should originate from the public or parapublic domains. On the other hand, such doubts are never respected in environmental matters and this attitude contributes another threat to system equilibria (example: DDT, PCB, radioactive waste). Added to this is the scientific incompatibility that too often exists between the background and knowledge of the decisionmaker and the nature of aspects implicated by the decision.

SINGLE-USE PROJECTS

In the past, to satisfy the needs of the population and to participate in the improvement of the quality of life, envisaged projects have often pursued one sole objective, hence their name: single-use projects. When populations showed a desire for regional economic expansion, the implantation of a factory in the region was sought. With respect to the environmental aspect, national parks, sanctuaries and the like, which respond to certain desires of the population, have already existed for several years. From the social point of view, numerous groups and non-profit sources of animation have developed with strictly this component in mind. These facts are illustrated in Figure 4. This figure is based on the finality of an improved quality of life and the three fundamental components (economic, environmental, social) constitute the three axes.

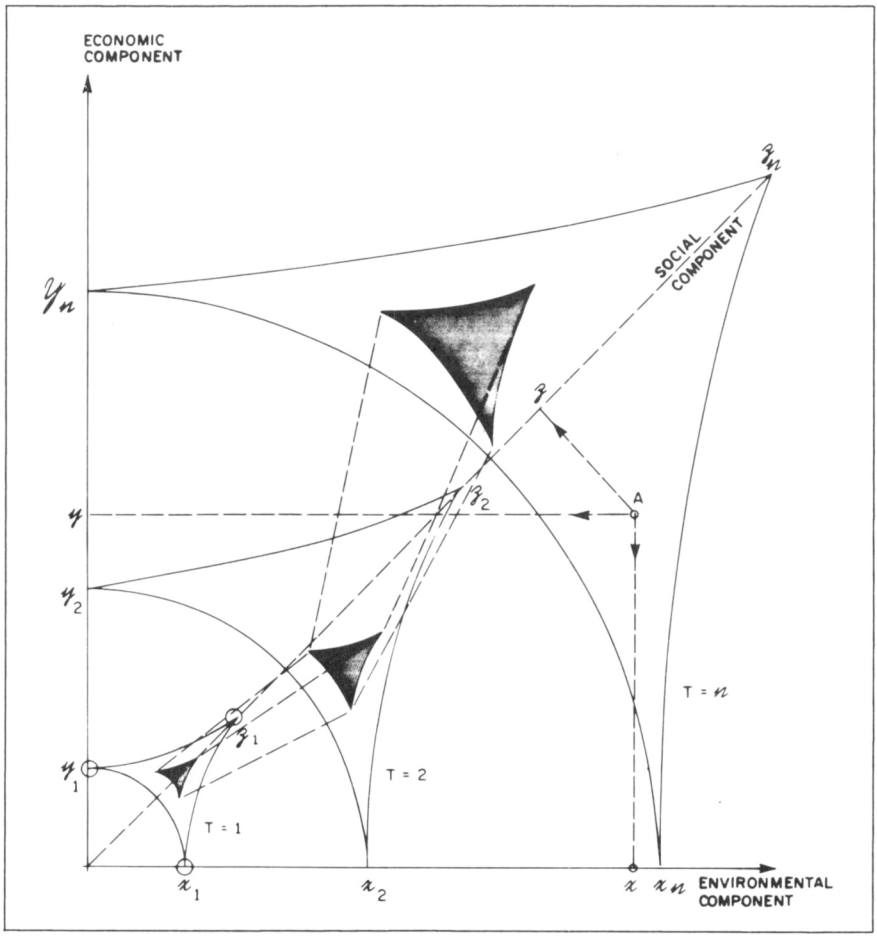

Figure 4. A management concept for single-use and multi-use projects.

The hypothesis behind this finality, the maximization of collective well-being, is represented by the planes $x_1 y_1 z_1$, $x_2 y_2 z_2$, . . . , $x_n y_n z_n$ at time periods t_1, t_2, . . . , t_n. Each of these planes, for a given time, describes the body of alternatives open to the "decisionmaker." It should be noted that the surface areas of the different planes between time t_2 and t_n will augment continually. The administrator is thus presumed to profit from an ever greater availability of possibilities. This increased availability is explained by the growth of different needs and uses due to demographic expansion and as well considerable technological progress.

Referring to Figure 4, single-use projects are represented by circles in the plane $x_1 y_1 z_1$ at time t_1. The three circles symbolize not only the placement of

these zones in the plane, but as well the tendency during this period to favor one aspect, indeed one sole objective, only one fundamental component. As can be expected, it is very difficult to situate oneself at the extremity of one of these axes because, theoretically, there exists but one project that favors a single given component at a given period of time.

Thus, actions posed during this period, in pursuit of one objective, will subsequently influence all other objectives [29]. This is why in the past, processes aspiring to an improvement in the quality of life have not been undertaken with any recognition of the need for integrating the three fundamental components, nor have they considered the possibility of multi-use projects [30].

MULTI-USE PROJECTS

The concept of multi-use projects is easy to approach within the domain of water resource management. For example, a dam can respond simultaneously to hydro-electrical demands, recreational uses and the drinking-water supply of cities and towns. It should be noted that multi-use projects are more advantageously realized in the public than in the private domain, in view of certain weaknesses in the free market system of free exchange. These weaknesses include:

- the existence of public goods;
- economies of scale and indivisibilities;
- externalities; and
- interdependences [31].

In terms of an improvement in the quality of life, the difference between single-use and multi-use projects amounts to the "consciousness raising" of people. The tastes, needs and aspirations of the population have conspicuously evolved for the past several years and will continue to modify themselves in the future [32]. This is due to the fact that in the context of the industrialized nations, in particular Europe and the Americas, the needs of yesterday that were principally based on strict necessity and a certain material security have come today to be fulfilled in part by various levels of government. This phenomenon is especially striking in the water resource field. Not too long ago, populations accepted the loss of a beach to the economic drive of a region without overly protesting.

For the past decade, and more particularly since 1972, with the appearance of the "Limits to Growth" [33], and the historic conference on "The Human Environment" at Stockholm, Sweden (June 1972), the necessity for integrating these three components of an improved quality of life has been recognized. The abundance of writings of this subject bears witness to this fact [34–37]. And, implicit to the importance of integrating these three components is the increasing priority of multi-use projects. Following this, one can postulate the

existence of a zone of acceptibility or "feasibility," situated within a range of possible project solutions, which permits a combination of economic, environmental and social aspects [38, 39].

An illustration of this concept is equally presented in Figure 4 by a shaded zone within each of the planes. The shaded area of a given plane, subject to the zone of acceptability, includes all projects undertaken in response to prescribed objectives and human needs. This acceptability zone must on one hand change position while on the other vary in surface area. The variability of the acceptability zone is a function of the needs and aspirations of the population as well as related governmental objectives [40, 41].

CONCLUSIONS

In order to remain situated in the zone of "feasibility," different methods of integration must be developed. Problems, in this respect, are gigantic. For a given study, a quantitative approach linking all three fundamental components is often difficult to establish. And all the quantitative aspects that must be developed, in order to apply a just and comparable consideration of the three components, become a task of growing importance.

That is why it is becoming urgent to refine methods which permit a serious evaluation of impact to take place. These methods must be objective, flexible, and integral, that is to say, capable of taking into account all of the environmental, economic, and social aspects surrounding a decision.

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