# Sociophysical Congruence as a Problem of Supply and Demand

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## Summary

This paper[1] reviews historical and contemporary conceptions of the environment in the social sciences and in planning, design and management. While the environment is now recognized as a potentially significant factor in human affairs, documented incongruities between people's needs and their sociophysical context persist. This incongruence is conceptualized as a problem of environmental supply and demand. Several underlying aspects of this problem are identified and newly emerging modes of generative decision-making are discussed as holding potential for enhancing the fit between behavior and the environment.

## Résumé

L'article examine les conceptions actuelles et passées de l'environnement telles qu'elles ont été utilisées par les sciences sociales, ainsi que dans la gestion et la planification. Quoique l'environnement soit aujourd'hui considéré comme un facteur potentiellement important pour la vie humaine, un certain nombre d'incongruités subsistent néanmoins entre la demande des gens et le contexte socio-physique qui leur est offert. Plusieurs aspects de cette non-congruence sont repérés. Les modes de décision qui les engendrent sont ensuite discutés. L'article se termine par l'examen des possibilités qui permettraient d'améliorer l'adéquation entre comportement et environnement.

## 1. Introduction

This paper discusses the emergence of space as a significant factor in community affairs. From a social evolutionary perspective, two interrelated historical developments and lines of inquiry are portrayed. The first describes changing conceptions of the environment in social scientific theory and research; the second describes changing processes of environmental planning, design and management.

Historical and contemporary social scientific conceptions of the environment are reviewed, illustrating a shift toward a view of environmental factors as variables with potentially significant social consequences. Building on this review, the environment is conceptualized as both a facilitating and a constraining factor which, in

1. Parts of this article will be included in a chapter by R. Studer in *Housing and Neighborhood*, edited by Van Vliet, W.; Choldin, W.; Michelson and D. Popenoe to be published by Greenwood Press, Westport, Ct.

conjunction with other factors, mediates access to resources and opportunities.

Beyond its impact on social science research programs, recognition and assessment of the significance of environmental variables in human social affairs also raises important questions regarding the efficacy of the processes through which the built environment is organized. The second part of the paper identifies some major developments in environmental decision-making from the unselfconscious processes found in indigenous primitive cultures, to rational comprehensive physical planning modes in industrialized cultures, to the increasingly pluralistic decision-making alternatives appearing in post-industrial cultures.

Physical planning, design, production and management are processes aimed at realizing congruence in sociophysical systems. Incongruences are seen to result from problems inherent in contemporary processes of environmental supply and demand. We identify four such problems and argue for a generative model, with particular emphasis on dialectical procedures, as holding potential for contributing to their solution. It should be emphasized that we will not attempt to develop an alternative framework in all of its details. Within the scope of this paper we can merely raise a number of relevant questions and outline some directions for further research required to address them.

## 2. Conceptions of the Environment

### *2.1. Social Scientific Conceptions of Space and Environment*

Current polemics regarding the relationship between space and resource allocative mechanisms (e.g., Green 1982; Castells 1983; Kirby 1983; Paris 1983; Saunders 1983) find their origin in early social scientific conceptions of the role of space and the physical environment more generally. Initially, social scientists felt a strong need to assert the uniqueness of their disciplines vis-à-vis the more established physical and natural sciences. For example, Auguste Comte, the founder of sociological theory, placed sociology at the top of a hierarchy of sciences, giving it legitimacy to distinct modes of inquiry (Turner & Beeghley 1981). Comte's faith in the reconstruction of the collapsed feudal society on the basis of progress unhampered by environmental constraints is typical of much subsequent social scientific thinking. Weber's (1921) detailed historical analysis of the city emphasizes institutional arrangements and is devoid of spatial connotations, as is Simmel's (1903) analysis of the metropolis. In Tonnies's (1887) influential Gemeinschaft-Gesellschaft typology, one looks in vain for spatial referents, although the latter form of societal organization requires an entirely different form of spatial organization, one where specialized land uses reflect a greater division of labor. In a related context, writing about the rules of the sociological method, Durkheim (1895) declared that the determining cause of a social fact should be sought among the *social* facts preceding it.

To document their independence, social scientists approached their subject matter in social terms without borrowing concepts from the physical and natural sciences.[2] Reviewing sociological theory, Timasheff (1967, 313-314) noted that social phenomena are now commonly recognized to be *sui generis*, in other words, irreducible to non-social facts. Similarly, Stanley (1968, 855) asserted that the main

2. This paragraph and the next are drawn from Catton and Dunlap (1980).

accomplishment and direction of the social sciences to date is the progressive substitution of sociocultural explanations for those stressing the determinative influence of physical nature.

Another major tradition in sociology has contributed to the tendency to ignore the significance of the physical environment. This tradition, derived from Weber's emphatic "Verstehen" methodology and elaborated by Mead, Cooley, Thomas, Berger and others, stresses in its explanations of human behavior the importance of understanding the ways individuals "define" their situation; from this perspective, the physical environment becomes relevant *only* if it is perceived and defined by people as being important.

In much the same way, psychologists have long ignored the physical environment. Even in field theory (Lewin 1951), the conceptual potential of physical properties remained very much implicit, and it is only fairly recently that environmental psychology has become a separate sub-discipline (Wohlwill 1970).

The work of human ecologists such as Mckenzie, Park, Burgess, and others associated with the so called Chicago School, did incorporate the spatial environment, but merely as a medium of or a stage for social phenomena. On this level, human ecology was less a theory and more a method of plotting the spatial distribution of (commonly pathological) behaviors. These behaviors might subsequently be correlated with social structural indices the distribution of which was seen to result from basic processes of economic competition and cooperation. Similarly, Schevky and Bell (1955) brought forward empirical data supportive of an *a posteriori* hypothesis that sociospatial patterns of residential differentiation are a *manifestation* of processes associated with the division of labor, the structure of productive activity, and societal scale more generally. Below, we will briefly describe the emerging recognition of the physical environment as a relevant factor in social scientific research.

### *2.2. The Emerging Significance of the Physical Environment in Social Scientific Research*

Several developments prompted social scientists to start explicitly considering the *physical* environment as a *socially* significant fact. To begin with, urban problems of the 1960's made evident that effects of underlying social structural inequalities were exacerbated by additional independent effects of physical conditions, notably the quality of housing and its location relative to needed community facilities and services (National Advisory Commission on Civil Disorders, 1968). Furthermore, there was an increasing concern about adverse effects of pollution and about environmental quality more generally. There was also a growing awareness of the real finiteness of scarce natural resources.

In recognition of these societal developments, social scientists began to examine implications regarding, for example, the structure of productive activities, distributive mechanisms and class relations (Morrison 1976; Schnaiberg 1980). Recent work has more systematically compared the applicability of traditional theoretical frameworks to the acknowledged sociophysical realities (e.g., Humphrey & Buttel, 1982). Catton and Dunlap (1980) describe this re-focusing as a paradigmatic shift. In their analysis, the Human Exemptionalist Paradigm assumes that humans are exempt from influences of the physical environment because they can overcome

spatial and ecological constraints by technological progress; this paradigm is giving way to what they call the New Ecological Paradigm which stresses people's interdependence with properties of the physical environment.[3]

The increasing cognizance of social scientists regarding the significance of the physical environment converged with a growing need on the part of planners for social scientific data. Disenchanted with the failures of public housing and urban renewal in the U.S. and with comprehensive planning generally, planners looked to social scientists for ways to bridge the gap with users of the environment. Social scientists readily engaged in research to supply planners with information on user needs; they also contributed by helping develop more open-ended planning procedures allowing for greater stakeholder involvement in the planning process (e.g., Hebbert 1983). This latter development is taken up later in this paper.

The concern with "fit" between the physical environment and user needs was conceptualized by Michelson (1976) who drew on Talcott Parsons's general action systems theory to develop the intersystems congruence model. According to this model, values of variables of the physical environment are more or less congruent with values of variables of the cultural, social, personality, and behavioral organism systems. A number of alternative approaches to "goodness of fit" and the match between people and their environment are available, emphasizing different aspects and appropriate to different levels of analysis (e.g., Alexander 1964; French *et al.* 1974; Greenberger *et al.* 1982; Kaplan 1983; Pervin 1968; Wicker 1972). Researchers working within these conceptual frameworks have empirically documented effects of the physical environment on the individual level (e.g., Cohen *et al.*, 1980), in interpersonal interactions (e.g., Yancey 1971), and in the community context.

A plethora of like studies have emerged, providing ample evidence of the significance of the physical environment in molding human affairs; able reviews of this research have been provided by Dunlap and Catton (1979), Russell and Ward (1982) and Stokols (1978). However, few researchers have given more than passing notice to antecedent political and economic factors that determine, in part, the extant degree of congruence (Michelson 1977). In recent theoretical work on urban theory, these antecedent conditions are given explicit consideration. Next, we will briefly discuss this work.

### *2.3. Current Discussions of the Role of Space in Social Scientific Analysis*

While the so-called "new" or "critical" sociologists espouse various different analytical frameworks, there has been a tendency to regard urban entities as spatial units of collective consumption with resource allocation mechanisms instituted or operated by the state (Harloe 1978; Kemeny 1982). In this connection, Saunders (1981) has recently argued that, while some social provisions made and managed by the state have a spatial reference (e.g., public housing, hospitals, schools), others do not (social security payments, family allowances, pension schemes). Extending this argument, Saunders has attempted to resurrect a nonspatial sociology, which differs from an aspatial sociology in that it recognizes the spatial factor as one among several, a factor contingent upon sociopolitical and economic conditions and pro-

3. A recent vicious exchange illustrates the heated debate surrounding the prevailing paradigmatic cleavage. See Ehrlich (1981; 1982) and Simon (1981; 1982).

cesses. For example, the ways in which political and administrative boundaries are drawn up may be crucial in creating or perpetuating relations of privilege and exclusion and in fostering a mobilization of bias in political systems (Archer 1983), but space is merely the articulation of antecedent power configurations. *Where* an event or process takes place is important in understanding the form it takes, but it is unlikely to explain *why* it occurs in the first place (Saunders 1983).

Here, we view the spatial and physical environment as taking on significance in the context of other societal factors. As such, spatial and environmental factors may be conceived of as variables which interact with or intervene in relationships with multiple interdependent variables to produce given effects on human behavior and community affairs; however, in other situations, dependent on the question at hand, spatial and environmental factors can also be conceptualized as dependent variables.

While space may affect people through various mechanisms (Stokols 1983), for the present purpose its significance is seen to lie in the ways and extent that it mediates access to opportunities at various levels and along various dimensions. This conceptualization is heuristically useful as it helps to identify historic and prevailing configurations of sociophysical opportunity fields (Van Vliet & Burgers, 1986). However, it is descriptive of *structure* only and does not consider decision-making processes governing the allocation of resources as a context within which this structure evolves. We next turn to these processes and their historical transformation as a function of societal changes.

## 3. Processes Effecting the Environment

### *3.1. The Processes of Environmental Organization*

The processes of environmental organization have as their underlying purpose the realization and maintenance of a state of congruence between individual and collective behavioral goals and properties of the physical environment – essentially a problem of (environmental) supply and (social) demand. Supply and demand relative to the built environment has been a major focus of urban economic analysis (e.g., Alonso, 1965); while this level of analysis certainly captures the *aggregate* reality of the problem, it provides only a limited understanding of its etiology and dynamics.

Committed as they are to systematic documentation of the social consequences of spatial organization, emerging programs of sociophysical research provide a deeper understanding of individual and collective sociophysical requirements, that is, the demand characteristics of the built environment. However, availability of this new knowledge does not automatically lead to sociophysical improvements. Also required are effective environmental supply processes, that is, instrumental and organizational means of realizing and maintaining physical systems and settings congruent with people's goals.

The processes which effect environmental supply include those of planning, design, production and management of environmental systems and settings. These processes, driven by a complex array of actors, purposes, organizations and institutions, operate in one form or another in all political economies. Regardless of their political economic context, all contemporary environmental supply systems

embody certain common problems; none is fully effective in maintaining congruence between people's goals and the supporting built environment. To better understand the nature of environmental supply and social demand processes, let us briefly review major evolutionary developments in these processes.

*3.2. The Evolution of Environmental Supply Processes*

In his attempt to redress contemporary problems in physical design in the early sixties, Christopher Alexander (1964) identified two fundamentally different evolutionary forms of physical decision-making: *unselfconscious* and *selfconscious*. The direct, unselfconscious form-making process of indigenous cultures is guided by certain fairly complex and rigidly maintained "unspoken rules". These covert "rules" produced physical settings integrally linked to explicit sociocultural conditions (and attendant behavioral requirements) on the one hand, and physical and technological constraints on the other. The resultant spatial arrangements and physical structures exhibited little variation and both the building norms and their products evolved over an extended time frame. The builders were close to their materials and techniques of construction, usually inhabited the shelters they produced and subsequently altered them as required by unanticipated events and emerging dysfunctions. In short, the unselfconscious form-making process was one of direct, iterative responses to slowly evolving sociophysical requirements. Figure 1 depicts this process wherein user-builders respond to, produce and alter physical settings predicated on their social, psychological and physiological requirements.

A fundamentally different situation emerges when cultures experience a transformation from unselfconscious to selfconscious form-making processes. In the latter, the functions of inhabitant-builders are assumed by specialists, i.e., master craftsmen, responsible for the organization and construction of physical settings. The process of incremental, element-by-element, component-by-component, adaptive change – the continuous process of construction-testing-alteration – is replaced by one in which all elements of the system are in flux and require simultaneous comprehension and conceptual organization. Sociophysical accommoda-

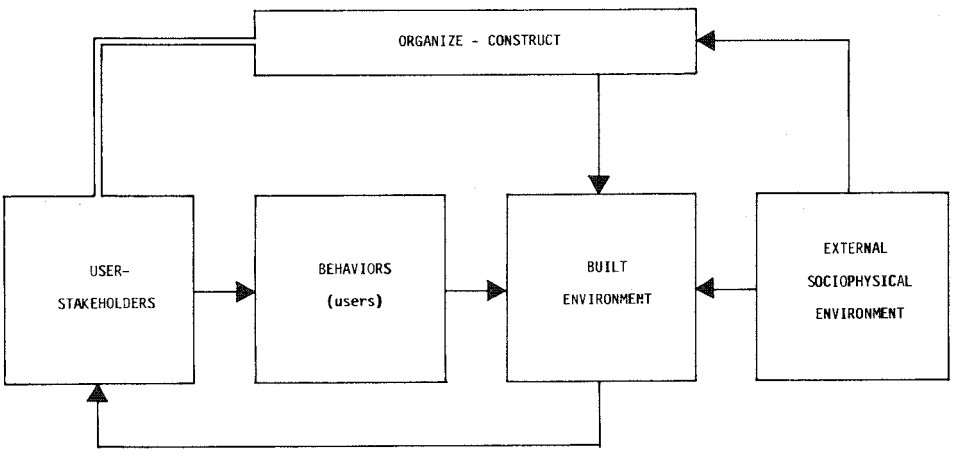


Fig. 1. Unselfconscious Process.

tion is no longer slow, incremental and adaptive, but rapid, synoptic and willful. Moreover, new technologies vastly relaxe the physical constraints, thus elaborating and complicating the range of possible solutions. One of the characteristic norms of selfconscious processes (see below) is that physical structures become less alterable, thus dampening incremental adjustments to emerging sociophysical incongruities.

Faced with a far more complex organizational task, responsible specialists eventually got around to the search for principles, normative theories and the like to provide guidance and render their problems tractable. Such prescriptions inevitably exhibit a certain arbitrariness, thus serious debate and criticism ensued. Emergence of form-making specialists also led to the establishment of guilds, special educational requirements and other institutionalized arrangements. The need to attain status within the guild produced a striving for identity and competition among prescriptive theories regarding how best to proceed and succeed. The success of the unselfconscious building effort depended on the form-maker's integral role in the sociocultural context. In contrast, the success of the selfconscious building effort, depends on the viability of the prescriptions, intentions or principles guiding form-makers.

The scientific and technological revolution produced vast changes in social organization. The greater differentiation and division of labor became manifest in new land use patterns, characterized by greater specialization and segregation. This trend was further reinforced by architect-planners like Le Corbusier who espoused the ideological principles embodied by the 1933 Athens Charter of the Congress International d'Architects Moderns (C.I.A.M.). The increasingly complex functions of conceptualizing, organizing and producing built environments also led to more specialized professionals, technicians, entrepreneurs, organizations and processes. Figure 2 depicts selfconscious processes as they have evolved.

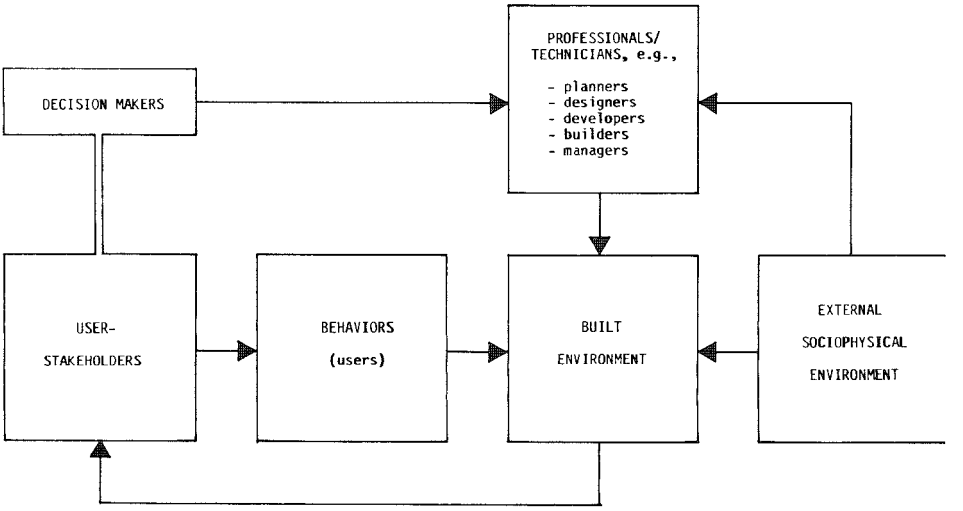


Fig. 2. Contemporary Selfconscious Decision Processes.

In general, decision-makers of various sorts interpret the requirements of user-stakeholders in organizing and producing built environments.

As positivist precepts came to dominate human affairs, decision-making processes became even more "selfconscious" (i.e., scientific), and so-called rational approaches have been increasingly brought to bear on problems of supply and demand relative to the built environment (Faludi, 1983). However, significant improvements in sociophysical congruence have not been realized. We will next sketch out some of the possible reasons for this, then consider some emerging developments.

### *3.3. Impediments to Effective Environmental Supply Processes*

Contemporary environmental supply systems share certain intrinsic problems. There is considerable evidence to suggest that these problems are found in widely different political-economic contexts, although the specifics of their manifestation and the ways of dealing with them may vary considerably. These problems all: (1) are predicated on limited knowledge of sociophysical relations and processes; (2) embrace physical technologies dissynchronous with social demand dynamics; (3) operate in complex decision-making environments with conflicting goals and perspectives; and, (4) embody inappropriate decision-making instrumentalities.

Basic and applied knowledge of sociophysical systems is a necessary, if not sufficient, condition for addressing the environmental supply and demand problem. Nothing approaching nomological knowledge of the relevant relationships is available for application to real-world settings. However, a major requirement of the planning, design and management of sociophysical systems involves certain kinds of predictions regarding their performance prior to implementation. Such predictions require a functional understanding of sociophysical relationships and processes. What we generally have is a piecemeal descriptive account of these. Given our present knowledge base, the ability to model and predict sociophysical performance becomes more problematic when dealing with larger aggregates. Social research programs focusing on environmental variables are committed to the generation of important new knowledge – a functional understanding – of environment-person-behavior relations at both disaggregate and aggregate levels. The systematic linking of these research programs to instrumental decision-making – the realization of a technology of environmental-behavioral programming and design – has yet to be fully consummated.

Dissynchronous social and physical system dynamics stem from the basic fact that the needs and goals of contemporary populations, both individually and collectively, are subject to considerable change, while physical environments, in contrast, are essentially static. The problem of environmental supply is thus made especially difficult by present physical technologies. To maintain congruence *over time*, and increase the probability of matching people to well-fitting environments, the obvious need is for physical systems capable of extensive adaptation along several continua; that is, spatial environments which can be readily and inexpensively reorganized or replaced in response to changing human goals and external conditions. There is little doubt that appropriate, cost-effective mass-produced physical

technologies more responsive to the dynamics of demand could be developed.[4] However, their implementation is inhibited by a complex set of factors.

Attached to the built environment is a great deal of symbolism – certain aesthetic and sociocultural values. These variables constitute important and valid requirements of users; some of them, however, appear to exacerbate environmental supply and demand problems. Consider, for example, permanence in the built environment. Planners and architects are generally trained, rewarded, and even immortalized for creating sturdy, long-lasting structures, not for providing environments responsive to the dynamics of users' sociobehavioral goals. Paradoxically, users are also enamored with permanence and symbols thereof in their built environments. Through developers the market place responds accordingly. Building codes and other regulations, construction norms, financial institutions, and craft guilds, all reinforce the same pattern. The result is a relatively permanent, expensive built environment, constructed with relatively unsophisticated building technologies on valuable land, which is responsive to some but certainly not all dimensions of human need.

If this analysis is accurate, we have a very basic and difficult problem: tenaciously held symbolic, aesthetic values on the part of certain stakeholders lead them to embrace goals in direct conflict with implementation of physical technologies responsive to other, seemingly more fundamental goals. This is a classic ill-structured problem, one quite resilient to conventional, positivist decision-making procedures, and one which is not likely to be solved via free market mechanisms.

Decision-making environments within which physical planning, design, production and management decision-makers must operate are highly complex, with various decision-makers operating at cross purposes. Neither capitalist market mechanisms (Gans 1959) nor socialist allocation mechanisms (Szelenyi 1983) appear to provide an adequate response to people's sociophysical needs. The point is that this manner of defining sociophysical problems begs the very question a viable decision-making process is intended to answer; that is to say, effective instrumental decision-making requires that physical problems be formulated, and solutions be validated, in terms of sociobehavioral variables.

If we had nomological knowledge of environment-behavior systems, and could make precise if-then statements regarding the sociobehavioral consequences of particular spatial configurations, the problem of maintaining congruence would become more tractable, but it would not be solved. That is, the normative issue would not have been addressed. The normative issue in physical decision-making comes down to the assessment of stakeholder perceptions of what ought to be done. Stakeholders are "all parties who will be affected by or who affect an important decision" (Mitroff & Emshoff, 1979). Stakeholders in environmental supply and demand problems include: 1) users; 2) non-user decision-makers; and 3) professionals, tech-

4. Relevant in this context is Habraken's so-called "supports" principle. Its original explication appeared in Dutch in 1961 and was translated into English in 1972 under the title *Supports: An Alternative to Mass Housing* (New York: Praeger). See also Habraken *et al.* (1976). The extension of this principle to the neighborhood level has as yet not been discussed in English publications. However, information on this approach may be obtained by writing to Stichting Architecten Research, Postbus 429, 5600 AK, Eindhoven, The Netherlands.

nicians, and relevant social scientists. Considerable conflict can emerge within *and* among each of these classes of actors regarding both ends and means. Practical solutions to collective environmental supply problems require resolution of conflicts among these various stakeholders, recognizing that power is unevenly distributed among them. Simon (1973) and Mason and Mitroff (1981) have classified such problems as *ill-structured.* They are characterized by one or more conditions: there are many decision-makers whose identity and/or perspectives of a problem cannot be specified; multiple conflicting objectives; interdependent, uncertain or unknown outcomes; and/or incalculable probabilities of achieving specified objectives (Dunn 1981). We are only beginning to fully comprehend the nature of such problem domains and the general characteristics of decision-making instrumentalities required for dealing with them. What we do know is that conventional decision theoretic and policy analytic methods developed for well-structured problems are inadequate, if not irrelevant to current problems of environmental supply and demand.

The purpose of outlining these rather fundamental difficulties has not been to paint a picture of intractability. Rather the aim is to identify realistically the prospects for upgrading sociophysical settings and systems utilizing existing and anticipated new social scientific knowledge. The basic issue comes down to the nature of extant decision-making processes. Let us now review recent developments bearing on these.

## 4. Solutions to Human Environmental Problems

### *4.1. Toward Generative Decision-Making*

As noted earlier, disparities in social demand and environmental supply systems are an important societal problem in *all* political economies. Blatant incongruences have been documented in countries with dominant capitalist economies (Gans 1959; Yancey 1971), in collectivist economies (Hegedus & Tosics 1983; Szelenyi 1983), as well as in less developed nations (Brolin 1972; Grenell 1972). We have argued that problems of supply and demand relative to the built environment cannot be fully understood and dealt with via an economic analysis of free market and other resource allocative mechanisms alone. It is also necessary to address the underlying organizational and procedural dimensions of environmental supply and demand systems.

The unselfconscious processes of indigenous cultures come to mind as an interesting (meta)model for approaching the problem. Are there principles and processes embodied therein which might be extrapolated to exponentially more complex post-industrial contexts? The issue of unselfconscious vs. selfconscious form-making comes down to assessing the viability of *imposed* vs. *generative* solutions to human environmental problems.

Imposed solutions characteristically emphasize empirical and instrumental dimensions and are developed by technicians external to the sociophysical problem and remote psychologically if not physically to those most directly impacted (Wengert 1976). Generative solutions, in contrast, characteristically emphasize the norms and values of all stakeholders and are developed via some form of direct participation in decision-making processes. The issues have sharpened in recent years

as the forces of "scientification" and "pluralization" have come into direct confrontation. The limitations of instrumental rationalism have been illuminated (e.g., Dunn 1982; Leiss 1975), and the effectiveness of conventional "scientific" decision-making methods in dealing with ill-structured spatial problems has been seriously challenged (e.g., Alexander 1984; Hall 1983). Demands of alienated stakeholders for participation at various levels of decision-making have, since the mid-sixties, become more extensive and intensive (Fagence 1977), and appear to be transforming conventional problem-solving paradigms. The distinctive characteristic of one such paradigm, an evolutionary perspective developed by Dunn (1971), is that the direction of change is generated from *within* the human system, thus exhibiting self-organizing, self-regulating properties not characteristic of "deterministic social engineering" (i.e., imposed processes). Depiction of sociophysical planning, design and management as processes of social experimentation and learning places the organization of physical support systems in a social evolutionary context, one not unlike that of unselfconscious processes found in indigenous cultures.

The purpose of either generative or imposed modes of planning, design and management decision-making is the same: to move a system or setting from where it *is* to where it *should be.* Imposed processes, predicated on a posture of instrumental rationalism, bracket normative and instrumental aspects of decision processes, and they generally assume the latter as given. However, the so-called fact-value debate has firmly established that factual and valuative issues are intertwined, indeed amalgamated, in all aspects and phases of decision-making (Michalos 1981; Studer, 1982). Generative processes address normative and instrumental dimensions of decision-making with equal emphasis and methodological rigor. Such processes appear highly appropriate to address the ill-structured nature of sociospatial supply and demand problems.

### *4.2. Methodological and Organizational Requirements*

Ill-structured problems require new methodologies that differ fundamentally from conventional ones. The nature of ill-structured problems requires not so much a theory of policy decision, as a theory of policy search, i.e., procedures that enable us to *structure* problems in the course of *solving* them. Proponents of *dialectical* methodologies (e.g., Mason & Mitroff 1981; Rein & White 1977), a particular form of generative decision-making, claim that such procedures are uniquely appropriate for addressing ill-structured problems. A dialectical methodology, in contrast to other modes of problem structuring, "is capable of producing a synthesis, *if* one is possible, which is based on full recognition and appreciation of conflicts, not by ignoring or trivializing them" (Mason & Mitroffe 1981). Dialectically based methodologies, i.e., those which facilitate reflective, intersubjective discourse and argument among stakeholders with conflicting goals and objectives, hold great potential for supporting generative forms of sociophysical decision-making (Goldstein 1984).[5] Figure 3 depicts generative processes in which users and other stakeholders in the environmental supply enterprise are linked into a decision-making process in

5. For example, dialectical procedures would seem highly appropriate to address the earlier noted conflict between stakeholders' values and needs regarding, respectively, permanence and responsiveness of the environment.

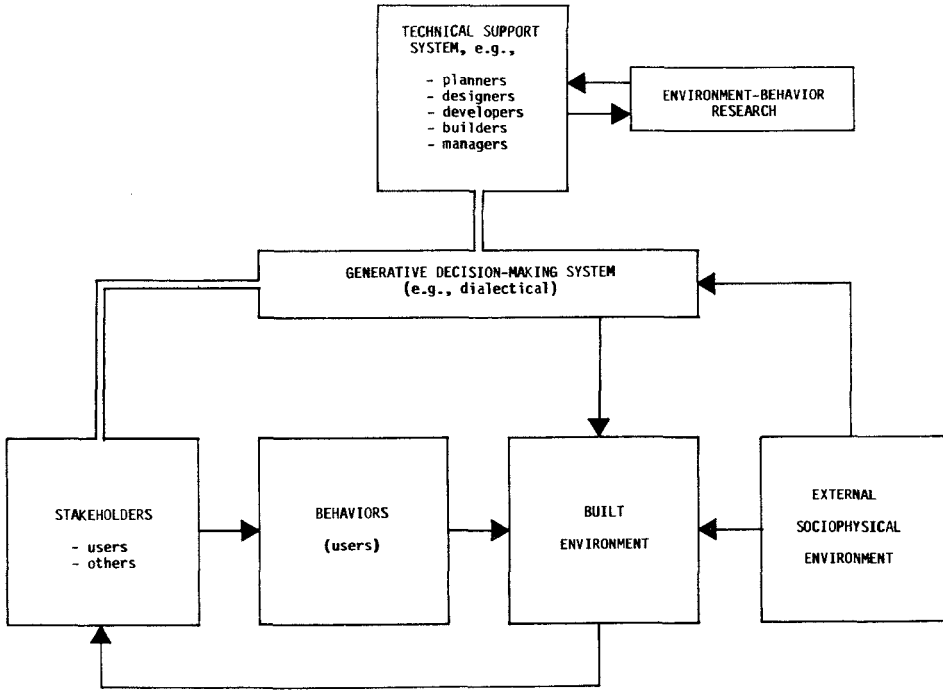


Fig. 3. Generative Sociophysical Decision Processes.

which conflicting perspectives, objectives and claims regarding ends and means are resolved.

Implementation of generative decision processes involving multiple stakeholder groups and directly linked to (sociophysical) knowledge generation functions requires not only new conceptualizations of environmental supply processes, but as well new organizational arrangements. While it is not yet clear what particular organizational forms are required, it is clear that present hierarchically structured, compartmentalized and discontinuous environmental supply functions have proved to be ineffective.

## 5. Conclusions

We are accumulating considerable evidence which demonstrates that pervasive incongruencies exist and persist between people's individual and collective goals and the built environment. The complex problems of environmental supply and demand have been quite resilient to reform in the past, and a society's investment in accommodating people's environmental needs must always be weighed against other, competing societal needs. These competing needs must, however, be weighed in light of social scientific research findings which indicate that sustained sociophysical incongruencies may carry significant economic, social, psychological and physiological costs. In this paper, we have argued that these incongruencies and

their implications stem, in part, from problems intrinsic to contemporary processes of environmental supply and demand operating in widely differing political economies. We identified four such problems and argued that their solution via extant decision-making and resource distribution mechanisms is unlikely. As stressed at the outset, our purpose has not been to describe the instrumentation required to effect an alternative approach, a task clearly beyond the scope of this paper. Our purpose was rather to raise questions which need to be addressed in future investigations, and to propose that generative modes of decision-making analogous to those found in indigenous cultures hold considerable potential for ameliorating extant supply and demand incongruities.

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