

URBAN SYSTEMS: A COMPARATIVE ANALYSIS
OF STRUCTURE, CHANGE AND PUBLIC POLICY

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July 1975

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Preface

This proposal, a continuation and extension of work begun at IIASA in 1974, was first discussed at the IIASA Conference on National Settlement Systems and Strategies last December. In its present form, it dates from a weekend of discussion and writing in Ottawa last May, when the authors met Dr. Pendleton of the Ford Foundation and Professor Glickman of the University of Pennsylvania. The primary purpose of this description of the project is the satisfaction of the Ford Foundation's information requirements; since those differ from the requirements of IIASA's national member organisations and of potential collaborators in this study, more fully elaborated versions will be forthcoming in the future.

The proposal was sent to the Ford Foundation in July 1975. I have every hope that it will be funded and will become an integral part of IIASA's future work on human settlements and services, resource and environmental management, and integrated regional development.

Howard Raiffa

July 1975

Proposal for a Study

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1. Introduction

1.1 The objective of this research is *to establish and use a framework of functional urban regions to give better understanding of the impact of public policies in the fields of population distribution and economic development.* In recent decades, governments in advanced industrial countries have used a variety of policy instruments to stimulate economic growth in certain regions and retard it in others; and to control the physical growth of cities. Though evaluations of such policies have been made, they suffer from lack of a comparable data base. This study aims to remedy the deficiency by employing standardised units of urban analysis to make a rigorous, comparative international study covering both Western and Eastern Europe, North America, and Japan. The study will be conducted at and through the International Institute for Applied Systems Analysis, Laxenburg, Austria, with collaboration from the countries concerned.

2. Objectives and Outputs

2.1 In the past two decades governments increasingly have attempted to influence patterns of spatial resource and population distribution. These efforts usually have been prompted by two concerns. First, there is a widespread feeling in many countries that one or more of the largest cities is too big, in the sense that the social costs of further growth exceed the social benefits. It is also widely felt that assistance should be given to promote the growth of lagging regions. These regions are usually rural and tend to have a relatively high proportion of their employment in the primary sector, but in some instances they are old industrial areas that need modernisation. Obviously the problems of big cities, lagging regions, and other parts of any given country are not independent of one another because the various areas are linked by flows of goods and services, migration, etc. Thus, regional and urban policies always have consequences for the whole of the national territory, whether or not they were intended to do so. To facilitate identification and evaluation of the costs and benefits associated with alternative regional and urban policies, it is desirable to define areas that include most of the population and that represent meaningful units of analysis.

2.2 Geographers, economists and planners concerned with the spatial aspects of national economic development have argued that growth-producing innovations tend to be

transmitted downward through the urban hierarchy, as well as from urban centers to their surrounding hinterlands. However, these processes are very imperfectly understood. The delineation of sets of urban regions for a large number of countries and the coordination and analysis of data by urban regions would contribute greatly to filling this gap; the urban regions are probably the only units of analysis that readily lend themselves to the testing of the major hypotheses concerning spatial-temporal growth transmission.

2.3 More generally, the presence or lack of empirical regularities among nations can itself provide valuable insights for public policy formulation. For example, if it can be shown that growth is in fact transmitted through an urban hierarchy, and if a country lacks cities in a certain critical size range in a lagging region, then one objective of urban policy could be the development of the needed urban center or centers. Also, although regional and urban policy objectives may vary among countries, spatial growth mechanisms may nevertheless be similar whether a country has a socialist or market economy. In any event, this is an hypothesis that could be tested in the proposed research.

2.4 The outputs of the research would be of interest to decision-makers in national and regional governments and also in international agencies (EEC, CMEA, OECD, UNEP, UN-ECE) concerned with evaluating and advising upon the

effectiveness of public policy instruments. But in addition, the data base would be freely available to researchers in universities, institutes, and governmental agencies.

3. The Proposal

3.1 The basic unit of analysis will be the *urban region*: a term intended to describe a city or agglomeration and its surrounding sphere of influence. An important part of such an urban region will be the *commuter zone*, which sends resident workers into the central city. Urban regions are thus similar to Brian BERRY's *Daily Urban Systems (DUS's)* (BERRY 1973) and to the *Metropolitan Economic Labour Areas (MELAs)* used in the study by HALL et. al. (1973); they tend to be larger than the *Standard Metropolitan Statistical Areas (SMSAs)* adopted by the US Census and by some European researchers (SCHMITZ, 1966; BOUSTEDT, 1960 and 1967), or by Kingsley DAVIS in his 1950-based study (INTERNATIONAL URBAN RESEARCH, 1959).

3.2 The present proposed study is therefore to be preceded by a preliminary definitional study, now underway with separate funding already guaranteed, in two parallel and closely linked projects at the University of Reading, England, and IIASA. This preliminary study will have two objectives:

- (a) to further review all relevant literature on urban growth and change in the countries con-

cerned, with special attention to definitional problems;

- (b) to define a set of urban regions for western, central, and eastern Europe, as far as data allow, and comparable as far as possible with the regions developed for the US by BERRY (1973), for Canada by RAY, for Britain by DREWETT, GODDARD and SPENCE (1974), and for Japan by GLICKMAN.

Commenced in June, 1975, this preliminary study should be sufficiently advanced within six months to feed into the main study now proposed.

3.3 In this main study, existing small-area data from all participating countries will be assembled into a coordinated data base in Laxenburg and used as a basis for research on public policy problems. Some of the more important policy questions are the following:

- (a) *Comparative growth*: what is the pattern of growth or decline in urban regions? Are there systematic geographical patterns? Are growth trends systematically related to size, and if so, how? By what mechanisms is growth transmitted over space? How far is growth to be explained in terms of the chief economic supports of the urban region? Does high income, generated by one or more leading industrial sectors, cause high growth? Are answers to these questions dependent on

economic mechanism?

- (b) *Internal change*: Is decentralisation of residential population taking place? Does it appear that the traditional pattern, whereby new jobs attract new people, still holds good? Conversely, is there evidence of attraction of people to amenity-rich areas, with industry in turn attracted to labour supplies? Are economic activities dispersing to multiple nuclei, leading to a weakening or even destruction of old core-periphery relations? What are the resulting patterns of travel to work and for other purposes? How far is dispersal leading to lower densities of occupation of the land?
- (c) *Quality of life*: A further extension of the work could develop indicators for quality of life in urban areas in different countries and continents. Up to now work has been done on this subject either at a coarse national aggregate level or for metropolitan areas within one country (cf. HOCH, 1973; SMITH, 1973). At present comparison is vitiated by lack of precisely comparable areal definitions; for instance, comparisons between Paris, London, New York, Tokyo and Moscow are greatly affected by the precise geographical units chosen for comparison.

(d) *Resource and energy stocks and flows.*

Models of this type have been developed in recent years for systems that are reasonably closed, but to develop them for urban areas clearly presents problems of data capture. Much of the information is not disaggregated in the right way, and flows in particular might be difficult to monitor. This part of the study would focus on the comparative efficiency of different urban systems in terms of resource use. One aspect, land use, would relate particularly closely to the themes of population growth and change already discussed.

3.4 Not all of the topics discussed above, especially under (c) and (d), can be pursued in depth with the resources proposed here. The proposed basis of support from various sources is set out in section 8 below.

4. Technical Problems

4.1 The research presents considerable technical problems of data acquisition and international comparison. Indeed, the preliminary stage involves discovering just how serious these are.

(a) *Geographical building blocks:* even within one country, these vary in scale (compare the township units of New England with the

giant county units of the American deserts). In an international comparison these variations are apt to be even greater. Thus within Europe, local government in Britain, Poland and Sweden is now reorganized on the basis of rather large units while other countries still retain a system based on small municipalities. Different countries will have data available only for certain larger-scale units and not for the smaller. This particularly applies to data on industrial structure, incomes, and other economic data. Aggregation upwards, so as to obtain some 'lowest common multiple,' may be the only answer, though various statistical intrapolation techniques may prove useful.

- (b) *Data availability:* some very important basic data vary in availability from country to country, though probably this is not as serious as heretofore. Commuting data for small areas will be absolutely basic to the exercise. Other spatial interaction data (migration, transportation and communication) will also be necessary. Basic population data will almost certainly be available everywhere, but migration data may not. Employment data for small areas, preferably classified at least by major sectors, will be a very important

basic input but may not be available everywhere; in any event there may be difficult problems of comparability. Data on incomes, production and energy may be the most elusive of all.

(c) *Time series*: the minimal objective would be to make an analysis for the intercensal decade 1960/61 - 1970/71, with, hopefully, a backward extension to 1950/51 in order to obtain a picture of changing trends over two decades. Here, the chief difficulty will be instability of census geographic units over time.

5. Organization of Research

5.1 Six interlocking activities can be distinguished, each demanding a different set of skills and financial resources. The nature of these activities is described in the following paragraphs, and a summary of cost, timing, and responsibility is given in section 8.

5.2 *Task 1: Definition*. The crucial data for the delimitation of urban regions (basically commuting or other daily interactance data) have to be surveyed, checked for quality and completeness, collected, and rendered onto maps. At the same time, field workers will reconnoiter a wide range of spatially compatible data sets, report on current work by other scholars in the various places visited, and establish informal links with statistical

agencies. A panel of national experts will be asked to provide written descriptions of local data and their sources to the field team at a workshop in Laxenburg early this fall.

5.3 *Task 2: Networks.* Resources are needed to set up and maintain liaison with people and institutions, especially when they span the globe. On the input side, there are two groups of resource people: the panel of European expert advisers, some of whom will later become collaborators in the decentralised phase of analysis (see 5.6); and the established groups in the US, UK, Australia, Japan, and Canada who are working in parallel. Early liaison and guidance must also be sought from national governments, UN agencies, and such multinational organisations as CMEA, EEC and OECD.

5.4 *Task 3: Research Planning and Direction.* The project director and his immediate colleagues will be supported by an international Advisory Committee (see 6.2) and by a continuing IIASA research seminar that will also draw on the expertise of resident scholars in other areas and on visitors.

5.5 *Task 4: Data.* A data directory system and supporting software are to be designed and installed at Laxenburg to receive, store and handle national data files. Existing hardware will suffice in the early stages, but will be supplemented by computer graphic equipment and an extra disc storage unit as part of IIASA's ongoing

program.

5.6 *Task 5: Analysis.* The material gathered at IIASA will be used in three ways. First, scholars resident at IIASA will perform most of the basic analyses of the data. Second, IIASA will invite proposals from outside scholars, through its national member organizations wherever appropriate, to use IIASA facilities for special analyses. Third, the data will be made available to interested researchers at reproduction cost. At a later stage it may be technically possible to allow some of our dispersed collaborators direct access through a IIASA-centered computer network.

5.7 *Task 6: Dissemination.* In addition to publication in scholarly journals, research results from the project will be made available by IIASA through its own publications. There will also be a need to develop special print and audio-visual materials for the governmental audiences mentioned above.

6. Personnel

6.1 Niles HANSEN will direct the project for IIASA, at least until the summer of 1977.

6.2 Peter HALL, Brian BERRY, Koichi MERA and Harry SWAIN will be available to HANSEN as members of the IIASA Advisory Committee on Human Settlements and Services. Academician Abel AGANBEGYAN of Novosibirsk has been invited

to join this group, but no answer has been received at this writing.

6.3 The work on the project at Laxenburg will be undertaken under HANSEN's direction by a team of full-time and part-time researchers drawn primarily from economics, geography, and related disciplines. Five man-years of senior researchers are allotted for this activity, plus four man-years of more junior scholars. Additionally, IIASA will provide overhead support for two man-years of externally financed work by senior resident scholars. Precise dispositions will be made by HANSEN according to circumstances during the development of the work.

7. Related Research Activities

7.1 The project, as presently conceived, consists primarily of research to be done or coordinated by IIASA, but several contributing subprojects will be funded and carried out by other institutions. Part of Task 1 (Delimitation of urban regions) is supported by a grant to the University of Reading from the Centre for Environmental Studies in London, amounting to approximately \$45,000. The second supplement is expected to be a \$40,000 planning grant from the United Nations Environmental Program to IIASA. This grant would fund a research planning effort dealing with methods of conserving materials and energy in urban systems. Through this grant, UNEP is encouraging IIASA to design a considerably larger

follow-on research effort, to be funded in part by UNEP. Also feeding into the project will be a third study, funded by the Ford Foundation at the University of Pennsylvania, in which Norman GLICKMAN and his associate Tatsuhiko KAWASHIMA of Gakushuin University, Tokyo, are studying urban regions in Japan, using definitions close to those to be employed in this project. In Canada, D. Michael RAY and the Ministry of State for Urban Affairs will provide comprehensive time series data on Canadian urban regions. At the University of Chicago, Brian BERRY's ongoing work, also funded by the Ford Foundation, will provide the basic data on urban regions within the United States. Finally, preliminary conversations with Riccardo PETRELLA and Marcus METELKA of the Vienna Centre (Centre Europeen de Coordination de Recherche et de Documentation en Sciences Sociales) have agreed to share data collected for their project on the costs of urban growth from sixteen countries in both eastern and western Europe.

7.2 Within IIASA, the proposed study will take advantage of several activities now planned or underway. The Computer Science group welcomes the chance to experiment with advanced methods for data management in a real, but in computer science terms, small, data base. That group is also actively developing the first East-West computer network, through which it may ultimately be possible for a number of collaborating institutions to use the Laxenburg data base directly. (This work is separately planned and budgetted and does not form part

of the present proposal.) The pending internal reorganisation of IIASA will strengthen the relevance of this data base, and the comparative analyses that flow from it: beginning in 1976, one of the two main areas of applied work for IIASA will be "integrated regional development." The other, a comprehensive comparison of primary energy options, will benefit from regionally specific demand analyses and, possibly, energy analyses, that will be made possible through the proposed study.

7.3 IIASA's present project on Urban and Regional Systems is expected to evolve into a permanent research program called Human Settlements and Services. Detailed planning of that program will not commence until late this summer, but it will incorporate all the present concerns of the Urban and Regional Systems Project, the health planning concerns of the present Biomedical Project, the facility siting problems of the Energy Project, as well as other areas yet to be defined. The compilation of a coordinated data base on urban regions in industrialised societies will be a capital asset of enduring importance in the new grouping, allowing empirical foundation for ongoing work on settlement systems and strategies (SWAIN, 1975) and planned work on resource-conserving urbanism.

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