THE HUMAN SETTLEMENT SYSTEMS STUDY: SUGGESTED RESEARCH DIRECTIONS

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Abstract

This paper critically discusses the nature and limitations of various lines of research that have been proposed within the general framework of the Human Settlements and Services research task. Recommendations are made concerning feasible directions for future research. In this regard particular attention is given to issues of urban versus regional systems, to structural interdependencies within national and regional settlement systems, and to spatial interaction patterns on an intraregional scale.

Preface

The IIASA research task on Human Settlements and Services: Development Processes and Strategies is attempting to establish and use a framework of functional urban regions to provide a better understanding of the impact of public policies on the spatial distribution of population and economic activity. The study involves the United States, Canada, Japan and nations in Eastern and Western Europe. This paper by a leading Polish geographer critically discusses the nature and limitations of various lines of research that have been proposed within the general framework of the task. Recommendations are made concerning feasible directions for future research. In this regard particular attention is given to issues of urban versus regional systems, to structural interdependencies within national and regional settlement systems, and to spatial interaction patterns on an intraregional scale.

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1. Peter Hall, Niles Hansen and Harry Swain, *Urban Systems: A Comparative Analysis of Structure, Change and Public Policy*, RM-75-35, July 1975.

2. Niles Hansen, *A Critique of Economic Regionalizations of the United States*, RR-75-32, September 1975.

3. Niles Hansen, *International Cooperation and Regional Policies Within Nations*, RM-75-48, September 1975.

4. Peter Hall, Niles Hansen and Harry Swain, *Status and Future Directions of the Comparative Urban Region Study: A Summary of Workshop Conclusions*, RM-75-59, November 1975.

5. Niles Hansen, *Growth Strategies and Human Settlement Systems in Developing Countries*, RM-76-2, January 1976.

6. Niles Hansen, *Systems Approaches to Human Settlements*, RM-76-3, January 1976.

7. Allan Pred, *The Interurban Transmission of Growth in Advanced Economies: Empirical Findings Versus Regional Planning Assumptions*, RR-76-4, March 1976.

8. Niles Hansen, *The Economic Development of Border Regions*, RM-76-37, April 1976.

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The Scope of the Study

A research project, once conceived, often undergoes reformulations at its more advanced stages. Such has been the case with the comparative study of human settlement systems, as illustrated by the early paper by Hall (1975) and a more recent contribution by Hansen (1976). In the former article such questions as the changing distribution of people and jobs (especially in terms of their concentration and deconcentration), occupational structure, travel to work and land occupancy patterns were stressed. It was also expected that the study should lead to the development of general social indices for urban areas as well as some indicators showing the efficiency of resource (particularly land) use. On the other hand, the paper by Hansen emphasizes the study of economic development processes in space as reflected by the transformations of settlement systems. In the latter case the methodological apparatus to be used in the analysis includes models of innovation diffusion and of contact systems. Consequently, the areal units originally referred to as Daily Urban Systems, corresponding to urban agglomerations in a broad sense, have later been replaced by the notion of functional economic regions. The two approaches give equal weight to policy questions while

claiming that the study should lead to a better understanding of the capacities and limitations of national settlement and regional development policies, and thus to provide guidelines for future policy formulations. Generally, however, the emphasis has shifted from the study of changing physical patterns to that of economic development processes over space.

Assuming that the research postulates presented above may be challenging as such, one can see a need to reexamine some of the strategic issues related to the study proper. More specifically, the aim of this short paper is to answer the following questions:

1) What is the degree of correspondence between the data base as specified in the project proposals and the data required as an input to the models which would have to be employed to meet the research postulates earlier referred to?

2) If it is found that the degree of correspondence is not fully satisfactory, what kind of additional information would be needed to fulfill the research claims and what are the prospects for securing such information on a comparative basis?

3) What is the best use that could be made of the existing data base or of the one that is likely to be assembled?

4) What directions of research on human settlement systems seem particularly promising and how could they be incorporated into the programme under discussion?

In the second part of the paper I shall attempt to illustrate with more specific examples some of the suggestions to be made under point four.

The first and second questions require a more detailed survey of the research postulates so far made. The postulates are ordered from more to less feasible to accomplish, assuming the availability of the small-area data specified by Hall, Hansen and Swain (1975B).

In the proposed format of the study major emphasis is put on the delineation of functional regions with the underlying notion of labour market areas. This is essentially a spatial interaction approach which considers trip patterns, especially patterns of work-trips, as a basic correlate of urban spatial structure. The idea goes back to the work of Pokshishevsky (1935) and since then it has been widely accepted in the literature. However, some reservations as to areal breakdowns are necessary in the specific context of the study. First, the regions to be identified may not be strictly comparable even if the delineation criteria remain more or less constant over space. For example, the 173 Daily Urban Systems in the United States represent probably quite different units than the 70 A-regions in Sweden. Even if variations in the spatial mobility level and in the density of the settlement network are taken into account there remains the question of the size of basic territorial units (i.e., counties vs. communes), and of the nesting of smaller centres within metropolitan labour markets. Secondly, the delineation criteria frequently will have to be relaxed to allow the whole (national) territory to be subdivided into functional urban regions. Therefore, the units identified

may in some cases represent actual commuting sheds of large urban centres while in other cases they may be closer to potential or hypothetical labour market areas.

The next problem pertains to the morphology and typology of functional urban regions. It may be assumed that within individual urban regions the core (central city), the metropolitan zone, and the outer zone would be identified. Within such a framework and using the demographic, employment and infrastructure data available, it is possible to trace the patterns of concentration and deconcentration with respect to population and economic activity. Furthermore, the mapping of spatial patterns may permit a classification of urban regions based on the concepts of core-periphery and urban field on the one hand (Hansen, 1976), and the concepts of the metropolitan region and the industrial conurbation on the other. The fallacy to be avoided relates to the interpretation of shifts occurring over time. It has been demonstrated by Hansen (1976) that the seventies can bring a new and formerly unexpected pattern of change in the distribution of population and economic activity. Therefore, it would be naive to draw long-range conclusions on the evolution of settlement systems using the limited evidence for the 1960-1970 decade.

Another group of questions can be studied on a more conditional and a less comparable basis. The patterns of technical infrastructure, social infrastructure (including housing), welfare, and population characteristics (such as age and sex composition and education level) belong under this category. It is still to be determined, however, what kinds of theoretical

hypotheses are to be tested with the use of such data and what techniques are to be employed.

Finally, we come to those postulates which cannot be seriously tackled with the help of the statistical information specified in the study proposals. One such question pertains to urban development processes. Can one specify as an operational task the identification of "mechanisms by which growth is transmitted over space" or of "the causes of high growth" when dealing with rather general and not strictly comparable data for one time period? For similar reasons it seems infeasible to carry out rigorous innovation diffusion analysis and, therefore, to test the three leading spatial diffusion hypotheses, i.e., hierarchical filtering, neighbourhood spread, and the large city-oriented diffusion model. It has been shown that spatial diffusion models are particularly demanding with respect to both spatial and temporal disaggregation of data inputs. Studies of organizational linkages (Goddard, 1975; Pred, 1976) and of contact systems (Törnqvist, 1975) represent somewhat similar cases. The latter could in fact be dealt with in terms of contact potential fields (and landscapes) using the available population and employment statistics along with some measures of spatial accessibility. The findings, however, would not relate to the actual magnitude and patterns of interaction and might, therefore, be partly misleading. On the other hand, a more conceptually appealing comparative analysis of actual contact systems is out of the question (even providing that the

necessary data are available) due to such problems as a lack of correspondence between various work functions and organizational structures.

It has also been proposed that the comparative study of human settlement systems would involve the problems of resource (such as land) use, energy flows and stocks, environmental change, and questions related to the quality of life. Since there is very little if anything related to these subjects in the proposed data matrix one may assume that the authors have given up at the very outset the idea of entering these fields of study. It may be noted that the studies of functional urban regions regarded as prototypes, i.e., the books by Berry (1973) and Hall (1973), have not treated these challenging topics in any detail[1].

Moving toward a more normative framework, it has been postulated that the study should permit analysis of the costs and benefits of various settlement policies. From what has been said above it follows that such an evaluation would have to be based mainly on the analysis of differential growth of cities and of concentration and deconcentration trends with respect to the distribution of population and economic activity. The availability of data for two points in time would preclude any extended policy analysis just as it would restrict ambitious modelling efforts.

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[1]Another book by Berry (1974) is wholly devoted to the study of environmental problems within an urban context.

Another problem concerns information on interregional and intraregional flows. If available, such data would enable one to test a number of basic hypotheses relating to the morphology of regional as well as national settlement systems. However, flow data (except perhaps for migration) are usually very difficult to collect even for a single case study; it cannot be expected that such information could be readily assembled on a broad comparative basis.

In a more constructive vein, and going back to questions three and four posed at the beginning of the paper, it may be proposed that the study of human settlement systems should consist of two hierarchically interrelated layers:

1) The comparative layer, whose objective would be to identify general patterns of functional urban regions and their overall internal structure. The data used would pertain to population, employment, commuting, and infrastructure. The analysis should reveal such characteristics of regional settlement systems as travel-to-work patterns and the levels of spatial concentration of population and economic activity. It could lead to broad policy considerations dealing with population distribution and regional development. However, due to the general character of the data available and the lack of suitably long time series of data, such an analysis would have to be of a general interpretive type. The chief value of the work would consist of the accumulation of massive, although not very detailed, empirical evidence on the spatial structure of urban regions and their change, and of testing some basic assumptions used in the existing models of urban and regional structure.

2) The case-studies layer, whose objective would be to test, in a systematic way, the major theoretical approaches related to human settlement systems on both the national and the regional scale. This could possibly result in the development of a new, integrated conceptual framework. The case studies should be individually designed and based on less conventional data, particularly flow data, as well as on extended time series of stock data. Preferably, the case studies should be linked with other on-going tasks--notably with the migration study and the regional development studies--to permit efficient use of data and research capacity. Some research approaches that could be employed in such case studies are described below.

Some Research Directions Proposed

There exist a number of theoretical concepts pertaining to the structure and development of settlement systems. These concepts, of course, vary in scope, precision, and universality. Moreover, they pertain as a rule to different dimensions of settlement systems. It may be postulated that empirical studies should be oriented towards concepts which are likely to be characterized by: (a) a considerable level of cross-cultural validity and (b) relevancy with regard to planning and policy formulations. Since the analysis is to be carried out for functional urban regions it should be able to test hypotheses related to both inter- and intraregional scales. In the remainder of this paper three possible research areas are distinguished and discussed in some detail. The discussion

draws in part on the initial proposals and on review papers related to the project.

Urban versus Regional Systems

It may be readily observed that some of the theories and models of spatial economic growth used in regional analysis (e.g., the growth pole and innovation diffusion concepts) have been more recently interpreted within the framework of urban growth and structure (see, for example, Hansen, ed., 1972; Parr, 1973). On the other hand, settlement network theories, notably the central place concept, have more often been used to explain some aspects of regional economic structure. With respect to centre-hinterland relations two essentially equivalent concepts have developed, i.e., the regional concept of core-periphery (Friedmann, 1972) and the settlement concept of metropolitan dominance (Bogue, 1950).

These apparent similarities have prompted a number of authors to suggest an integration of the two streams of thought. For example, Richardson (1973, p. 135-138) has strongly advocated an integration of regional and urban economics. He claims that the theory of regional growth has paid insufficient attention to urbanization and urban structure as an influence on regional growth performance. More specifically, Richardson identifies four areas of overlapping interest: (1) the analysis of migration in its interregional and intraregional dimensions on one hand, and in the interurban and rural-urban dimensions on the other; (2) the problem of spatial innovation transmission

patterns; (3) the role of agglomeration economies, and particularly of urbanization economies, in regional development; and (4) the problem of estimating and predicting growth potential from the growth centre policy perspective.

Although such arguments are generally viable, it would be quite confusing to identify regional growth theory with the concepts relating to the development of settlement systems. To be sure, Richardson defines his economic regions as labour market areas, or functional urban regions--and this is the only case when the two types of spatial systems are equivalent. One should refer here to earlier definitions of nodal regions and of urban agglomerations as functional regions (see Dziewoński, 1967). At the same time, other regional systems, such as those of administrative, planning, and ethnic regions, do not necessarily correspond to patterns of settlement systems, and their study cannot be exclusively based on settlement systems-oriented concepts. Since the major attribute of urban systems, as contrasted with regional systems, is their discontinuity over space (Webber, 1964), no settlement systems-based concept of spatial economic growth can successfully develop unless it extends beyond the traditional notion of regional systems.

Although the spatial discontinuity assumption is generally acknowledged, there are relatively few generalizations that can be made concerning the morphology of national settlement systems. Most of the existing concepts and models pertain to individual components of the settlement system rather than to the system as a whole. There have been attempts at reformulating more

traditional concepts, primarily the notion of rank-size relationships, within a dynamic framework. However successful they may be, these efforts are usually limited to certain aspects of settlement system structure. A more comprehensive approach was recently proposed by Domański (1975), who has interpreted systems dynamics in terms of idealization theory, introducing the concept of locational values. Other approaches are mostly based on the study of spatial organizational linkages and information flows (Goddard, 1975; Pred, 1973). They offer "a large-city focussed model of city-system development" (Pred, op. cit.) whose structure, however, remains to be specified.

To date, implicit settlement systems models--in particular models of interurban and interregional migration--have been most successful in operational terms. These models have extended beyond the traditional pull-push interpretation of migration flows and are able to account for the fact that the probability of both in- and outmigration increases during periods of rapid economic expansion of a city or a region and falls off during the subsequent stabilization periods (Cordey-Hayes and Gleave, 1973; Rogers, 1976).

From this brief overview a number of questions can be extracted which should be subjected to empirical analysis. They include the following questions: (a) What is the intensity of interaction (other than work trips) between the core areas and the remaining zones of functional urban regions on one hand, and among the core areas (major cities) on the other hand, i.e.,

do urban agglomerations or large cities in general form a subsystem within the national settlement system, or do such subsystems mainly have a regional character?; (b) what is the nature of interregional, as compared to intraregional, linkages, and how do they evolve over time, i.e., are regionally-oriented linkages becoming interregionally oriented or vice versa?; (c) what is the interdependence between patterns of flows (other than migration) and intraurban growth patterns?

Structural Interdependencies within National and Regional Settlement Systems

Questions of the kind discussed so far involve a need for flow data, though it is conceivable to base analyses on stock data, provided such information is arranged into relatively long time series. The findings would pertain to implicit interdependencies within settlement systems and they may also be of interest from both the theoretical and planning points of view.

One basic concept to be tested is that of urban hierarchy. It is generally assumed that settlement systems are characterized by a certain measure of hierarchical organization. Nevertheless, due to widespread discontent with central place theory, the notion of urban hierarchy has not been given enough recognition in recent work. The question should not be dealt with in emotional terms but rather in terms of broad empirical evidence. It may be hypothesized, for example, that at least in centrally-planned economies the administrative hierarchy of urban places

should correspond to their functional hierarchy, as measured by the concentration of tertiary activities (even if employment in the local government sector is not explicitly considered). More precisely, one could anticipate that the administrative hierarchy exerts an influence on the evolution of the functional hierarchy of urban places by adjusting the number of hierarchical orders and by shifting central functions among cities. Admittedly, to separate individual components of change may not be a simple task. Even the most "typical" central functions can form clusters which are specialized at the national level. Variations in the magnitudes of such indices as size of sales or number of doctors per thousand inhabitants may be accounted for by varying income levels and supply levels. Furthermore, the economic base rules, especially the inverse relationship between the size of the place and the share of its exogenous sector, must also be given proper consideration (see Mera, 1975). Another complicating factor is the internal functional specialization of urban agglomerations, which makes their constituent urban units hardly comparable to other, self-contained cities.

The notion of urban hierarchy also offers a starting point for testing other models pertaining to regional settlement systems. The concept of metropolitan dominance (Bogue, 1950; Duncan et al., 1960), which was largely abandoned during the sixties, supplies certain missing links between central place theory and the more fashionable and up-to-date (although still rather vague) model of urban fields (Friedmann and Miller, 1965).

It was originally claimed that processes of metropolitan growth transform the traditional central place structure by "robbing" the surrounding lower-order cities of their commercial and manufacturing functions and creating a zone of metropolitan shadow. This results in the emergence of regional labour markets, dominated by centripetal forces and identified with the metropolitan labour shed. A net decrease of transportation costs, which had been a major factor in the development of metropolitan dominance patterns, can eventually bring about a gradual deconcentration of economic activity, thus challenging the very notion of dominance. The result is an urban field pattern in which the peripheral zones offer comparative advantages to both residents and communication-oriented industries because of amenity and non-congestion factors, while core areas tend to attract less mobile sectors. In an urban field the commuting patterns become increasingly complex and time-variant, although the whole area retains the relatively high degree of closure characteristic of a single market area.

It should be noted that somewhat parallel notions are shared by the theory of unified (or integrated) settlement systems (Khodzaev and Khorev, 1973), which postulates an integration of urban and rural settlement, and the replacement of physical concentration by an increasing intensity of interaction. Such a substitution would result in a more homogeneous spatial distribution of population and economic activity, thus allowing higher equity standards to be met.

Although some of these concepts refer to historical patterns while others are intended to apply well into the future, they may still provide useful points of reference in the examination of the changing morphology of urban systems.

Spatial Interaction Patterns: Intraregional Scale

One of the problems encountered in any analysis of inter-regional versus intraregional interactions is a difference in the nature of contacts. In intraregional, and particularly intraurban, situations these interactions tend to be of a daily and face-to-face character. Since one of the basic, if not the basic, type of contacts involves links between the place of residence and the place of work, it becomes evident that spatial interaction models on an urban and regional scale have to rely to a high degree on generalizations concerning the structure of functional urban regions as labour market areas.

Spatial interaction models of cities and regions have developed rapidly over the past fifteen years (see, for example, reviews by Senior, 1973; and Korcelli, 1975) in response to a growing demand for new planning tools. Yet it is generally acknowledged that such models are rather partial in that they are based on an oversimplified picture of the structure, inter-dependencies, and human activity patterns within urban regions. These shortcomings are now recognized by both the model builders and their critics; for example, Cesario and Smith (1975) have recently postulated the development of a data base to test spatial interaction hypotheses. This is one of the research

areas in which a systematic study of functional urban regions could provide inputs for the development of theory and of theory-based planning models.

One can see three possible contributions to be made. First, spatial interaction models have primarily considered two types of linkages, work and service trips. Other interactions, such as social contacts and recreational trips, have not been generally accounted for in the models. Hypothetically, these linkages could be taken into account by including a social clustering term and a similar recreational dispersion term in the allocation formula. This, however, seems to be a partial remedy. Spatial interaction models should be more explicitly based upon the concepts of daily and weekly human activity patterns and the concepts of time-location budgets. This calls for basic empirical work.

Second, spatial interaction models have not been able to account for the operation of feedbacks between endogenous and exogenous sectors. This is true partly because the knowledge of interdependencies among various economic activities within an urban region remains inadequate. It should be possible to introduce a more detailed sectoral disaggregation of the models. At present at least three different definitions of the exogenous and endogenous sectors are in use, but there is a tendency to include more and more activities in the exogenous category. This certainly does not enrich the models' structures; research should be undertaken on how to make activities which are now treated as exogenous an endogenous part of model-building.

Third, the role of the spatial accessibility variable in the interaction models should be counterbalanced by a more explicit consideration of other allocation factors, such as the amenity factor. This especially applies to the residential (housing stock) allocation submodel. Detailed land use and environmental quality studies may result in the identification of systematic variations in the values of different allocation factors (i.e., locational values) within urban regions.

Conclusions

As previously mentioned, the three approaches proposed are illustrative; they do not exhaust the possible scope and range of case studies of human settlement systems. A more comprehensive, systematic strategy is conceivable and some effort should be devoted toward this goal.

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