REGIONAL SCIENCE AS AN INPUT TO PUBLIC PLANNING

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The Need for an Improved Theoretical Framework

In 1967, the planning profession in the United States celebrated its fiftieth anniversary. The commemoration was marked by a brief backward glance and a hard look at the challenges of the future, notably at the need for the planning profession to adapt more fully to the rapid technological advances of the past decade.

As Brian McLoughlin has observed,[1] public planning in recent years has begun to emerge from a long sleep. As the urbanized region has become the dominant form of human settlement, problems and opportunities arising within such urban aggregations have become manifold, increasing in both scope and complexity. In recognizing these factors of increased complexity, many planning educators and practitioners have become acutely aware of the lack of good theoretical foundations for the study and guidance of these urban regions.

Despite many advances made in the last two decades, many formidable gaps in the theory and practice of public planning remain. It is not yet possible to see obvious linkages between such growing fields as regional analysis and the new urban sociology; between decision theory and the practical world of data processing; or between these and questions of resource management, land use policy, and urban design. There is a need to bring developments in both theory and practice to the attention of a wider body of people and to provide a framework related to the emerging problems of understanding and planning cities and regions.

Fortunately, there is evidence to suggest that the higher-order framework required to elevate public planning to the challenges which face the profession is beginning to take form. Beginning in the strategic studies of the forties, there has been a significant growth in the application of operations research techniques in almost all fields where complex systems are managed. With the pioneering works in the field of regional science have emerged methodologies for dealing with the complex economic subsystems of the urban system. Increasingly, such methodologies are being used to solve problems in the public sector. The identification and description of complex situations has been greatly facilitated by the techniques of operations research and systems analysis which, in turn, rest on the foundations of general systems theory.

Walter Isard, in the introductory chapter to Methods of Regional Analysis, asserts that the basic principles and approaches to regional science provide an analytical framework which can penetrate interdependence not only within systems but among systems. Therefore, applying a broad definition of systems analysis, it may be concluded that regional science is a form of systems and analysis--one which should provide an important input to the "scientification" of public planning.

Perhaps the most exciting prospect of synthesis is offered by cybernetics--the study of the processes of information transfer, communication, and control in very large and complex systems. It is now clear that the fun-

damental principles of control in complex systems are universal, irrespective of the actual nature of the systems--real or conceptual, animate or inaminate.

The Search for a Systems Approach to Public Planning

In view of the great currency enjoyed by the methodologies of regional science, operations research, systems analysis, and other systems approaches, both in the natural and social sciences, it is not surprising that there is a growing self-consciousness among theorists and practitioners alike concerning the need for a more systematic approach to the field of public planning.

It was perhaps inevitable that pressures would emerge from all levels of government to apply a "systems" approach in an effort to resolve the problems of urban areas. The word "resolve" is used here advisedly; few members of the new generation of planners think that most urban problems will ever be completely solved. In the United States and Great Britain especially, the call has gone out for a more scientific approach to the planning and development of our urban areas--from congressmen and members of Parliament to small town mayors; from cabinet members and ministers to community welfare workers; from labor leaders to professors. Most planners recognize that the subject matter of their field involves extremely complex problems of ever-evolving and rapidly changing urban systems. Those concerned with complex urban systems are aware of the existence of a great demand for improved methods of research and application which would enable the planner and decision-maker to deal more effectively with these problems.

The emerging consciousness of the need for a new theoretical basis for public planning, in turn, has resulted in a new dimension--a new emphasis--in planning education. It seems clear that the "new generation" of planners--the more recent entrees into the profession--will be called upon to make greater use of the scientific environment in which it has been reared. However, it is the "next generation"--the current students of planning and urban affairs--who must establish significant footholds with regard to the application of more sophisticated techniques of analysis and synthesis--or alternatively, fully test the theoretical possibility of ruling out science as a tool to cope with the problems of the urban environment.

The "Scientification" of Planning

In recent years, the planning profession cheerfully had adopted many analytical techniques from other disciplines. For the most part, however, this has been a process of adoption without adaption. As Richard Snyder has observed in a similar context:

> ...those who venture into other disciplines on foraging expeditions often come back with superficially attractive loot, in some cases exemplified by a shiny new vocabulary ripped from its theoretical context and disciplinary home.[2]

The proliferation of planning studies involving the use of description and predictive models, simulations, gaming theory, cost-benefit analysis, regional matrices, and other methods characteristic of the systems approaches gives evidence of the interest and eager adoption of these approaches. These studies also stand in mute testimony of the inherent dangers in hurriedly proceeding toward such applications without first developing the theoretical bases needed for a systems approach in public planning.

There remains a good deal of skepticism among the more traditionally schooled planners who have been trained in the application of the planning process to the physical environment. In part, this skepticism stems from misunderstandings as to the relation of these systems methodologies to the more traditional notions of physical planning. It has been suggested that what has been called physical planning is misleading and should be renamed spatial planning.[3] The theoretical and practical concerns of spatial planning are the organization of space in all of its forms.

Distinctive planning specialization appears to be evolving around various basic spatial concepts. Purely physical space is central to the thinking of ecologically minded planners. Urban space is the major concern of the more traditional city planner. Perceptual space--defined by an interaction process between the observer's mind and physical reality[4]--increasingly is the focus of the urban design. Social space--defined largely by individual and group interaction processes as determined by values, beliefs, and attitudes--appears to be a basis for an emerging field of social planning. Economic space--defined by forces of economic influence and patterns of interaction among economic actors and institutions--is a major working concept for a new breed of regional planner.

Accepting this distinction, it may be suggested that regional planners chiefly are concerned with economic development, or more precisely, with the spatial incidence of economic growth. Consequently, they are interested in the structure and transformation of economic space. Their attempt is to reorganize this structure in ways to achieve a range of social objectives. For this purpose, both physical and nonphysical means may be used.

The linkages between the concerns of regional planners and those of regional scientists should be quite evident. Many of the analytical techniques which have been adopted by planners working at the regional scale had their origins and development on regional science. Unfortunately, we are still a long way from a generally applicable theory of space-economy and its performance in a normative development situation. There also is a danger that the attainment of better general explanations of spatial organization may be led astray by an exuberance for new analytical techniques.

The Need for a Hybrid Approach

While some reservations have been advanced in the foregoing discussion, this is not to suggest that the disciplines of regional science, operations research, systems analysis, and other systems approaches should not be brought into the field of comprehensive public planning. Undoubtedly, there are mutual benefits to be derived from a careful blending of the concepts and techniques from these related fields. It is far easier, however, to advocate a "systems" approach to planning problems than it is to apply such an approach.

A great deal of work must be undertaken before any wholesale transfer of systems techniques can be made to the field of public planning. In fact, it may well be that such outright transfers are neither desirable nor possible. Rather, it may be necessary to formulate a "hybrid" approach--one which retains the scientific applications of regional science, operations research, and systems analysis and the social and human value orientation of comprehensive public planning.

Dr. Cantanese of Georgia Tech and I have made a first attempt at defining the possible dimensions of this hybrid which we have called Systematic Planning.[5] The term Systematic Planning was selected to convey the im-

pression that the complex matters to be dealt with are system-like in their characteristics and behavior and that the planning to be carried out is to be done in a more systematic fashion. At the same time, Systematic Planning is designed to handle evolutionary systems problems, that is, problems which require a time-phased approach, allowing for the changing needs and specifications of the total system.

How Planning and Current Systems Approaches Differ

Although a systems approach frequently has been applied as a method of "pure" analysis (as opposed to "applied" analysis), the major applications have been concerned primarily with problem-solving situations. In part, this characteristic stems from the mathematical orientation of the methodologies of these systems oriented disciplines. If no immediate problem exists, then there is relatively little need for rigorous methodological procedures.

Public planning, on the other hand, often is anticipatory in its orientation, dealing with matters that are not imminent problems. While nearly all planning involves the formulation of corrective measures to alleviate mistakes of the past, the essence of planning is preventative rather than remedial. When a city has an adequate water supply but wants to increase its capacity to meet future demands, no immediate problem is involved, but there is planning. When a city initiates regulatory measures, such as zoning or housing codes, the codes are designed to meet future problems, although the action may be prompted by existing conditions.

Thus, one of the principal differences between a systems problem and a planning problem is that the former tends to be a more immediate problem which must be resolved, while the latter often tends to be a future or potential problem. The immediacy of a systems problem can be identified by the ability to attach costs to the continued existence of the problem. When an industrial firm commissions a team of experts in operations research to solve a problem, the problem usually involves measurable inputs and a productive process, both of which can be subjected to controlled experimentation. There is usually a well defined goal--either the maximization of profits or the minimization of costs--to be achieved through alternative production processes. These processes, in turn, can be tested by varying the kinds and amounts of inputs through controlled experimentation.

In urban systems, however, the problems involve the relationship of a great number of variables associated with a plurality of goals that simultaneously are operative. Some of these goals are fairly straightforward and unambiguous; others are quite general and defy clear definition. At the same time, multiplicity of changeable variables are involved. Thus, one cannot vary certain elements while keeping others constant. Social and economic phenomena do not exist in a vacuum but constantly are subjected to interaction. We cannot be sure, however, which force exercises the stronger pull. This is not to say that public planning does not deal with immediate problems, rather that it also deals with problems that have not yet come into being.

Problems that are most adaptable to systems analysis tend to be unidimensional in nature, whereas planning problems are often multidimensional. For example, a problem for a systems approach might be "to develop a program and technology to place a man on the moon by 1970." A planning problem may be "to work toward the creation of an optimal environment, where men can live the 'good life.'" Many believe that the formulation of a planning problem often is an excuse for a lack of more specific goals and objectives by which an adequate statement of the problem can be made. There is some validity to this criticism, but it also must be recognized that public planning

deals with highly interrelated problems which frequently must be described in unrestrictive terms. For example, to create an optimal environment would mean that such physical subsystems as transportation, open space, and housing, as well as the governmental system, the economic system, and the social system all must be designed with the "best" set of relationships between and among them. The optimal solution to a systems problem, on the other hand, may involve only a single dimension and, in fact, may result in the suboptimization of many other systems.

Suboptimization in the Field of Regional Science

This problem of suboptimization has been recognized by many regional scientists. As Walter Isard has observed:

> A careful cutting into social processes with a fine-edged analytical scalpel exposes a primary stratum of premises underlying each of the three channels already discussed. These fundamental premises make clear that the three channels are each a special case of a more general system. These premises make clear that the three channels attack only problems which are primarily economic and for the most part postulate optimizing behavior of an economic type. Viewed from a broad social welfare standpoint, such channels, therefore, are at best suboptimizing.[6]

Isard has laid the foundation for a fourth channel, one which attempts to establish a "Values-Social Goals" framework. It is in this area of theoretical development that the "meeting ground" between the planning process and the analytical techniques of regional science has the greatest potential. As Isard has noted, the operational development of this values-social goals framework is contingent on extensive, path-breaking research in the social sciences. In order to proceed from values to the setting of goals, studies are needed to throw much more light on: (1) the interrelated and constantly changing roles and functions of individuals, groups, and communities in a society constrained by resource limitations; (2) the processes of communication, interaction, attitude formation, and decision-making; (3) the power structure of society, its relation to political organization, and administrative practices and diverse institutional arrangements; and many other basic questions which have become a central focus of the emerging interface between a number of disciplines. Many of these questions, of course, are fundamental to the social sciences in general and are largely outside the realm of regional science per se. However, significant contributory studies can be made:

> In particular, a very promising project would develop the concept of community participation potential and fully explore with the use of diverse attitude measurement techniques the possibility of roughly equating gains in community participation with dollar losses in efficiency. A successful attack here could in turn lead to significant studies on the proper allocation of functions among diverse levels of government, the development of more satisfactory benefit cost procedures, the advancement of capital-budgeting practices, and various basic social problems, as well as greatly facilitate the required restatement of values as systems and subsystem goals, especially when these values are conflicting.[7]

The value of such studies to the field of public planning would be im-

measurable.

The Need for Tools of Synthesis

Whereas systems methodologies have had widespread application as tools of analysis in shorter range problem-solving situations, as applied to the field of public planning, these methodologies must be used as tools of synthesis. In planning, it is necessary to deal with possible situations which can only be forecast. The operational situations envisaged do not as yet exist and, further, have only a probability of actually existing at some point in the future. In a very real sense, it may be said that the systems to be analyzed do not exist but must be "invented." By the same token, the operational laws governing the behavior of these systems must be brought into being by proper prior manipulation of the operational environment. This means that both the "invented" system and operational laws must be conceptualized and analyzed.

The synthesis must include not only the means already existing which might be gainfully preserved for use in future operations, but also many new means must be constructed in order to achieve a competitive advantage that does not now exist. These new means must be identified if the synthesis is to be truly creative.

In developing tools of synthesis for public planning, several important obstacles must be overcome. For example, most aspects of future urban systems are probabilistic in nature. This characteristic necessitates the development and study of alternative future systems. It is important to seek an optimization of each alternative, but it also is necessary to consider how to optimize the future by comparing the values and objectives associated with an interrelated set of alternative optimized future systems. To date, relatively little consideration has been given to the formulation of concepts and techniques which would permit such an evaluation. This constitutes an important area in which the field of regional science and other systems approaches could contribute to the advancement of public planning.

In light of continuing technological uncertainty, it will be necessary to deal with very large and complex urban systems. As systems techniques are applied to situations in the very long-range future, concentration on small parts of the system will likely become relatively unprofitable. The forecast of the future operational environment improves, at least in a general way, as the size of the system under consideration is increased.

Techniques for dealing with the problem of uncertainty have been developed in the more advanced systems-oriented disciplines. The problem, however, is to achieve a better interface between these disciplines and the field of planning. More course work in systems analysis, operations research, regional science, and other systems-oriented disciplines must be added to the already overburdened curricula of graduate planning programs. Further efforts also must be made to develop research in the application of these techniques to complex urban systems. Such research should be undertaken on a team basis, with participants from a wide variety of disciplines.

A second important obstacle to be overcome also is associated with the rate of technological change. Technical progress has achieved a greater magnitude both in its scope and effect than ever before. The range of choices resulting from increased knowledge has become so great and major innovations occur with such rapidity that frequent shifts of major porportions are possible to improve performance in the structure, functions, or processes of various complex systems. The rate of innovation no longer is limited by

the appearance of new knowledge. Rather, limitations are imposed by the problems of processing and understanding the great amount of new knowledge available, the difficulty associated with long lead times required for conceptual development, and the relatively limited resources available in each particular area of innovation.

With the accumulation of information doubling each five to ten years, many have assumed that we soon will have enough knowledge to solve most of our major problems. Yet, as Professor Harold G. Cassidy pointed out in a recent article,[8] a crisis is developing in information. This crisis, Cassidy contends, is intricately interwoven into the crisis of population, resource utilization, environmental pollution, problems of health and poverty which confront our nation and many other parts of the world. This crisis is "a crisis of intellectual poverty."

In large part, this crisis is the by-product of three significant trends which are accompanying the exponential growth of accumulated information: (1) the number of specialties is increasing; (2) the time required to prepare for any one specialty typically is increasing; and (3) the degree of interdependence among specialties is increasing.[9] To acknowledge the paradox of intellectual poverty in the midst of a superabundance of information is to indict a host of social, political, and economic institutions, but especially our contemporary (albeit traditional) approach to higher education.

Another significant obstacle stems from the existence of both internal and external competition that drives all segments of large, complex systems to exploit fully any possible innovation that will yield advantages. This is true in business, in affairs of government, and in conflicts between nations. With disturbing frequency, it is beginning to become true among academic disciplines.

The final problem of synthesis is a resultant of those previously enumerated. If organizational survival is to be assured, the level of system effectiveness must be as high as possible. The length of lead times required, the uncertainty of future urban systems, the problems of forecasting the future environment, and the keen competition among participants make the attainment of a high level of system effectiveness a most difficult undertaking. At the same time, methods for evaluating the effectiveness of alternative systems still are largely in the formative stage.

Disciplinary Specialization and the Crisis in Information

In the past several decades, many disciplines have become concerned with the rapid development of our urban environment and with the problems which attend this growth. Progressive disciplinary specialization has contributed to new levels of penetration and incisiveness and has led to a number of important advances in our understanding and knowledge as to how the urban system functions.

An abundant and ever-increasing literature testifies to a significant awareness in many disciplines of the various dimensions of the urban problem. Characteristically, however, this literature is widely scattered both with reference to the disciplines which have produced it and with reference to the publications in which it appears. These various disciplines, for the most part, have approached the problem from their own particular theoretical base. Relatively little interfacing of concepts has been achieved, and attempts at integration have been singularly rare and generally unsatisfactory.

As Robert S. Lynd has observed in his book, Knowledge for What?:

> Never before have our data been so imposing in quantity and refinement. And yet, never before have the lacunae been so devastatingly apparent. The comfortable old assumed process of separate scientific disciplines, growing each from its center toward its fellows and thus filling in the gaps, is either not working or not working fast enough to provide a social science corpus on which a floundering world can rely.

Our society has evolved gradually into an age that might be called the "age of the specialized specialist." Increased industrialization and the technology revolution has resulted in a complex "division of labor" which has far outstripped the wildest predictions of the earlier harbingers of this phenomenon. What now is required is a greater emphasis on the development of the "specialized generalist"--the specialist with a universal mind.

With the coming of the information explosion and the consequent rapidity of change in techniques of problem-solving and production, a new set of demands is becoming more and more insistent. Individuality, mobility, flexibility, and creative synthesis are becoming the order of the day among the younger generation; and in the current vernacular of youth, much of our education system "just ain't where it's at, baby!" More and more, it is becoming evident that the task of the educational system should be one of programming the student's mind with various techniques--techniques which he can then use to program and re-program his own mind in a dynamic world of complex change.

As United States Commissioner of Education Harold Howe has suggested, American educators should stop thinking

> ...of our colleges and universities as post-adolescent storage bins during the knowledge-injected cycle and start thinking of them as incubators of leaders for the issues that our society confronts.[10]

A student's mind might be viewed as a system for the acquisition, storage, retrieval, and utilization of information. Until recently, most of the attention in the nation's schools and colleges has been given to the storage function. Such an approach is in keeping with the notions of mass production and standardization, under which the mind is programmed to acquire, store, and utilize a fairly definite body of knowledge in a reasonably unchanging way from year to year.

In the future, however, the mind will be required to be more of a mental laboratory with built-in storage facilities, rather than merely a mental warehouse. It will have to make day-to-day decisions regarding the raw materials (facts) to be selected and accepted for storage; where and how they will be stored; when and how they will be utilized in the process of performing an experiment; and which results of one experiment (or experience) to combine with other results in the design of new experiments.[11]

Planning Education

In the emerging, dynamic world of ideas--where synthesis and interchange will be of the essence--there is an acute need for devising better institutional arrangements for the meeting of minds. This need is perhaps more evident and most crucial in relation to our urban environment and the various disciplines manifesting a concern for this environment. It is incumbent upon our system of education to seek all means whereby faculty and students,

technicians and laymen, specialist and generalists, theoreticians and practitioners can continue to benefit from the relevant contributions of many disciplines while maintaining and increasing the flow of urban research and the development of broadly oriented students of the urban environment. Opportunities must be provided not only for members of one specialty to get together, but for numerous types of specialists at different levels of sophistication to join in free exchange of ideas and viewpoints. In so doing, it must be recognized that not only do individual disciplines, departments, and schools possess unique strengths, but that each may be uniquely strengthened by the contributions of others.

All of this has obvious relevance to planning education. I have suggested that the field of planning is faced with a critical need for an improved theoretical framework if it is to be successful in meeting the challenges of the urban environment. Such a theoretical framework, it appears, might be derived from a careful blending of the concepts and methodologies of various systems approaches--such as regional science, operations research, systems analysis, and cybernetics--with the more traditional orientation of the comprehensive planning process. What this means is that a core discipline must be developed which provides the student with a common exposure to several basic areas of concern. Through this core curriculum, the student is provided with a systematic (and systems-oriented) consideration of the overlapping and interdependent characteristics and problems of the urban environment. This exposure should enable the student to be more productive in the understanding of the possible contributions of his own area of specialization as well as the "cross-fertilization" of concepts to be derived from an interdisciplinary approach.

Employment of sophisticated tools of analysis often is criticized because the results are completely esoteric to the people who must use them for decisions. In addition, such tools of analysis often lead to a cleavage between the planners and the public who view these efforts with great suspicion. These criticisms should not be taken lightly. The use of systems analysis has had its greatest success in areas where technicians prevailed in decision-making roles, and there seldom was any requirement or need for public approval or understanding. Obviously, this is not the case with urban systems. It is not essential that decision-makers and the concerned public fully understand the systems techniques which may be applied in the planning process. The planner must be able, however, to translate the results of the analysis into terms that can be understood by the public.

There is clearly a need for new approaches in higher education which permit greater interaction among the various disciplines which manifest a concern for the urban environment in a way that capitalized on the framework inherent in those areas of study generally designated as regional science, systems engineering, or systems analysis. Such an approach represents an important departure from the more traditional pattern; but it is one that warrants careful consideration by all universities that have an interest in planning education.

FOOTNOTES

[1]J. Brian McLoughlin, Urban and Regional Planning: A Systems Approach (Frederick A. Praeger, 1969), p. 15.

[2]Richard C. Synder, "A Decision-Making Approach to the Study of Political Phenomena," Approaches to the Study of Politics, Roland Young (ed.) (Northwestern University Press, 1958), p. 5.

[3]John Friedmann and William Alonso, Regional Development and Planning (MIT Press, 1964).

[4]Kevin Lynch, The Image of the City (Harvard University Press, 1960).

[5]Anthony J. Cantanese and Alan Walter Steiss, Systematic Planning: Theory and Application (Heath-Lexington Books, 1970).

[6]Walter Isard, et. al., Methods of Regional Analysis: An Introduction to Regional Science (MIT Press, 1960), pp. 681-682. The three channels to which Isard refers, of course, embody the principal theoretical constructs and methodological concepts of regional science: (1) Interregional Comparative Cost Analysis; (2) Industrial Complex Analysis: (3) Input-Output Analysis; (4) techniques for population and migration analysis; (5) techniques for analyzing the Urban-Metropolitan Structure; (6) Gravity Models, potential Modela, and Spatial Interaction Modela, and so forth.

[7]Isard, op. cit., p. 754.

[8]Harold G. Cassidy, "On Incipient Environmental Collapse," BioScience, XVII (1967).

[9]See: Jere W. Clark, "The Role of Systems Analysis in the Education System of the Seventies," an address presented at the annual meeting of the Society for General Systems Research, 1968.

[10]"The Campus No Longer an Island," Council Journal, Council for Higher Education, United Church of Christ, November, 1967, p. 2.

[11]For a further development of this analogy, see: Karl W. Deutsch, The Nerves of Government: Models of Political Communication and Control, (The Free Press of Glencoe, 1963), Chapter 5.