The Human Settlements and Services Area: The First Five Years

Andrei Rogers

FOREWORD

In October 1977, the International Institute for Applied Sys-
tems Analysis (IIASA) marked the fifth anniversary of the signing
of its Charter and by the middle of 1978 the Institute had completed
its first 5 years of research activity. On these occasions, the
Institute's staff and management reflected upon the path that has
been followed in IIASA's development thus far and upon the road
that lies ahead. Doing so has enabled us to see more clearly than
is possible from day to day what has been accomplished at IIASA,
what difficulties have arisen, and what opportunities and challenges
exist.

We believe that these retrospective and prospective views can
be of value to the Institute's staff and management as well as to
those outside the Institute who are interested in its work: members
of Advisory and Liaison Committees, consultants, prospective and
former staff members, visitors, and members of the scientific and
decision-making communities who follow IIASA's activities.

With that in mind, Andrei Rogers, chairman of the Human Settle-
ments and Services Area, has prepared this review. The Area was
formed in 1976 through the merger of the Urban and Regional Systems
Project and the Biological and Medical Systems Project, both of
which had been initiated in the beginning of 1974. This Report
describes the evolution since 1974 of IIASA's concern with the human
population, its distribution on the globe, the settlements it forms,
and the services it needs. Besides describing the research that has
been carried out in the Area and its on-going activities, the Report
presents its current research plans for 1979-1983. Lists are given
of the staff who have served in the Area (and in its predecessor
projects) since 1974, and of the resulting publications. Biogra-
phies of the staff and abstracts of the publications for 1978 have
also been provided.

It is our hope that this Report will extend understanding of the goals and activities of the Human Settlements and Services Area and of IIASA and, thereby, broaden the international network of persons and institutions collaborating in our work or making use of the Institute's results.

Roger E. Levien
Director
International Institute for
Applied Systems Analysis

ACKNOWLEDGMENTS

CONTENTS

INTRODUCTION TO IIASA AND ITS
RESEARCH PROGRAM*

The International Institute for Applied Systems Analysis
(IIASA) 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 5½ years that followed the original meeting in 1967
between McGeorge Bundy, former National Security Advisor to U.S.
President Lyndon Johnson, and Jermen Gvishiani, Deputy Chairman
of the State Committee of the USSR Council of Ministers for
Science and Technology, negotiations were held by representatives
of distinguished scientific bodies from 12 nations. Joining
Dr. Bundy and Professor Gvishiani in the deliberations that led
to the final charter were such persons as Sir Solly Zuckerman
of the UK Cabinet Office; Philip Handler, President of the
National Academy of Sciences; Aurelio Peccei of Italy; and
Pierre Aigrain of the General Delegation for Scientific and Tech-
nical Research, France.

The agreement of the founders on four major subjects has
exerted significant influence on the evolution of the Institute.
Perhaps the most important of these was the *nongovernmental
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 In-
stitute were insulated from the undesirable intrusion of inter-
national political differences.

The second important agreement was on the selection of
Applied Systems Analysis as the descriptive phrase in the

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*This chapter is a summary of pages 3-23 of *The First Five Years:
 Director's Review,* by Roger E. Levien. Laxenburg, Austria:
 IIASA, 1977.

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 pertained to 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, and 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 of the United States and the Soviet Union, which had taken a leading role in IIASA's establishment, agreed to pay the largest, equal amounts; 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.

In 1973, after a 5½-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 newborn Institute. Simply bringing scientists from East and West together was not enough to guarantee meeting the high standards needed for an influential institute. The program had to have 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 of its 12 National Member Organizations (NMOs), yet be within the capabilities and interests of the staff that could be brought together quickly. (The number of NMOs has risen since this time to 17; a list of member organizations and IIASA Council members is given in Appendix A.)

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

Fortunately, it was possible to bring scientists to IIASA quickly; by October 1973, just a year after the Charter was signed, over 20 scientists were participating in the Institute's work, and four projects were under way (Figure 1).

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 Bio-medical Project while remaining in his Moscow position. A deputy, Dr. Alexander Kiselev, came to IIASA full time to oversee the day-to-day management of the project. In less than 2 years, the re-search program at IIASA had come fully to life.

1973	1974	1975

Energy Systems
W. Häfele

Water Resources
A. Letov — *Y. Rozanov (Acting)* — *Z. Kaczmarek*
Ecological and Environmental Systems
C.S. Holling — *W. Foell*

Urban and Regional Systems
H. Swain
Biological and Medical Systems
D. Venedictov

Large Organizations
H. Knop
Integrated Industrial Systems
A. Cheliustkin/I. Lefkowitz

Methodology
G. Dantzig — *T. Koopmans* — *W. Jewell (Acting)* — *M. Balinski*
Computer Science
A. Butrimenko

Survey of the State of the Art
R. Levien
General Activities
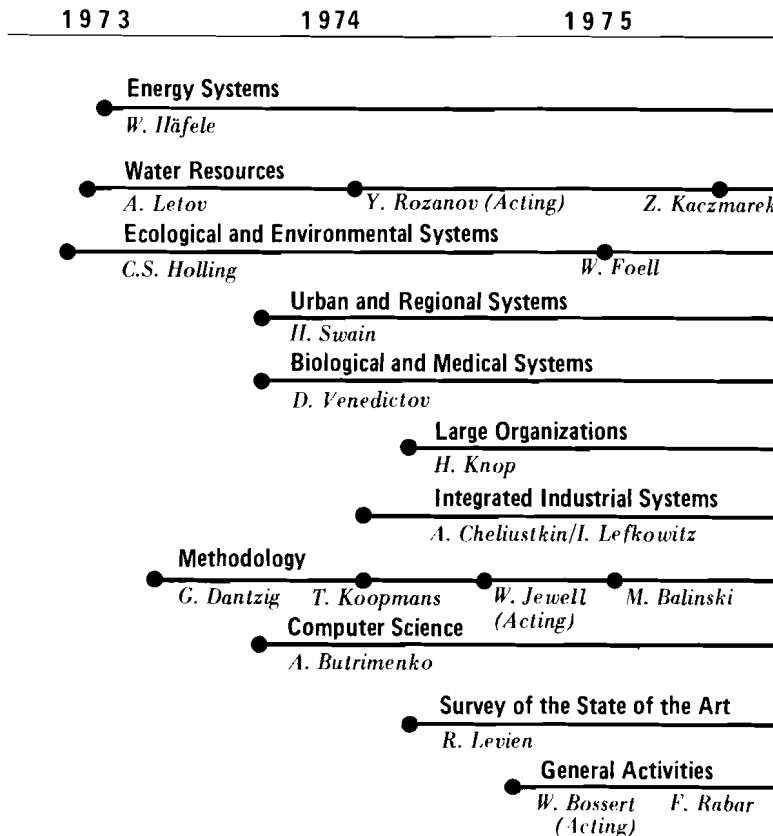*W. Bossert (Acting)* — *F. Rabar*

Figure 1. Development of the IIASA research program, 1973-1975.

It was not possible, however, for the new project leaders 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 would be 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 create a product responsive to the needs of the eventual users. Furthermore, 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 decision makers 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 2 years defined systems analysis by *doing* systems analysis.

Through this "defining while doing" method, various emphases developed. There was the emphasis on providing assistance to decision makers--whether they were forest managers, energy policy makers, 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 affect the decision. This meant that IIASA must be an inter-disciplinary research institution.

The phrase "international applied" also had to be given meaning, and during the first 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 readily accessible resources. Problems of the second kind were identified as *universal:* these are problems that lie within the boundaries of single nations but are shared by all nations. 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 3 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 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, however, at this point a number of difficulties became evident. Two were preeminent: too many different activities were being attempted with too small a staff, and the 11 projects were too separate from each other, losing the intended benefits of IIASA's interdisciplinary and international character. The Institute therefore reviewed 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 under way. For management reasons, it was necessary that the number of principal research leaders be nearly halved. The result was a proposal for a new "matrix" structure of the research plan and research management.

The second Director, Dr. Roger E. Levien of the Rand Corporation in the United States, presented the proposed matrix structure to the Council for approval 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 needed for IIASA's systems analysis. The Programs would be considered to be finite, with results to be obtained in 4 to 5 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 about 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.

After 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 stated clearly in its Research Plan, as are its approaches to systems analysis and the application of systems analysis to international problems. A reasonable balance has been struck between the need 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 problem 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

1973 1974 1975 1976 1977

ENERGY SYSTEMS

Energy Systems

W. Häfele

W. Häfele

FOOD & AGRICULTURE

Water Resources

F. Rabar

A. Letov   Y. Rozanov (Acting)   Z. Kaczmarek

RESOURCES AND ENVIRONMENT

O. Vasiliev

Ecological and Environmental Systems

F. Rabar (Acting)

C.S. Holling   W. Foell

Urban and Regional Systems

HUMAN SETTLEMENTS AND SERVICES

H. Swain

Biological and Medical Systems

N. Hansen   A. Rogers

D. Venedictov

Large Organizations

MANAGEMENT AND TECHNOLOGY

H. Knop

Integrated Industrial Systems

H. Knop   A. Straszak   R. Tomlinson
(Acting)

A. Chelustkin/I. Lefkowitz

Methodology

SYSTEM AND DECISION SCIENCES

G. Dantzig   T. Koopmans   W. Jewell   M. Balinski
(Acting)

M. Balinski

Computer Science

A. Butrimenko

Survey of the State of the Art

GENERAL RESEARCH

R. Levien

R. Levien (Acting)

General Activities

INTEGRATED REGIONAL DEVELOPMENT

W. Bossert   F. Rabar
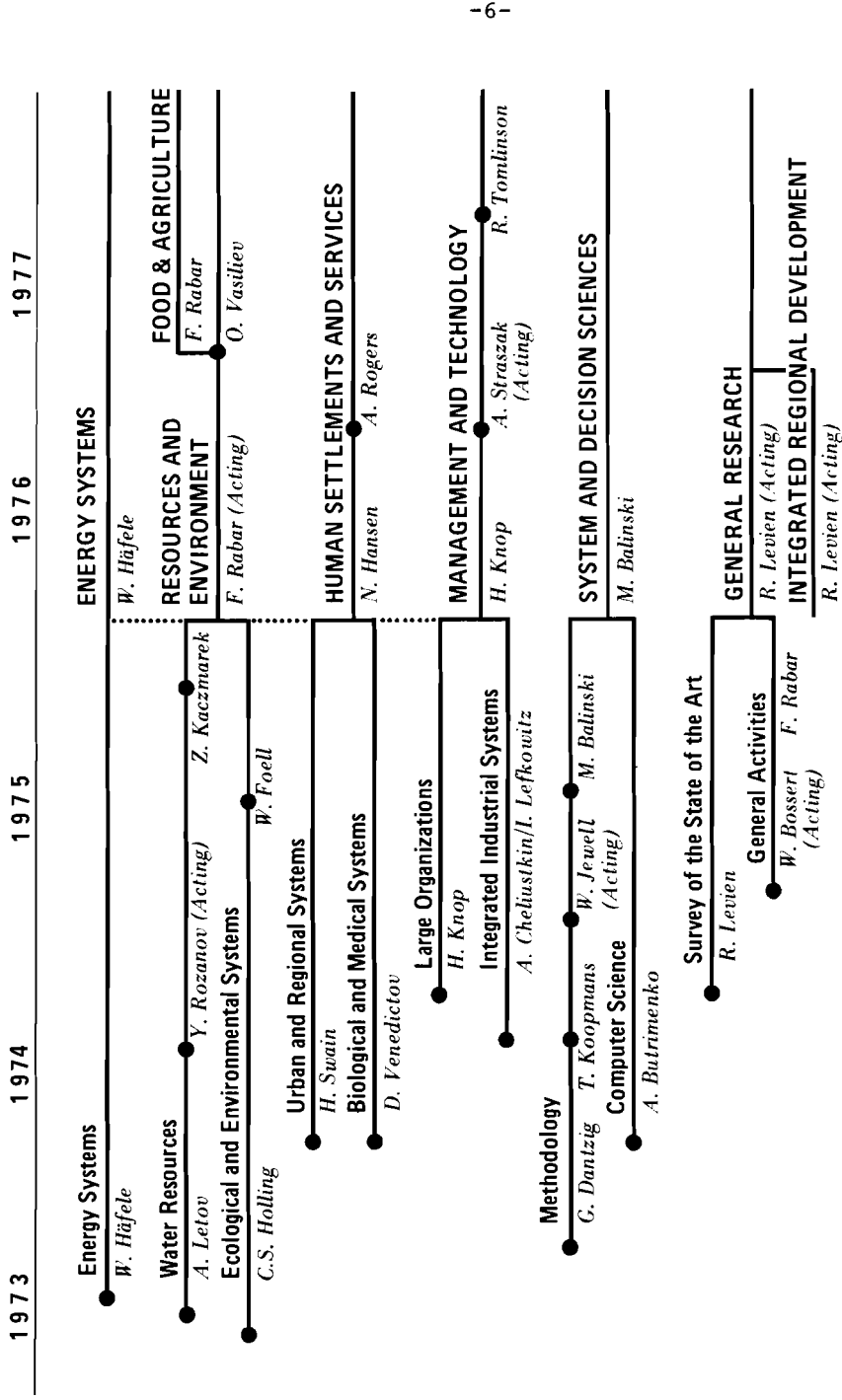*(Acting)*

R. Levien (Acting)

Figure 2.   Development of the IIASA research program, 1973-1977.

in the NMO countries is achieved? And how can the results of ef-
fective 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.

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

THE HERITAGE OF THE URBAN
AND THE BIOMEDICAL PROJECTS (1974-1975)

The research area called Human Settlements and Services (HSS)
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 re-
ferred 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, near Vienna,
to develop research directions for IIASA's Urban Project; also in
the summer of 1973, an international planning conference of roughly
similar scale met at the same location to carry out an analogous
task for the Biomedical Project.

Dr. Michael Rousselot (France), the chairman of the Urban Pro-
ject'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 insti-
tutes and in 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 recom-
mended a research strategy that would combine methodological work
on important "big" problems with quick and useful results obtained
from solving smaller problems.

The 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 depopulating areas. Some of the nuts-and-bolts problems suggested were the industrialized production of new housing units, intrametropolitan traffic analysis and control, and the delivery of health services.

In January 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, as head of the project. The project addressed policy issues revolving around national settlement systems development [Cordey-Hayes and Gleave, UK (RR-74-94); Swain, Canada (CP-75-3 and CP-75-9); and Swain and MacKinnon, Canada (CP-75-4)], and also considered problems of the design and operation of automated traffic guidance systems [Strobel, GDR (RR-77-12)] and urban emergency services [Blum, USA]. For more information on national settlement systems development, see Swain et al. (H. Swain, M. Cordey-Hayes, and R. MacKinnon, eds. 1975. Special issue of *Environment and Planning* 7:741-884); on automated traffic guidance systems, Strobel (H. Strobel, ed. In press. *Computer-Controlled Urban Transportation*. Wiley, Chichester, England); and on urban emergency services, Blum (CP-76-7).

By early 1975, research activities in the project had developed sufficiently to merit the publication of a status report (CP-75-10). 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 (Hansen, 1976), and another, under the direction of Dr. Andrei Rogers (USA), focusing on the quantitative analysis of migration and settlement processes (Rogers, 1976). Work on automated traffic control and on urban emergency services continued as before.

The August 1973 Planning Conference on Biological and Medical Systems identified a large number of possible research topics. During the early stages, Dr. Mark Thompson (USA) was the acting leader of this project and research was begun on such medical issues as cervical cancer screening (CP-75-5), Down's syndrome prevention (RR-75-6), and problems of the visually impaired (RR-74-14).

A year later, Dr. Dimitri Venedictov (USSR), 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 the completion of those research topics previously begun.

In 1974 a second Biomedical Conference was held, the proceedings of which were published commercially (Bailey and Thompson,

1975); and it was concluded at a third conference, in December 1975, that IIASA should concentrate on the development of a universal macromodel of national health care systems (CP-77-4).

THE MARRIAGE OF THE PROJECTS AND THE BIRTH OF THE HUMAN SETTLEMENTS AND SERVICES AREA (1976-1978)

The year 1976 was one 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 the Biomedical Projects were merged to create the Human Settlements and Services 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: 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 of 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 the Biomedical Projects: 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--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 decision makers 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 deeper understanding of the demo-economic 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 family of models for national health care systems and to apply them, in

collaboration with national research centers, as an aid to health service planners. This approach envisages a number of linked submodels dealing with population, disease prevalence, resource needs, resource supply, resource allocation, and external systems. Different submodels and combinations of submodels will be appropriate for applications in different health services.

The major achievements of this task in 1977-1978 were (a) a number of working versions of the submodels, built and tested and now available, and (b) the initiation of experiments with the models by a number of collaborating national research centers, using their own data, to see how the models might be applied to health service planning issues in their countries. (See Appendix B for a list of institutions collaborating with the HSS Area in 1978.)

A submodel for forecasting population change, developed by the Migration and Settlement Task, is being used as part of the Health Care System model. Submodels have also been developed for estimating the prevalence of two specific types of disease-- degenerative and infectious--and for general morbidity (RM-77-43, RM-77-40, RM-78-10). 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 for the pattern of development of future resource needs.

The health care resource allocation submodel (RR-78-8) has been gradually extended and improved. The original submodel simulates how the health care system allocates a single resource among various types of patients. One extension of this submodel (RM-78-50) includes the allocation of many resources within one mode of treatment. Another extension (RM-78-67) includes methods for estimating parameters from historical resource allocation patterns.

Research centers in Bulgaria, Canada, Czechoslovakia, the Federal Republic of Germany, France, the German Democratic Republic, Japan, and the United Kingdom, as well as the World Health Organization (WHO), have expressed the wish to apply some or all of these submodels for their own purposes (CP-77-8), and a start has been made in implementing them on the computers at these centers. This work will continue so that the submodels can be applied in real health care planning situations. The resulting practical experience will suggest modifications and directions for further development.

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

The Human Settlement Systems Task has sought 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 have been

-- 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

During the past 2 years, 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, the German Democratic Republic, Romania, and Bulgaria. 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, Ireland, Belgium, Denmark, and Norway. In addition, efforts have 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.

Country-by-country analyses were carried out for the Federal Republic of Germany, Hungary, Japan, Poland, and Switzerland (RM-77-17, RM-77-25, RM-77-52, CP-78-4). Partial analyses were done for a few of the non-German-speaking countries of Western Europe for which a data base is available (RM-78-39).

A capstone conference was held in October 1978, closing out the task, and the proceedings of this conference, including the data base of the study, are expected to be commercially published in 1979.

The task's activities have been useful in establishing an international network of scholars with common research interests and perspectives (Hansen, 1978; RM-78-9). This network provides IIASA with an effective framework for collaborative research on some problems arising out of the recent dramatic shifts in spatial development trends observed in many of the modern industrialized countries. The Urban Change Task will build on this foundation.

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 policy makers with more effective methodological 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 among 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 scholars in several NMOs.

An important part of the Migration and Settlement Task has been its comparative study (RM-78-36), which carries out a comparative analysis of the relationships among geographical mobility, urbanization, and national development by assembling, summarizing, and analyzing data on migration and spatial population growth in all 17 NMO countries. A task force meeting held at IIASA in September 1978 included all scientists working on this study, and most of the completed or nearly completed reports were presented at this time.

By using new demographic methods developed recently at IIASA (RM-78-15), the Institute and its collaborating institutions achieved important results during 1977-1978, including the following:

-- A number of computer programs were published that 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-77-30, RR-78-18).

-- The study initiated a methodological investigation of ways to estimate missing data, since some of the data required for the analyses are frequently not available (RM-77-57, RM-77-58). 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 all the 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 becoming available (RR-78-6, RR-78-13). Publication of a three-volume work in IIASA's International Series is planned for 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 beginning to generate results. Much of the activity of the past 2 years has been devoted to conceptualization, design, and recruitment. A task force meeting was held in May 1977, and a

proposed plan of action was agreed upon. Several papers were published, establishing a new publication series in the HSS Area (RR-77-14, RM-77-18, RM-77-41). Important contacts were made with groups doing similar or complementary work in the International Labour Office, the World Bank, the Population Division of the United Nations, and the Population Council. Possible candidates for case studies have been identified: Mexico, Japan, Poland, Sweden, and Kenya (RM-78-12, RM-78-55). Several leading scholars in the field were recruited for 1978 and 1979, and a second task force meeting in which representatives from Mexico and the World Bank and an international group of scholars participated, was held in May 1978 to initiate the Mexican case study.

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 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 marshaled 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 increase of population and food supply are basic to the problem being examined in the IIASA Food and Agriculture Program (FAP). 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 members of the FAP, is analyzing the transition of a national economy from a primarily rural agrarian society to an urban industrial service society; data from several nations selected for case studies will be used. The task has two themes:

-- Population growth and economic (agricultural) development (together with the FAP)
-- Resource/service demands of population growth and economic development

Early efforts have focused on the first theme, and subsequent activities will consider the second.

THE RESEARCH PLAN: 1979-1983

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 doable 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 sys-
tems 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 interna-
        tional importance

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

    -- IIASA aspires to have scholars on its research staff
        from each NMO and to collaborate with institutions from
        each NMO in order to assure that its internationality
        is reflected throughout its research program and to
        serve as an international clearinghouse.

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-- IIASA aspires to ensure 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, dissemi-
nating the current state of the art internationally.
-- IIASA aspires to ensure 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 in the 1979-1983 *Research Plan*
(p. 3), research that satisfies all three of these goals is dif-
ficult to design and carry out because the efforts to reach 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 dis-
tributed among nations, doing so might detract from
efforts to advance international collaboration. Appli-
cability might also suffer, because those members of the
the scientific community who work to advance science are
often not inclined to devote effort also to its applica-
tion. And if the goal were primarily to achieve applica-
tion, international collaboration and advancement of
science might suffer in consequence.

The inherent difficulty 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 can subjectively locate points that represent potential re-
search 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 are a number of unresolved substantive and methodological
problems that could be attacked by an international team of scien-
tists located at IIASA. Thus the activity is doable, 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 di-
mension, however, would be low, particularly if one interprets
the term "applied" to mean "used by and of direct relevance to
decision makers."

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
United States, in cities such as New York and Washington, D.C.
The approaches and methodologies used--e.g., rent control studies
and housing allowance experiments--are innovative and undoubtedly
contribute to the advancement of the state of the craft of urban
policy analysis. They most certainly are applied. But they are of
marginal relevance for decision makers in the planned-economy NMO

INTERNATIONAL COLLABORATION

MATHEMATICAL
DEMOGRAPHY

ADVANCED
ANALYSIS

HOUSING
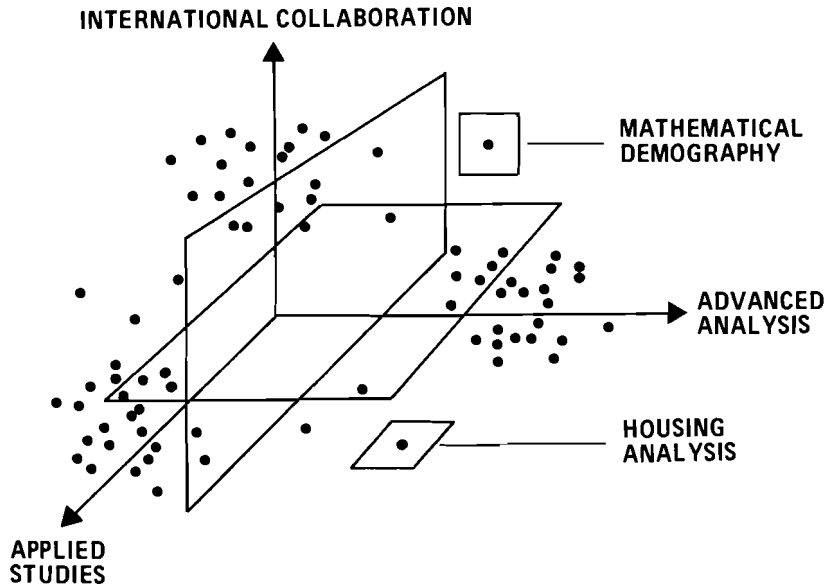ANALYSIS

APPLIED
STUDIES

Figure 3.   Area research: the goal space.

countries. Thus such research, while scoring high on the applied
and the 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 IIASA
Research Plan, were selected for the research agenda because they
appear to be in a good position to score high on all three dimen-
sions of the IIASA goal space. They are, in a broad sense, of in-
terest to most NMOs; they are to various degrees applied; and their
state of the art is such that important contributions to the collec-
tive international body of knowledge are possible.

                         Resources and Constraints

     IIASA, in general, and the HSS Area, in particular, have
certain resources and constraints. Financial resources are
available on a regular basis and are of sufficient scale to
permit innovative and meaningful research. The physical facil-
ities and scientific services are generous by most international

and national standards. And for its human resources, IIASA can draw from the world's 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 playing an influential 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 along a continuum spanning a demand/supply dichotomy. *One end of the continuum asks what needs doing; the opposite end asks what we can 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 underemployment, inadequate health care 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 reveals weaknesses as a strategy for selecting a research agenda in a setting such as IIASA's. For example, the state of the art may be such that very few useful statements can be made about the resolution of a particular policy problem, i.e., it is not doable. Or the topic might be doable, but perhaps not at IIASA: for example, the issue may be of relevance to only a few countries, or the problem may require skills for which IIASA has no comparative advantage over national institutions, or the topic may not be interdisciplinary in character.

Instead of stressing the demand side of the research agenda question, the HSS Area is emphasizing the supply aspect. Specifically, we ask: Given the rich menu of potential research topics, what is it that roughly a dozen scientists drawn from 17 countries and, say, half a 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 activities of the HSS Area, described in the IIASA Research Plan, were selected for the agenda not only because they are important issues, but also because they appear to be particularly doable 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 drawn from various countries, these activities should yield findings useful to national and local decision makers 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

-- The *recruitment* of qualified scholars to carry out the research
-- The management of their collaborative *production*
-- 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 variables influence both the process and the product of an Area's operations and therefore become an *indirect* element of its research strategy.

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 focus of research in the HSS 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 from 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, together with changing rates of natural increase, can produce significant impacts on the needs for housing, sanitation, health care, transport, nutrition, education, and employment. They form the context 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, and the World Health Organization, as well as national institutions such as The Urban Institute in the United States and the Institute for Systems Studies in the Soviet Union. The principal contributions that IIASA makes 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 similar experiences with similar difficulties are not shared; successful solutions to urgent problems are not disseminated for possible application elsewhere. In the light of this, the HSS Area seeks to serve as a forum for the international exchange 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 elsewhere 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 perspectives of a number of traditional modes of inquiry, integrating these different thoughtways, and then exporting the successful integrations to the academic, professional, and decision-making communities in the 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 of analyzing and solving 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 decision makers concerned with solving these problems.

First, there are problems of *urban systems management.* The decision maker is concerned with a short-run (e.g., 1 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 HSS Area. Tasks in
1979-1983 will include Urban Information Systems and Normative
Location Models. The first study will focus on the use of com-
puters in urban and regional management; the other will examine
the planning problem of locating service centers of different
sizes to meet the requirements of a dispersed population in an
"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 decision maker's time hor-
izon is a long one in such matters, generally lying within the
range of 15 to 20 years. For problems of development, the sys-
tems can be altered structurally, and plans are the usual vehi-
cles 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 re-
search tasks concerned with the national development of human
settlement systems. Past HSS studies of migration and of growth
of urban and regional systems in several 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 group. It will
complement the continuing Population, Resources, and Growth Task,
which concentrates on the resources and service demands of urban-
ization and development in *less developed* countries.

The range of systems problems that lie between the extremes
of management and development may be categorized as problems of
investment in *human resources and services*. The decision maker's
time horizon in dealing with such problems is ordinarily 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 the HSS Area's
research in investment systems problems, which will continue
through 1983. Research on manpower planning, with an initial
focus on health care manpower, will commence in 1980 and may de-
velop into a broader concern with human resource planning in
general.

5-Year Perspective (1979-1983)

It is envisioned that the Area's three major themes will
continue over the next 5 years, but that their task compositions
will change (Figure 4). Several tasks will probably be concluded,
e.g., Urban Information Systems and Normative Location Models;
others, such as the Health Care Systems Task, will continue, per-
haps with revised perspectives. Exploratory activities in manpower
analysis are expected to crystallize into a clearly articulated
research task. And new tasks, such as Housing, Education, and
Transport Investment, could evolve from present activities and
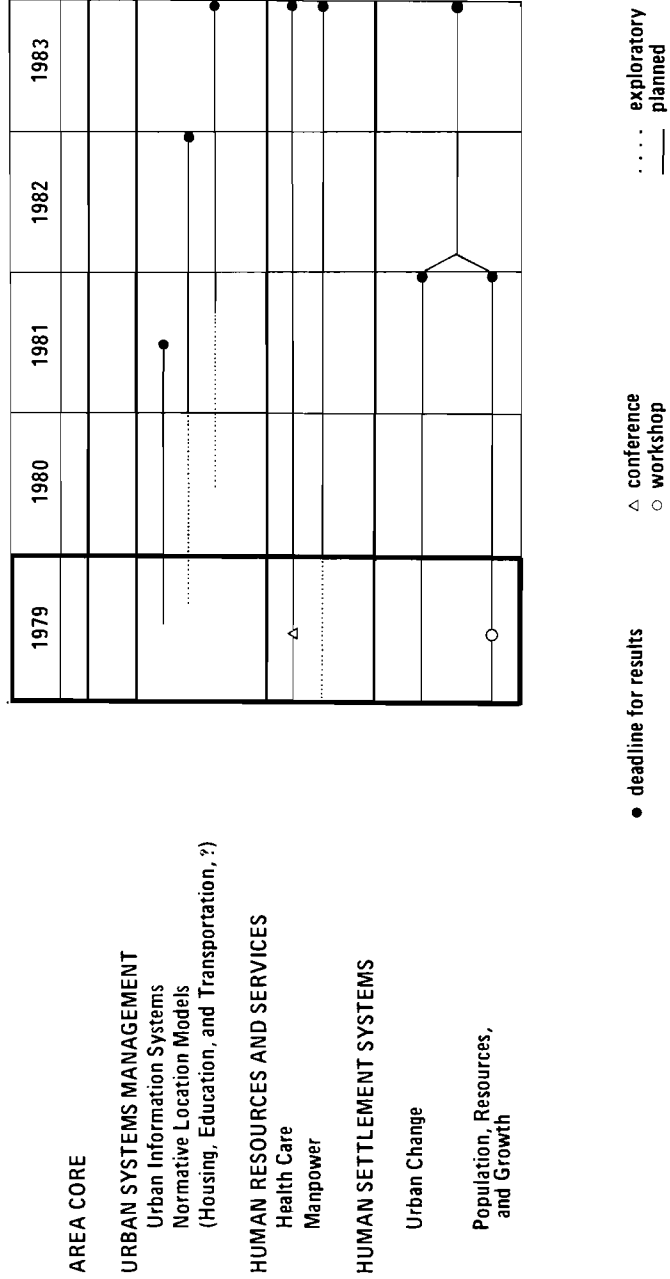interests. Merger of the Urban Change Task, focusing on developed

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Figure 4. The Human Settlements and Services Area: research schedule, 1979-1983.

countries, and the Population, Resources, and Growth Task, focusing on the developing countries, is planned for 1982 in order to produce a global assessment of human settlement problems along the lines of the 1976 UN Habitat Conference.

DETAILED TASK STATEMENTS

In 1979 IIASA will begin its seventh year of research, and the HSS Area its 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 is increasingly characterizing the Institute's evolution.

The HSS research plan described in the following pages represents a departure from earlier plans in that it is a 5-year plan. It includes a relatively detailed outline with budget allocations for 1 year (Table 1) and presents a more general perspective for the subsequent 4 years. The individual task descriptions that follow are taken from the recently approved 1979-1983 Research Plan of the Institute.

Table 1. Human Settlements and Services task budget summary sheet.

| Tasks | 1979 Budget (Austrian schillings) | | | |
| | Total funds | IIASA funds | | External |
		Area funds	Program funds	
Area core	2,050,000	2,050,000	--	--
Urban Information Systems	750,000	750,000	--	--
Modeling of 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	--
TOTAL	9,800,000	9,500,000	300,000	--

RESEARCH AREA   HUMAN SETTLEMENTS AND SERVICES

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

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 March 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* concluded in 1978 will be an important Core activity in 1979. In addition to producing a three-volume publication in the IIASA *International Series*, to appear in 1981, the dissemination activities will also include a special session at the 1979 US 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.

RESEARCH AREA	HUMAN SETTLEMENTS AND SERVICES
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

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:

o Identifying the *international community of researchers* and facilitating communication and exchange among them through an international conference, publications, and joint projects;

o Collating the findings of current studies in various countries and integrating them into a *comprehensive worldwide overview* of the field;

o 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

o The further development of an *international network* to
  facilitate information exchange and joint research projects.

o A comprehensive *overview* of current studies on the use and
  impact of computerized urban and regional information systems.

o 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

o 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 prac-
tical 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 trans-
fer 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*. Policy-makers 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.

RESEARCH AREA   HUMAN SETTLEMENTS AND SERVICES

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

o A *methodological process* for applying models to comprehensive
   HCS planning problems at the national level.

o 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.

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

Expected Results 1980-1983

o A *report* to be produced in 1980 reviewing the experience in
applying the submodels during 1978-1979.

o Approaches using available routine statistical data for *build-
ing and identifying HCS submodels.*

o 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.

o 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 individ-
ual 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 *Migra-
tion 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:

o   The Resources and Environment Area—the modeling of interactions between the health care and the environment systems;

o   The Management and Technology Area—application of the model to health service planning in relation to program management;

o   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.

A workshop on aspects of HCS is planned for mid-1979.

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:

o   Development of the model to improve the representation of a *market oriented* HCS;

o   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;

o   Development of the model to render it applicable to *devel-oping countries*, in collaboration with the Food and Agriculture Program;

o   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.

	1976-1977	1978	1979	1980	1981	1982	1983	Through 1983
RESEARCH AREA			HUMAN SETTLEMENTS AND SERVICES					

RESEARCH AREA   HUMAN SETTLEMENTS AND SERVICES

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

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 re-
search 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 collaborat-
ing scholars and institutions established by these two previous research
Tasks. Periodic workshops and conferences will be held to foster the ex-
change 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.

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 Popula-
tion, Resources, and Growth Task and a *major global assessment* will be carried
out similar to that of the UN Habitat Conference.

RESEARCH AREA   HUMAN SETTLEMENTS AND SERVICES
with FOOD AND AGRICULTURE PROGRAM

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 atten-
tion as part of a general concern over whether population increase will out-
strip 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 develop-
ment 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 *transi-
tion of a national economy from a primarily rural agrarian to an urban indus-
trial-service society.* Data from several countries selected as case studies
will be used, and the Task will encompass two themes:

    o Spatial population growth and economic (agricultural) devel-
       opment (together with the Food and Agriculture Program);

    o 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

o 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).

o A *prototype system model* that focuses on the demoeconomics of urbanization and on its developmental antecedents and consequences.

o 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:

o *Develop a model* of the interdependence between population, development, and resource/service demands;

o *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.

THE RESEARCH STAFF

1978

Twenty-seven research scholars were with the HSS Area in 1978 for periods longer than 1 month. Together with the much larger 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 give an indication of the richness of this mixture. These biographies are followed by a listing of HSS scholars of earlier years.

Research Scholars

Luis J. Castro, Mexico (October 1977-), came from Mexico to work with the HSS Area on a comparative study of migration and settlement patterns in NMO countries and on 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. (1975) from the Urban Systems Engineering and Policy Planning Program at Northwestern University, Illinois. In Mexico, he was a professor at the Graduate School of Civil Engineering at UNAM and a project leader for a consulting firm.

Donaldo Colosio, Mexico (March 1978-), joined IIASA to work with the Population, Resources, and Growth Task on urbanization and economic development in Mexico. He has a Bachelor's degree in Economics from the Instituto Technoloqico y de Estudios Superiores de Monterrey, and a Master's degree in Reqional Science from the University of Pennsylvania; he is currently writing his Ph.D. dissertation in Regional Science at Penn. In Mexico, Mr. Colosio

worked with the consulting firm SITA on the economic analysis of
public regional investment, and taught microeconomics at the Uni-
versidad Iberoamericano in Mexico City. Mr. Colosio is also
Research Manager for the HSS Area.

   Peter Fleissner, Austria (January 1975-), is from the
Institute for Socio-Economic Development Research of the Austrian
Academy of Sciences, Vienna. He joined IIASA on a part-time basis
to develop frameworks for international comparisons of health care
systems. Dr. Fleissner received a Dipl. Ing. in electronics (1968)
and a Dr. Tech. in mathematics (1971) from the Technical University
in Vienna. He also has a diploma in Economics from the Institute
for Advanced Studies in Vienna and was a lecturer in econometrics
at the Technical University (1971-1973).

   Richard J. Gibbs, UK (May 1977-May 1978), came from the United
Kingdom to carry out research on health care systems modeling with
an emphasis on models of resource allocation. Dr. Gibbs received
his Bachelor's degree in Natural Sciences (1965) from Cambridge
University and his Ph.D. in Operational Research (1974) from
Warwick University. He is a group leader at the Operational Re-
search Services of the Department of Health and Social Security in
London. His scientific interests include research on models of
social services for use in planning and management and the imple-
mentation of models in real problem situations.

   Peter Gordon, USA (February 1978-August 1978), came from the
University of Southern California, where he is Associate Professor
of Economics and Urban and Regional Planning. His work with the
HSS Area consisted of analyzing data on functional urban areas and
investigating the life cycle of metropolitan areas. Professor
Gordon received a B.A. in Economics (1965) from the University of
California, Los Angeles; an M.A. in Economics (1967) from the Uni-
versity of Southern California; and a Ph.D. in Regional Science
(1971) from the University of Pennsylvania.

   Martti J. Hirvonen, Finland (April 1978-June 1978), joined
IIASA to work on the analysis of spatial and temporal evaluation
processes of human settlement systems in Finland. Professor
Hirvonen received an M.A. in Economics (1966) from the University
of Tampere, an M.A. in Regional Science (1969) from the University
of Pennsylvania, and a Ph.D. in Economics (1971) from the Univer-
sity of Tampere. From 1974 to 1975 he was Professor of Economics
at the University of Jyvaskyla; since 1975 he has been Professor
of Economics and Vice-Chairman of the Economics Department at the
University of Tampere.

   Jiri Hruby, Czechoslovakia (May 1978), is a research specialist
in food and nutrition who came to IIASA to work with the FAP and
the HSS areas. Dr. Hruby graduated from the Faculty of Law,
Charles University, Prague (1950). In 1971, he joined the Food
and Agriculture Organization of the United Nations for a 3-year
assignment as a Nutrition Advisor in Pakistan; since 1976 he has
been with the Economics Research Institute of Agriculture and Food
in Prague.

David J. Hughes, UK (April 1978-), came to IIASA from the Operational Research Services of the Department of Health and Social Security, United Kingdom. As a member of the Modeling Health Care Systems Task, he is concerned with the development and application of resource allocation models. Dr. Hughes holds a degree in Engineering Science (1971) and a D. Phil. in Stochastic Control Theory (1974), both from Oxford University; in 1977 he received an M.Sc. in Statistics from London University. He has been with the Operational Research Services since 1974, working on resource allocation, regional planning, and modeling of patient progress in cancer.

Bruce F. Johnston, USA (September 1978-), joined the HSS Area to work on aspects of agricultural and rural development and on problems of the provision of low-cost health services. Professor Johnston received his Ph.D. in Agricultural Economics (1953) from Stanford University. From 1945 to 1948 he was Chief, Food Branch, at the General Headquarters, Supreme Commander for the Allied Powers in Tokyo, and was later agricultural economist at the U.S. Mission to NATO and the European Regional Organization 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-), joined the HSS Area to work on international comparative studies; since August 1978 he has been active half time with the IIASA Integrated Regional Development group. Professor Kawashima received his Master's degree in Economics from the University of Tokyo and his Ph.D. in Regional Science from the University of Pennsylvania. He has worked on the research staff of the Regional Science Research Institute in Philadelphia; since 1973 he has been a Professor of Regional Science and Transportation at Gakushuin University in Tokyo.

Allen Kelley, USA (December 1978-), joined the Population, Resources, and Growth Task 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; before 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 has been actively involved in designing computer-based instructional programming systems that have been widely adopted both in the United States and elsewhere.

Pavel I. Kitsul, USSR (December 1977-), a research scholar at 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 received his Ph.D. in Physics and Mathematics (1973) from the Moscow Institute of Physics and Technology. 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), came from the Institute for Control Sciences of the USSR Academy of

Sciences to do research on the modeling of large-scale systems, with applications to health care. Dr. Klementiev received his Ph.D. in Technology (1971) from the Moscow Institute of Physics and Technology. Since 1966, he has been a senior fellow with the Institute for Control Sciences, Moscow. From 1971 to 1973 he was Chief of the Computer Center Laboratory of the Moscow Municipal Committee.

Piotr Korcelli, Poland (April 1978-May 1978), has been associated with the HSS Area since October 1975, and has worked at IIASA for short periods of time since then. He will be joining the Area in 1979 for 1 year, coming from the Institute of Geography and Spatial Organization of 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 a Habilitation Doctorate in 1973. In 1973-1974 he was a research assistant at the University of Maryland.

Karel Kühnl, Czechoslovakia (September 1978-), of the Department of Economic and Regional Geography, Faculty of Science at Charles University, Prague, joined IIASA to carry out research on the methodology of analyzing multiregional population systems. Dr. Kühnl received his Ph.D. (1976) from the Faculty of Science of Charles University; he had previously been 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), a research scholar from the Institute for Control Sciences, Moscow, joined the HSS Area to work on the design of urban management information systems. Dr. Kulba is a graduate of the Moscow Institute of Transportation Engineers, where he received a diploma in Engineering Electromechanics. He earned his Ph.D. in Technical Sciences (1970) from the Institute for Control Sciences, and is currently the Scientific Secretary of the Urban Council of the Soviet Committee for Systems Analysis.

Jacques Ledent, France (February 1977-), joined IIASA to do research on the demoeconomic studies of migration and human settlement evolution. Mr. Ledent received his degree in engineering (1969) from the Ecole Nationale des Ponts et Chaussées and his Master's degree in Civil Engineering (1972) from Northwestern University, Illinois; he is currently writing his Ph.D. dissertation on 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-), joined the HSS Area to participate in studies of changing regional specializations and their employment consequences. Dr. Ohlsson received his Ph.D. in Economics (1974) from the University of Uppsala. Since 1974, he has been senior research economist with the Expert Group on Regional Studies, Ministry of Industry, Stockholm, and in 1976 was

awarded his docent title. Earlier, he had been 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, Stockholm.

Dimiter N. Philipov, Bulgaria (September 1977-), came to the HSS 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 include the mathematics of population growth and demo-economics. At IIASA, he is concentrating on the comparative study of migration and settlement.

Henry Rempel, Canada (May 1978-August 1978), an 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 (1964) from Ohio State University; in 1971 he obtained his Ph.D. in Economics from the University of Manitoba. He has been a lecturer at Bluffton College (Ohio) and a research associate at the University of Nairobi, Kenya.

Clark W. Reynolds, USA (April 1978-August 1978), a professor at the Food Research Institute at Stanford University, joined the HSS Area to study the interdependence of economic and migration factors in Mexican economic development. Professor Reynolds obtained his Ph.D. in Economics (1962) from the University of California at Berkeley. He taught economics at Occidental College (California) from 1961 to 1962, and at Yale University from 1962 to 1967; since 1967, he has been Associate and then Full Professor at the Food Research Institute. His scientific interests include economic development, international trade and finance, and social history.

Andrei Rogers, USA (July 1975-), has led the HSS 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 in the City and Regional Planning Department at the University of California at Berkeley and the Technological Institute at Northwestern University, Illinois. 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-), 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 in 1964, and his final doctoral degree in Medical Science in 1973. In 1976 he became a Professor of Social Medicine and Public Health.

Michael Teitz, USA (January 1978-March 1978), joined the HSS Area from the Department of City and Regional Planning, University

of California at Berkeley, where he was Department Chairman. His research at IIASA focused on alternative perspectives on 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--Madison, and the University of Pennsylvania.

Alexandr Umnov, USSR (February 1978-May 1978), came to IIASA to work with the System and Decision Sciences Area and the HSS 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, Moscow, specializing in mathematical cybernetics theory and the applications of mathematical programming.

Frans J. Willekens, Belgium (June 1975-November 1978), came to IIASA in June 1975 from Northwestern University, Illinois, 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 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), a sociologist-economist from Novosibirsk, came to the HSS 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 in Economics from the University at Novosibirsk. She is currently a member of the Institute of Economics and Management of Industrial Production, Novosibirsk, where she heads the division of social problems of labor and of social planning of labor resources and the sector studying urban and rural social problems. Dr. Zaslavskaya is a corresponding member of the Academy of Sciences of the USSR.

Research Assistants

Grabher, Elfrieda	Austria	Aug 77-Aug 78
Tsipouris, Helen	Greece	July 78-Nov 78

1977

Research Scholars

Castro, Luis	Mexico	Oct 77-
Fleissner, Peter	Austria	Jan 75- (part time)
Fujimasa, Iwao	Japan	July 76-Sept 76 July 77-Aug 77
Gibbs, Richard	UK	May 77-Apr 78

Glickman, Norman	USA	May 77-Aug 77
Hansen, Niles	USA	July 75-Aug 77
Kaihara, Shigekoto	Japan	Aug 76-Oct 76 Aug 77-Sept 77
Kawashima, Tatsuhiko	Japan	July 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	July 75-
Shigan, Evgenii	USSR	Nov 76-
Willekens, Frans	Belgium	June 75-Nov 78

Research Assistants

Grabher, Elfrieda	Austria	Aug 77-Aug 78
Hay, Dennis	UK	July 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-June 77

1976

Research Scholars

Atsumi, Kazuhiko	Japan	Aug 76-Sept 76
Blum, Edward	USA	Sept 74-June 76
Fleissner, Peter	Austria	Jan 75- (part time)
Fujimasa, Iwao	Japan	July 76-Sept 76
Glass, Norman	UK	July 74-June 76
Hansen, Niles	USA	July 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	June 76-Aug 76
Rapoport, Samuel	GDR	Oct 75-Dec 75 Feb 76
Rogers, Andrei	USA	July 75-
Shigan, Evgenii	USSR	Nov 76-
Strobel, Horst	GDR	June 74-Aug 74 June 75-Sept 75 June 76-Nov 76
Venedictov, Dimitri	USSR	Jan 75-Dec 76
Welsh, William	USA	Jan 76-Aug 76
Willekens, Frans	Belgium	June 75-Nov 78

Research Assistants

Latko, Frank	USA	Jan 76-June 76
Le Gloannec, Annemarie	France	Oct 75-June 76
Leitner, Helga	Austria	June 75-June 76
Sherrill, Koren	USA	Jan 76-Aug 77

1975

Research Scholars

Afifi, Abdelmonem	USA	Sept 74-Aug 75
Baecher, Gregory	USA	Aug 74-July 75
Bigelow, James	USA	Sept 74-Oct 75
Blum, Edward	USA	Sept 74-June 76

Cordey-Hayes, Martyn	UK	Mar 74-Mar 75
Domanski, Ryszard	Poland	June 74-July 74 Feb 75-Mar 75
Fleissner, Peter	Austria	Jan 75- (part time)
Glass, Norman	UK	July 74-June 76
Gorham, William	USA	June 75
Hansen, Niles	USA	July 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	June 74-June 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	July 75-
Sokolov, Valery	USSR	May 74-Dec 75
Strobel, Horst	GDR	June 74-Aug 74 June 75-Sept 75 June 76-Nov 76
Swain, Harry	Canada	Jan 74-Dec 75
Thompson, Mark	USA	Feb 73-Aug 75
Tobler, Waldo	USA	Dec 74-Aug 75
Venedictov, Dimitri	USSR	Jan 75-Dec 76
Willekens, Frans	Belgium	June 75-Nov 78
Zilov, Vadim	USSR	May 75-Dec 75

Research Assistants

Brown, Hamilton	USA	Sept 74-Sept 75
Gambrelle, Jean-Marie	France	Dec 73-May 75
Heuse, Lisbeth	FRG	June 75-Aug 75
Kelley, Gillian	UK	Apr 74-Apr 75
Le Gloannec, Annemarie	France	Oct 75-June 76
Leitner, Helga	Austria	June 75-June 76
Skarke, Annemarie	Austria	Jan 75-July 75

1974

Research Scholars

Afifi, Abdelmonem	USA	Sept 74-Aug 75
Baecher, Gregory	USA	Aug 74-July 75
Bigelow, James	USA	Sept 74-Oct 75
Blum, Edward	USA	Sept 74-June 76
Collins, John	Canada	June 74-Aug 74
Cordey-Hayes, Martyn	UK	Mar 74-Mar 75
Domanski, Ryszard	Poland	June 74-July 74 Feb 75-Mar 75
Glass, Norman	UK	July 74-June 76
Kudinov, Oleg	USSR	Feb 74-July 74
Logan, Malcolm	Australia	Dec 74-Jan 75
Majone, Giandomenico	Italy	June 74-June 75
Miller, James	USA	July 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	June 74-Aug 74 June 75-Sept 75 June 76-Nov 76

Swain, Harry	Canada	Jan 74-Dec 75
Thompson, Mark	USA	Feb 73-Aug 75
Tobler, Waldo	USA	Dec 74-Aug 75

Research Assistants

Brown, Hamilton	USA	Sept 74-Sept 75
Gambrelle, Jean-Marie	France	Dec 73-May 75
Uhlaner, Carole	USA	July 73-Sept 73

PUBLICATIONS

        The published results of IIASA's research have appeared 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 HSS 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 formal vehicle for
reporting Institute research, intended for broad distribution
to the scientific community. RRs receive careful review, edit-
ing, typing, and printing. The RR classification is used to
report final results of research and to report interim or con-
tributing work when the results are felt to merit broad circu-
lation.

        The *Collaborative Publication* (CP) is used both for 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 is still an official Institute publication.
Because of their interim nature, RMs generally do not receive
the careful technical review given RRs.

        All of the HSS Area publications in these four categories
are listed below, by year. Abstracts of 1978 publications are
provided.

1978

Book

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

Effective planning on the part of urban and regional policy makers requires understanding of the structure and the 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 HSS Area of IIASA.

Research Reports

RR-78-3. Regional Multiplier Analysis: A Demometric Approach. J. Ledent.

This paper reports on the design and testing of a framework for conducting regional multiplier studies in areas experiencing rapid population growth. It puts forward the demometric approach, which 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. The models are then used to derive tentative impact and dynamic multipliers that substantiate the role of households as consumers and suppliers of labor in the development of the Tucson SMSA (Standard Metropolitan Statistical Area). The major finding is that, for the same level of resources, the second model yields better policy implications than the modified (and therefore the traditional) economic base model.

RR-78-6. 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 devoted entirely 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-78-8.   The IIASA Health Care Resource Allocation Submodel:
Mark 1.   R. Gibbs.

Within the context of the IIASA Health Care System (HCS)
model the function of the resource allocation submodel is to
simulate how the HCS allocates limited supplies of resources to
competing demands. The principal outputs of the submodel should
be the number of patients treated in different categories and
the modes and standards of treatments they receive. The Mark 1
version of the submodel, described in this paper, simulates the
allocation of one resource within one mode of treatment; it
should be possible to use the approach to develop further ver-
sions to cover more general cases. The main assumption of the
submodel is that in allocating its resources the HCS attempts
to optimize a utility function whose parameters can be inferred
from data on past allocations. Depending upon the type of data
available, different procedures for parameter estimation can be
incorporated, with the algorithm for solving the model, into a
computer program whose main inputs consist solely of empirical
data. The program is fairly small and can be readily run on
most scientific computer installations. The use of the submodel
is illustrated by a hypothetical application using hospital data
from England.

RR-78-13.   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 analy-
sis 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-78-6) and with that issue stands as the final report on the
methodological contributions of the Migration and Settlement
Task at IIASA.   The four papers focus on spatial population dy-
namics, sensitivity analysis, shrinking large-scale population
models, and demometrics of migration and settlement.

RR-78-18.   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.   Included are the
multiregional life table, multiregional demographic projections,
fertility and mobility analyses of life table and stable popula-
tion 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 deck.

Collaborative Publications

CP-78-4. Functional Urban Regions in Hungary. L. Lackô, 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 based primarily on the criteria set forth by IIASA's Task on Human Settlement Systems: Development Processes and Strategies. The methodological concept of functional spheres of influence was adopted as well. The delineation was made using 1970 Census data.

Research Memoranda

RM-78-1. 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 treat 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 that includes submodels for population, disease prevalence, resource supply, and resource allocation and that 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 among competing demands. To perform this role a submodel is proposed that is derived from a resource allocation model being used in health service planning in the United Kingdom. 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, the submodel is easier 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-78-3. 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 that is based on the calculation of essential parameters of health care from statistics. The essential parameters proposed in the previous memorandum were population structure, morbidity rate, recovery rate, death rate, patient registration rate, and awareness rate. The present report deals with the successful application of the method to the analysis of medical demands at the national level in Japan. The results indicate

that over the past 15 years the awareness rate was the most important factor contributing to the increase in number of patients. The model predicts, however, that in the future the change of population structure will be the major reason for the increase in the number of patients in Japan.

RM-78-9. *A Spatial Complex Analysis of Agglomeration and Settlement Patterns. P. Nijkamp.*

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

RM-78-10. *A Morbidity Submodel of Infectious Diseases. I. Fujimasa, S. Kaihara, K. Atsumi.*

The number of 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 structure of the country, and the outputs are the number of sick and dead and the prevalence rates of infectious diseases. The submodel 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 hospital stay. The outputs of the submodel agree with WHO statistics for Japan and for 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 a symptom of the growth. Data were collected from a survey conducted by J.R. Harris, M.P. Todaro, and the author in 1968 and from the 1969 Census. The influence of education, age, land, and income on the decision-making process is analyzed, and 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 iden-
tifying important areas of further research in migration and
urbanization in Kenya.

*RM-78-15. The Formal Demography of Migration and Redistribu-
tion: Measurement and Dynamics. A. Rogers.*

This paper gives an overview of migration and redistribu-
tion 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-78-17. The Demography of Labor Force Participation.
F. Willekens.*

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

*RM-78-20. Models for Educational and Manpower Planning: A
Dynamic Linear Programming Approach. A. Propoi.*

This paper shows that many optimization problems for educa-
tional and manpower planning models can be written in a standard
dynamic linear programming (DLP) form. A basic model of educa-
tional planning is described, and extensions of the model (in-
vestment 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-78-21. Aggregate Model for Estimating Health Care System
Resource Requirements (AMER). A.A. Klementiev, E.N. Shigan.*

The model for estimating resource requirements plays an
important role in the elaboration of a national health care
system model. Resource needs are determined on the bases of
estimates of population trends and morbidity rates and desired
health care standards. Data from comprehensive studies carried
out in the United Kingdom, Japan, and the USSR were used in the
design of the morbidity estimation model. The desired standards
were taken from the practice of central planning that exists in
the USSR. Through the use of this model in an interactive man-
ner, it is possible to test alternative planning strategies.

Preliminary results of testing and running this model in several countries indicate that it could be used for estimating resource requirements in developed countries.

RM-78-25. Some Methodological and Empirical Considerations in the Construction of Increment-Decrement Life Tables. J. Ledent.

This paper deals with the calculation of combined life tables that allow entries as well as withdrawals from alternative states, namely, increment-decrement life tables. The paper provides 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 integration method, the cubic integration method, and an interpolative-iterative method. The paper develops 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-78-28. Stable Growth in the Nonlinear Components-of-Change Model of Interregional Population Growth and Distribution. J. Ledent.

The paper proposes a general components-of-change model for a multiregional demographic system. Characterized by independently derived retention probabilities, the model 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 the peculiar properties of the nonlinear model, the author concludes that it cannot be a useful substitute for the linear model in the study of the dynamics of multiregional population systems.

RM-78-36. Migration and Settlement in Bulgaria. D. Philipov.

This paper examines the recent evolution of Bulgaria's population as part of IIASA's comparative study of migration and settlement patterns in its NMO 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 information on current spatial population dynamics in the country and offer valuable insights that can be used to improve the national population policy.

RM-78-39. Deconcentration Without a "Clean Break." P. Gordon.

This report reviews recent papers that argue that urbanization trends in the United States show a reversal of past patterns.

The author suggests that a reversal is not obvious and evidence of it may simply be the result of a statistical artifact: urbanization that has spilled over metropolitan boundaries may simply be more of the same outward growth that would show up as a metropolitan to nonmetropolitan growth shift. A new data file for 18 other developed countries is examined; these data are suitable for computations of versions of the Hoover index of population concentration. Such calculations suggest that the 18 countries examined are experiencing more traditional urban outward expansion, thus adding to the skepticism about the reversal or "clean break" hypothesis.

RM-78-50. 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 (HCS) 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 that was used in the Mark 1 version previously reported: that in allocating its resources the HCS attempts to optimize a utility function whose parameters can be inferred from data on past allocations. The paper analyzes estimation procedures that use historical allocation data directly. Both these procedures and the solution algorithm have been realized in a small computer program that can be readily run on most scientific computer installations. The use of the submodel is illustrated by three hypothetical applications using hospital data.

RM-78-52. 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 is carried out by generalizing a model of interregional growth rate differences published by Dixon and Thirlwall in 1975. An extension of this model is proposed that 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. It is shown that nonstatic long-term rates of change emerge from the simulation of this extended model: regional cycles accompanied by cycles of divergence and convergence of incomes result from population shifts due to migration.

RM-78-55.   Rural-Urban Population Projections for Kenya and Implications for Development.   M. Shah, F. Willekens.

This paper projects the rural and the 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 for employment, demand for food, health, education, and development in general are analyzed separately for the urban and the rural sectors, and a general framework for the study of the urbanization process is also proposed.

RM-78-56.   The Dynamics of Two Demographic Models of Urbanization.   J. Ledent.

This paper is the first of a series of three intended to shed some light on the urbanization phenomenon, using two alternative models of rural-urban population growth. The first is a model proposed by N. Keyfitz in 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 A. Rogers in 1968, in which the gross migration flows out of both rural and urban regions are explicitly considered. This paper examines and compares the dynamics of these models on the basis of constant rates of natural increase and migration, and demonstrates the simplicity of their properties, especially in the case of the second model, which also appears more realistic because of its symmetrical treatment of the rural and the urban regions. In addition, it suggests the ability of both models to give insights into the relation between the rates of natural increase and inmigration in accounting for urban population growth.

RM-78-57.   The Factors and Magnitude of Urbanization Under Natural Increase and Migration Patterns.   J. Ledent.

This paper, the second of a series on the urbanization phenomenon, compares the results of two alternative models--the model proposed by N. Keyfitz in 1978 and the continuous version of the multiregional model of population growth and distribution developed by A. Rogers in 1968--under constant factors of natural increase and migration. For both models, the evolution of the magnitude of urbanization as well as the relative importance of natural increase and migration in accounting for urban growth are examined. Emphasis is placed on the time spans necessary to reach two crossover points: the point at which natural increase starts exceeding inmigration in the urban region (crossover point of type I) and the point at which the urban population becomes larger than the rural population (crossover point of type II).

RM-78-58. The Forces of Urbanization Under Varying Natural Increase and Migration Rates. J. Ledent.

This paper is the third and last of the series dealing with the question of whether a nation's urban population grows mostly by rural-urban migration or by natural increase. The discussion centers on the analytical study of the Keyfitz model of urbanization and the Rogers components-of-change model applied to a rural-urban system. In the preceding papers, the rates of natural increase and migration were constant; in this paper the rates are allowed to vary. A major part of the analysis is based on the Keyfitz model, shown earlier to be less meaningful than the Rogers model but lending itself to greater tractability when rates are allowed to vary. In particular, the Keyfitz model is used 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-78-67. The IIASA Health Care Resource Allocation Submodel: Estimation of Parameters. D.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 resources among 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 available for estimating the parameters of the model and develops methods that make 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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Research Reports

RR-77-12   *Traffic Control Systems Analysis by Means of Dynamic State and Input/Output Models.* H. Strobel.

RR-77-14   *Migration, Urbanization, Resources, and Development.* A. Rogers.

RR-77-23   *Normative Modelling in Demo-Economics.* F. Willekens, A. Rogers.

Collaborative Publications

CP-77-4   *Health System Modeling and the Information System for the Coordination of Research in Oncology.* D.D. Venedictov, editor.

CP-77-7   *Optimization Applied to Transportation Systems.* H. Strobel, R. Genser, M. Etschmaier, editors.

CP-77-8   *Modeling Health Care Systems.* E.N. Shigan, R. Gibbs, editors.

Research Memoranda

RM-77-3   *Job Search, Migration, and Metropolitan Growth.* J.R. Miron.

RM-77-6   *An Approach to Building a Universal Health Care Model: Morbidity Model of Degenerative Diseases.* S. Kaihara, I. Fujimasa, K. Atsumi, A.A. Klementiev.

RM-77-8   *A Dynamic Linear Programming Approach to National Settlement System Planning.* A.I. Propoi, F. Willekens.

RM-77-9   *The Spatial Reproductive Value: Theory and Applications.* F. Willekens.

RM-77-10   *Economic Aspects of Regional Separatism.* N. Hansen.

RM-77-17   *Functional Urban Regions and Central Place Regions in the Federal Republic of Germany and Switzerland.* K. Sherrill.

RM-77-18   *Understanding World Models.* N. Keyfitz.

RM-77-22   *An Analytical Overview of Urban Information Systems in the United States.* K.L. Kraemer, J.L. King.

RM-77-25   *Changes in the Spatial Population Structure of Japan.* T. Kawashima.

RM-77-26   *Non-Linear Programming Approaches to National Settlement System Planning.* Y. Evtushenko, R.D. MacKinnon.

RM-77-30   *More Computer Programs for Spatial Demographic Analysis.* F. Willekens, A. Rogers.

RM-77-37   *Intrinsic Rates and Stable Age-Specific Mortality (and Migration) Rates of the Growth Matrix Operator in the Single Region (Multiregion) Population Model.* J. Ledent.

RM-77-39   *Growth and Change in the Japanese Urban System: the Experience of the 1970's.* N.J. Glickman.

RM-77-40   *Alternative Analysis of Different Methods for Estimating Prevalence Rate.* E.N. Shigan.

RM-77-41   *Optimization of Rural-Urban Development and Migration.* R. Kulikowski.

RM-77-43   *On the Estimation of Morbidity.* A.A. Klementiev.

RM-77-46 *The Japanese Urban System During a Period of Rapid Economic Development.* N.J. Glickman.

RM-77-47 *The Management of the Japanese Urban System: Regional Development and Regional Planning in Postwar Japan.* N.J. Glickman.

RM-77-48 *Financing the Japanese Urban System: Local Public Finance and Intergovernmental Relations.* N.J. Glickman.

RM-77-49 *Health Care System Models: A Review.* P. Fleissner, A.A. Klementiev.

RM-77-52 *An Approach to the Analysis of Functional Urban Regions: A Case Study of Poland.* P. Korcelli.

RM-77-53 *Health Care Resource Allocation Models - A Critical Review.* R. Gibbs.

RM-77-55 *On the Relationship of Childhood to Labor Force Migration Rates.* M.A. Stoto.

RM-77-57 *Model Migration Schedules and Their Applications.* A. Rogers, R. Raquillet, L.J. Castro.

RM-77-58 *The Recovery of Detailed Migration Patterns from Aggregate Data: An Entropy Maximizing Approach.* F. Willekens.

1976

Research Reports

RR-76-4 *The Interurban Transmission of Growth in Advanced Economies: Empirical Findings Versus Regional-Planning Assumptions.* A. Pred.

RR-76-9 *Model Multiregional Life Tables and Stable Populations.* A. Rogers, L.J. Castro.

Collaborative Publications

CP-76-7 *IIASA Conference '76*, vol. 2.

CP-76-11 *Transportation Systems Analysis.* H. Strobel, editor.

Research Memoranda

RM-76-1 *The Comparative Migration and Settlement Study: A Summary of Workshop Proceedings and Conclusions.* A. Rogers.

RM-76-2 *Growth Strategies and Human Settlement Systems in Developing Countries.* N. Hansen.

RM-76-3   *Systems Approaches to Human Settlements.*   N. Hansen.

RM-76-11   *Aggregation and Decomposition in Population Projection.* A. Rogers.

RM-76-19   *Comparing Health Care Systems by Socio-Economic Accounting.*   P. Fleissner.

RM-76-25   *Spatial Zero Population Growth.*   A. Rogers, F. Willekens.

RM-76-26   *Social Learning: A Model for Policy Research.*   J. Friedmann, G. Abonyi.

RM-76-27   *Regional Development and Land-Use Models: An Overview of Optimization Methodology.*   J.R. Miron.

RM-76-28   *Optimization Models of Transportation Network Improvement: Review and Future Prospects.*   R.D. MacKinnon.

RM-76-29   *Alternative Land-Use Policy Tools for Green Area Preservation in Regional Development.*   J.R. Miron.

RM-76-30   *On Dualistic Equilibrium and Technical Change in a Simple Human Settlement Model.*   J.R. Miron.

RM-76-36   *A Computer Method for Projecting a Population Sex-Age Structure.*   A.A. Klementiev.

RM-76-37   *The Economic Development of Border Regions.*   N. Hansen.

RM-76-38   *The Human Settlement Systems Study: Suggested Research Directions.*   P. Korcelli.

RM-76-45   *Spatial Mobility and Settlement Patterns: An Application of a Behavioural Entropy.*   P. Nijkamp.

RM-76-48   *Two Methodological Notes on Spatial Population Dynamics in the Soviet Union.*   A. Rogers.

RM-76-49   *Sensitivity Analysis.*   F. Willekens.

RM-76-50   *Optimal Migration Policies.*   F. Willekens.

RM-76-51   *Alsace-Baden-Basel: Economic Integration in a Border Region.*   N. Hansen.

RM-76-58   *Computer Programs for Spatial Demographic Analysis.* F. Willekens, A. Rogers.

RM-76-64   *Commuting: An Analysis of Works by Soviet Scholars.* G.P. Kiseleva.

RM-76-65   *Mathematical Approach to Developing a Simulation Model of a Health Care System.*   A.A. Klementiev.

RM-76-66   *Are Regional Development Policies Needed?*   N. Hansen.

RM-76-68 *Demometrics of Migration and Settlement.* A. Rogers.

RM-76-71 *Functional Urban Regions in Austria.* K. Sherrill.

RM-76-81 *The Spatial Reproductive Value and the Spatial Momentum of Zero Population Growth.* A. Rogers, F. Willekens.

1975

Book

Bailey, N.T.J., Thompson, M. (1975), editors, *Systems Aspects of Health Planning*, North-Holland, Amsterdam.

Research Reports

RR-75-6 *Economic Aspects of the Prevention of Down's Syndrome (Mongolism).* N. Glass.

RR-75-7 *Systems Analysis for the Evaluation of Bio-Medical Research.* M. Thompson.

RR-75-8 *On the Logic of Standard Setting in Health and Related Fields.* G. Majone.

RR-75-10 *The Utility and Compatibility of Simple Migration Models.* D. Gleave.

RR-75-19 *Spatial Interaction Patterns.* W. Tobler.

RR-75-23 *Australian Initiatives in Urban and Regional Development.* M.I. Logan, D. Wilmoth.

RR-75-24 *Spatial Population Dynamics.* A. Rogers, F. Willekens.

RR-75-26 *Non-Linear Programming Approaches to National Settlement Systems Planning.* Y. Evtushenko, R.D. MacKinnon.

RR-75-31 *Exploratory Analyses of the 1966-1971 Austrian Migration Table.* R.D. MacKinnon, A.M. Skarke.

RR-75-32 *A Critique of Economic Regionalizations of the United States.* N. Hansen.

RR-75-33 *Balancing Apples and Oranges: Methodologies for Facility Siting Decisions.* G. Baecher, J. Gros, K. McCusker.

RR-75-34 *Transportation, Automation and the Quality of Urban Living.* H. Strobel.

RR-75-41 *Chemical Kinetics and Catastrophe Theory.* E.H. Blum, R.K. Mehra.

RR-75-42 *An Investigation of a Hypothetical Medical Screening Program.* J.H. Bigelow, H.V. Lee.

Collaborative Publications

CP-75-1   *Proceedings of IIASA Workshop on Road Traffic Safety in Europe.* A. Afifi, coordinator.

CP-75-3   *National Settlement Strategies East and West.* H. Swain, editor.

CP-75-4   *Issues in the Management of Urban Systems.* H. Swain, R.D. MacKinnon, editors.

CP-75-5   *Proceedings of the Joint IIASA/WHO Workshop on Screening for Cervical Cancer.* J.H. Bigelow, coordinator.

CP-75-9   *Selected Papers from IIASA Conference on National Settlement Systems and Strategies.* H. Swain, editor.

CP-75-10   *The IIASA Project on Urban and Regional Systems: A Status Report. Urban Project.* (Formerly SR-75-1-URB.)

Research Memoranda

RM-75-3   *Policies for the Treatment of Chronic Renal Failure: The Question of Feasibility.* G. Majone.

RM-75-6   *Road Safety Research in the Perspective of Policy Analysis.* M. Thompson.

RM-75-14   *Catastrophe Theory and Urban Processes.* J. Casti, H. Swain.

RM-75-18   *Probability Theory in Geological Exploration.* G.B. Baecher.

RM-75-19   *Urban Research Institutions in France.* C. DeNarbonne, H. Swain.

RM-75-21   *The Anokhin Theory of the Functional System: Its Principal Propositions, Operational Architectonic and Possible Application in Biology and Medicine.* V.G. Zilov.

RM-75-23   *Systems Analysis of Some Bio-Medical Problems Related to Medical Treatment Management.* A.M. Petrovsky.

RM-75-29   *Subjective Sampling Approaches to Resource Estimation.* G.B. Baecher.

RM-75-30   *Extrapolating Trending Geological Bodies.* G.B. Baecher, J.G. Gros.

RM-75-31   *A Systems Approach to Health Care.* A. Kiselev.

RM-75-35   *Urban Systems: A Comparative Analysis of Structure, Change and Public Policy.* P. Hall, N. Hansen, H. Swain

RM-75-37   *Urban Planning and Engineering.* A. Rogers.

RM-75-39   *Sampling for Group Utility.*   G.B. Baecher.

RM-75-42   *On the Dynamics of the Ignition of Paper and Catastrophe Theory.*   R.K. Mehra, E.H. Blum.

RM-75-48   *International Cooperation and Regional Policies Within Nations.*   N. Hansen.

RM-75-56   *Why Policy Research Institutes?*   W. Gorham.

RM-75-57   *Spatial Migration Expectancies.*   A. Rogers.

RM-75-58   *An Optimal Approach to National Settlement System Planning.*   R.K. Mehra.

RM-75-59   *Status and Future Directions of the Comparative Urban Regional Study: A Summary of Workshop Conclusions.*   P. Hall, N. Hansen, H. Swain.

RM-75-62   *Factors Affecting Participation in Cervical Cancer Screening Programs.*   J.H. Bigelow, H.L. Brown.

RM-75-68   *The Influence of Urbanization on the Birth Rate and Mortality Rate in Major Cities of the USSR.*   G.P. Kiseleva.

RM-75-69   *An Interactive System for Experimenting with Development Planning.*   V. Sokolov, M. Valasek, I. Zimin.

RM-75-74   *Soviet Population Policy.*   G.J. Demko.

RM-75-78   *The Functional System Theory of an Organism and Its Application in Research into Singleminded Behaviour in Animals.*   V.G. Zilov.

1973-1974

Research Reports

RR-74-9   *Dynamic Models of the Interaction Between Migration and the Differential Growth of Cities.*   M. Cordey-Hayes, D. Gleave.

RR-74-13   *A Study of Research and Development in Environmental Engineering Using a Systems Approach.*   M. Thompson.

RR-74-14   *Technological Prosthetics for the Partially Sighted: A Feasibility Study.*   J. Page.

Collaborative Publications

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

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

Research Memoranda

RM-74-5   *A Maximization Problem Associated with Drew's Institution-*
           alized Divvy Economy. A.G. Wilson.

RM-74-6   *Linear Programming and Entropy Maximizing Models.*
           A.G. Wilson.

RM-74-24   *Do Variations in Urban Form Affect Environmental Quality?*
           B.J.L. Berry.

Appendixes

APPENDIX A: NATIONAL MEMBER ORGANIZATIONS
               AND COUNCIL MEMBERS

The Academy of Sciences
of the Union of Soviet
Socialist Republics
Professor Jermen Gvishiani

The Canadian Committee for IIASA
Dr. Michael J.L. Kirby

The Committee for IIASA of the
Czechoslovak Socialist Republic
Professor Dr. Tibor Vasko

The French Association for the
Development of Systems Analysis
Mr. Jacques Lesourne

The Academy of Sciences of the
German Democratic Republic
Professor Dr. Karl Bichtler

The Japan Committee for IIASA
Professor Hiromi Arisawa

The Max Planck Society for
the Advancement of Sciences,
Federal Republic of Germany
Dr. Friedrich Schneider

The National Committee for
Applied Systems Analysis and
Management, People's Republic
of Bulgaria
Professor David Davidov

The National Academy of Sciences,
United States of America
Dr. N. Bruce Hannay

The National Research Council,
Italy
Professor Guido Torrigiani

The Polish Academy of Sciences
Professor Jan Kaczmarek

The Royal Society of London,
United Kingdom
Dr. B. John Mason

The Austrian Academy of Sciences
Professor Leopold Schmetterer

The Hungarian Committee for
Applied Systems Analysis
Professor Istvan Lang

The Swedish Committee for
Systems Analysis
Dr. Carl Gustav Jennergren

The Finnish Committee for IIASA
Professor Dr. Pekka Kuusi

The Foundation IIASA-Netherlands
Professor Dr. Pieter de Wolff

APPENDIX B: COLLABORATING INSTITUTIONS, 1978

The following institutions have been collaborating actively
with the HSS Area during 1978. In order to become a collaborating
institution, 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 contrib-
utes to its successful completion in at least one of the following
categories:

-- Data collection and/or processing in conjunction with
   IIASA
-- A scientific survey in conjunction with IIASA
-- Written contributions to an IIASA publication (research
   report, collaborative publication, book)
-- Model development in conjunction with IIASA
-- Evaluation and/or implementation of models developed
   or refined at IIASA
-- A case study conducted in conjunction with IIASA

(The sources of the English names of institutions are the *World of
Learning 1977-1978*, 2 vols., Europa, London, 1977; and IIASA usage.)

HEALTH CARE SYSTEMS

Austria   Institute of Socio-Economic Development
                     Research, Vienna

Bulgaria   Central Research Institute of Public
                     Health, Sofia

Canada   Department of Information and Operational
                     Research, University of Montreal

Czechoslovakia	Institute of Haematology and Blood Transfusion, Prague
	Institute of Medical Bionics, Bratislava
	Institute for Postgraduate Training of Physicians, Bratislava
	Institute of Social Medicine and Organization of Health Services, Prague
Finland	Ministry of Health, National Board of Health, Planning Department, Helsinki
	Research Institute for Social Security, Helsinki
Federal Republic of Germany	Institute for Medical Data Processing, Munich
	Industrial Enterprises, Ltd., Munich
	Hannover Medical Center
	The Ulm University
German Democratic Republic	Humboldt University, Berlin
Japan	Institute of Medical Electronics, Faculty of Medicine, University of Tokyo
Netherlands	Ministry of Health and Environment, The Hague
	University of Leiden
Union of Soviet Socialist Republics	Institute for Control Sciences, Moscow
	The Central Research Institute of Social Medicine and Public Health, Moscow
United Kingdom	Operational Research Services, UK Health Ministry, London
	South Western Regional Health Authority, Bristol
World Health Organization	Headquarters, Geneva; Regional Office for Europe, Copenhagen

HUMAN SETTLEMENT SYSTEMS

Bulgaria	Complex Research and Design Institute of Regional and Town Planning and Architecture, Sofia
Denmark	Danish Building Research Institute, Hørsholm

Finland	Tampere University, Economics Department
German Democratic Republic	Institute for Geography and Geoecology 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
Romania	Institute of Architecture, Bucharest
United Kingdom	University of Reading, Department of Geography

MIGRATION AND SETTLEMENT

Austria	Austrian Institute for Regional Planning, Vienna
Belgium	European Research Institute for Regional and Urban Planning, Brussels
Bulgaria	Institute for Statistics, Sofia
Canada	University of Quebec, National Institute of Scientific Research
Czechoslovakia	Charles University, Faculty of Natural Science, Prague
Finland	University of Helsinki, Department of Geography
France	National Institute of Demographic Studies, Paris
Federal Republic of Germany	Federal Research Institute for Regional Geography and Regional Planning, Bonn-Bad Godesberg
German Democratic Republic	Institute of Geography and Geoecology of the Academy of Sciences of the GDR, Leipzig
Hungary	Demographic Research Institute, Central Statistical Office, Budapest
Italy	National Research Council, Livorno
Netherlands	Delft University, Department of Building Research

Poland   Institute of Geography and Spatial Organiza-
                               tion, Polish Academy of Sciences, Warsaw

Sweden   Demographic Research Institute, Göteberg

                             University of Göteberg, Department of
                               Economics

                             National Central Bureau of Statistics,
                               Stockholm

Union of Soviet   The Institute of Economics and Management
  Socialist Republics   of Industrial Production, Siberian Depart-
                               ment of the Academy of Sciences of the USSR,
                               Novosibirsk

United Kingdom   University of Leeds, Department of Geography

United States   U.S. Bureau of the Census, Population Divi-
                               sion, Washington, D.C.

POPULATION, RESOURCES, AND GROWTH

Mexico   El Colegio de Mexico, Mexico City

Poland   Institute of Econometrics, Academy of
                               Economic Sciences, Katowice

United States   Stanford Food Research Institute, Stanford,
                               California

                             Harvard Population Studies Center, Cambridge,
                               Massachusetts

The Human Settlements and Services Area: The First Five Years

Andrei Rogers

PREFACE

     The original version of this status report was prepared on
the occasion of the first meeting of the Area's Advisory Commit-
tee, held in Laxenburg on March 23-25, 1979. Since the publica-
tion of that report two research tasks have been concluded, two
other tasks have progressed further toward their completion, and
two new tasks have been initiated. Thus it is appropriate, on
the occasion of the forthcoming second meeting of the Advisory
Committee, to describe the more recent activities and plans of
the Human Settlements and Services Area. This is the principal
purpose of Supplement: 1979, the Area's report of its sixth
year.

CONTENTS

RESEARCH IN 1979

The Human Settlements and Services Area (HSS) in 1979 ex-
perienced a number of "firsts". The year began with the publi-
cation of the Area's first Status Report. Another first was a
Status Report for one of its tasks: The Health Care Modeling
Task, published in April. The Area convened its first Advisory
Committee meeting in March and offered its (and IIASA's) first
short course in September. By the end of the year the Area had
published 24 Working Papers, two Research Reports, two Status
Reports, and two Collaborative Publications.

The Core Task
(Andrei Rogers, USA, Chairman)

In September of this year, the Core Task sponsored a two-
week short course on Migration and Settlement. The principal
purpose of this course was to disseminate the models and find-
ings of the Task of the same name which was concluded last year.
Over 30 participants attended the course and their evaluation
of it was very favorable. As a result, plans are underway to
repeat the course for a Latin American audience in Mexico in
1980.

Other activities connected with the former Migration and
Settlement Task included the coordination and support of the
national case studies, currently being completed in the IIASA
member nations. The first two Research Reports, on the United
Kingdom and on Finland, were published this year and three ad-
ditional reports are in press.

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The Core budget supported the Area's first Advisory Committee meeting in March of this year (see the Appendix to this supplement). Ten internationally renowned scientists (among them 1979 Nobel Prize-winner Theodore Schultz) assessed the quality of the Area's research activities and offered advice.

The Normative Location Modeling Task
(Georgio Leonardi, Italy, Task Leader)

The Normative Location Modeling Task started only in September of this year and is still in its formative stages. Nonetheless, significant progress has been made to date in designing the basic perspective of this activity.

With regard to theoretical issues, the initially stated goal of a state-of-the-art review has been broadened into that of finding unifying features in the different existing location models. This approach seems to be fruitful as a step towards the construction of a unified theoretical and computational framework for normative location analysis. Furthermore, the analysis carried out so far has revealed that basic consistency can be achieved between a wide class of normative location models and other models already developed at IIASA, both at the micro and the macro scale (i.e., entropy-based models and random utility models developed as part of HSS and Regional Development activities).

While the current state of the art deals mainly with the conventional static, single-level location model, the main directions for future theoretical advances are dynamic, multilevel location models.

The introduction of dynamics into optimal location modeling is essential for coping with service location problems in urban areas, both because of changes in demand and because of interactions with already existing facilities. The latter is a particularly important problem in a built environment, where relocating and closing some facilities may be part of an optimal solution.

The introduction of multilevel structures is required in many important location problems, the most typical being that of health care facilities location. In a more general sense, this stage of the research will have to build a mathematical programming framework for systems composed of many kinds of different, but interacting, services whose location has to be optimized simultaneously.

Reviews of published models and new theoretical perspectives have been initiated and are being carried out for dynamic single-level models and for multilevel (both static and dynamic) models. Work on algorithms and case studies is in the process of being defined.

The Health Care Systems Modeling Task
(Evgenii Shigan, USSR, Task Leader)

A major product of the Health Care Task in 1979 was its
first Status Report. This document summarizes the achievements
of the Task up to the end of 1978. It has been well received
and has proved to be a useful vehicle for disseminating the work
of the Task.

In June the Task held a workshop on Health Care Systems
(HCS) Modeling: Application and Development. One of the aims
of the workshop was to update current knowledge about the state
of the art in Health Care Modeling at IIASA, in international
agencies, and in national centers. This was achieved. The work-
shop also considered whether the research of the Task should be
extended to include the modeling of the interrelationships be-
tween health and economic systems. This aim is partly motivated
by an attempt to encourage NMO countries with market-oriented
health care systems to participate more actively in the Task. The
workshop participants agreed that this type of modeling should
be included in the Task's program, but there was less agreement
about the type of research that should be carried out. It was
suggested that IIASA explore the possibilities with interested
parties, and report back at the next such meeting. An important
outcome of the workshop was the favorable response towards col-
laborative research with IIASA expressed by the U.S. delegation.

Another major achievement of 1979 was the use of DRAM Mark
I (developed by Richard Gibbs) to assist policy makers in the
Department of Health and Social Security in the UK. It was used
to estimate the effect on the number of hospital in-patients
treated (and the average level of care each would receive) of
applying differing financial projections for 1986 national ex-
penditures on hospital beds.

An informal meeting on Low-Cost Health Delivery Systems in
Developing Countries, organized by Bruce Johnston and Evgenii
Shigan, took place in July of this year. The meeting brought
together a group of highly knowledgeable and creative people,
several of whom have had direct experience with health care in
developing countries. The outcome of the meeting was a stimu-
lating set of research proposals, some of which those at the
meeting thought IIASA should take up. The report of the meeting
is currently under review by the IIASA research management.

In October, a joint IIASA/AMIEV (International Medical As-
sociation for the Study of Living Conditions and Health) Confer-
ence was held at the Institute. This conference was concerned
with health and the environment. The conference indicated that
much is already known about the unfavorable influence on health
status of such factors as noise, stress, excessive consumption
of food and drink, chemical pollution, and radiation. It is
also clear that much of this knowledge is not being used in edu-
cation programs and in environmental planning. The conference
also discussed the possibility of developing contacts with a

number of research centers. Adding an environment subsystem to
the existing HCS framework of models may be a future direction
for the Task.

The Task has been involved with three conferences/meetings
in 1979 (Collaborative Publications were produced for two of
them). This has resulted in fewer Working Papers by individual
scientists than in the previous year. In general the Task has
aimed to set up collaborative research in morbidity estimation
and resource allocation in NMO countries. This has been most
successful in the UK, Czechoslovakia, and Bulgaria. The col-
laborative research also has stimulated the development of the
existing framework of the HCS model. Latest versions of the pro-
grams have also been implemented in the FRG, the Netherlands,
and Canada. Working Papers are currently in preparation on the
analysis of data from Czechoslovakia and the UK, using DYMOD and
DRAM, two models developed by the HCS Task.

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The Urban Change Task
(Tatsuhiko Kawashima, Japan, and Piotr Korcelli, Poland,
Task Leaders)

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Recent urbanization trends have been characterized by a
paradoxical polarization: while the large urban agglomerations
in the more developed countries have either experienced absolute
population declines or are growing at rates lower than those
typical for other settlements, the increase of the urban popula-
tion in the less developed countries not only continues to be
rapid, but also tends to be mainly concentrated in the largest
urban centers. Those trends have generated two major urban pol-
icy debates: one focused on the so-called metropolitan maturity,
and the other on excessive urban expansion and urban primacy.

Although several categories of urban models are available,
few of them can be effectively used in policy-oriented studies
because they do not sufficiently describe both the non-growth
and the rapid growth situations. It is believed that a clear
representation of population dynamics coupled with economic com-
ponents could bring about a major breakthrough in urban model
building.

Within this broader goal, the Urban Change Task has begun
the development of models concerning the

- changing intersectoral shares and locational require-
  ments of individual sectors as determining factors in
  the evolution of urban systems,

- changing structure of urban systems as affected by the
  evolution of fertility and mobility at a national and
  regional scale, and

- adjustment of urban spatial structures to economic,
  technological, and social requirements (including re-
  distribution of jobs, changes in household size and
  composition, and shifts in housing demand).

Work has started this year on the development of models at each of the levels identified above. It is expected that such models will be linked and tested within the framework of national case studies, carried out in NMO countries. The studies also aim to extend research conducted in the two tasks which were concluded in 1978: the Migration and Settlement Task and the Human Settlement Systems Task. Thus, during 1979, the Task performed three principal activities.

The first was the dissemination of the results achieved in the two earlier tasks focusing on human settlements. This included the editing of (1) the proceedings of the Conference on the Analysis of Human Settlement Systems, held at IIASA in October 1978, and (2) the papers presented at the session on mathematical demography of the Population Association of America Meetings held in Philadelphia in April 1979. Publication of both volumes is planned for 1980.

The second was the extension of fundamental urban concepts and relevant methodology, including the development of demographic-economic models of interregional and interurban growth; the review and evaluation of economic models of migration, together with a quantitative analysis of migration flows; the construction of an analytical framework for a simultaneous study of migration and journey-to-work, and the identification of an alternative approach to the study of urban spatial interaction.

The third activity consisted of exploratory work on selected national case studies including the Swedish Case Study, which has already produced preliminary results on the components of urban-industrial employment change, the trends in regional patterns of industrial specialization, and the implications of Swedish regional policy for recent urban-regional change. In cooperation with the Systems and Decision Sciences Area at IIASA, a general equilibrium model for a small open economy has been completed, aimed at elucidating future economic development at the macro and sectoral levels.

The Population, Resources, and Growth Task
(Allen Kelley and Andrei Rogers, USA, Task Leaders)

The introduction of population into dualistic models of economic development has to date been somewhat limited in scope. Most economic-demographic modeling has focused on the aggregate impacts of total population growth and, as a result, attention to the many elements of economic dualism has played a somewhat smaller role in the analysis. This modeling orientation may well have been appropriate given the objective of assessing the overall implications of population growth in the recent decades. It will be less defensible in the future given the dramatic rates of urban growth in the Third World and the structural changes that are accompanying these trends.

In order to evaluate the nature and consequences of these trends, it is necessary to develop economic-demographic frameworks which highlight the causes and consequences of the urbanization process. In particular, modeling must focus on the determinants and impacts of the intersectoral transfers of factors: labor, land, and capital. The Population, Resources, and Growth Task seeks to develop improved specifications for such a model. Confrontation of the issues of urbanization and dualism requires a modeling emphasis which is somewhat different from that of the current economic-demographic paradigms. This is not a criticism of existing research but rather a recognition of the significance of the role of urbanization in the future trends and patterns of population and economic growth. It should be emphasized that some of the specifications studied in this Task are already incorporated in several existing models. However, no single framework combines their joint influences, and some of the specifications are missing altogether.

The Population, Resources, and Growth Task produced a number of preliminary results in 1979. A paper describing the Task's prototype model (the Kelley-Williamson model) was published late in the year. Reports of two case study applications of such a model were also completed: Mexico and Poland. The model for the Mexican Case included some important market distortions, a relevant sectorial division, as well as a meaningful migration process for Mexico. A second report on Mexico focused on a shift-share analysis of labor productivity emphasizing the possible contribution to increases in labor productivity of interregional labor force migration and the impact of intersectoral labor force shifts within the Mexican economy. The Polish Case Study used a number of economic, technological, and demographic variables to explain the past growth of the Polish economy.

Two important studies of the influence of agricultural technology on rural-urban migration and the urbanization process were published. One concentrated on policy-feasibility: what are the constraints determining the rural development objectives that are in fact achievable with existing resources and organizational skills? The second stressed the impact of alternative agricultural technologies on migration and human settlement patterns.

A book-length manuscript on rural-urban labor migration and urban employment in Kenya using census data and data from a migration survey organized by the author was submitted to commercial publishers for their consideration. Finally, work on the Swedish Case Study was initiated.

THE RESEARCH STAFF

1979

Twenty-one research scholars were with the HSS Area in 1979
for periods longer than one month. Together with the much larger
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 give
an indication of the richness of this mixture.

Research Scholars

Philip Aspden, UK (April 1979-April 1980), joined the
Modeling Health Care Systems Task to work on the application of
mathematical models to the allocation of health care resources.
Before coming to IIASA, he was Principal Scientific Officer at
the Operational Research Unit of the Department of Health and
Social Security in London. He received his Ph.D. in Operational
Research from Lancaster University in 1971. Dr. Aspden has
worked on the establishment of computerized information systems
for the UK road program and for clinical research.

Luis J. Castro, Mexico (October 1977-), came from Mexico
to work with the HSS Area on a comparative study of migration
and settlement patterns in NMO countries and on 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. (1975) from the Urban
Systems Engineering and Policy Planning Program at Northwestern
University, Illinois. In Mexico, he was a professor at the Grad-
uate School of Civil Engineering at UNAM and a project leader
for a consulting firm.

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Donaldo Colosio, Mexico (March 1978-July 1979), joined the HSS Area to work with the Population, Resources, and Growth Task on urbanization and economic development in Mexico. He has a Bachelor's degree in Economics from the Instituto Technologico y de Estudios Superiores de Monterrey, and a Master's degree in Regional Science from the University of Pennsylvania; he is currently writing his Ph.D. dissertation in Regional Science there. In Mexico, Mr. Colosio worked with the consulting firm SITA on the economic analysis of public regional investment, and taught microeconomics at the Universidad Iberoamericano in Mexico City.

Peter Fleissner, Austria (January 1975-), is from the Institute for Socio-Economic Development Research of the Austrian Academy of Sciences, Vienna. He joined IIASA on a part-time basis to develop frameworks for international comparisons of health care systems. Dr. Fleissner received a Dipl. Ing. in electronics (1968) and a Dr. Tech. in mathematics (1971) from the Technical Institute for Advanced Studies in Vienna and was a lecturer in econometrics at the Technical University (1971-1973).

David J. Hughes, UK (April 1978-April 1979), came to IIASA from the Operational Research Services of the Department of Health and Social Security, United Kingdom. As a member of the Modeling Health Care Systems Task, he is concerned with the development and application of resource allocation models. Dr. Hughes holds a degree in Engineering Science (1971) and a D.Phil. in Stochastic Control Theory (1974), both from Oxford University. He has been with the Operational Research Services since 1974, working on resource allocation, regional planning, and modeling of patient progress in cancer treatment programs.

Bruce F. Johnston, USA (September 1978-August 1979), joined the HSS Area to work on aspects of agricultural and rural development and on problems of the provision of low-cost health services. Professor Johnston received his Ph.D. in Agricultural Economics (1953) from Stanford University. From 1945 to 1948 he was Chief, Food Branch, at the General Headquarters, Supreme Commander for the Allied Powers in Tokyo, and was later agricultural economist at the U.S. Mission to NATO and the European Regional Organization in Paris. He has been with the Food Research Institute at Stanford since 1954 and has published widely on agricultural development and structural transformation.

Hiromitsu Kaneda, Japan (June 1979-November 1979), came to IIASA to work on modeling patterns of agricultural development in order to explain the interrelationships between technological change in agriculture and internal migration. Professor Kaneda studied economics at Doshisha University in Kyoto and Amherst College, USA. He received his Ph.D. in Economics in 1964 from Stanford University. His scientific interests include economic development, agricultural economics, and international economics.

Tatsuhiko Kawashima, Japan (July 1977-September 1979), joined the HSS Area to work on international comparative studies; since August 1978 he has been active half-time with the IIASA Integrated Regional Development group. Professor Kawashima received his Master's degree in Economics from the University of Tokyo and his Ph.D. in Regional Science from the University of Pennsylvania. He has worked on the research staff of the Regional Science Research Institute in Philadelphia; since 1973 he has been a Professor of Regional Science and Transportation at Gakushuin University in Tokyo.

Allen Kelley, USA (December 1978-August 1979), joined the Population, Resources, and Growth Task 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 is now Chairman of the Department of Economics at Duke University, North Carolina. In addition to his scholarly interests in demoeconomic development Professor Kelley has been actively involved in designing computer-based instructional programming systems that have been widely adopted both in the United States and elsewhere.

Pavel I. Kitsul, USSR (December 1977-), a research scholar at 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 received his Ph.D. in Physics and Mathematics (1973) from the Moscow Institute of Physics and Technology. His scientific interests include the theory and application of stochastic processes and identification and control in complex systems.

Piotr Korcelli, Poland (June 1979-), has been associated with the HSS Area since October 1975, and has worked for IIASA for short periods of time since then. He is currently on leave from the Institute of Geography and Spatial Organization of 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 a Habilitation Doctorate in 1973. In 1973-1974 he was a research assistant at the University of Maryland.

Jacques Ledent, France (February 1977-), joined IIASA to do research on demoeconomic studies of migration and human settlement evolution. Mr. Ledent received his degree in engineering (1969) from the Ecole Nationale des Ponts et Chaussees and his Master's degree in Civil Engineering (1972) from Northwestern University, Illinois; he is currently writing his Ph.D. dissertation on 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.

Giorgio Leonardi, Italy (October 1979-), joined the HSS Area to work on problems of normative location modeling. Dr. Leonardi received his Ph.D. from the Polytechnic Institute of Milano, Faculty of Architecture, in 1969. Presently he is with the Polytechnic Institute of Torino where his research involves activity location-allocation models, multifacility optimal location models, dynamic spatial interaction models, and optimal natural recreational management models.

Lennart Ohlsson, Sweden (August 1978-August 1979), joined the HSS Area to participate in studies of changing regional specializations and their employment consequences. Dr. Ohlsson received his Ph.D. in Economics (1974) from the University of Uppsala. Since 1974, he has been senior research economist with the Expert Group on Regional Studies, Ministry of Industry, Stockholm, and in 1976 was awarded his docent title. Earlier, he had been 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, Stockholm.

Dimiter N. Philipov, Bulgaria (September 1977-), came to the HSS 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 include the mathematics of population growth and demoeconomics. At IIASA, he is concentrating on the comparative study of migration and settlement.

Andrei Rogers, USA (July 1975-), has led the HSS 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 in the City and Regional Planning Department at the University of California at Berkeley and the Technological Institute at Northwestern University, Illinois. His current research focuses on migration and the evolution of human settlement systems in both developed and developing countries.

Ahmed Seifelnasr, Egypt (August 1979-), came to work on demographic analysis from the Johns Hopkins University on a Population Council fellowship. He began his studies in applied statistics and demography at Cairo University and went to the USA in 1974 to continue his studies at the Department of Population Dynamics at Johns Hopkins University where he received his Ph.D. in 1979. Dr. Seifelnasr has been a lecturer at the University of Cairo and the University of Benghazi in Libya as well as a research assistant at the American University in Cairo.

Evgenii N. Shigan, USSR (November 1976-), 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 in 1964, and his

final doctoral degree in Medical Science in 1973. In 1976 he became a Professor of Social Medicine and Public Health.

Svetlana Soboleva, USSR (July 1979-), joined the HSS Area from the Institute of Economics and Industrial Engineering, Siberian Branch of the USSR Academy of Sciences, Novosibirsk where she received her Ph.D. in 1973. Dr. Soboleva's scientific interests include problems of modeling migration, the influence of socioeconomic factors on demographic processes, and methodological problems of modeling. She has published several papers on mathematics, demography, and demographic mathematical modeling and has participated in international workshops.

Marc G. Termote, Canada (June 1979-November 1979), came to IIASA to work on the Urban Change Task. He has a Ph.D. in Law from the University of Louvain, Belgium (1960), and a Ph.D. in Economics also from the University of Louvain (1969). Between 1969 and 1973 he was a Professor in the Department of Demography and at the Economics Institute, University of Louvain. Dr. Termote is now a Professor at the University of Quebec, Institute National de la Recherche Scientifique (INRS), and Consultant for Statistics Canada, the Ministry of Urban Affairs, and the Ministry of Immigration.

Frans J. Willekens, Belgium (July 1979-September 1979), first came to IIASA in June 1975 from Northwestern University, Illinois joining the HSS Area for three years 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 and completed his dissertation while at IIASA. From 1971 to 1973 he was Assistant Professor of Agricultural Economics at the National University of Zaire.

Research Assistants

Coen, Margery	USA	Aug 1979 -	
Just, Peer	FRG	Jan 1979 -	
Karlström, Urban	Sweden	July 1979 -	
Kogler, Walter	Austria	Sep 1979 -	
Schmidt, Robert	USA	Dec 1978 -	Aug 1979

PUBLICATIONS

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

    The *Status Report* (SR) summarizes the research and goals of
the area or task and describes its ongoing activities.

    The *Research Report* (RR) is IIASA's formal vehicle for re-
porting 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 and to report interim or contributing
work when the results are felt to merit broad circulation.

    The *Collaborative Publication* (CP) is used both for results
of research done jointly with other research organizations and
for proceedings of conferences and workshops.

    The *Working Paper* (WP) provides a means for the informal
distribution of intermediate results to scientific colleagues
within and outside the Institute.

    All of the HSS Area 1979 publications in these four cate-
gories are listed below with abstracts.

1979

Status Reports

SR-79-1.   The Human Settlements and Services Area: The First Five Years.   A. Rogers.

The Human Settlements and Services Area was formed in 1976
through the merger of the Urban and Regional Systems Project and
the Biological and Medical Systems Project, both of which had
been initiated in the beginning of 1974.   This report describes
the evolution since 1974 of IIASA's concern with the human popu-
lation, its distribution on the globe, the settlements it forms,
and the services it needs.   Besides describing the research that
has been carried out in the Area and its ongoing activities, the
Report presents its current research plans for 1979-1983.   Lists
are given of the staff who have served in the Area since 1974,
and of the resulting publications.   Biographies of the staff and
abstracts of the publications for 1978 have also been provided.

SR-79-4.   Health Care Systems Modeling at IIASA: A Status Report.   E. Shigan, D. Hughes, P. Kitsul.

This report describes work that has been carried out up to
the Fall of 1978 by the Health Care Systems Modeling Task in the
Human Settlements and Services Area at IIASA.   It focuses in par-
ticular on the submodels that have been developed and tested,
and on the collaboration that has been established with similar
research teams in a number of countries around the world.   The
Task has set a goal of creating a model that will assist national
decision makers in their policy formation.   This model consists
of a number of linked submodels dealing with various related
topics from population growth to resource allocation.   Some of
these submodels have already been tested, and collaborating
national research centers have started to implement them with
their own data.   The resulting experience of the past several
years is described in this review.

Research Reports

RR-79-3.   Migration and Settlement: 1.   United Kingdom. P. Rees.

This report is the first of a series on the comparative
analysis of patterns of interregional migration and spatial popu-
lation growth in the National Member Organization countries of
IIASA.   In it, the pattern of population change in UK regions is
explored by applying both conventional single region methods and
new multiregional techniques.   Current patterns of spatial popu-
lation growth are outlined using components of growth tabulations,

multiregional population accounts tables, and an analysis of the age-specific patterns of fertility, mortality and migration. The first British multiregional life table, spatial fertility expectancy table, and multiregional migraproduction table are described and summary measures from these tables are compared with their single-regional equivalents. Population projections are carried out using a multiregional survivorship matrix for British regions and the results are compared with official and accounts-based projections. The report concludes with speculations about the causes underlying the patterns observed and assesses the role of governmental policy in shaping those patterns.

RR-79-9. Migration and Settlement: 2. Finland. K. Rikkinen.

The second migration and settlement comparative analysis of national patterns of interregional migration and spatial population growth was carried out by Professor Kalévi Rikkinen of the University of Helsinki, Finland. His report shows that some important and policy-relevant changes are taking place in both the age-structure of the population and in its regional distribution. Multiregional demographic techniques are applied to data from the base year 1974 in order to analyze regional population dynamics. The techniques used incorporate the multiregional life table, including a life expectancy matrix, mobility and fertility analysis, and population projections. The report concludes with the main features of population distribution policy in Finland, emphasizing the agricultural policies regarding the clearance of new land and the recent attention to problems of urban growth and decline.

Collaborative Publications

CP-78-12. Systems Modeling in Health Care: Proceedings of an IIASA Conference, November 22-24, 1977. E. Shigan, Editor. (Published in 1979.)

An international conference on the elaboration of a dynamic health care systems model was held in Laxenburg on November 22-24, 1977. This conference was dedicated to the further development of health care systems modeling at IIASA, its National Member Organizations (NMOs), and international organizations. It focused on the development and practical application of mathematical models of health care systems elaborated at IIASA and in its NMOs. The proceedings include papers submitted by the organizers of the conference, reports by the participants from different national and international organizations, and the main content of discussions that took place during all sessions.

CP-79-10. Health Delivery Systems in Developing Countries. A Committee Report. B. Johnston, Editor.

During the past two years, the HSS Area at IIASA has been engaged in research on urbanization and development in developing countries. An important future component of this research is to be the study of the demand for services, such as health. Although health care research has been a central part of HSS activities since the establishment of the Area, it has only addressed problems in the developed world. The possibility of extending that research to consider the problems of health delivery in low-income countries, experiencing rapid rates of urbanization, led to the informal meeting of experts described in this report.

CP-79-15. Modeling Health Care Systems: June 1979 Workshop. E. Shigan, P. Aspden, P. Kitsul.

These Collaborative Papers contain the papers submitted by the participants of the June 1979 IIASA Workshop on modeling Health Care Systems (HCS) and a brief summary of the principal items of discussion that took place. The aims of the Workshop included reviewing the HCS modeling that has been done at the participating organizations and discussing the possibility of extending the HCS Task at IIASA to include health-economic models.

Working Papers

WP-79-14. A Demoeconomic Model of Poland: DEMP 1. Z. Pawlowski.

This paper presents a demoeconometric model of Poland: a model that tries to explain the growth mechanism of the economy not only by analyzing economic and technological factors, but also by making use of a number of demographic variables. The behavior of several important demographic variables is, in turn, presented as being a function of economic factors.

WP-79-15. A Model of the Equilibrium Between Different Levels of Treatment in the Health Care System: Pilot Version. D. Hughes

Health Care Systems manage to balance competing demands for care with limited supplies of resources. They achieve an equilibrium. This paper describes a resource allocation model that represents this equilibrium as the equalizing of pressures between different levels of treatment. A pilot version of the model is formulated, solved, and programmed, and an illustrative example is given. Work towards a more sophisticated model is proposed.

*WP-79-16. Migration Age Patterns: Measurement and Analysis.
L. Castro, A. Rogers.*

This paper develops support for three principal points.
First, the profiles of age-specific gross migration rates all
over the world have a fundamental regularity that can be captured
and expressed in mathematical form. Second, this mathematical
"model" schedule summarizes the empirical regularity in a way
that permits analytical examinations to be carried out regarding
the fundamental properties of the migration age profiles. Finally,
migration rate schedules may be conveniently decomposed to
illuminate the influences on migration patterns of the migration
level, the age composition of migrants, and the age composition
of the population in the region of origin.

*WP-79-17. Migration and Settlement in the German Democratic
Republic. G. Mohs.*

This paper is part of IIASA's comparative study of migration
and settlement patterns in its member nations. The study of mi-
gration and settlement in the German Democratic Republic is based
on the data of 1975. The multiregional demographic analysis of
fertility, mortality, and internal migration, performed for a
system of five long-term economic planning regions, reflects the
behavior of the population in 1975 and the consequences of the
multiregional development of the GDR's population.

*WP-79-19. Urbanization and Economic Development in Mexico.
D. Colosio.*

The objective of the research described in this paper is to
provide an economic framework for the evaluation of the Mexican
urbanization process over the past three decades. A dynamic sim-
ulation model is proposed that emphasizes a rural-urban dichotomy
giving special attention to rural-urban migration. Other fea-
tures of the model are the inclusion of a public sector, whose
main role is to channel public funds for the accumulation of
capital in both urban and rural areas; and the specification of
consumer demand functions. It is believed that the above consti-
tutes a proper framework to evaluate the macroeconomic effects
of urbanization, such as changes in production structure, employ-
ment levels, distribution of income between urban and rural areas,
and changes in demand patterns.

*WP-79-29. Chronic Illnesses and Socio-Economic Conditions: The
Finland Case 1964 and 1968. P. Fleissner.*

This paper is concerned with the prevalence of chronic ill-
nesses in Finland for the years 1964 and 1968. Three different
methods of analysis of variance are used to establish quantita-
tive relationships between the prevalence of chronic illnesses
and socio-economic factors such as income of family head, quantity

of medical supplies, and distance to the nearest physician. A strong inverse relationship between the prevalence of chronic illnesses and income was found to be about ten times higher than the relationship between chronic illnesses and medical supply variables.

WP-79-32. Components of Urban Industrial Employment Change in a Small Open Economy: Sweden. L. Ohlsson.

The dense, large urban region has often been assumed to lead a region's structural development because of agglomeration economies and easy access to both a rapidly changing market and a variety of production resources. This paper analyzes whether or not three metropolitan regions of Sweden adapted their industrial sector rapidly and successfully between 1965-1975 compared to more sparsely populated parts of the country. The regions include some areas which have received industrial aid during the period.

WP-79-33. Tracing Regional Patterns of Industrial Specialization Trends in Sweden. L. Ohlsson.

The analysis of the development of regional industrial specialization can seek to emphasize determinants which are specific to each individual region or those which are common to all regions. This analysis introduces a conceptual framework useful for the study of specialization trends in the "footloose" industry sector of Sweden and some basic hypotheses. A regression analysis of these hypotheses is undertaken starting from a set of identities which establish some regional interdependencies in the commodity markets.

WP-79-34. A Conceptual Framework for an Assessment of Swedish Regional Policy. L. Ohlsson.

In the literature on the employment effects of regional policy, the concept of employment effect is often discussed as if it had a single, well-defined meaning. That this is not at all the case is argued in this paper, which focuses on the derivation of a more clearly defined conceptual framework that is then applied in an assessment of Swedish regional policy. It is demonstrated that for the choice of instruments of regional policy, it is important to strive for estimates of a variety of consequences possibly producing employment effects. Moreover, the analysis suggests that different estimation methods often produce answers to different questions rather than different answers to a given question. For this reason the problem specification is more important for the choice of methods than is often recognized.

WP-79-39. DEMP-1: Some Counterfactual Simulation Results.
Z. Pawlowski.

This is the second IIASA Working Paper on DEMP-1--the Demo-econometric Model of Poland. This model seeks to examine the process of economic growth and its impact on the time-behavior of demographic variables, such as birth, death, and migration rates, and population totals in urban and rural areas. The paper presents the reduced form of the model and illustrates some of its uses: counterfactual simulation results and direct multiplier analysis. The analysis of direct multipliers shows that trends and sharp shifts of economic policy, which occur from time to time because of changes in relevant economic and administrative decisions, play an especially large role in the impact of economics on demographic factors.

WP-79-40. Multiregional Methods for Subnational Population Projections. A. Rogers, D. Philipov.

Most projections of urban and rural populations are generated by models that are fundamentally nonspatial and uniregional in character. Migration streams are treated as net flows, and urban and rural populations are projected independently of each other. This paper argues for a multiregional spatial perspective that incorporates directional gross migration flows. Differences between the two approaches are identified and problems of bias and inconsistency are discussed.

WP-79-41. A Shift-Share Analysis of Regional and Sectoral Productivity Growth in Contemporary Mexico. C. W. Reynolds.

This paper presents a shift-share analysis of labor productivity in Mexico. Following a brief review of the role of rising labor productivity in recent economic growth, the analysis focuses on 1) the possible contribution to increases in labor productivity of interregional labor force migration, and 2) the impact of intersectoral labor force shifts within the Mexican economy. The paper concludes that the shift factor is declining as a contributor to productivity growth, both regionally and sectorally, at the same time that migration's contribution to growth in the labor force is on the increase.

WP-79-51. Migration and Urbanization in the Asian Pacific.
J. Ledent, A. Rogers.

The principal aim of this paper is to suggest two alternative methods for assessing the reasonableness of alternative sets of United Nations projections of population growth and urbanization. Both methods use models of urban population dynamics that are simple enough to be called transparent. The conclusion of the paper is that the most recent UN projections appear to be reasonable ones in the light of historical experience.

WP-79-52. Food, Health, and Population: Policy Analysis and Development Priorities in Low-Income Countries. B. Johnston, W. Clark.

This paper presents a policy analysis of rural development strategies in low-income countries. The major focus of the analysis is to define the constraints that determine the rural development objectives that are in fact obtainable with existing resources and organizational skills. The dominant constraints imposed by the structural and demographic characteristics of the low-income countries are particularly emphasized, showing that the concentration of population and poverty in rural areas will continue to be a distinguishing feature of these countries into the next century. Equally important are the interactions of malnutrition, infection, and unregulated fertility. Also analyzed are the relationships among various socioeconomic factors, fertility rates, and population growth, and their implications for the design of feasible development policies are explored. The lack of consensus required for effective action is especially evident in the case of nutrition-related aspects of development programs. Special attention is therefore devoted to the interrelationships among food intake, nutrition, and health.

WP-79-59. Estimation of Migration Flows: A Validation of Entropy Solutions. P. Forslund and J. Schoettner.

The collection of disaggregated data is an expensive as well as a time-consuming procedure. If real data could be replaced by estimations from data on a highly aggregated level, much effort could be saved. The entropy maximizing method can be used to estimate interregional migration flow matrices for the whole population or subgroups of the population, when the available data are in an aggregated form. This paper presents the entropy-maximizing method and tests its validity for different levels of data aggregation. The tests are carried out by means of information theory and the chi-square distribution.

WP-79-60. Physician Behaviour: The Key to Modeling Health Care Systems for Government Planning. F. Rutten.

The purpose of this paper is to indicate a possible direction of future activities at IIASA with respect to modeling the economic mechanisms in health care provision. It is argued that both in centrally planned economies and in market oriented economies, the decision makers at the national and regional level are faced with uncertainty about the reactions to their policies at the level of treatment of the patients. Therefore, modeling behaviour at this decision level is most useful. The main decision maker at this level is the physician. A brief survey of research activities concerned with modeling physician behaviour is also presented.

WP-79-65. Migration Age Patterns: II. Cause-Specific Profiles.
A. Rogers, L. Castro.

    This paper seeks to illuminate the role played by various
reasons for migration in accounting for observed variations of
age-specific migration rates. The focus is on the levels and
age profiles of different cause-specific migration schedules and
on their contribution to aggregate migration age curves that
change over time and space.

WP-79-81. Modeling Urbanization and Economic Growth. A. Kelley,
J. Williamson.

    The past quarter century has witnessed unprecedented eco-
nomic progress in the Third World. Yet major problems have arisen,
some of which are the consequences of the progress itself and may
become serious constraints on future development. City growth is
one such problem. This paper presents a general equilibrium
economic-demographic model which highlights various aspects of
urbanization. Attention is focused on the determinants and con-
sequences of rural-urban migration, on the resource demands of
housing associated with rapid urbanization, on optimal land use
between urban and rural activities, and on the allocation of in-
vestments to education and labor force training.

WP-79-88. Entropy, Multiproportional, and Quadratic Techniques
for Inferring Detailed Migration Patterns from Aggregate Data.
Mathematical Theories, Algorithms, Applications, and Computer
Programs. F. Willekens, A. Pór, R. Raquillet.

    This paper presents techniques for inferring migration flows
by migrant category from commonly available aggregate data. The
data are in the form of marginal totals of migration flow matrices
or prior information on certain cell values. A generalized esti-
mation procedure is presented which incorporates both maximum
liklihood and χ^2 estimates. The validity of the methods is tested
by comparison of estimates and observations for Austria and
Sweden. The techniques are then applied to infer age-specific
migration flows for Bulgaria.

WP-79-90. Nondifferentiable Optimization Promotes Health Care.
D. Hughes, E. Nurminski, G. Royston.

    An example of a health resource allocation model, solved
previously by piecewise linear approximation with data from Devon,
UK, is solved using nondifferentiable optimization (NDO). The
example illustrates a new application for NDO, and the novel ap-
proach makes clearer the workings of the model.

WP-79-92. The Choice of Technology in Strategies for Agricultural Development: Mechanical Innovations in East Africa. B. Johnston.

Agricultural innovations in low-income developing countries such as Kenya, Tanzania, and Uganda must be capable of increasing productivity as well as employing a growing labor force. A major thesis of this paper is that animal-drawn implements have a strategic role to play in these countries. The choice between animal- and engine-powered implements is discussed and an attempt is made to point out the principal obstacles to the identification and diffusion of improved farm equipment. Section III of the paper emphasizes the problems involved in absorbing a rapidly increasing labor force into productive employment. In the concluding section, an attempt is made to apply "good policy analysis" to some of the more important and controversial issues that arise in the choice of technology for agricultural development.

WP-79-102. Computer Program for Increment-Decrement (Multistate) Life Table Analysis: A User's Manual to LIFEINDEC. F. Willekens.

This paper lists and describes a FORTRAN computer program to calculate increment-decrement (multistate) life tables. It has been adapted from the program for multiregional life table analysis, published in Willekens and Rogers (1978). The use of the program is illustrated for a four-state marital-status life table for Belgium and a two-state working life table for Denmark.

WP-79-109. Issues in Policy Analysis of Agricultural Development and Internal Migration. H. Kaneda.

This paper investigates 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. An immediate objective is to supplement representative computable general equilibrium models by focusing on issues in policy analysis related to the choice of technology within agriculture and to the pattern of migration and urbanization. It is argued that there are important advantages in a dispersed, rurally-oriented pattern of population reallocation and in avoiding excessive concentration of the growth of industrial output and employment in a few established large cities.

THE RESEARCH PLAN: 1980-1984

The HSS Area is concerned with people, their distribution
in space, and their needs--health care, nutrition, education,
transportation, and housing. The Area has evolved from the
Urban and Regional Systems Project and the Biomedical Project.
To satisfy the needs of IIASA's Programs and other Areas, to
respond to the interests of the NMOs, and to contribute to the
advancement of the state of the art, three main research themes
have been selected.

The primary emphasis of the first theme is on state-of-the-
art reviews and dissemination (not on research) of knowledge
about contemporary urban system problems. Studies have dealt
with computer-based urban traffic control systems and with urban
emergency services. Due to last-minute difficulties in recruit-
ment for the Computer Information Systems Task, a task focusing
on the use of normative location models in urban and regional
management was initiated instead in late 1979 and will continue
through 1980. Exploratory topics in 1980 and 1981 may also in-
clude such diverse subjects as transportation and housing.

The human resources and services theme deals with "human
resources as the wealth of nations". It focuses on the analysis
of policies and programs that promote the *utilization* of human
potential and the cost-effective *provision* of social and personal
needs. Through 1984, work will continue on the health care sys-
tems study, which is concentrating on questions of morbidity,
health resource demand, supply and allocation, and the interac-
tions between the health care system and the socioeconomic
environment of which it is a part. Research on manpower analy-
sis stressing health care manpower and urban labor markets, will
commence in 1980. The societal consequences of recently changing
national patterns of labor force composition, participation, and
mobility in developed countries will also be examined.

The third and final theme of research in the HSS Area is focused on human settlement systems and their resource and service demands in the course of population and economic growth. Past HSS studies of migration and growth in urban and regional systems of different countries have formed the foundation of a new Task: Urban Change. This Task started in 1979 with a view to studying the problems of urban growth and decline in highly urbanized, post-industrial societies. It complements the continuing research effort on Population, Resources, and Growth that is concentrating on the determinants and consequences of urban transition and development in rapidly urbanizing countries.
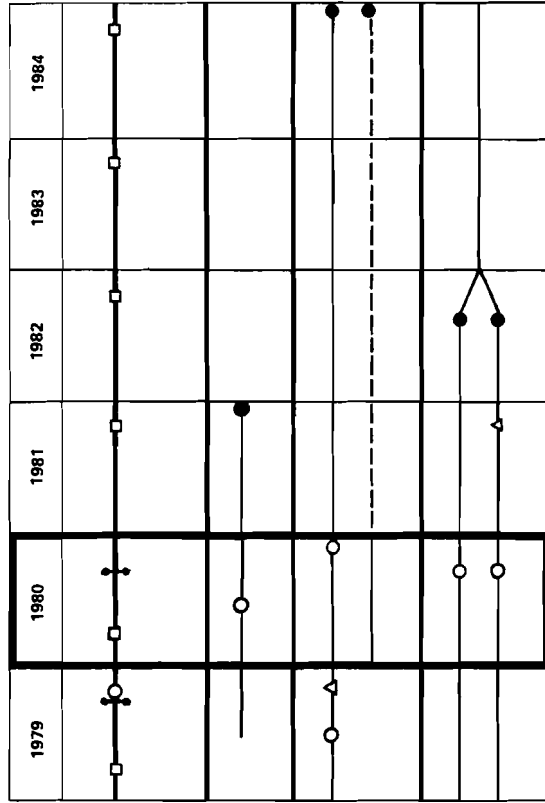
Over the next five years, work on the Area's three major themes will continue, but the Tasks will change. Several Tasks will be concluded, e.g., Normative Location Modeling. Other Tasks, such as Health Care Systems and, possibly, Manpower Analysis, may continue with revised perspectives. And new Tasks, such as Housing, Education, and Transport Investment, could evolve. In 1982 the Urban Change Task and the Population, Resources, and Growth Task will be merged, in order to produce a global assessment of human settlement problems along the lines of the 1976 UN Habitat Conference.

HUMAN SETTLEMENTS AND SERVICES AREA

	Task/Budget Summary Sheet			
	1980 Budget (AS)			
		IIASA Funds		
Tasks	Total Funds	Area Funds	Program Funds	External Funds
Area Core	1,780,000	1,780,000	—	—
Normative Location Modeling	810,000	810,000	—	—
Modeling Health Care Systems	2,520,000	2,520,000	—	—
Manpower Analysis	600,000	600,000	—	—
Urban Change	2,008,000	1,820,000	—	188,000
Population, Resources, and Growth	2,520,000	2,520,000	—	—
	10,238,000	10,050,000	—	188,000

Research Schedule

HUMAN SETTLEMENTS AND SERVICES AREA

	1979	1980	1981	1982	1983	1984

Area Core

Urban Systems Management

Normative Location Modeling

Human Resources and Services

Modeling Health Care Systems

Manpower Analysis

Human Settlement Systems

Urban Change

Population, Resources, and Growth

● Deadline for Results

□ Advisory Committee Meeting
△ Conference
✗ Task Force Meeting
○ Workshop
❙ Short Course

⋯⋯ Exploratory
——— Planned
— — — Possible

HUMAN SETTLEMENTS AND SERVICES AREA

Task 0: AREA CORE

PURPOSE

Core activities include conceptualization of research, recruitment of scientists, task management, communication with advisory committees and policy makers, and dissemination of results. Core funds are used to support consultants, short-term appointments for exploratory studies, and distinguished visitors; 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 publications.

ACTIVITIES 1980

Apart from normal management activities, the Core budget will support exploratory studies on transportation and housing. These studies will be carried out to identify appropriate topics and methodologies for future research tasks.

The further dissemination of the principal findings of the Migration and Settlement Task, concluded in 1978, will continue through 1980, and end with a three-volume publication in IIASA's *International Series on Applied Systems Analysis*. Finally, training courses for Asian and Latin American demographers may be offered.

TASK RESOURCES

Budget and Person-Months

	1976–1978[a]	1979	1980	1981	1982	1983	1984	Through 1984
AS (millions)	1.2	2.05	1.8	1.75	1.75	1.75	1.75	12.05
Person-Months	14	20	20	16	16	16	16	118

[a]Expenditures.

HUMAN SETTLEMENTS AND SERVICES AREA

Task 1: NORMATIVE LOCATION MODELING
(1979-1981)

OBJECTIVES AND EXPECTED RESULTS

The public provision of urban facilities and services often takes the form of a few central supply points serving a large number of spatially dispersed demand points: for example, hospitals, schools, libraries, and emergency services such as fire and police. A fundamental characteristic of such systems is the spatial separation between suppliers and consumers. No market signals exist to identify efficient and inefficient geographical arrangements; thus the location problem is one that arises in both East and West, in planned and in market economies.

The principal objective of the Normative Location Modeling Task is to conduct the first comprehensive international East-West assessment of the design and application of optimizing approaches in the location of public facilities and services in urban areas. The assessment will be published as a volume in IIASA's state-of-the-art series.

Expected Results 1980

- The development of an international network for information exchange and joint research projects
- Work on a comprehensive overview of current studies on the design and use of normative location models
- An outline of a state-of-the-art survey of models and applications in urban governments

Expected Results 1981

- A final draft of a state-of-the-art book to be published in IIASA's *International Series on Applied Systems Analysis*. Four areas of normative location modeling that seem particularly promising for a comparative perspective will be considered: (a) models with fixed total demand: e.g., fire stations and schools; (b) models with total demand: e.g., housing and services; (c) dynamic location problems: dynamic programming and nondifferentiable optimization models; (d) multiple criteria location models.

ACTIVITIES

Point of Departure

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 workshop, 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 and preparing a state-of-the-art survey that describes and evaluates different normative models and their applications in urban governments

Activities 1980

This Task will examine and integrate studies in the field being carried out in NMO countries. A state-of-the-art volume will be outlined for publication in the IIASA *International Series* and a workshop will be held to discuss the draft outline.

Activities 1981

A final draft of the state-of-the-art volume will be prepared and distributed for comments to scholars and decisionmakers in the NMO countries. A capstone conference will be held.

TASK RESOURCES

Budget and Person-Months

	To 1979	1979	1980	1981	1982	1983	1984	Through 1984
AS (millions)	—	0.75	0.8	0.5	—	—	—	1.85
Person-Months	—	3	6	8	—	—	—	17

Internal Collaboration

- Resources and Environment Area, Task 1
- System and Decision Sciences Area, Task 3

Expected External Collaboration

- Department of Industrial Engineering and Management Science, Northwestern University, Evanston, Illinois, USA
- Institute for Systems Studies, Moscow, USSR
- Institute of the Science of Architectural and Territorial Systems, Turin, Italy
- Department of Geography, University of Leeds, Leeds, UK

HUMAN SETTLEMENTS AND SERVICES AREA

Task 2: MODELING HEALTH CARE SYSTEMS
(1975-1984)

OBJECTIVES AND EXPECTED RESULTS

The main goal of this Task is to construct a Health Care System (HCS) simulation model for use in health service planning. The result will be a family of submodels describing the main aspects of the HCS (such as population dynamics, morbidity, resource allocation) and its interactions with the national economy. The submodels may be applied collectively in a comprehensive approach to health service planning.

The work is designed for regional, national, and international decision-makers and is meant to assist them in the examination of the consequences of policy options for resource supply levels, for example. The submodels will be tested in a number of NMO countries with the assistance of the World Health Organization (WHO) and collaborating research centers in the NMO countries. The results should also be useful for international agencies such as WHO and the United Nations Development Program (UNDP).

Expected Results 1980

- Disaggregation of morbidity estimation by the International Classification of Disease (ICD)
- Investigation of horizontal and vertical substitution effects in resource allocation modeling
- Development of new submodels of, for example, manpower and the economic influences on health care systems
- A report on the application of the submodels in a number of NMO countries from 1978 to 1979, which will be presented at a workshop in late 1980

Expected Results 1981-1984

- A further set of models of the HCS with computer programs and application results, dealing with topics to be selected in 1980, but which may include: models for estimating health care parameters on the basis of medical and demographic statistics; models of market and insurance mechanisms in countries where they strongly affect the HCS; models for planning at the regional level and for coordination of regional and national planning; models to assist management and planning in individual sectors of the HCS (e.g., models of inpatient and outpatient services and emergency care); models for use in the

HCS of developing countries and models expressing the influence of economic and environmental variables on the HCS.
- A final Status Report that describes the results of applying IIASA HCS models in various NMO countries, and that includes international comparisons. Directions for further work will be suggested.

ACTIVITIES

Point of Departure

Although a large number of models exist for examining individual sectors and aspects of health care systems, there has been little success in using models for the comprehensive planning of health services. To construct such models, aspects of health services are viewed in the Task as parts of a system so that submodels dealing with each aspect can be developed and linked. To date, submodels have been constructed dealing with population, morbidity, resource requirements and allocation, and some aspects of resource supply. These submodels have been tested using data from NMO countries, and one of them is being used to analyze health policy issues in the United Kingdom. Methodology, mathematical tools, and applications in a number of NMO countries are described in a Status Report recently prepared by the Task team.

Activities 1980

Activities will include extension and further application of the existing submodels together with dissemination of the results. Applications will proceed with the assistance of WHO and in collaboration with local research centers in the United Kingdom, Canada, the Federal Republic of Germany, the German Democratic Republic, the Netherlands, Czechoslovakia, and the Soviet Union (where work has commenced). A new modeling area will be manpower analysis (in conjunction with the Area's Manpower Analysis Task). A joint meeting of the Resources and Environment (REN) and the Human Settlements and Services (HSS) Areas and the International Medical Association for the Study of Living Conditions and Health (AMIEV) was held in 1979 to promote collaboration on HCS planning. Development of the submodels to improve their 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 may be possible in case study regions of the Regional Development (RD) Task and the Management and Technology (MMT) Area. Collaboration with the System and Decision Sciences (SDS) Area on 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 will be continued. A workshop is planned for late 1980.

Activities 1981-1984

In 1981 the Task will initiate a new phase of activity extending through 1984 that will include:

- Dissemination of the experience gained through 1980
- Further development of the modeling approach to help in health care planning
- The study of possibilities for new work or a new Task

TASK RESOURCES

Budget and Person-Months

	1975-1978[a]	1979	1980	1981	1982	1983	1984	Through 1984
AS (millions)	6.54	2.5	2.5	2.5	2.5	2.5	2.5	21.54
Person-Months	126	40	40	40	40	40	40	366

[a]Expenditures.

Internal Collaboration

- System and Decision Sciences Area, Task 3
- General Research, Task 2
- Management and Technology Area, Task 3

Expected External Collaboration

- Institute of Socio-Economic Development Research, Vienna, Austria
- University of Montreal, Department of Informatics and Operational Research, Montreal, Canada
- Institute of Medical Bionics, Bratislava, Czechoslovakia
- Institute of Postgraduate Training of Physicians, Bratislava, Czechoslovakia
- Institute of Social Medicine and Organization of Health Services, Prague, Czechosovakia
- Institute of Medical Data Processing, Statistics and Biomathematics (ISB), Munich, FRG
- Humboldt University, Department of Scientific Theory and Organization, Berlin, GDR
- Ministry of Health and the Environment, Leidschendam, the Netherlands
- Institute of Control Problems, Moscow, USSR
- Central Research Institute of Social Hygiene and Public Health, Moscow, USSR
- Operational Research Unit, Department of Health and Social Security, London, UK
- South Western Regional Health Authority, Bristol, UK
- World Health Organization (WHO)

HUMAN SETTLEMENTS AND SERVICES AREA

Task 3: MANPOWER ANALYSIS
(exploratory)

OBJECTIVES AND EXPECTED RESULTS

The principal objective of the Manpower Task is the analysis of problems related to changing labor force composition, the behavior of urban labor markets, and shortages of manpower in critical service sectors. Models and theories will be constructed to explain manpower supply and demand interactions and their effect on skilled/unskilled labor intensities and spatial employment patterns. The focus will be on national and sectoral problems of manpower in the more-developed countries. For this work, the Manpower Analysis Task will draw on the results of the Health Care Task, the Population, Resources, and Growth Task, and the Urban Change Task, where related problems are being analyzed.

Expected Results 1980

- A health manpower study of physician manpower
- An analysis of labor force composition that emphasizes the processes of entry, withdrawal, and occupational/regional transitions at the national and urban levels

The former activity will be carried out in collaboration with the Area's Health Care Task; the latter topic will be studied in collaboration with the Area's Urban Change Task, IIASA's Regional Development (RD) Task, and the System and Decision Sciences (SDS) Area.

Expected Results 1981-1984

- A model describing the dynamics of changing population compositions and retirement patterns in near zero growth populations and their consequences for the service sector
- An analysis of urban labor markets in the Nordic countries
- A study of contemporary socioeconomic influences on labor force participation, the changing role of women, and recent shifts in people's attitudes toward work and their consequences for labor productivity

ACTIVITIES

Point of Departure

A number of experts in the manpower field were brought to IIASA as consultants in 1978 and 1979 to help outline this Task. Several exploratory papers have been published and important contacts have been established with external institutions such as the Employment Program of the International Labour Organisation (ILO).

Activities 1980

Work on physician manpower will be pushed forward in 1980. Preliminary contacts with potential national collaborating institutions working on manpower problems will be established. Research on the dynamics of manpower supply will be launched.

Activities 1981-1984

With the establishment of contacts with external policy making institutions and problems, the activities of this Task in 1981 will turn to collaborative applied research focusing on the following problems: shortages of manpower in near stationary national populations; the functioning of urban labor markets in the Nordic countries; and the impacts of the changing socioeconomic influences on labor supply and productivity.

Workshops, interviews, and exchanges of personnel will be the principal means for maintaining an applied perspective for this research.

TASK RESOURCES

Budget and Person-Months

	To 1978	1979	1980	1981	1982	1983	1984	Through 1984
AS (millions)	—	—	0.6	?	?	?	?	—
Person-Months	—	—	8	?	?	?	?	—

Internal Collaboration

- System and Decision Sciences Area, Task 2
- General Research, Task 2

Expected External Collaboration

- Department of Economics, Tampere University, Finland
- Woodrow Wilson School of Public Affairs, Princeton, New Jersey, USA

HUMAN SETTLEMENTS AND SERVICES AREA

**Task 4: URBAN CHANGE
(1979-1984)**

OBJECTIVES AND EXPECTED RESULTS

Declining rates of national population growth, varying levels of regional economic activity, and shifts in the migration patterns of people and jobs are characteristic 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 demoeconomic change and its major causes and consequences in developed countries, and to develop better methods for understanding and forecasting the consequences of alternative scenarios for demographic and economic change in postindustrial societies.

Expected Results 1980

- Construction of a demoeconomic model of human settlement dynamics for metropolitan areas in postindustrial society
- Follow-up of the case study on Sweden and initiation of other case studies (in the GDR, Japan, Poland, the US, and the UK)
- A study of industrial development and regional-urban change

Expected Results 1981-1984

- Completion of an urban demoeconomic model and its application
- Conclusion of case studies on urban change in such countries as Sweden, the GDR, Japan, Poland, and the UK
- 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 uses the empirical findings of the previous Human Settlement Systems Task and the methodology of the previous Migration and Settlement Task. It draws on the complementary natures of these earlier research Tasks to elaborate the new focus on urban-metropolitan changes in postindustrial societies. It relies on the international network of collaborating scholars and institutions established by the two previous research Tasks. Periodic workshops and conferences will be held to foster the exchange of data, models, and experiences. This task is partially supported by external funds (ICSAR project: Industrial Location and Regional Urban Change).

The Task is concerned with the effect on urban areas of changes in the location of production activities and population. Changes in the location of production activities (with their consequent changes in labor demand) respond to institutional and market forces from outside the urban region or the nation. Changes in labor supply, however, can be responsive to factors originating within the urban region.

The Task seeks to include three types of studies: studies of urban changes arising from the interactions between the urban economy and the rest of the world (i.e., the rest of the national economy and world markets); studies of urban changes as a consequence of the interaction of the urban economy with other urban regions in the country; and studies of changes that alter the internal structures of urban areas.

Activities 1980

Work will be continued on the model of urban dynamics with special emphasis on migration, employment change, and labor force participation. At the same time, in collaboration with the System and Decision Sciences (SDS) Area and the Regional Development (RD) Task, efforts will be made, starting with the Swedish case study, to complete the first version of a model capable of simulating the impact of changes in world markets on regional industrial specialization, on population flows, and on employment patterns of small, open economies. A workshop will be held for the assessment of the model in late 1980. Other case studies will then be initiated.

Activities 1981-1984

Further elaboration of the human settlement model will be undertaken from 1981 to 1984, and efforts will be made to extend the model to include resource and service demand submodels for health, manpower, and housing, as well as to link the model with the policy institutions identified in the case studies. This research will be carried out in collaboration with the SDS Area, the RD Task, and the Manpower Analysis Task.

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

TASK RESOURCES

Budget and Person-Months

	To 1979	1979	1980ᵃ	1981	1982	1983	1984	Through 1984
AS (millions)	—	2.0	2.0	2.5	2.5	(2.5)	(2.5)	9.2 (14.2)
Person-Months	—	35	40	40	40	(40)	(40)	155 (235)

ᵃIncluding AS 188,000 from external funds.

Internal Collaboration

- System and Decision Sciences Area, Task 2
- General Research, Task 2

Expected External Collaboration

- Institute for Geography and Geoecology of the Academy of Sciences of the GDR, Leipzig, GDR
- Gakushuin University, Tokyo, Japan
- Institute of Geography and Spatial Organization, Polish Academy of Sciences, Warsaw, Poland
- Institute for Systems Studies, Moscow, USSR
- Stockholm School of Economics, Stockholm, Sweden
- Department of Geography, University of Leeds, Leeds, UK

External Funding

- ICSAR (U.S. National Academy of Sciences program of support for International Cooperation in Systems Analysis Research)

HUMAN SETTLEMENTS AND SERVICES AREA

Task 5: POPULATION, RESOURCES, AND GROWTH
(1977-1984)

OBJECTIVES AND EXPECTED RESULTS

What are the probable resource and service demands caused by 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 urban management problems be eased by reduced urban growth rates? Such questions are part of a larger question of whether population increase will outstrip the growth in food supplies and exhaust the stock of natural resources.

A fundamental problem confronting mankind is that of attaining a balance between population and food. The Task will continue to study the process by which urbanization and economic development affect food demand, and how, in turn, alternative agricultural policies influence urbanization and development. A research team of the HSS Area is analyzing the transition of a primarily rural agrarian economy to an urban industrial-service economy; data from several countries are being used. The initial focus is on spatial population growth and economic development, after which the implications of population growth, urbanization, and economic development for resource/service demands will be studied.

Expected Results 1980

- Deeper investigation of the interdependence between internal migration and technological change in the agricultural sector will continue, stressing the effect of alternative agricultural technologies on migration and human settlement patterns.
- Applications of models of urbanization and development constructed during 1978 and 1979. The applications will seek to make models policy-relevant by fitting them to several case-study nations.

Expected Results 1981-1984

Demand for resources and services increases with economic development and growing affluence as well as with population growth. The Task will examine the relationship between resource/service demands and population and economic development, focusing in particular on land, energy, water resources, and health and educational services. For this examination we will

- 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 national case studies, a global assessment of urbanization and economic development and demands for resources and services will be carried out in 1982 and 1983.

ACTIVITIES

Point of Departure

During 1978, case studies were initiated in Mexico, Poland, and Kenya. A task force meeting was held on the Mexican Case Study and the analytical framework was completed. A preliminary version of a demoeconomic model for Poland was developed, and a detailed analysis of rural-urban migration and economic development in Kenya was concluded.

Important contacts have been made and maintained with groups doing similar or complementary work in the International Labour Organisation (ILO), the World Bank, the Population Division of the United Nations, the Population Council, the Mexican Ministry of Human Settlements, the Institute of Econometrics in Katowice, Poland, and the Food Research Institute at Stanford University in the United States.

Activities 1980

In 1980, work will be carried further on the study of urbanization and economic development. Models will be applied to two more national case studies: Sweden and Japan. At the same time, a deeper understanding will be sought on the interactions between rural-urban migration and technological changes in agriculture. The final report on the Mexican Case Study will be presented to the Mexican national authorities. A workshop, jointly sponsored with the System and Decision Sciences Area, focusing on general equilibrium modeling will be held late in the year.

Activities 1981-1984

In 1981, research on urbanization and resource/service demands will begin. A resource/service demand model will be linked to the demoeconomic model. This work will be carried out in collaboration with the Resources and Environment (REN) Area.

An international conference on population, resources, and growth will be held in late 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 begins to take place in 1982. The results of this work will be published in 1983 and will form the background report of an IIASA "Habitat" conference.

TASK RESOURCES

Budget and Person-Months

	1977-1978[a]	1979	1980	1981	1982	1983	1984	Through 1984
AS (millions)	4.77	2.2	2.5	2.5	2.5	2.5	2.5	19.47
Person-Months	78	40	40	40	40	40	40	318

[a]Expenditures.

Internal Collaboration

● System and Decision Sciences Area, Task 3

Expected External Collaboration

● College of Mexico, Mexico City, Mexico
● Institute of Econometrics, Academy of Economic Science, Katowice, Poland
● Stanford Food Research Institute, Stanford, California, USA
● Department of Economics, Duke University, North Carolina, USA
● Stockholm School of Economics, Stockholm, Sweden
● Institute of Economics and the Organization of Industrial Production, Novosibirsk, USSR

APPENDIX: The Human Settlements and Services Area's
International Advisory Committee

Prof. Mark BLAUG
Research Unit in the Economics
  of Education
University of London
  Institute of Education
Malet Street
London WC1E 7HS
UK

Prof. Walter STÖHR
Interdisciplinary Institute for
  Urban and Regional Studies
University of Economics
Hasenauerstrasse 42/8
A-1180 Vienna
AUSTRIA

Prof. Kazimierz DZIEWONSKI
Institute of Geography and
  Spatial Organization
Polish Academy of Sciences
Krakowskie Przedmieście 30
00-927 Warsaw
POLAND

Prof. Dr. Horst STROBEL
University for Transport Studies
  "Friedrich List"
Friedrich List Platz 1
801 Dresden
GDR

Dr. William GORHAM
President
The Urban Institute
2100 M Street, NW
Washington, D.C.   20037
USA

Dr. Léon TABAH
Director
Population Division
United Nations
New York, New York   10017
USA

Prof. Koichi MERA
Institute of Socio-Economic
  Planning
The University of Tsukuba
Sakura, Ibaraki 300-31
JAPAN

Dr. Dimitri VENEDICTOV
Deputy Minister of Health
Rachmanovski per 3
Minzdraw
Moscow
USSR

Prof. Theodore W. SCHULTZ
Department of Economics
The University of Chicago
1126 East 59th Street
Chicago
Illinois 60637
USA

Prof. Tatiana ZASLAVSKAYA
The Institute of Economics
  and Industrial Management
The Siberian Branch of the
  USSR Academy of Sciences
Novosibirsk 630 090
USSR

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