THE HUMAN SETTLEMENTS AND SERVICES AREA: THE FIRST FIVE YEARS

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International Institute for Applied Systems Analysis

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I. INTRODUCTION TO IIASA AND ITS RESEARCH PROGRAM*

The International Institute for Applied Systems Analysis is an international research organization founded in October 1972 to work on the common problems of industrialized nations and, thereby, serve as a "bridge between East and West". During the five and a half years that followed the original meeting in 1967 between McGeorge Bundy, former national security advisor to President Lyndon Johnson, and Jermen Gvishiani, Deputy Chairman of the State Committee for Science and Technology of the USSR Council of Ministers, negotiations were held by representatives of distinguished scientific bodies from 12 nations. Joining Bundy and Gvishiani in the deliberations that led to the final charter were such persons as Sir Solly Zuckerman of the Cabinet Office, United Kingdom; Philip Handler, President of the National Academy of Sciences, United States; Aurelio Peccei of Italy; and Pierre Agrain of the General Delegation for Scientific and Technical Research, France.

Four major agreements of the founders exerted significant influence on the evolution of the Institute. Perhaps the most important of these was the *non-governmental status* given to IIASA. This meant that its members would be scientific institutions from each nation and not the governments themselves. Consequently, the scientific activities of the Institute were insulated from the undesirable intrusion of international political differences.

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*This chapter is a summary of pages 3-23 of *The First Five Years: Director's Review* written by Roger Levien.

The second important agreement was the selection of *Applied Systems Analysis* as the descriptive phrase in the Institute's name. Although this phrase has a useful ambiguity, allowing for leeway in its interpretation, the founders intended it to denote the application of modern methods of analysis to contemporary problems of society.

The third agreement was the acceptance of the offer of the Austrian government to *locate the Institute at Schloss Laxenburg*, 16 kilometers south of Vienna. The generosity of the Austrian offer and the helpfulness of the Austrian authorities were significant reasons for this acceptance, but Vienna's situation on the very border between East and West made it an especially appropriate location that has served the Institute well.

The fourth crucial agreement concerned the *financing* of the Institute. Several features are noteworthy. The scientific bodies from the US and the Soviet Union, which had taken a leading role in IIASA's establishment, agreed to pay the largest, equal amounts, and the other scientific bodies would contribute smaller, but also equal amounts. All contributions would be in freely exchangeable currency in amounts equivalent to specified dollar figures. These provisions established the principle of equity among IIASA's members, but by fixing the contributions in terms of the dollar, they also set the stage for subsequent difficulties when the dollar declined in value relative to the currency of Institute expenditures, Austrian schillings.

After the five and a half year planning period, IIASA was ready to begin its scientific research under the leadership of Professor Howard Raiffa of Harvard University. The research program identified by the early leaders at IIASA could lead to the success or failure of this newly-born Institute. Simply bringing scientists from East and West together was not enough to meet the high standards needed for an influential institute. The program had to serve three goals: to strengthen international collaboration, to contribute to the advancement of science and systems analysis, and to achieve application to problems of international importance. The Institute's research program had to respond to the interests of all 12 of its MNOs, yet be within the capabilities and interests of the staff that could be brought together quickly.

The task confronting Professor Raiffa was to identify a portfolio of topics among which each NMO would be able to find several that satisfied its interests. Discussions with the NMOs led to the identification of nine subjects that appeared to fulfill the requirements of a balanced portfolio, and a series of Planning Conferences on those topics was organized.

Each selected topic became the theme for a research project, six of which were considered "applied" projects (Energy Systems, Ecological Systems, Water Resources, Management of Urban Systems, Biological and Medical Systems, Integrated Industrial Systems) and three of which were considered "support" projects (Methodology, Computer Science, Design and Management of Large Organizations).

Fortunately, it was possible to bring scientists to IIASA quickly; by October 1973, just one year after the Charter's signing, over 20 scientists had come to participate in the Institute's work, and four projects were underway.

In 1974, Dr. Harry Swain, a Canadian from the Ministry of Urban Affairs, came to lead the Urban Project. During the Institute's second year, two additional projects were added to the original nine (Survey of the State of the Art of Systems Analysis and the General Activities Project). At this time, Dr. Dimitri Venedictov, Deputy Health Minister of the USSR, agreed to serve as leader of the Biomedical Project while remaining in his Moscow position. A deputy, Dr. Alexander Kiselev, came full-time to IIASA to oversee the day-to-day management of the project. In less than two years, the research program at IIASA had come fully to life (Figure 1).

The new project leaders, however, were not able simply to step into an existing position and carry on. They were responsible for developing a new form of research in a new Institute. In order to do this, they needed to define the type of scientist that was able to accomplish international applied systems analysis research.

What is the meaning of "systems analysis" and "international applied"? Systems analysis is not a well-developed scientific discipline. In fact it might more appropriately be called a scientific "craft", in which a skilled individual draws upon the knowledge and tools of different sciences and technologies to weave a product responsive to the needs of the eventual users.

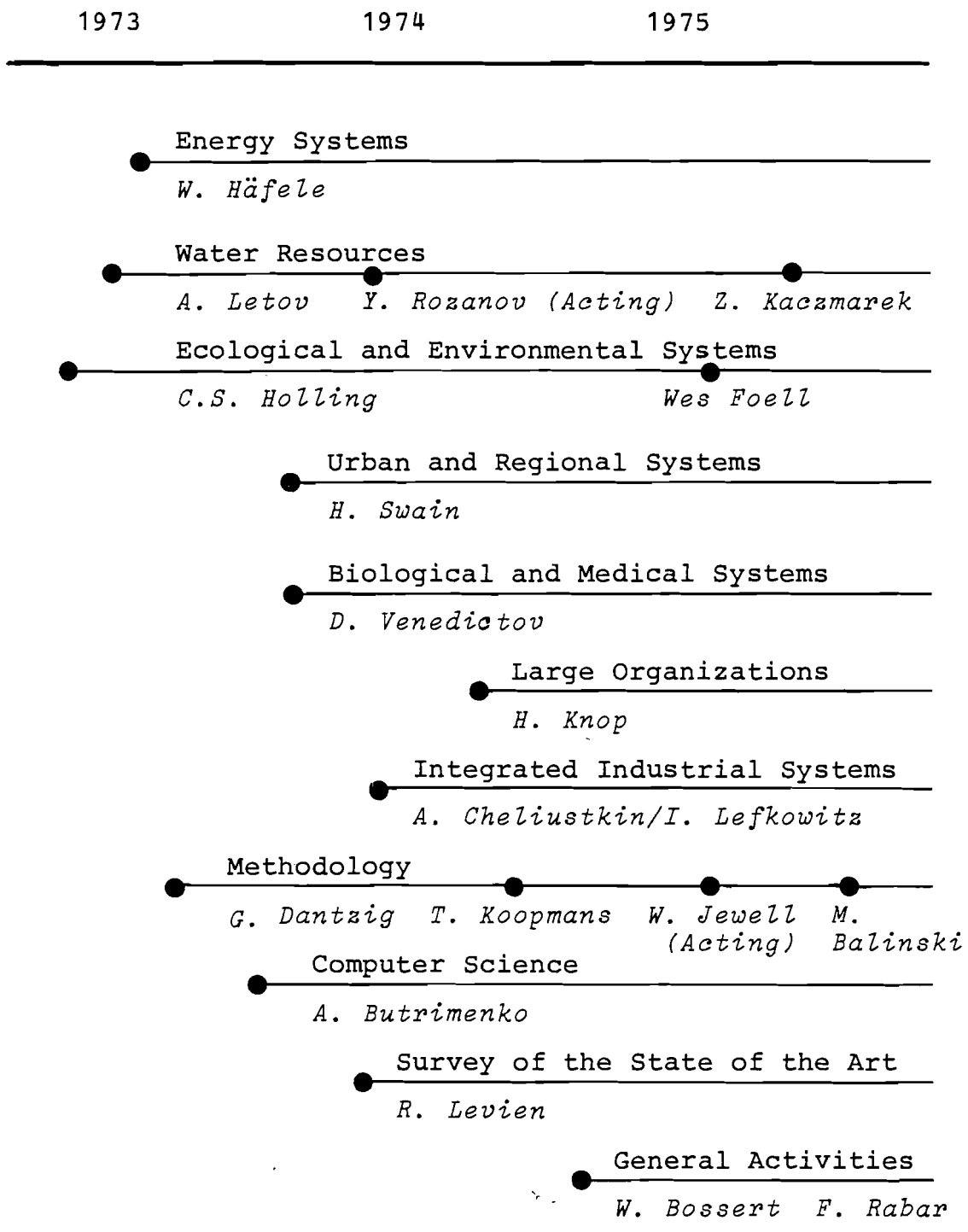

Figure 1. Development of the Research Program (1973-1975).

Futhermore, systems analysis has not been developed to an equal extent in all of IIASA's NMO countries. And even within the relatively small community of individuals who call themselves "systems analysts", there is a wide range of opinion about what the activity is, and how it is best conducted.

Dr. Raiffa defined systems analysis as being concerned with assisting decisionmakers to choose among alternative courses of action under uncertainty. With this as a guide, the project leaders developed their approaches to each problem and over the first two years defined systems analysis by doing it.

Through this "defining while doing" method, various emphases developed. There was the emphasis on providing assistance to decisionmakers--whether they be forest managers, energy policymakers, or regional planners. Another was the emphasis on breadth of view when investigating a policy question. Instead of studying the problem from the perspective of a single discipline, IIASA's systems analyses would seek to include all those matters that truly affect the decision. This aspect means that IIASA must be an interdisciplinary research institution.

The phrase "International Applied" in the Institute's title also had to be given meaning, and during the beginning months the scientists at IIASA came to recognize two kinds of international problems. The first were those problems that inherently involve more than one nation and cannot be resolved without the actions of many nations. These were referred to as "global" issues and include, for example, the concern for man's interaction with the climate, his utilization of the

oceans, and the shape of global development in the face of rapidly growing population and depletion of the readily accessible resources. The second category was identified as "universal" issues, problems that lie within the boundaries of single nations but that all nations share. These include such topics as the design and operation of national health care systems, the management of water resources, and the protection of the environment in a specified region.

By the end of the first three years, the focus of research at IIASA was sufficiently defined to provide coherence in the work accomplished. The 70 scientists then at the Institute were pursuing their fields of research in the eleven specified projects. Thus, in the fall of 1975, the phrase "systems analysis" was gaining meaning through innovation and experience and the international applied role of the Institute was coming into focus. Not surprisingly, at this point, a number of difficulties became evident. Two were preeminent - too many different activities were being attempted with too few staff, and the eleven projects were too separate from each other, losing the intended benefits of IIASA's interdisciplinary and international character.

In mid-1975, therefore, the Institute undertook a careful review of its research plan and organization with the intention of focusing its efforts on fewer topics, and of achieving greater interaction among the various projects, while maintaining continuity with the work already underway. For management reasons, it was also necessary to reduce the number of principal research leaders from eleven to about half that many. The result was a

proposal for a new "matrix" structure of the research plan and research management.

The proposed matrix structure was presented to the Council for approval by the second Director, Dr. Roger Levien of the Rand Corporation in the United States, when he assumed office in November 1975. In place of the one-dimensional structure of eleven independent projects working in parallel, the matrix structure had two dimensions: the first (considered as the horizontal rows in the matrix) consisted of several Research Programs, which were to be concentrated efforts addressing major international issues, both global and universal; the second (considered as the vertical columns in the matrix) comprised four Research Areas, which were to be groups of specialists in the basic fields of knowledge that were needed for IIASA's systems analysis. The Programs would be considered to be finite in extent with results to be obtained in four or five years. The Areas, however, would be viewed as the continuing pillars of IIASA's activities, although the emphasis within each Area might shift significantly over time. The General Activities projects would be transformed into General Research, which was to function as a broadly defined Area, somewhat outside the matrix.

The matrix structure went into effect in early 1976 after approval from the Council members who shared the Director's concern for the diversity and separateness of the Project structure. Figure 2 shows the manner in which the nine projects were condensed into four Areas and two Programs.

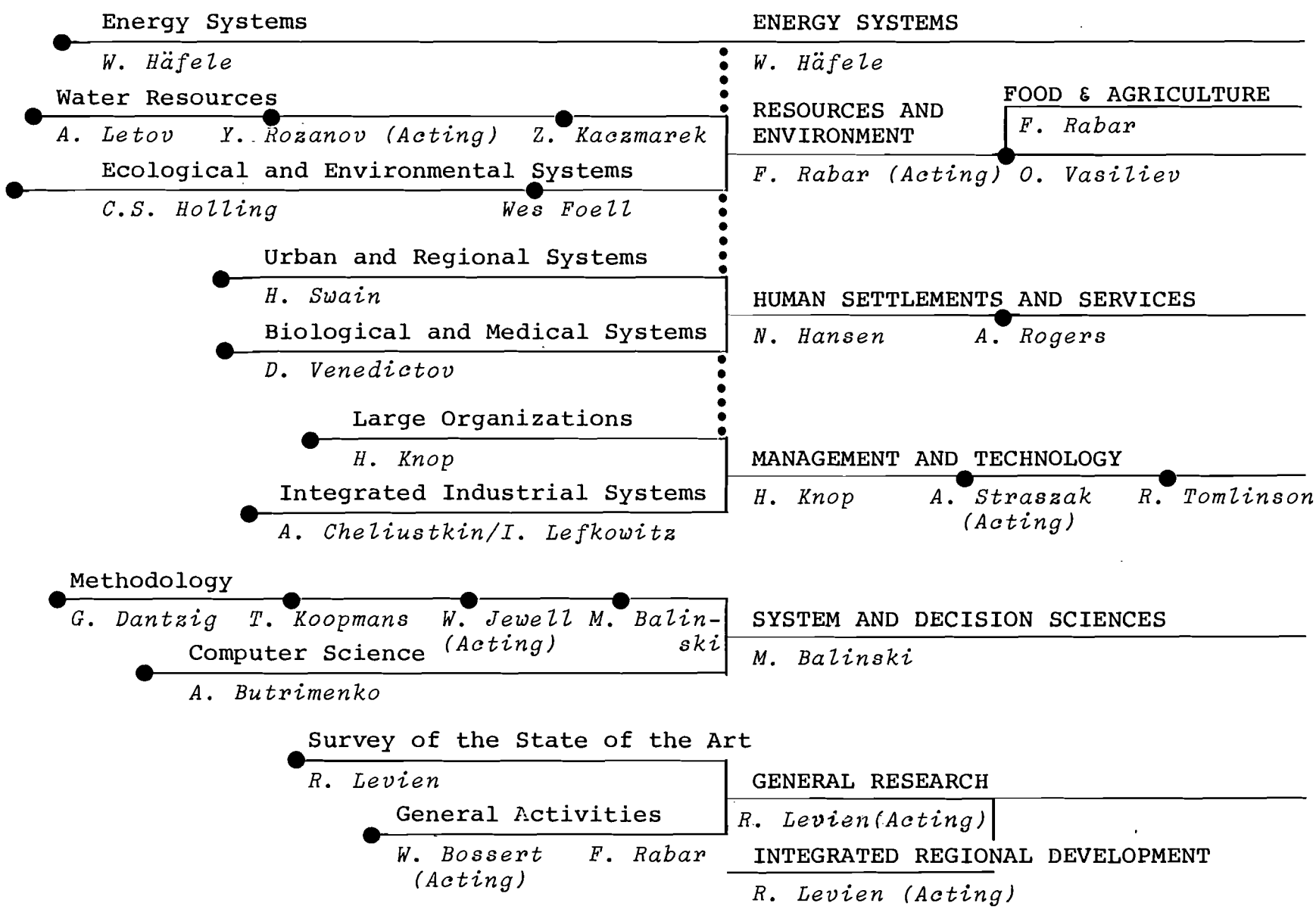

Figure 2. Development of the Research Program (1973-1975).

After five years of innovation and experimentation, of success and failure, of some constants and many changes, and of rapid growth followed by leveling off, the Institute has reached a stage of relative stability and constancy. The range of topics it can and should treat is clearly stated in its Research Plan, as are its approaches to systems analysis and its application to international problems. A reasonable balance has been struck between the necessity to focus the attention of a modest-sized staff on a relatively small number of tasks, and the need for a systems analysis organization to retain a broad range of competence.

The central problem affecting IIASA's research program in the future is how to improve the applicability and the application of its results. This has four aspects. How can the research be designed so as to increase its potential applicability? How can the high quality of the scientific staff be maintained while its efforts are focused on applied problems? How can suitable collaborative research be arranged so that contact with real problems in the NMO countries is achieved? And how can the results of effective applied research be formulated so that they are useful to the different audiences in the NMO countries? These questions will shape the agenda for the Institute during the next phase of its development.

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II. INTRODUCTION TO THE HUMAN SETTLEMENTS AND SERVICES AREA AND ITS RESEARCH PROGRAM

II.1 The Heritage of the Urban and Biomedical Projects (1974-1975)

The research area called Human Settlements and Services had its origins in two projects that were started at IIASA in 1974: the Urban and Regional Systems Project (known as the Urban Project) and the Biological and Medical Systems Project (more commonly referred to as the Biomedical Project). Urban systems and health care were obvious candidates for inclusion in the initial portfolio of research projects to be carried out at IIASA. Both activities were of interest to a wide international audience, and scientists from East and West were ready to come to Laxenburg to participate in research programs focusing on these topics. The two projects were launched with planning conferences. A planning conference of some 40 experts met in the summer of 1973 in Baden to develop directions for IIASA's Urban Project's research; another international planning conference of roughly similar scale met at the same location in August of 1973 to carry out an analogous task for the Biomedical Project.

Dr. Michael Rousselot (France), the chairman of the Urban Project's planning conference, pointed to the growing importance of urban problems throughout the world and stressed the need for sound urban analysis. He also emphasized the advantage that IIASA would have in launching cooperative studies with other research institutes and carrying out comparative studies among nations.

Dr. William Gorham (USA), President of the Urban Institute, called for studies that would concentrate both on highly abstract work and on detailed "nuts-and-bolts" problem solving. He recommended a research strategy that would combine methodological work in the important "big" problems with the quick and useful results obtained from solving smaller problems.

Topics suggested for study included land use theory, settlement development, transportation modeling, input-output analysis, and further elaboration of models dealing with conflicting objectives and continued disequilibrium. Under the heading of "big" problems, the experts recommended research in migration, including the synthesis of economic and demographic behavior, research on the effects of technological change, and the study of policies dealing with de-populating areas. Some of the "nuts-and-bolts" problems suggested were the industrialized production of new housing units, intra-metropolitan traffic analysis and control, and the delivery of health services.

In January of 1974, the Urban Project was started at IIASA with the appointment of Dr. Harry Swain (Canada), a geographer from the Ministry of Urban Affairs in Canada. The project addressed policy issues revolving around national settlement systems development [Drs. Cordey-Hayes, UK, (RR-74-009), Swain, and MacKinnon, Canada (CP-75-003, CP-75-004, and CP-75-009)],*

*See also, Harry Swain, Martyn Cordey-Hayes, and Ross MacKinnon, eds. (1975), Special issue of *Environment and Planning*, 7, 7, 741-884.

and also considered problems in the design and operation of automated traffic guidance systems [Dr. Strobel, GDR, (RR-77-012)] and urban emergency services (Dr. Blum, USA).*

By early 1975, research activities in the Project had developed sufficiently to merit the publication of a status report (CP-75-010). Later in 1975, the Project's interests in national settlement systems development crystallized in the form of two related research tasks: one under the direction of Dr. Niles Hansen (USA), dealing with human settlement systems patterns**, and another, under the direction of Dr. Andrei Rogers (USA), focusing on the quantitative analysis of migration and settlement processes.† Work on automated traffic control and on urban emergency services continued as before.

In August 1973, the IIASA planning conference on Biological and Medical Systems identified a large number of possible research topics. During the beginning stages, Dr. Mark Thompson was the acting leader of this project and research was begun on such medical issues as cervical cancer screening (CP-75-005), Down's syndrome prevention (RR-75-006), and the problems of the visually impaired (RR-74-014).

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*Horst Strobel, editor, *Computerized Urban Traffic Guidance and Control Systems* (forthcoming); Ed Blum (1976), Urban Emergency Services, in *IIASA Conference '76*, 2, International Institute for Applied Systems Analysis, Laxenburg, Austria, pp.93-99.

**N. Hansen (1976), Systems Approaches to Human Settlements, in *IIASA Conference '76*, 2, International Institute for Applied Systems Analysis, Laxenburg, Austria, pp.37-41.

†Rogers (1976), Migration and Settlement, in *IIASA Conference '76*, 2, International Institute for Applied Systems Analysis, Laxenburg, Austria, pp.43-68.

One year later Dr. Dimitri Venedictov (USSR), the Deputy Minister of Health of the Soviet Union, was appointed the leader of the Biomedical Project. Unable to leave his post in Moscow, Dr. Venedictov was represented in Laxenburg by his deputy, Dr. Alexander Kiselev (USSR) who, following the recommendations of the 1973 planning conference, formulated a research program that addressed the development of a methodology for the dynamic modeling of national health care systems as well as completing those research topics previously begun.

In 1974 a second Biomedical conference was held, the proceedings of which were published as a book,* and in December 1975 it was concluded at a third conference that IIASA should concentrate on the development of a universal macromodel of national health care systems (CP-77-004).

II.2 The Marriage of the Projects and the Birth of the Human Settlements and Services Area (1976-1978)

1976 was a year of transition for the Institute. The basic directions of IIASA's research strategy were redefined, and the Institute's eleven projects were reorganized to form four Areas and two Programs. Under this new matrix structure, the Urban and Biomedical Projects were merged to create the Human Settlements and Services (HSS) Area, which was given the mission of assembling a team of scientists who would span the fields of knowledge and provide the links to the appropriate scientific communities dealing with the earth's human endowment:

*N.T.J. Bailey and M. Thompson, eds. (1975), *Systems Analysis of Health Planning*, North Holland Publishing Co.

population, settlement patterns and processes, and human resources and services. Dr. Niles Hansen (USA), the leader of the Urban Project since the departure of Dr. Harry Swain in late 1975, assumed the chairmanship of this new Area.

Research in the HSS Area in 1976 was concerned with problems in the management of urban services, investment in health care, and migration and human settlement development. The Area's research activities were organized around the five tasks inherited from the Urban and Biomedical Projects, namely, Computerized Urban Traffic Control Systems, Urban Emergency Services, Modeling of National Health Care Systems, Human Settlement Systems, and Migration and Settlement.

In the fall of 1976 the first two tasks were gradually phased out, Dr. Andrei Rogers (USA) was appointed Area Chairman, and a new task, entitled Population, Resources, and Growth, was outlined.

The resulting research agenda of four tasks was maintained throughout 1977 and 1978. The updated goals for the four tasks were:

- The design of a general model of a national health care system for application by decisionmakers in national health institutions;
- The delineation of analytically more relevant descriptions of functional urban areas for the study of the spatial and temporal evolution of human settlement systems;

- The development of improved methodological tools for quantitative analyses of migration and multiregional population growth;
- The search for a deeper understanding of the systematic demoeconomic interrelationships and resource-service demands that arise in national processes of urbanization and economic development.

The Health Care Systems Task (E. Shigan, USSR, Task Leader)

The aim of the Health Care Systems task is to build a national health care system model and to apply it, in collaboration with national research centers, as an aid to health service planners. The model should contain a number of linked submodels dealing with population, disease prevalence, resource needs, resource supply, resource allocation, and external systems. Different versions of the model, with combinations of submodels, will be appropriate for different health service applications.

The major achievements of this task in 1977-1978 were, first, a number of working versions of the model and its submodels, built and tested, and now available, and, second, a number of collaborating national research centers starting to experiment with the models, using their own data, to see how the models might be usefully applied to deal with health service planning issues in their countries.

A submodel for forecasting population, developed by the Migration and Settlement task, is being used as a part of the

Health Care System Model. Submodels also have been developed for estimating the prevalence of two specific types of disease--degenerative and infectious--and for general morbidity (RM-77-043, RM-77-040, RM-78-010).

The submodels for population and disease prevalence have been integrated and incorporated into a model for estimating future aggregate requirements for health services resources, given certain assumptions about the pattern of resource utilization (RM-78-21). This allows the user to explore alternative scenarios about the pattern of development of future resource needs.

Several alternative versions of the health care resource allocation submodel have also been built (RR-78-008, RM-78-050). This submodel simulates how the health care system allocates its scarce resources between competing demands.

Research centers in Bulgaria, Canada, Czechoslovakia, the FRG, France, the GDR, Japan, and the UK, and the World Health Organization (WHO), have expressed the wish to apply some or all of these submodels for their own purposes (CP-77-008). A start has been made in implementing them on the computers at these centers. This work will continue in the future so that the submodels can be applied in real health care planning situations. The resulting practical experience will suggest modifications and directions for the further development of the overall Health Care System Model.

The Human Settlement Systems Task (T. Kawashima, Japan, Task Leader)

The Human Settlements task seeks to gain a better understanding of the spatial and temporal evolution of human settlement systems. This work has been supported in part by the Ford Foundation. The aims of the task are:

- To delineate a comparable set of functional urban regions for industrialized countries with either planned or market economies;
- To develop a data base for analyzing economic and demographic changes in the countries involved;
- To undertake country-by-country analyses using this data base;
- To carry out an international comprehensive analysis that draws on these country-by-country analyses;
- To disseminate results to researchers and policy-makers interested in national, regional, and urban settlement strategies.

In 1977-1978, interaction with the direct collaborative network in the NMO countries has produced *complete delineations of functional urban regions* for Hungary, Japan, and Poland and has initiated the delineation process for Finland and the GDR. Comparative delineations were also made at the University of Reading, UK, with which IIASA has an indirect link, for Sweden, Portugal, The Netherlands, Italy, Spain, France, and Ireland. In addition, efforts have also been made to involve a number of other Eastern European countries.

A data base for these regions has been organized and structured within an easy retrieval system, developed on a trial basis over the year.

Country-by-country analyses were carried out for the FRG, Hungary, Japan, Poland, and Switzerland (RM-77-017, RM-77-025, RM-77-052, CP-78-004). Partial analyses were done for a few of the non-German-speaking countries of Western Europe for which a data base is available (RM-78-039).

The task's activities have been useful in establishing an international network of scholars with common research interests and perspectives (Hansen, 1978; RM-78-009). This network now provides IIASA with an effective framework for collaborative research on some problems that arise out of the recent dramatic shifts in spatial development trends observed in many of the modern industrialized countries.

The Migration and Settlement Task (F. Willekens, Belgium, Task Leader)

The Migration and Settlement task has been investigating the spatial dimensions of population growth in an effort to provide policymakers with more effective methdological tools for analyzing and planning human settlement systems.

Spatial demography is concerned with the analysis of multiregional population systems, primarily with respect to their size, age, and regional composition, and their changes over space and time. This perspective allows one to study the demographic interactions between the urban agglomerations that shape national human settlement patterns. The focus on

the migration between regions and on regional differences in fertility, mortality, and age composition is of particular importance for forecasting local and multiregional populations.

IIASA-stimulated studies on internal migration are under way in a number of NMO countries. In addition, new projects applying this methodology are being established by national scholars in several NMOs.

An important part of the Migration and Settlement task is its comparative study (RM-78-036). The purpose of the study is to carry out a comparative analysis of the relationships between geographical mobility, urbanization, and national development by assembling, summarizing, and analyzing data on migration and spatial population growth in a number of development and developing countries. The emphasis of the study is therefore on empirical research.

By using new demographic methods recently developed at IIASA (RM-78-015), the Institute and its collaborating institutions have achieved important results during 1977-1978 including the following.

- O A number of computer programs were published which allow the computation of multiregional life tables, projections of multiregional populations into the future, fertility and migration analyses of both stationary and stable populations, and evaluation of the demographic impact of alternative paths to zero population growth (RM-77-030, RR-78-).

- The study initiated a methodological investigation of ways to estimate missing data, since frequently parts of the considerable amounts of data required for the analyses are not available (RM-77-057, RM-77-058). This investigation comprises both a critical review of existing methodology and the development of new methods. The results will be of particular importance for developing countries and various units of the United Nations, such as its Population Division.
- A network of scholars in NMO countries has been established, generating a substantial exchange of ideas and experience with regard to the analysis and the projection of spatial population systems.

The Migration and Settlement task was concluded in late 1978. Final reports on its activities are beginning to become available (RR-78-006, RR-78-013). A three-volume publication in IIASA's State of the Art Series is planned for completion by 1981.

The Population, Resources, and Growth Task (A. Rogers, USA, Acting Task Leader)

The Population, Resources, and Growth task was started in 1977, and is already beginning to generate results. Much of the activity of the past two years has been devoted to conceptualization, design, and recruitment. A task force meeting was held in May of 1977, and a proposed plan of action was agreed upon. Several papers were published, establishing

a new publication series in the HSS Area (RR-77-014, RM-77-018, RM-77-041). Important contacts were made with groups doing similar or complementary work in the International Labour Office (ILO), the World Bank, the Population Division of the United Nations, and the Population Council. Possible candidates for case studies were identified: Mexico, Japan, Poland, Sweden, and Kenya (RM-78-012). And several leading scholars in the field were recruited for 1978 and 1979.

A task force meeting in May of 1978 dealt with the initiation of the Mexican case study. Representatives from Mexico, the World Bank, and an international group of scholars participated. The Population, Resources, and Growth task is concerned with fundamental aspects of national processes of urbanization and development. In an effort to gain an improved understanding of the systemic interrelationships that abound in national processes of urbanization, agricultural change and spatial concentration during the course of economic development, the task is focusing on: the associated demoeconomic dualistic developmental antecedents, the demographics of rapid urbanization, and the resource-service demands that spatial concentration of human activities generate. More information is needed about these three processes before convincing evidence can be marshalled for or against rapid rates of urbanization.

A related problem confronting many developing nations is that of attaining a balance between population and food. Differentials in rates of population increase and of food supply are basic to the problem being examined in the Food

and Agriculture Program. The initial research thrust of the Population, Resources, and Growth task will thus be to improve understanding of how urbanization and development affect food demand, and of how, in turn, alternative agricultural policies influence urbanization and development. Toward this end, an HSS research team, working with the Food and Agriculture Program, is analyzing the transition of a national economy from a primarily rural agrarian to an urban industrial-service society. Data from several nations selected as case studies will be used, and the task encompasses two themes:

- Population growth and economic (agricultural) development (together with the Food and Agriculture Program);
- Resource/service demands of population growth and economic development.

Early efforts will focus on the first theme, and subsequent activities on the second.

APPENDIX B: COLLABORATING INSTITUTIONS, 1978

The following institutions have been actively collaborating with the Human Settlements and Services Area during 1978. In order to become a collaborating institute, an organization must have at least one staff member who has worked (away from Laxenburg and without IIASA payment) on a task that is part of the IIASA Research Plan and that contributes to its successful completion in at least one of the following categories:

- Data collection and/or processing in conjunction with IIASA,
- Scientific survey in conjunction with IIASA,
- Written contributions to a IIASA publication (RR, CP, book),
- Model development in conjunction with IIASA,
- Evaluation and/or implementation of IIASA developed or refined models,
- Conducting a case study in conjunction with IIASA.

Health Care Systems:

Austria	Institute of Socio-economical Development, Vienna
Bulgaria	Central Research Institute of Public Health, Sofia
Czechoslovakia	Institute for Postgraduate Training of Physicians, Bratislava
	Institute of Medical Bionics, Bratislava
Finland	Ministry of Health Planning Department, Helsinki
	Research Institute for Social Security, Helsinki

FRG	Hannover Medicine High School, Hannover
	The Ulm University, Ulm
GDR	Humbold University, Humbold
Japan	Institute of Medical Electronics, Faculty of Medicine, University of Tokyo, Tokyo
Netherlands	Ministry of Health and Environment, The Hague
	University of Leiden, Leiden
UK	Operation Research Department of Health and Social Security, London
USSR	Institute of Control Science, Moscow
	The Central Research Institute of Social Medicine and Public Health, Moscow

Human Settlement Systems:

Finland	Tampere University, Economics Department, Tampere
GDR	Institute for Geography and Geology of the Academy of Sciences of the GDR, Leipzig
Hungary	Ministry of Building and Urban Development, Division for Physical Planning and Regional Development, Budapest
Japan	Gakushin University, Tokyo
Poland	Institute of Geography and Spatial Organization, Polish Academy of Sciences, Warsaw
UK	University of Reading, Department of Geography, Reading

Migration and Settlement:

Austria	Austrian Institute for Regional Planning, Vienna
Bulgaria	Institute for Statistics, Sofia
Canada	University of Quebec, National Institute of Scientific Research, Quebec

Czechoslovakia	Charles University, Faculty of Natural Science, Prague
Finland	University of Helsinki, Department of Geography, Helsinki
France	National Institute of Demographic Studies, Paris
FRG	Federal Research Institute for Regional Geography and Regional Planning, Bonn-Bad Godesberg
GDR	Academy of Science, Institute of Geography and Geocology, Leipzig
Hungary	Demographic Research Institute, Central Statistical Office, Budapest
Italy	National Research Council, Livorno
Netherlands	Delft University, Department of Building Research, Delft
Poland	Academy of Science, Institute of Geography and Spatial Organization, Warsaw
Sweden	Demographic Research Institute, Göteberg
	Göteberg University, Department of Economics
	National Central Bureau of Statistics, Stockholm
UK	University of Leeds, Department of Geography, Leeds
USA	Census Bureau, Population Division, Washington, D.C.
USSR	The Institute of Economics and Industrial Management, Novosibirsk

Population, Resources, and Growth:

Mexico	El Colegio de Mexico, Mexico City
Poland	Economic Institute, Katowice
USA	Stanford Food Research Institute, Stanford
	Harvard Population Studies Center, Cambridge

III. THE RESEARCH PLAN: 1979-1983

III.1 Research Design Strategy

To understand the HSS Area's Research Plan, it is helpful to be aware of IIASA's particular objectives, its resources (IIASA's comparative advantage), and its constraints. These interact to define what is and what is not do-able in the unique IIASA setting; they also contribute to the management problems faced by all Area Chairmen at the Institute; and together with these management problems they determine both the process and the product of an Area's research. Thus, in a very concrete sense, they pose a systems analysis problem for the research designer.

Objectives

In his discussion of IIASA's research program, summarized in the first section of this report, the Director identifies three objectives:

- To strengthen international collaboration;
- To contribute to the advancement of science and systems analysis;
- To achieve application to problems of international importance.

In articulating the meaning of these three objectives, Dr. Roger Levien puts forward the following aspirations:

- IIASA aspires to have scholars on its research staff, and collaborating institutions, from each NMO; to assure that its internationality is reflected throughout its research program; and to

serve as an international clearing house.

- IIASA aspires to assure that the work embodied in its analyses satisfies the criteria of good science; contributes to the advancement of the disciplines germane to IIASA's interests; and promotes the further development of systems analysis, disseminating the current state of the art internationally.
- IIASA aspires to assure that its studies have a beneficial effect on mankind's ability to deal with problems of international importance, both global and universal.

As the Director points out, research that satisfies all three of these goals is difficult to design and to carry out because the effort to reach toward any one of them may conflict with efforts to work toward the others.

> "For example, if the single objective of the Institute were to advance science, then it would recruit its staff solely on the basis of scientific excellence, without regard for their nationality. But since scientific achievements in various fields are not uniformly distributed among nations, doing so might detract from efforts to advance international collaboration. Applicability might also suffer, because those members of the scientific community who work to advance science are often not inclined to devote effort also to its application. And if the goal were primarily to achieve application, international collaboration and advancement of science might suffer in consequence."*

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*Roger E. Levien, "IIASA's Research Strategy", in *Research Plan 1979-1983*, p.3.

The inherent dilemma of identifying research activities that score high on all three objectives is illustrated in Figure 3, where the objectives define a three-dimensional goal space in which one subjectively can locate points that represent potential research tasks that an Area such as HSS can seek to carry out.

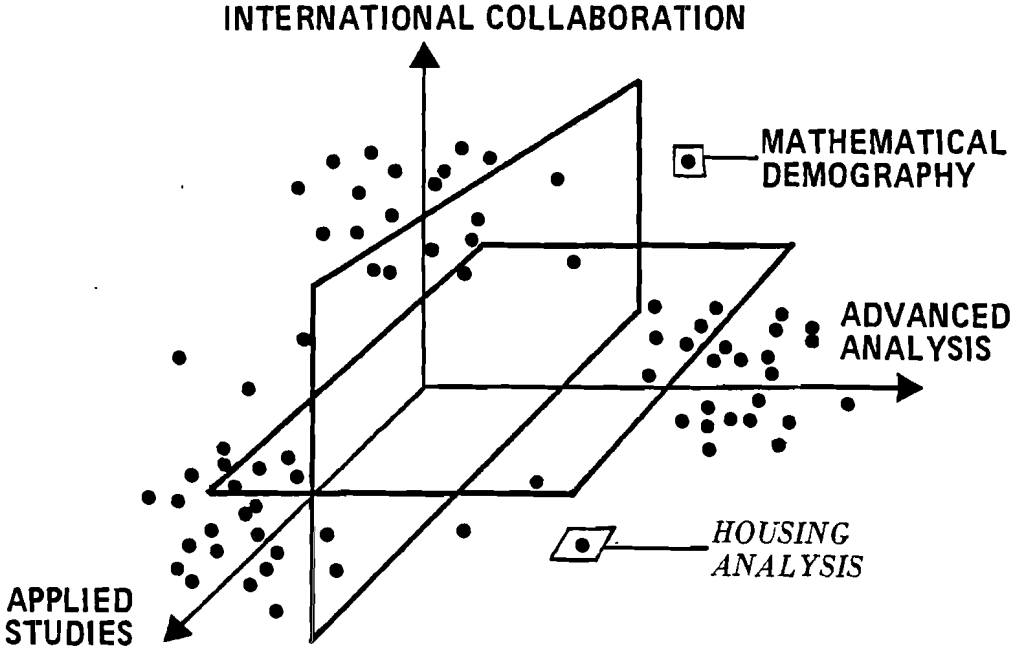
Consider, for example, a potential topic such as mathematical demography. The subject is one that has an international (East/West) community of scholars and a well-defined body of literature. There exist a number of unresolved substantive and methodological problems that could be attacked by an international team of scientists located at IIASA. Thus the activity is do-able, could be carried out by scholars representing both East and West, and with high probability would produce significant contributions to the existing body of knowledge. It would score high on two of the three dimensions of the goal space. Its score on the applied dimension, however, would be low, particularly if one interprets the term "applied" to mean "used by and of direct relevance to decisionmakers" (Figure 3).

As another illustration, consider the topic of urban housing policy analysis. Important work on this topic has been and is being carried out, for example, by the Rand Corporation in the US, in cities such as New York and Washington. The approaches and methodologies used, e.g., rent control studies and housing allowance experiments, are innovative and undoubtedly are contributions to the advancement of the state-of-the-craft or urban policy analysis. They most certainly are applied. But they are of marginal relevance for decisionmakers in the

I. THE 3 MAJOR GOALS OF IIASA

- INTERNATIONAL COLLABORATION
- ADVANCED ANALYSIS
- APPLIED STUDIES

II. THEIR INTERACTION: THE GOAL SPACE



III. THE 4 MAJOR MANAGEMENT PROBLEMS

- RESEARCH DESIGN
- RECRUITMENT
- PRODUCTION
- COMMUNICATION

Figure 3. Area research: process and product.

planned economy countries of IIASA. Thus such research, while scoring high on the applied and advancement-of-analysis axes of the goal space, would in all likelihood score low on the East-West dimension.

The research tasks of the HSS Area, described in the Research Plan, were selected for the research agenda because they appear to be in a good position to score high on all three dimensions of the IIASA goal space. They are in a broad sense of interest to most NMOs; they are to various degrees applied; and their state-of-the-art is such that important contributions to the collective international body of knowledge are possible.

Resources and Constraints

IIASA, in general, and the HSS Area, in particular, have available to them particular resources and constraints. Financial resources are available on a regular basis and are of sufficient scale to permit innovative and meaningful research. The physical facilities and scientific services are generous by most international and national standards. And for its human resources, IIASA can draw from the world's entire scientific community, East and West.

But there are constraints. First-class scholars are in short supply in all countries, and to get them to drop everything to come to IIASA is difficult. Once here, they often need to be fitted into a larger scheme of research participation than they wish. And the motivational variables at an Area Chairman's disposal are meager: for example, IIASA has no tenure and the first salary increase comes only a year after

a scientist's arrival; thus it plays an influencing role only in long-term appointments. Finally, IIASA's scientific staff must be balanced geographically. This is a constraint to the extent that linguistic and cultural differences can slow the pace of an interdisciplinary applied research effort.

The adequate resources and the unique constraints of IIASA influence a research design strategy in a number of ways. A particularly useful framework for examining these is to locate them within a demand-supply dichotomy. *The first asks what needs doing, the latter asks what can we do well.*

There is no shortage of pressing global and universal topics for our research agenda: explosive rates of population growth, urban decay, malnutrition, urban unemployment and under-employment, inadequate health delivery, traffic congestion, pollution....the list goes on and on. What is more sensible than to say, "Let us recruit experts in these fields, bring them to IIASA, ask them to synthesize their respective perspectives and recommendations on each of the important issues, and then disseminate the conclusions to our NMOs"?

What at first glance seems like plain common sense, upon closer examination shows itself to be an inappropriate method for selecting a research agenda in a setting such as IIASA's. For example, the state-of-the-art may be such that not much useful can be said regarding the resolution of a particular policy problem, i.e., it is not do-able. Or the topic might be do-able, but perhaps not at IIASA, e.g., the issue may be of relevance to only a few countries, or the problem may require

skills in which IIASA has no comparative advantage over national institutions, or the topic is not interdisciplinary in character.

Instead of emphasizing the demand side of the research agenda question, the HSS Area is focusing more on the supply aspect. Specifically, we ask: What is it that roughly a dozen scientists drawn from seventeen countries and, say, a half-dozen disciplines, can do well with a budget of about 10 million Austrian schillings in an institute located in Laxenburg, Austria? We believe that this places the problem of research design in a more realistic perspective.

The research activities of the HSS Area, described in the Research Plan, were selected for the research agenda because they appear to be particularly do-able at IIASA. They do not demand vast data banks and computational facilities, they deal with problems that are "ripe" (in the sense that one would advise a prospective Ph.D. student to tackle parts of them), and they have a high interactability index in that several disciplines are involved in their study. With modest levels of effort by scholars, of somewhat less than Nobel-Laureate stature, they should yield findings useful to national and local decisionmakers in IIASA's NMOs.

A careful consideration of objectives, resources, and constraints helped to define the research agenda that appears in the HSS Area's research plan that follows. The translation of that agenda into concrete research products, however, depends on a number of other variables, among the most important of

which are (Figure 3):

- the *recruitment* of qualified scholars to carry out the research,
- the management of their collaborative *production*, and
- the dissemination of the results of their efforts through appropriate and effective channels of *communication*.

Although not an immediate and direct component of a research design strategy, these other management problems influence both the process and the product of an Area's operations and therefore become an *indirect* element of its research strategy.

III. 2 Research Focus and Organization

Strategies of research design, applied within a broad substantive focus of interest, at IIASA generate a set of research activities called *tasks*, which may be clustered into a smaller number of research *themes*.

Focus

The flows of research in the Human Settlements and Services Area, reflected in its name, is on *people*--how many there are, where they live and work, the kinds of work they do, their needs and demands for various facilities and services, and their impacts on resources and the environment.

Many contemporary problems of human settlements and services arise as consequences of developments that have converged

to create critical problems in urban agglomerations throughout the world: unprecedented population increase and massive rural-to-urban migration in the less developed countries and declining rates of population growth and changing patterns of internal migration in many parts of the more developed world.

Where people choose to live is as important as the number of children they choose to have. Shifting patterns of migration, therefore, together with changing rates of natural increase can produce significant impacts on the needs for housing, sanitation, health, transport, nutrition, education, and employment, among others. They form the contextual frame for IIASA's research area on problems of human settlements and services.

IIASA's Contributions

Many organizations are conducting research on problems of human settlements and services. They include international organizations such as the Population Division of the UN, the World Bank, the International Labour Office (ILO), and the World Health Organization (WHO), as well as the national institutions such as the Urban Institute in the USA, and the Institute for Systems Studies in the USSR. The principal contributions that IIASA tends to make to these activities are *coordination* and *dissemination*, *integration*, and *expansion*.

Much of the current research in this field is uncoordinated at the international level, and common experiences with common difficulties are not shared; successful resolutions of urgent problems are not disseminated for possible application elsewhere.

In the light of this, the Human Settlements and Services Area seeks to serve as a forum for international exchanges of ideas and experiences regarding common problems arising from changing national patterns of urban and rural development.

Many of the human settlements and services problems examined at IIASA are studied by geographers, urban planners, demographers, economists, and others, but typically in terms of the particular discipline's own scholarly perspective. What is often lacking is a holistic, overall metadisciplinary view that transcends the narrow, stylized formalisms of the constituent disciplines. The HSS Area therefore strives to foster a multidisciplinary approach in its activities by mixing the conceptual schemas of a number of traditional modes of inquiry, integrating these different thoughtways, and then exporting the successful integrations to the academic, professional, and decisionmaking communities in its NMO countries.

Finally, successful multidisciplinary integrations of current knowledge and experience regarding human settlement and service problems frequently identify areas for further analytical study. Thus, an important component of HSS activities is the expansion of the current state of the art in analyzing and resolving the problems of urban settlements.

Organization

Ongoing and planned IIASA research concerned with problems of human settlements and services may be conveniently organized into three overlapping *themes*, differentiated according to

the time horizon usually adopted by decisionmakers concerned with their resolution.

First, there are problems of *urban systems management*. The decisionmaker is concerned with a short-run (e.g., one year) systems problem in the sense that he must deal with the system as it is and cannot alter its fundamental structure. The usual method for implementing solutions to problems of management is the adoption of a set of policies. Traffic control through improved signalization procedures is a good example of such a management problem; it has been an important research activity in the Human Settlements and Services Area in the past. Topics in 1979-1983 will include Urban Information Systems and Normative Location Models. The former study will focus on the use of computers in urban and regional management; the latter will examine the planning problem of locating service centers of different sizes to meet the requirements of a dispersed population in some "optimal" manner. These studies will demand relatively little IIASA investment, but their results--state-of-the-art reviews and international exchanges of experience--will be of value to the NMOs. Additional topics are still being considered.

At the other end of the spectrum are problems of *human settlement systems development*. The decisionmaker's time horizon is a long-run one in such matters and generally lies in the range of 15 to 20 years. In problems of development, the systems can be structurally altered and plans are the usual vehicles for guiding the instruments of implementation. Population,

growth, urbanization, resource demands, and economic development are interrelated facets that delineate a set of the Area's research tasks concerned with the national development of human settlements systems. Past HSS studies of migration and growth of urban and regional systems in different countries will form the foundation of a new task in 1979: Urban Change. This Task will study problems of urban transition in *developed* countries, in collaboration with IIASA's Regional Development Task. It will complement the continuing Population, Resources, and Growth Task that concentrates on the resource and service demands of urbanization and development is *less developed* countries.

The range of systems problems that lie between the polar extremes of management and development may be categorized as problems of investment in *human resources and services*. The decisionmaker's time horizon in dealing with such problems is normally anywhere from 3 to 5 years. Programs, rather than policies or plans, are the principal method of implementation, and although marginal alterations of the system are possible, the time perspective is too short to develop an entirely new system. Research in Health Care Systems modeling is an important example of Human Settlements and Services research in investment systems problems. This work will continue through 1983. Research on Manpower Planning, with an initial focus on health care manpower, will commence in 1980 and may develop into a broader concern with human resource planning in general.

Five-Year Perspective

It is envisioned that the Area's three major themes will continue over the next five years, but that their Task compositions will change. Several Tasks will probably be concluded, e.g., Urban Information Systems and Normative Location Models. Others, such as the Health Care Systems, and possibly the Manpower studies, may continue with revised perspectives. And new Tasks, such as Housing, Education, and Transport Investment, could evolve from present activities and interests. It is planned to merge in 1982 the Tasks Urban Change, focusing on developed countries, and Population, Resources, and Growth, focusing on the developing countries in order to produce a global assessment of human settlement problems along the lines of the 1976 UN Habitat Conference (Figure 4).

III. 3 Detailed Task Statements

1979 will begin IIASA's seventh year of research and the HSS Area's sixth. The earlier history of rapidly changing research agendas at the Institute has been replaced by a slowly evolving long-range program. The 1979-1983 research plan of the HSS Area reflects the maturity that increasingly is characterizing the Institute's evolution.

The HSS research plan that is described in the following pages represents a departure from earlier plans in that it is a five-year plan. It includes a relatively detailed outline with budget allocations for one year (Table 1) and presents

HUMAN SETTLEMENTS AND SERVICES AREA

RESEARCH SCHEDULE

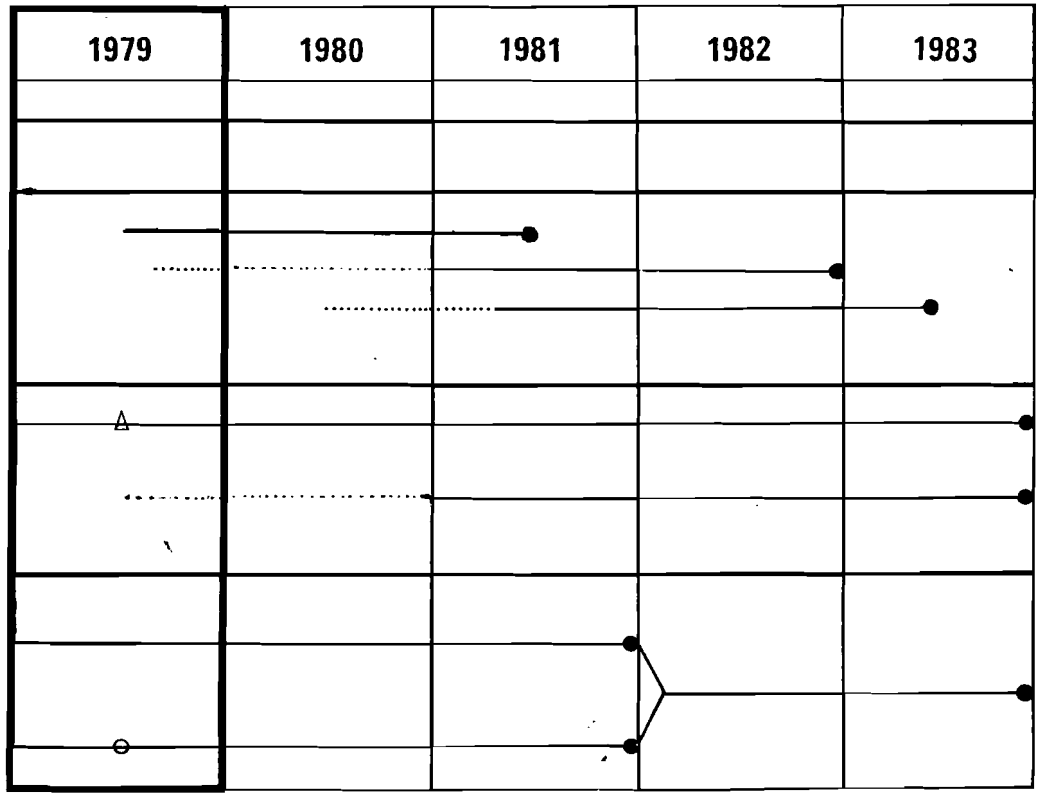


Figure 4. The Human Settlements Area: Research Schedule, 1979-1983.

a more general perspective for the subsequent four years. The individual Task descriptions that follow are reproduced from the recently approved 1979-1983 Research Plan of the Institute.

Table 1. Human Settlements and Services Task/Budget Summary Sheet.

Tasks	1979 Budget (AS)			
	Total Funds	IIASA Funds		External Funds
		Area Funds	Program Funds	
Area Core	2,050,000	2,050,000	—	—
Urban Information Systems	750,000	750,000	—	—
Modeling Health Care Systems	2,500,000	2,500,000	—	—
Urban Change	2,000,000	2,000,000	—	—
Population, Resources, and Growth	2,500,000	2,200,000	300,000	—
	9,800,000	9,500,000	300,000	—

TASK 0: Area Core

BUDGET AND PERSON-MONTHS

	1976-1977*	1978	1979	1980	1981	1982	1983	Through 1983
AS (millions)	-	1.2	2.05	1.75	1.75	1.75	1.75	10.25
Person-Months	-	14	20	16	16	16	16	98

*Expenditures.

PURPOSE

Core *activities* include planning, direction, and management; conceptualization of research, recruitment of scientists, production management, interactions with advisory committees and policymakers, dissemination activities, and Area-wide support functions. Core *funds* are used to support Area-wide consultants and short-term appointments directed at exploratory studies; collaborative activities such as task force meetings, seminars and short courses, planning workshops, and advisory committee meetings; and technical editorial assistance to help the scientific staff improve the clarity of their exposition in Area publications.

ACTIVITIES 1979

Apart from Area-wide management activities, the Core budget will support two exploratory studies in 1979, *normative location modeling* and *manpower*, to determine whether these topics deserve to be accorded research Task status, and if so, to design a conceptual and methodological perspective for the research.

It is also planned to convene an *advisory committee meeting* in late March of 1979. The principal purpose will be to present, in substantive detail, the Area's long-range research directions and to receive constructive criticism and advice from experts.

Finally, dissemination of the principal findings of the *Migration and Settlement Task* will be an important Core activity in 1979. In addition to producing a three-volume publication in the IIASA State-of-the-Art Series, the dissemination activities will also include a special session at the 1979 U.S. Population Association of America Conference, a training course to be held at IIASA in late September of 1979, and a number of conference and seminar presentations by the members of the Migration and Settlement research team.

TASK 1: Urban Information Systems

DURATION 1978-1980

BUDGET AND PERSON-MONTHS

	1976-1977*	1978	1979	1980	1981	1982	1983	Through 1983
AS (millions)	-	0.3	0.75	0.5	-	-	-	1.55
Person-Months	-	4	12	8	-	-	-	24

*Expenditures.

OBJECTIVES AND EXPECTED RESULTS

Objectives and Final Results

The principal objective of the Urban Information Systems Task is to conduct the first comprehensive international assessment of the use and impact of computerized urban and regional information systems in the planning, management, and operation of local governments.

Currently, there is limited international cooperation and exchange related to urban information systems, mainly among developed countries; only recently has an exchange occurred between developed and the developing countries or among the developing countries. A few efforts have been undertaken by the UN, by the United Nations Educational, Scientific and Cultural Organization (UNESCO), and by the Organisation for Economic Co-operation and Development (OECD).

Initially, IIASA's role will be exploratory and will include the following broad activities:

- Identifying the *international community of researchers* and facilitating communication and exchange among them through an international conference, publications, and joint projects;
- Collating the findings of current studies in various countries and integrating them into a *comprehensive worldwide overview* of the field;
- Conducting a *comparative analysis* of approaches to urban information system use and publishing a state-of-the-art survey that describes and evaluates generic applications of computing in urban governments.

Expected Results 1979

- The further development of an *international network* to facilitate information exchange and joint research projects.
- A comprehensive *overview* of current studies on the use and impact of computerized urban and regional information systems.
- An *outline of a state-of-the-art survey* of generic applications of computing in urban governments.

The latter two topics will be studied in cooperation with the Management and Technology Area.

Expected Results 1980

- A *state-of-the-art book* to be published in IIASA's International Series of monographs on applied systems analysis. Three areas of computerized urban information systems that seem particularly promising for a *comparative perspective* will be considered:
  - *Generic applications*, e.g., geoprocessing systems such as DIME(USA), TRAMS (UK), and NIMS (Scandinavia); population census systems; medical and emergency service systems.
  - *Local policies*, e.g., centralized versus decentralized computing; integrated versus independent systems.
  - *National policies*, e.g., decentralized conglomerations of small policies and incentives for local institutions versus national policies of centralized computing systems in such areas as population census, land use, social services, and police.

ACTIVITIES

Point of Departure

The main attraction of international cooperation and exchange is a practical one: differences in approach serve as examples for others to consider. In particular, policies and applications in one country represent prototypes that might be considered for adoption in another, where they do not exist. A *comparative international perspective* permits an assessment to be made of the impacts of these prototypes under various political and institutional arrangements, and thereby aids the evaluation of the utility of their transfer to the country interested in adopting them.

Activities 1979

This Task will begin by examining, evaluating, and interrelating *current studies* in the field being carried out in NMO countries and in international agencies such as the OECD, UNESCO, and the UN. A state-of-the-art volume will be outlined for publication in the IIASA International Series in 1980. Policymakers will be involved in all of these activities.

Activities 1980

A *workshop* will be held in early 1980, and a final *draft of the state-of-the-art volume* will be prepared and distributed for comments at an international conference to be held at IIASA in 1981.

TASK 2: Modeling Health Care Systems

DURATION 1975-1983

BUDGET AND PERSON-MONTHS

	1976-1977*	1978	1979	1980	1981	1982	1983	Through 1983
AS (millions)	4.04	2.5	2.5	2.5	2.5	2.5	2.5	19.04
Person-Months	82	44	40	40	40	40	40	326

*Expenditures.

OBJECTIVES AND EXPECTED RESULTS

Objectives and Final Results

The main goal of this Task is to construct a Health Care System (HCS) *simulation model* for health service planning. The model is designed to assist decisionmakers in the examination of possible consequences of policy options.

The model will consist of submodels describing aspects of both the HCS and certain strong interactions with other systems such as the national economy and the physical environment. The submodels will be linked by a conceptual framework so that they may be applied collectively in a comprehensive approach to health service planning. The model, and its constituent submodels, will be tested in a number of NMO countries with the assistance of WHO and collaborating research centers in these countries.

The model is designed for decisionmakers at the higher levels of health care systems--regional, national, and international. The results should also be useful for international agencies such as WHO and the United Nations Development Program (UNDP).

Expected Results 1979

- A *methodological process* for applying models to comprehensive HCS planning problems at the national level.
- A set of linked *submodels* and their *computer programs* for the following aspects of the HCS—population forecasting, morbidity and prevalence estimation, resource-need calculations, resource-supply predictions, and resource allocations--as well as impact analyses of certain relationships between the HCS and some strongly interacting external systems such as the physical environment and the national economy.

- Empirical results gained from the *application* of these submodels, separately and together, to real HCS planning issues in a number of NMO countries.

Expected Results 1980-1983

- A *report* to be produced in 1980 reviewing the experience in applying the submodels during 1978-1979.
- Approaches using available routine statistical data for *building and identifying HCS submodels*.
- A further set of *submodels*, with *computer programs*, dealing with HCS topics to be selected in 1980, which may include
  - models for estimating health care parameters on the basis of medical and demographic statistics;
  - the representation of market mechanisms in those countries where the mechanism strongly affects the HCS;
  - models for use at the regional level of planning and for its interaction with the national level;
  - models for use in the HCS of developing countries;
  - models to assist management and planning in individual sectors of the HCS, e.g., hospitals, emergency services.
- A final *review* of the experience in applying models to the HCS in various countries and a comparison of their roles in countries with different types of HCSs (e.g., centrally planned, market-oriented).

ACTIVITIES

Point of Departure

Although a large number of models exist worldwide for examining individual sectors and aspects of the HCS, until now there has been relatively little success in using models for the *comprehensive planning of health services*. Accordingly, a conceptual framework has been drawn up for the work of the Task in which aspects of health services are viewed as parts of a complete system so that submodels dealing with each aspect can be linked together. To date, submodels have been constructed dealing with population (by the *Migration and Settlement Task*) and with aspects of morbidity; these submodels have been tested using data from NMO countries. Pilot versions of submodels for resource need and allocation have also been constructed. At a IIASA conference in November 1977, participants from NMO countries and WHO, including senior health service planners, expressed keen interest in attempting to use these submodels for their own purposes and invited the Task team to assist them.

Activities 1979

With the assistance of WHO, and in collaboration with local research centers, the existing *submodels* will be applied during 1979 in a number of countries including the UK, the FRG, the GDR, and Czechoslovakia, where work has commenced. The *submodels of resource need and resource allocation* will have to be developed from their existing initial versions in the light of experience with these applications. In addition, new submodels will be created for dealing with resource supply and with certain aspects of the interaction between the HCS and the economic and the environmental systems.

The work will be carried out in close cooperation with other Research Areas:

- The Resources and Environment Area--the modeling of interactions between the health care and the environment systems;
- The Management and Technology Area--application of the model to health service planning in relation to program management;
- The System and Decision Sciences Area--the use of optimization, identification, and other mathematical techniques for modeling the interaction of the health care and economic systems and in the use of computer networks.

Activities 1980-1983

Dissemination of the experience gained in building and applying the HCS model up to 1980 will be a major activity in that year. A conference to assess this experience will be held, at which contributions will be invited from collaborating scientists and planners in national centers and WHO. Following this a status report will be published. At the same time a new phase of model development will commence. The directions selected for this development work will depend upon the reception of and reactions to the results achieved in the previous period, but are expected to include at least some of the following:

- Development of the model to improve the representation of a *market oriented* HCS;
- Development of the model to improve its applicability at the *regional level of HCS planning* and to contribute to the interaction between the regional and national levels that occurs in HCS planning;
- Development of the model to render it applicable to *developing countries*, in collaboration with the Food and Agriculture Program;
- Design of new models to assist in the management and planning of *individual sectors of the HCS*, e.g., hospitals, clinics, emergency services, and geriatric services.

The first results of this work will be *publications* of the formulations of the model developments and computer programs. This will be followed by a phase during which the developed model in its various forms will be *applied* in NMO countries and, perhaps, elsewhere. At the end of this period, in 1982 and 1983, it is hoped that results of successful applications will be known and that it will be possible to conclude the Task by a *comparative study* of the application of the models in countries with different types of HCSs.

TASK 3: Urban Change

DURATION 1979-1983

BUDGET AND PERSON-MONTHS

	1976-1977*	1978	1979	1980	1981	1982	1983	Through 1983
AS (millions)	-	-	2	2.5	2.5	2.5	2.5	12
Person-Months	-	-	35	40	40	40	40	195

*Expenditures.

OBJECTIVES AND EXPECTED RESULTS

Objectives and Final Results

Declining rates of national population growth, continuing differential rates of regional economic activity, and shifts in the migration patterns of people and jobs are characteristic empirical aspects of many urbanized countries. In several instances, they have combined to bring about a relative (and in some cases *absolute*) decline of highly urbanized areas, e.g., New York City, Tokyo, London, and Stockholm. In other cases, they have brought about rapid metropolitan growth, e.g., Houston, Miami, and Moscow.

The objective of this research Task is to bring together and synthesize available empirical and theoretical information on *urban change and its major consequences* in developed countries. The principal final results of the study will be a model, or a system of models, that will be useful for understanding and projecting the human settlement consequences of alternative patterns of demographic and economic change in post-industrial societies.

Expected Results 1979

- o A few "in-depth" *case studies* (e.g., Japan, Sweden, Poland, and the GDR).
- o An *overview* of the empirical situation in IIASA's NMOs.
- o A preliminary *demoeconomic model* of human settlement dynamics in a post-industrial urban society.

Expected Results 1980-1983

- o Conclusion of *case studies*.

- o A completed *simulation model* of human settlement dynamics and their impacts in developed countries.

- o A merger of the Task with the Population, Resources, and Growth Task to produce a *global review* and assessment of human settlement developments, their consequences, and their resource and service demands.

ACTIVITIES

Point of Departure

The Urban Change Task will build on the empirical foundation provided by the previous Human Settlement Systems Task and on the methodological foundation developed by the previous Migration and Settlement Task. It will draw on the data and methodological tools inherited from these earlier research Tasks, which will be concluded in 1978, using them to elaborate the new focus on urban-metropolitan changes in post-industrial societies.

The new Task will also rely on the international network of collaborating scholars and institutions established by these two previous research Tasks. Periodic workshops and conferences will be held to foster the exchange of data, models, and experiences.

Activities 1979

In collaboration with IIASA's Regional Development Task, work will be carried forward on *changing regional specializations* and their impacts on population and employment shifts. Models of urban demoeconomic dynamics will be outlined and a few case study applications will be attempted, using the data bank accumulated from previous studies.

A *planning workshop* will be held to assist in the Task's development and to identify NMC interests and policies more specifically.

Activities 1980-1983

The further elaboration of the *demoeconomic human settlement model* will be undertaken in 1980-1983, and efforts will be made to extend the model to include resource and service demand submodels for health, manpower, housing, etc.

In 1982, the Task's activities will be merged with those of the Population, Resources, and Growth Task and a *major global assessment* will be carried out similar to that of the UN Habitat Conference.

TASK 4: Population, Resources, and Growth

DURATION 1977-1983

BUDGET AND PERSON-MONTHS

	1976-1977*	1978	1979	1980	1981	1982	1983	Through 1983
AS (millions)	1.89	2.88	2.5**	2.5	2.5	2.5	2.5	17.27
Person-Months	34	44	40	40	40	40	40	278

*Expenditures.
**Including AS 300,000 from the Food and Agriculture Program.

OBJECTIVES AND EXPECTED RESULTS

Objectives and Final Results

What are the probable resource and service demands of urban growth over the next 30 to 50 years in the more and the less developed countries? How important will urban *population* growth be relative to urban *economic* growth as a generator of increased demand? To what extent would the management problems associated with meeting these demands be eased by significantly reduced urban growth rates? Such questions are receiving increasing attention as part of a general concern over whether population increase will outstrip the growth in food supplies and exhaust the natural resource stock.

A fundamental problem confronting mankind is that of attaining a *balance between population and food*. Differentials in rates of population increase and of food supply are basic to the problem being examined in the Food and Agriculture Program. The initial research thrust of the Task will thus be to improve understanding of the process by which urbanization and development affects food demand, and how, in turn, alternative agricultural policies influence urbanization and development. Toward this end, an HSS research team, working with the Food and Agriculture Program, will analyze the *transition of a national economy from a primarily rural agrarian to an urban industrial-service society*. Data from several countries selected as case studies will be used, and the Task will encompass two themes:

- Spatial population growth and economic (agricultural) development (together with the Food and Agriculture Program);
- Resource/service demands of population growth and economic development (together with the Resources and Environment Area).

Initial efforts will focus on the first theme, and subsequent activities on the second.

Expected Results 1979

- An *investigation of the interdependence between internal migration and technological change* in the agricultural sector, stressing the impact of alternative agricultural technologies on migration and human settlement patterns (with the Food and Agriculture Program).
- A *prototype system model* that focuses on the demoeconomics of urbanization and on its developmental antecedents and consequences.
- The *application of this model* to several case study nations (Mexico, Japan, Poland, Kenya, and Sweden).

Expected Results 1980-1983

Resources and services are demanded by people; hence, if all else is fixed, demand should increase with population size. But demand also increases with economic development and growing affluence. We will examine the association of resource/service demands with *population and development*, in particular, land and water resources and health care and educational services. We shall attempt to:

- *Develop a model* of the interdependence between population, development, and resource/service demands;
- *Apply this model* in several national case studies.

Finally, building on the experiences of the national case studies, a global assessment of urbanization and development and their aggregate demands for resources and services will be carried out in 1982-1983.

ACTIVITIES

Point of Departure

During 1977, the conceptualization and design of this research activity was explored in detail. A task force meeting was held and a proposed plan of action agreed upon. Several papers were published, establishing a new publication series in HSS. Important contacts were made with groups doing similar or complementary work in the ILO, the World Bank, the Population Division of the UN, and the Population Council. Candidates for case studies were identified: Mexico, Japan, Poland, Kenya, and Sweden.

Several research activities related to the Task were initiated in 1978. Scholars, recruited in 1977, arrived and began work on migration and technological change in agriculture, on the design of the fundamental demoeconomic

model, and on the Mexican, Polish, and Kenyan case studies. Collaborative research groups were established with the Human Settlements Ministry in Mexico and with the Economics Institute in Katowice, Poland. A major international conference was held.

Activities 1979

In collaboration with scholars in the Food and Agriculture Program, work will be carried forward on *migration and technological change*, on *demoeconomic modeling*, and on *national case studies*. The findings of the Mexican case study will be presented to the Mexican national authorities. A small task force meeting will be held to focus work on the Japanese and the Swedish case studies. Collaboration with the World Bank will be expanded.

Activities 1980-1983

In 1980, research on the demoeconomics of urbanization will be extended to consider its impact on resource and service demands. The objective will be to build a *resource/service demand model* and to link it to the demoeconomic model. This work will be carried out in collaboration with the Resources and Environment Area.

An *international conference on population, resources, and growth* will be held in 1981, at which the Task's interim report will be presented. Following this report, work at the global level will commence as the planned merger of this Task with the *Urban Change Task* takes place in 1982. Findings of this aggregate assessment will be published in 1983 and will form the background report of a IIASA "Habitat" conference.

IV. THE RESEARCH STAFF

1978

Twenty-six research scholars joined the Human Settlements and Services Area in 1978 for periods longer than one month. Together with the much large number of short-term visiting scholars, they brought to the Area a wide variety of disciplinary skills, cultural backgrounds, and national perspectives. The brief biographies listed below given an indication of the richness of this mixture. These biographies are followed by a listing of HSS scholars of earlier years.

Research Scholars

Luis Javier Castro - Mexico (October 1977 -)

Luis Castro came from Mexico to join the Human Settlements and Services Area. His research is contributing to a comparative study of migration and settlement patterns in IIASA's NMO countries and to a case study of Mexico's urbanization and development. Professor Castro received his Civil Engineering degree (1970) from the Universidad Nacional Autonoma de Mexico (UNAM) and his M.Sc. from the Urban Systems Engineering and Policy Planning Program at Northwestern University, Illinois (1975). In Mexico he was a professor at the Graduate School of Civil Engineering at UNAM and a project leader for a consulting firm.

Peter Fleissner - Austria (January 1976 -)

Peter Fleissner is from the Institute for Socio-Economic Development Research of the Austrian Academy of Sciences. He

joined IIASA on a part-time basis to work on frameworks for international comparisons of health care systems. Dr. Fleissner received his Dipl. Ing. (1968) and Dr. Tech. (1971) from the Technical University in Vienna, in the fields of electronics and mathematics, respectively. He also has a diploma in Economics from the Institute for Advanced Studies in Vienna and has been a lecturer in econometrics at the Technical University (1971-1973).

Richard John Gibbs - UK (May 1977 - May 1978)

Richard Gibbs came from England to carry out research in Health Care Systems Modeling with an emphasis on models of resource allocation. Dr. Gibbs received his Bachelor degree in Natural Sciences (1965) from Cambridge University, England, and his Ph.D. in Operational Research (1974) from Warwick University. He is a group leader in the Operational Research Service in the Department of Health and Social Security in London, and his scientific interests include research on models of social services for use in planning and management, and the implementation of models in real problem situations.

Peter Gordon - USA (February 1978 - August 1978)

Peter Gordon came from the University of Southern California, where he is Associate Professor of Economics and Urban and Regional Planning. At IIASA he worked in the Human Settlements and Services Area to analyze data on functional urban areas and to investigate the life cycle of metropolitan areas. Professor Gordon received his B.A. in Economics from the University of California, Los Angeles (1965) and his M.A., also

in Economics, from the University of Southern California (1967). He obtained his Ph.D. in Regional Science in 1971 from the University of Pennsylvania.

Martti J. Hirvonen - Finland (April 1978 - June 1978)

Martti Hirvonen joined IIASA to work on the analysis of spatial and temporal evaluation processes of human settlement systems in Finland. Professor Hirvonen received his M.A. in Economics from the University of Tampere (1966), an M.A. in Regional Science from the University of Pennsylvania (1969), and a Ph.D. in Economics (1971) from the University of Tampere. From 1974 to 1975 he was a Professor of Economics at the University of Jyvaskyla and since 1975 he has been Professor of Economics at the University of Tampere and vice-chairman of tne Economics Department.

Jiri Hruby - CSSR (May 1978)

Jiri Hruby, a research specialist on food and nutrition from the Economic Research Institute of Agriculture and Food in Prague, came to IIASA to divide his time between the Food and Agriculture Program and the Human Settlements and Services Area. Dr. Hruby graduated from the Faculty of Law, Charles University, Prague (1950). In 1971 he joined the FAO for a 3-year assignment as FAO Nutrition Advisor in Pakistan and since 1976 he has been with the Economics Research Institute of Agriculture and Food.

David J. Hughes - UK (April 1978 -)

David Hughes of the Operational Research Service in the

Department of Health and Social Security, UK, is a member of the Modeling Health Care Systems Task and is concerned with the development and application of resource allocation models. Dr. Hughes graduated from the Oxford University (1971) in Engineering Science and received his D. Phil. in Stochastic Control Theory (1974) also from Oxford, and an M.Sc. in Statistics (1977) from London University. He has been with the Operational Research Service of DHSS since 1974, working on resource allocation, regional planning, and modeling of patient progress in cancer.

Bruce F. Johnston - USA (September 1978 -)

Bruce Johnston, from the Food Research Institute of Stanford University, has been working at IIASA on various aspects of agricultural and rural development and on problems in the provision of low cost health services. Professor Johnston received his Ph.D. in Agricultural Economics from Stanford University (1953). From 1945-1948 he was Chief, Food Branch at GHO, SCAP in Tokyo, and later agricultural economist at the US mission to NATO and European Regional Organizations in Paris. He has been with the Food Research Institute at Stanford since 1954 and has published widely on agricultural development and structural transformation.

Tatsuhiko Kawashima - Japan (July 1977 -)

Tatsuhiko Kawashima came to IIASA to join the Human Settlements and Services Area to work on international comparative studies and since August 1978 has been active half-time

with the Regional Development group. Professor Kawashima received his Master's degree in Economics from the University of Tokyo and his Ph.D. (1971) in Regional Science from the University of Pennsylvania. He has worked on the research staff of the Regional Science Research Institute in Philadelphia and since 1973 he has been a Professor of Regional Science and Transportation at the Gakushuin University in Tokyo, Japan.

Allen Kelley - USA (December 1978 -)

Allen Kelley joined the Population, Resources, and Growth Task in order to work on the modeling of demographic-economic interactions in national development processes. Professor Kelley received his Ph.D. in Economics (1964) from Stanford University, and prior to coming to IIASA he was Chairman of the Department of Economics at Duke University, North Carolina. In addition to his scholarly interests in demoeconomic development, Professor Kelley also has been actively involved in designing computer-based instructional programming systems that have been widely adopted both in the US and abroad.

Pavel I. Kitsul - USSR (December 1977 -)

Pavel Kitsul, a research scholar in the Institute for Control Sciences of the USSR Academy of Sciences since 1970, came to IIASA to participate in the Modeling Health Care Systems Task. Dr. Kitsul graduated from the Moscow Institute of Physics and Technology and received his Ph.D. in Physics and Mathematics (1973) from the same institute. His scientific interests include the theory and application of stochastic processes, and identification and control in complex systems.

Alexandre A. Klementiev - USSR (November 1975 - February 1978)

Alexandre Klementiev came from the Institute of Control Sciences of the USSR Academy of Sciences to do research in the modeling of large-scale systems, with applications to health care. Dr. Klementiev received his Ph.D. in Technology (1971) from the Moscow Physical-Technical Institute. He has been with the Institute of Control Sciences since 1966 and now holds the position of senior fellow. From 1971 to 1973 he was chief of the Computer Center Laboratory of the Moscow Municipal Committee.

Piotr Korcelli - Poland (April 1978 - May 1978)

Piotr Korcelli has been associated with the Human Settlements and Services Area since October 1975 and has worked at IIASA for short periods of time since then. He will be joining the Area for one year in 1979, coming from the Institute of Geography and Spatial Organization in the Polish Academy of Sciences where he heads the Department of Urban and Population studies. Dr. Korcelli received his Ph.D. in Economic Geography (1968) from the Polish Academy of Sciences and his Habilitation Doctorate in 1973. In 1973-1974 he was a Research Assistant at the University of Maryland.

Karel Kühnl - CSSR (September 1978 -)

Karel Kühnl of the Department of Economic and Regional Geography, Faculty of Science at Charles University, Prague, joined IIASA in order to carry out research on the methodology for the analysis of the multiregional population systems. Dr. Kühnl received his Ph.D. (1976) from the Faculty of Science of Charles University and previously was a planner at the State

Institute for Regional Planning. He is an Assistant Professor of Regional Planning and Population Geography at Charles University and a consultant on human settlement matters to the Czechoslovak Ministry of Building.

Vladimir Kulba - USSR (March 1978 - May 1978)

Dr. Kulba, a research scholar from the Institute for Control Sciences, joined the Human Settlements and Services Area to work on urban management information systems design. Dr. Kulba is a graduate of the Moscow Institute of Transportation Engineers where he received a diploma of Engineering Electro-Mechanics. He earned his Ph.D. in Technical Sciences (1970) from the Institute for Control Sciences and is presently the Scientific Secretary of the Urban Council of the Soviet Committee for Systems Analysis.

Jacques Ledent - France (February 1977 -)

Jacques Ledent joined IIASA to do research in the demo-economic studies of migration and human settlement evolution. Mr. Ledent received his degree in engineering from the Ecole Nationale des Ponts et Chaussées (1969) and his Master's degree in Civil Engineering from Northwestern University (1972). He currently is writing his Ph.D. dissertation in Urban Systems Engineering. He has been an Engineer with the Bureau Central d'Etudes pour les Equipements d'Outre Mer and a Research Specialist at the Division of Economic and Business Research, College of Business and Public Administration at the University of Arizona.

Lennart Ohlsson - Sweden (August 1978 -)

Lennart Ohlsson, joined IIASA to participate in studies of changing regional specializations and their employment consequences. Since 1974, he has been senior research economist at the Expert Group on Regional Studies, Ministry of Industry, Stockholm. Dr. Ohlsson received his Ph.D. in Economics (1974) from the University of Uppsala. He was awarded his docent title and position in 1976. Previous to this he was a teaching assistant and lecturer in economics at the University of Uppsala, and a research economist at the Industrial Institute for Economic and Social Research.

Dimiter N. Philipov - Bulgaria (September 1977 -)

Dimiter Philipov joined IIASA's Human Settlements and Services Area from the Scientific Institute of Statistics at Sofia. Mr. Philipov studied mathematics, mathematical statistics, and probability theory at the University of Sofia. His scientific interests center on the mathematics of population growth and on demoeconomics. At IIASA, he is concentrating on the comparative study of migration and settlement.

Henry Rempel - Canada (May 1978 - August 1978)

Henry Rempel, Associate Professor in the Department of Economics at the University of Manitoba, came to IIASA to complete a study of rural-urban labor migration and urban employment in Kenya. Professor Rempel graduated from the University of Manitoba in 1961 and received his M.A. in Economics from Ohio State University (1964). In 1971 he obtained his Ph.D.

in Economics from the University of Manitoba. He has been a lecturer at Bluffton College and a research associate at the University of Nairobi, Kenya.

Clark W. Reynolds - USA (April 1978 - August 1978)

Clark Reynolds, a Professor in the Food Research Institute at Stanford University, joined IIASA to study the interdependence of economic and migration factors in Mexican economic development. Professor Reynolds obtained his M.A. and Ph.D. in Economics from the University of California at Berkeley (1962). He He taught economics at Occidental College (1961 to 1962) and at Yale University (1962 to 1967). Since 1967 he has been Associate and then Full Professor at the Food Research Institute, Stanford University. His specific interests are economic development, international trade and finance, and social history.

Andrei Rogers - USA (July 1975 -)

Andrei Rogers has led the Human Settlements and Services Area at IIASA since 1976. Professor Rogers received his Bachelor's degree in Architecture (1960) from the University of California at Berkeley and his Ph.D. in Urban and Regional Planning (1964) from the University of North Carolina at Chapel Hill. Since then he has been a professor at the University of California at Berkeley in the city and Regional Planning Department and at Northwestern University in the Technological Institute. His current research focuses on migration and the evolution of human settlement systems in both developed and developing countries.

Evgenii N. Shigan - USSR (November 1976 -)

Evgenii Shigan came from the Central Institute for Advanced (Post-Graduate) Medical Training at the Ministry of Health of the USSR in Moscow. His research focuses on the application of operations research to public health. Professor Shigan graduated from the First Moscow Medical Institute and subsequently received his M.D. in 1960, his Ph.D. in medical statistics and epidemiology (1964), and his final doctorate degree in medical science in 1973. In 1976 he became Professor of Social Medicine and Public Health.

Michael Teitz - USA (January 1978 - March 1978)

Michael Teitz joined the Human Settlements and Services Area from the Department of City and Regional Planning, University of California, Berkeley, where he recently was Department Chairman. His research at IIASA focused on alternative perspectives for manpower research. He also consulted with scientists in the Area on the subject of urban growth and decline. Dr. Teitz has degrees from the London School of Economics, the University of Wisconsin, and the University of Pennsylvania (Regional Science).

Alexandr Umnov - USSR (February 1978 - May 1978)

Alexandr Umnov came to IIASA to work with the System and Decision Sciences Area and the Human Settlements and Services Area. In Moscow he is a supervisor of a laboratory for Applied Systems Modeling at the Institute for Systems Studies. Dr. Umnov received his Ph.D. (1972) from the Institute for

Control Sciences with a major in mathematical cybernetics theory and the applications of mathematical programming.

Frans J. Willekens - Belgium (June 1975 - November 1978)

Frans Willekens came to IIASA in June 1975 from Northwestern University, to work on migration and settlement systems research. Dr. Willekens studied agricultural engineering, economics, and sociology at the University of Leuven (Belgium) and received his Master's degree in 1970. He began his Ph.D. studies in Urban Systems Engineering and Policy Planning at Northwestern University in 1973 and completed his dissertation while at IIASA. From 1971 to 1973 he was Assistant Professor of Agricultural Economics at the National University of Zaire.

Tatiana Zaslavskaya - USSR (May 1978 - June 1978)

Tatiana Zaslavskaya, a sociologist-economist from Novosibirsk, came to the Human Settlements and Services Area to work on the analysis of rural migration and development and to contribute to the comparative migration and settlement study. Professor Zaslavskaya received her doctorate from Novosibirsk in Economics. She is currently a member of the Institute of Economics and Industrial Management where she heads the division of social problems of labor and social planning of labor resources and the sector studying urban and rural social problems. Dr. Zaslavskaya is a corresponding member of the National Academy of Sciences in the USSR.

1978

Research Assistants

Colosio, Luis Donaldo	Mexico	Feb. 78 -
Grabler, Elfrieda	Austria	Aug. 77 - Aug. 78
Tsipouris, Helen	Greece	Jul. 78 - Nov. 78

1977

Research Scholars

Castro, Luis	Mexico	Oct. 77 -
Fleissner, Peter	Austria	Jan. 76 -
Fujimasa, Iwao	Japan	Jul. 76 - Sept. 76 Jul. 77 - Aug. 77
Gibbs, Richard	UK	May 77 - Apr. 78
Glickman, Norman	USA	May 77 - Aug. 77
Hansen, Niles	USA	Jul. 75 - Aug. 77
Kaihara, Shigekoto	Japan	Aug. 76 - Oct. 76 Aug. 77 - Sept. 77
Kawashima, Tatsuhiko	Japan	Jul. 77 -
Klementiev, Alexandre	USSR	Feb. 76 - Feb. 78
Ledent, Jacques	France	Feb. 77 -
Philipov, Dimiter	Bulgaria	Sept. 77 -
Raquillet, Richard	France	Jan. 77 - Oct. 77
Rogers, Andrei	USA	Jul. 75 -
Shigan, Evgenii	USSR	Nov. 76 -
Willekens, Frans	Belgium	Jun. 75 - Nov. 78

Research Assistants

Grabher, Elfrieda	Austria	Aug. 77 - Aug. 78
Hay, Dennis	UK	Jul. 77 - Aug. 77
Shah, Iqbal	Pakistan	Aug. 77 - Sept. 77
Sherrill, Koren	USA	Jan. 76 - Aug. 77
Tambashi, Oleko	Zaire	Aug. 77 - Sept. 77
Till, Werner	Austria	Apr. 77 - Jun. 77

1976

Research Scholars

Atsumi, Kazuhiko	Japan	Aug. 76 - Sept. 76
Blum, Edward	USA	Sept. 74 - Jun. 76
Fleissner, Peter	Austria	Jan. 76 -
Fujimasa, Iwao	Japan	Jul. 76 - Sept. 76
Glass, Norman	UK	Jul. 74 - Jun. 76
Hansen, Niles	USA	Jul. 75 - Aug. 77
Hoeck, Martin	Netherlands	Sept. 75 - Nov. 75 Apr. 76
Kaihara, Shigekoto	Japan	Aug. 76 - Oct. 76
Kiselev, Alexander	USSR	Mar. 75 - May 76
Kiseleva, Galina	USSR	Aug. 75 - Mar. 76
Klementiev, Alexandre	USSR	Feb. 76 - Feb. 78
Korcelli, Piotr	Poland	Oct. 75 - Dec. 75 Mar. 76 - Apr. 76 Apr. 78 - May 78
Miron, John	Canada	Sept. 75 - Aug. 76
Olshansky, Vladislav	USSR	Jun. 76 - Aug. 76
Rapoport, Samuel	GDR	Oct. 75 - Dec. 75 Feb. 76
Rogers, Andrei	USA	Jul. 75 -
Shigan, Evgenii	USSR	Nov. 76 -
Strobel, Horst	GDR	Jun. 74 - Aug. 74 Jun. 75 - Nov. 76 Jun. 76 - Nov. 76
Venedictov, Dimitri	USSR	Jan. 75 - Dec. 76
Welsh, William	USA	Jan. 76 - Aug. 76
Willekens, Frans	Belgium	Jun. 75 - Nov. 78

Research Assistants

Le Gloannec, Annemarie	France	Oct. 75 - Jun. 76
Leitner, Helga	Austria	Jun. 75 - Jun. 76
Sherrill, Koren	USA	Jan. 76 - Aug. 77

1975

Research Scholars

Afifi, Abdelmonem	USA	Sept. 74 - Aug. 75	HSS/SDS
Baecher, Gregory	USA	Aug. 74 - Jul. 75	ENP/HSS
Bigelow, James	USA	Sept. 74 - Oct. 75	HSS/SDS
Blum, Edward	USA	Sept. 74 - Jun. 76	
Cordey-Hayes, Martyn	UK	Mar. 74- Mar. 75	
Domanski, Ryszard	Poland	Jun. 74 - Jul. 77 Feb. 75 - Mar. 75	
Glass, Norman	UK	Jul. 74 - Jun. 76	
Gorham, William	USA	Jun. 75	
Hansen, Niles	USA	Jul. 75 - Aug. 77	
Hoeck, Martin	Netherlands	Sept. 75 - Nov. 75	
Kiselev, Alexander	USSR	Mar. 75 - May 76	
Kiseleva, Galina	USSR	Aug. 75 - Mar. 76	
Korcelli, Piotr	Poland	Oct. 75 - Dec. 75 Mar. 76 - Apr. 76 Apr. 78 - May 78	
Logan, Malcolm	Australia	Dec. 74 - Jan. 75	
MacKinnon, Ross	Canada	Sept. 74 - Aug. 75	
Majone, Giandomenico	Italy	Jun. 74 - Jun. 75	
Miron, John	Canada	Sept. 75 - Aug. 76	
Page, John	UK	Jan. 74 - Mar. 75	
Rapoport, Samuel	GDR	Oct. 75 - Dec. 75 Feb. 76	
Rogers, Andrei	USA	Jul. 75 -	
Sokolov, Valery	USSR	May 74 - Dec. 75	
Strobel, Horst	GDR	Jun. 74 - Aug. 74 Jun. 74 - Sept. 75 Jun. 76 - Nov. 76	

Swain, Harry	Canada	Jan. 74 - Dec. 75	
Thompson, Mark	USA	Feb. 73 - Aug. 75	DIR/HSS
Tobler, Waldo	USA	Dec. 74 - Aug. 75	
Venedictov, Dimitri	USSR	Jan. 75 - Dec. 76	
Willekens, Frans	Belgium	Jun. 75 - Nov. 78	
Zilov, Vadim	USSR	May 75 - Dec. 75	

Research Assistants

Gambrelle, Jean-Marie	France	Dec. 73 - May 75	
Heuse, Lisbeth	FRG	Jun. 75 - Aug. 75	
Kelley, Gillian	UK	Apr. 74 - Apr. 75	
Le Gloannec, Annemarie	France	Oct. 75 - Jun. 76	
Leitner, Helga	Austria	Jun. 75 - Jun. 76	
Skarke, Anne-marie	Austria	Jan. 75 - Jul. 75	

1974

Research Scholars

Afifi, Abdelmonem	USA	Sept. 74 - Aug. 75	HSS/SDS
Baecher, Gregory	USA	Aug. 74 - Jul. 75	ENP/HSS
Bigelow, James	USA	Sept. 74 - Oct. 75	HSS/SDS
Blum, Edward	USA	Sept. 74 - Jun. 76	
Collins, John	Canada	Jun. 74 - Aug. 74	
Cordey-Hayes, Martyn	UK	Mar. 74 - Mar. 75	
Domanski, Ryszard	Poland	Jun. 74 - Jul. 75 Feb. 75 - Mar. 75	
Glass, Norman	UK	Jul. 74 - Jun. 76	
Kudinov, Oleg	USSR	Feb. 74 - Jul. 74	
Logan, Malcolm	Australia	Dec. 74 - Jan. 75	
Majone, Giandomenico	Italy	Jun. 74 - Jun. 75	
Miller, James	USA	Jul. 73 - Aug. 73 Aug. 74	
Page, John	UK	Jan. 74 - Mar. 75	
Sokolov, Valery	USSR	May 74 - Dec. 75	
Steiner, Karl	Austria	Oct. 74 - Nov. 74	
Strobel, Horst	GDR	Jun. 74 - Aug. 74 Jun. 75 - Sept. 75 Jun. 76 - Nov. 76	
Swain, Harry	Canada	Jan. 74 - Nov. 76	
Thompson, Mark	USA	Feb. 73 - Aug. 75	DIR/HSS
Tobler, Waldo	USA	Dec. 74 - Aug. 75	

Research Assistants

Brown, Hamilton	USA	Sept. 74 - Sept. 75	
Gambrelle, Jean-Marie	France	Dec. 73 - May 75	

V. PUBLICATIONS

The published results of IIASA's research can appear as one of the following four types of publications, depending on the nature of the work and its intended audience.

- In the case of the Human Settlements and Services Area, two *books* have been assembled based on papers given at conferences held at IIASA. These books are published outside of IIASA.
- The *Research Report* (RR) is IIASA's most formal vehicle for reporting Institute research, intended for broad distribution to the scientific community. RRs receive careful review, editing, typing, and printing. The RR classification is used to report final results of research, interim, or contributing work where the results are felt to merit broad circulation.
- The *Collaborative Publication* (CP) is used to convey results of research done jointly with other research organizations and for proceedings of conferences and workshops.
- The *Research Memorandum* (RM) is less formal than the RR classification, but still is an official Institute publication. Because of their interim nature RMs generally do not receive the careful technical reviews given RRs.

All the Human Settlements and Services Area publications in these four categories are listed below by year. An abstract of each publication is included for those published in 1978.

1978

Book

Hansen, N. (1978), *Human Settlement Systems: International Perspectives on Structure, Change and Public Policy*, Ballinger Publishing Company, Cambridge, Massachusetts.

Effective planning on the part of urban and regional policy makers requires an understanding of the structure and processes of human settlement systems. This book offers theoretical and empirical insights into the factors that influence the evolution of these systems. It is an outgrowth of a conference on the dynamics of human settlement systems organized by the Human Settlements and Services Area of the International Institute for Applied Systems Analysis.

Research Reports

RR-78-003. Regional Multiplier Analysis: A Demometric Approach. J. Ledent.

This paper reports on the design and testing of an adequate framework for conducting regional multiplier studies in areas experiencing rapid population growth. It puts forward the demometric approach, one that applies econometric methods to the analysis of demoeconomic growth. Two alternative models are proposed here. The first is an aggregate model presenting a demometric revision of the traditional economic base model. The second model, an enlarged version of the first, is characterized by a breakdown of economic activities into nine major

sectors. Both models are fitted to data for the rapidly growing metropolitan area of Tucson, Arizona, USA. The models are then used to derive tentative impact and dynamic multipliers which substantiate the role of households as consumers and suppliers of labor in the development of Tucson SMSA. The major finding is that, for the same level of resources, the second model yields better policy implications than the modified (and therefore also the traditional) economic base model.

RR-78-006. Migration and Settlement: Selected Essays. A. Rogers, editor.

This publication reproduces the contents of a special issue of the journal *Environment and Planning, A* (May 1978) that was entirely devoted to an exposition of work carried out within the Migration and Settlement Task at IIASA. The seven articles focus on topics related to model migration schedules, spatial zero population growth, migration behavior, regional multiplier analysis, national settlement system policy modeling, and a study of migration and settlement in Bulgaria.

RR-78-008. The IIASA Health Care Resource Allocation Submodel: Mark 1. R. Gibbs.

Within the context of the IIASA Health Care System model the function of the resource allocation submodel is to simulate how the HCS allocates limited supplies of resources between competing demands. The principal outputs of the submodel should be the numbers of patients treated, in different categories, and the modes and standards of treatments they receive. The Mark 1 version of the submodel is described in this paper. It simulates the allocation of one resource within one mode of treatment but it should be possible to use the approach to develop further

versions to cover more general cases. The main assumption of the model is that in allocating its resources the HCS attempts to optimise a utility function whose parameters can be inferred from data on past allocations. Depending upon the type of data that is available different procedures for parameter estimation can be incorporated with the algorithm for solving the model into a computer programme whose main inputs consists solely of empirical data. The programme is fairly small and can readily be installed on most scientific computer installations. The use of the submodel is illustrated by a hypothetical application using hospital data from England.

RR-78-013. Migration and Settlement: Measurement and Analysis. A. Rogers, F. Willekens.

This report brings together four articles that describe major results of IIASA's research on the measurement and analysis of migration and population redistribution patterns. It complements a collection of seven papers published recently as a special issue of the journal *Environment and Planning, A (RR-78-006)* and with that issue stands as the final report on methodological contributions of the Migration and Settlement Task at IIASA. The four papers focus on spatial population dynamics, sensitivity analysis, shrinking large-scale population models, and demometrics of migration and settlement.

RR-78- . Spatial Population Analysis: Methods and Computer Programs. F. Willekens, A. Rogers.

This report reviews the integrated methodology for spatial or multiregional demographic analysis, developed at IIASA, and

presents the FORTRAN IV codes of the computer programs and a user's manual to implement this methodology. They include: the multiregional life table; multiregional demographic projections; fertility and mobility analyses of life table and stable population analyses; the spatial reproductive value; and the analysis of alternative paths to spatial zero-population-growth. The focus of the report is on the interpretation of the output. The user's manual focuses on the preparation of the data check.

Collaborative Publications

CP-78-004. Functional Urban Regions in Hungary. L. Lacko, G. Enyedi, G. Koszegfalvi.

This study focuses on the delineation of functional urban regions in Hungary and the regional survey of the economic and demographic characteristics of these regions. The work of delineation was primarily based on the criteria set forth by IIASA's research Task on Human Settlement Systems: Development Processes and Strategies. However, the methodological concept of functional spheres of influence was adopted as well. The delineation was made using 1970 Census data.

Research Memoranda

RM-78-001. A Disaggregated Health Care Resource Allocation Model. R.J. Gibbs.

The planning of health services can be viewed as occurring in two stages--the estimation of the amounts of health care resources that would be needed if the Health Care System (HCS)

were to test all sick individuals at clinically desirable standards and the downward revision of these estimates in order to comply with economic constraints. To assist in the second stage a model is proposed which includes submodels for population, disease prevalence, resource supply, and resource allocation and which could be used interactively by the planner to explore resource options. The role of the resource allocation submodel in this design is to simulate how the HCS allocates limited resources between competing demands. To perform this role a submodel is proposed which derives from a resource allocation model which is being used in health service planning in the UK. The submodel as proposed here can be applied to only one sector of the HCS at a time whereas the UK model can be applied to several sectors simultaneously. However it is more easy to use than the UK model and its computational requirements are considerably lighter. The submodel is described in terms of its application to the hospital in-patient sector and its performance is illustrated by a hypothetical application to the South Western Region of England.

RM-78-003. Analysis and Future Estimation of Medical Demands Using a Health Care Simulation Model: A Case Study of Japan. S. Kaihara, N. Kawamura, K. Atsumi, I. Fujimasa.

A method of building a universal health care model was proposed in RM-77-6. This method is based on the calculation of essential parameters of health care from ordinary statistics. The essential parameters proposed in the previous report were population structure, morbidity rate, recovery rate, death rate, patient registration rate and awareness rate.

The method was applied successfully to the analysis of medical demands at the national level of Japan. The results showed that in the past 15 years the awareness rate was the most important factor which contributed to the increase of the patients. But in the future, the model predicted that the change of population structure will be the main cause of the increase of the number of patients in Japan.

RM-78-009. A Spatial Complex Analysis of Agglomeration and Settlement Patterns. P. Nijkamp.

Spatial complex analysis may be a useful approach to provide an integrated view of the agglomeration phenomena inherent in human settlement patterns. By means of vector profile methods a quantitative frame of reference can be provided for a further study of the determinants and the coherence of a certain agglomeration pattern. The use of a newly developed multivariate statistical technique, via interdependence analysis, provides a reasonable background for a more profound analysis based on spatial correspondence techniques. Given this technique, the determinants of a certain spatial allocation pattern can be identified. The analysis in this paper is illustrated by means of several empirical results for the province of North-Holland in the Netherlands.

RM-78-010. A Morbidity Submodel of Infectious Diseases. I. Fujimasa, S. Kaihara, K. Atsumi.

The number of sick persons with infectious diseases in a country can be estimated by a morbidity submodel of infectious diseases. The input to such a model is the population of

structure of the country and the outputs are numbers of sick and dead, and the prevalence rates of infectious diseases. The model makes use of three disease-specific rates, which are assumed to be constant across developed countries, namely, the morbidity rate, the recovery rate, and the death rate per capita. For this paper values of these three rates were calculated from Japanese survey data describing disease-specific prevalence rates, death rates, and durations of stay. The outputs of the model are in good agreement with WHO statistics from Japan and other developed countries.

RM-78-12. The Role of Rural-Urban Migration in the Urbanization and Economic Development Occurring in Kenya. H. Rempel.

This paper focuses on rural-urban migration in Kenya after independence in 1963 and includes a brief survey of the historical forces that shaped the urbanization process. The basic thesis is that rural-urban migration is a rational response to development in Kenya. Migration does not shape this development, it is merely one symptom of the growth. Data were collected from a survey conducted by J.R. Harris, M.P. Todaro, and the author in 1968 and the 1969 Population Census. The influence of education, age, land, and income on the decision-making process is analyzed. The effects of migration on rural and urban areas are discussed; however, the conclusions reached are tentative because available information is limited. The paper concludes by identifying important areas of further research in migration and urbanization in Kenya.

RM-78-015. The Formal Demography of Migration and Redistribution: Measurement and Dynamics. A. Rogers.

This paper is a broad overview of migration and redistribution research currently being carried out at IIASA. Fundamental concepts regarding problems of migration measurement are set out and several multiregional demographic models dealing with the redistributional dynamics of national populations are outlined.

RM-78-017. The Demography of Labor Force Participation. F. Willekens.

This paper illustrates the demographer's perspective of labor force analysis and shows how recent methodological developments in demography, can fruitfully be applied to manpower studies. First, curves of age-specific labor force participation rates are investigated and it is shown how their universal features enable one to describe the schedules by a limited number of parameters. Next, an increment-decrement table of working life is developed and compared with the conventional technique of working life table construction. Finally, an improved labor force projection model is presented.

RM-78-020. Models for Educational and Manpower Planning: A Dynamic Linear Programming Approach. A. Propoi.

This paper shows that many optimization problems for educational and manpower planning models can be written in a standard dynamic linear programming form. A basic model of educational planning is described and extensions of the model (investment and vocational training submodels and a three-level

educational model) are given. The possibilities and limitations of DLP as applied to manpower and educational planning problems are discussed.

RM-78-021. Aggregate Model for Estimating Health Care System Resource Requirements (AMER). A.A. Klementiev, E.N. Shigan.

In the process of national health care system model elaboration, the model for estimating resource requirements plays an important role. Resource needs are determined on the basis of estimates of population trends and morbidity rates, and a set of desired health care standards. For the creation of the morbidity estimation model, data from comprehensive studies carried out in the UK, Japan, and the USSR were used. The desired standards were taken from the practice of central planning now existing in the USSR. Using this model in an interactive regime, it is possible to test alternative planning strategies. Preliminary results of testing and running this model in various countries show that this computer model could be used in different developed countries for estimating resource requirements.

RM-78-025. Some Methodological and Empirical Considerations in the Construction of Increment-Decrement Life Tables. J. Ledent.

The topic of this paper revolves around the calculation of those combined life tables that allow entries as well as withdrawals from alternative states, namely, increment-decrement life tables. The paper provides a complete theoretical presentation of such tables, focusing on the contrasts between the movement and the transition approaches. It also sets forth,

for both approaches, life table construction methods based on three alternative methodological variations: the linear and the cubic integration methods, and an interpolative-iterative method. Finaly, the paper develops more precise methods for constructing a multiregional life table, for which the generally available death and migration rates are not consistent with either the movement or the transition approaches.

RM-78-028. Stable Growth in the Nonlinear Components-of-Change Model of Interregional Population Growth and Distribution. J. Ledent.

In this paper, a general components-of-change model for a multiregional demographic system is proposed. Characterized by independently derived retention probabilities, it subsumes two of the previously proposed models of population growth and distribution: the linear model studied by Rogers and the nonlinear model put forward by McGinnis and Henry. These two special cases are shown to be symmetrical variants of the proposed general model for a similar consideration of the independently derived retention probabilities. Because of its peculiar properties, we conclude that the nonlinear model cannot be a useful substitute for the linear model in the study of the dynamics of multiregional population systems.

RM-78-036. Migration and Settlement in Bulgaria. D. Philipov.

This paper examines the recent evolution of Bulgaria's population. It is part of IIASA's comparative study of migration and settlement patterns in its member nations. The paper presents a multiregional demographic analysis of fertility,

mortality, and internal migration for a seven-region disaggregation of the Bulgarian state. The results give a detailed snapshot of current spatial population dynamics in the country and offer valuable insights useful for improving the national population policy.

RM-78-039. Deconcentration Without a "Clean Break". P. Gordon.

This report reviews recent papers which argue that urbanization trends in the US shows a reversal of past patterns. The review suggests that a reversal is not obvious and may simply appear as a result of a statistical artifact: urbanization which has spilled over metropolitan boundaries may simply be more of the same outward growth but would show up as a metropolitan to non-metropolitan growth shift. A new data file for eighteen other developed countries is examined. These data are suitable for computations of various versions of the Hoover index of population concentration. Such calculations suggest that the eighteen countries examined are experiencing more traditional urban outward expansion. This adds to scepticism of the reversal or 'clean break' hypothesis.

RM-78-050. The IIASA Health Care Resource Allocation Submodel: Mark 2 - the Allocation of Many Different Resources. D.J. Hughes.

The function of the resource allocation submodel within the IIASA Health Care System model is to simulate how the HCS allocates limited supplies of resources between competing demands. The principal outputs of the submodel are the numbers of patients treated, in different categories, and the modes

and quotas of treatment they receive. The Mark 2 version of the submodel described in this paper simulates the allocation of many resources within one mode of treatment. It uses the same main assumption as used in the Mark 1 version previously reported; namely that in allocating its resources the HCS attempts to optimise a utility function whose parameters can be inferred from data on past allocations. This paper analyzes estimation procedures which use historical allocation data directly. Both these procedures and the solution algorithm have been realized in a small computer program which can be readily installed on most scientific computer installations. The use of the submodel is illustrated by three hypothetical applications using hospital data.

RM-78-052. A Demoeconomic Model of Interregional Growth Rate Differences. J. Ledent, P. Gordon.

This paper sets forth a *demoeconomic* approach to interregional development along non-neoclassical lines. This objective is carried out by generalizing a recently published model of interregional growth rate differences (Dixon and Thirlwall, 1975). An extension of this model is proposed which includes migration as well as other demographic aspects of development (labor force participation and unemployment), endogenously and simultaneously determined. Interestingly enough, the nature of these variables provides an impetus for reconsidering linearity: the proper modeling of demoeconomic effects necessarily introduces nonlinearities. Nonstatic long-term rates of change are shown to emerge from the simulation of this

extended model: as a consequence of population shifts due to migration, there appear regional cycles accompanied by cycles of divergence and convergence of incomes.

RM-78- . Rural-Urban Population Projections for Kenya and Implications for Development. M. Shah, F. Willekens.

This paper projects the rural and urban populations of Kenya into the future by applying the methodology of multiregional demography. A base run and six alternative scenarios of fertility, mortality, and rural-urban migration are considered. The demographic consequences of these alternative scenarios on employment, demand for food, health, education, and on development in general are analyzed separately for the urban and rural sectors. A general framework for the study of the urbanization process is also proposed.

RM-78- . The Dynamics of Two Demographic Models of Urbanization. Jacques Ledent.

This paper is the first of a series of three which attempt to shed some light on the urbanization phenomenon, using two alternative models of rural-urban population growth. One is a model recently proposed by Keyfitz (1978) in which migration is viewed as a net flow out of the rural region; the other is a continuous two-region version of the model of population growth and distribution developed by Rogers (1968), in which the gross migration flows out of both rural and urban regions are explicitly considered. This first paper examines and compares the dynamics of these alternative models on the basis of constant rates of natural increase and migration. It demonstrates the simplicity of their properties, especially in the

case of the second model which also appears more realistic due to its symmetrical treatment of the rural and urban regions. In addition, it suggests the ability of both models to give some insights into the relative rates of natural increase and inmigration in accounting for urban population growth.

RM-78- . The Factors and Magnitude of Urbanization Under Natural Increase and Migration Patterns. Jacques Ledent.

This paper is the second of a series intended to shed some light on the urbanization phenomenon. Its main purpose is to contrast the results provided by two alternative models--the model proposed by Keyfitz (1978) and the continuous version of the multiregional model of population growth and distribution developed by Rogers (1968)--under constant regimes of natural increase and migration. In both cases, the evolution of the magnitude of urbanization as well as that of the relative importance of natural increase and migration in accounting for urban growth are examined. A particular emphasis is placed on the time spans necessary to reach two cross-over points: the point at which natural increase starts exceeding inmigration in the urban region (cross-over point of type I) and the point at which the urban population becomes larger than the rural population (cross-over point of type II).

RM-78- . The Forces of Urbanization Under Varying Natural Increase and Migration Rates. Jacques Ledent.

This paper is the third and last of a series seeking to shed some light on the question of whether a nation's urban population grows mostly by rural-urban migration or by natural increase.

Again, the discussion evolves around an analytical study of the Keyfitz model of urbanization (Keyfitz, 1978) and the Rogers components-of-change model (Rogers, 1968) applied to a rural-urban system. Here, in contrast, to the preceding papers in which rates of natural increase and migration were constant, the present paper allows these rates to vary. A larger part of the analysis is based on the Keyfitz model, shown earlier to be less meaningful than the alternative model but lending itself to an easier tractability when rates are allowed to vary. In particular, the Keyfitz model is used in an attempt to connect the variations of rural-urban (net) migration rates to economic changes through a simple scheme of wage differentials, later supplemented by the Todaro hypothesis.

RM-78- . The IIASA Health Care Resource Allocation Submodel: Estimation of Parameters. David J. Hughes.

The function of the resource allocation submodel within the IIASA Health Care Systems model is to simulate how the HCS allocates limited supplies of resource between competing demands. The principal outputs of the submodel are the numbers of patients treated, in different categories, and the modes and quota of treatment they receive. This paper reviews the data which are available for estimating the parameters of the model, and develops methods which made direct use of historical allocation data. Separate procedures are developed for estimating elasticities, ideal levels of care, and resource costs. These procedures have been realized as computer programs, and their use is illustrated by three examples using hospital data.

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RR-77-012 Traffic Control Systems Analysis by Means of Dynamic State and Input/Output Models. H. Strobel.

RR-77-014 Migration, Urbanization, Resources, and Development. A. Rogers.

RR-77-023 Normative Modelling in Demo-Economics. F. Willekens, A. Rogers.

Collaborative Publications

CP-77-004 Health System Modeling and the Information System for the Coordination of Research in Oncology. D.D. Venediktov, editor.

CP-77-007 Optimization Applied to Transportation Systems. H. Strobel, R. Genser, M. Etschmaier, editors.

CP-77-008 Modeling Health Care Systems. E.N. Shigan, R. Gibbs, editors.

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Collaborative Publications

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Collaborative Publications

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CP-75-003 National Settlement Strategies East and West. H. Swain, editor.

CP-75-004 Issues in the Management of Urban Systems. H. Swain, R.D. MacKinnon, editors.

CP-75-005 Proceedings of the Joint IIASA/WHO Workshop on Screening for Cervical Cancer. J.H. Bigelow, coordinator.

CP-75-009 Selected Papers from IIASA Conference on National Settlement Systems and Strategies. H. Swain, editor.

CP-75-010 The IIASA Project on Urban and Regional Systems: A Status Report. Urban Project. (Formerly SR-75-1-URB).

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CP-73-004 Proceedings of IIASA Planning Conference on Urban and Regional Systems, July 30-August 1, 1973. Urban Project. (Formerly PC-73-4).

CP-73-005 Proceedings of IIASA Planning Conference on Medical Systems, August 6-8, 1973. Bio-Medical Project. (Formerly PC-73-5).

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