



# TRANSPORTATION SYSTEMS ANALYSIS

HORST STROBEL, editor  
OCTOBER 1976  
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Report of a IIASA Planning Workshop  
Schloss Laxenburg, Austria,  
16-20 February 1976

Views expressed herein are those of the contributors and not necessarily those of the International Institute for Applied Systems Analysis.

The Institute assumes full responsibility for minor editorial changes, and trusts that these modifications have not abused the sense of the writers' ideas.

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## Table of Contents

INTRODUCTION . . . . .	1
Aim of the Workshop . . . . .	1
Working Plan . . . . .	1
ALTERNATIVES CONSIDERED. . . . .	2
Alternative I . . . . .	2
Alternative II . . . . .	2
Alternative III . . . . .	3
PARTICIPANTS' EVALUATION OF THE ALTERNATIVES . . . . .	3
THE PROPOSALS . . . . .	4
Proposal 1: Transportation, Communication and Integrated Regional Development . . . . .	4
Proposal 2: Environment- and Resource-Conserving Urban/Regional Transportation Systems . . . . .	8
THE NEXT STEPS . . . . .	13
Appendix 1. Methodology Transfer Proposal: Applied Dynamic Simulation for Urban Traffic Management . . . . .	14
Appendix 2. Agenda . . . . .	17
Appendix 3. List of Participants . . . . .	18



## INTRODUCTION

### Aim of the Workshop

In 1975, IIASA decided to co-sponsor the IFAC Workshop on Optimization Applied to Transportation Systems, scheduled to take place in Vienna from 17 to 19 February, 1976.

Professor Howard Raiffa, then Director of IIASA, proposed that the Institute take advantage of the presence in Vienna of transportation experts by holding a small meeting at IIASA. The meeting would identify possibilities for both future in-house transportation research activities and external cooperation with national research institutes in the countries of IIASA National Member Organizations (NMOs).

### Working Plan

The IIASA Planning Workshop was held at Laxenburg, Austria, on 16 and 20 February, 1976. On 16 February, the Planning Workshop was devoted to:

- Presenting a survey of IIASA's general research strategy established in 1975, and the transportation research work developed to date at IIASA;
- Discussing the objectives of possible future research activities in the field of transportation;
- Presenting participants' contributions that deal with their proposals and ideas for transportation research.

On the second day of the IIASA Planning Workshop, held on 20 February, the participants dealt with:

- Evaluating the written comments, the informal discussions, and the scientific results of the IFAC Workshop;
- Drafting proposals for future transportation research activities at IIASA;
- Discussing these proposals.

The IFAC Workshop, held in Vienna on 17 to 19 February, provided the participants of the IIASA Planning Workshop with opportunities for informally discussing their ideas and making proposals. Moreover, during this three-day period, the participants of the IIASA Planning Workshop prepared written comments on the research alternatives presented on 16 February at the IIASA Workshop.

## ALTERNATIVES CONSIDERED

Discussion of possible future transportation research activities at IIASA was started with the presentation of guidelines for dealing with the following:

- The IIASA general *research plan* developed in 1975;
- *Past and present* transportation-related research activities at IIASA;
- *Constraints and objectives* for possible future transportation research activities at IIASA--for example, significance of the proposals to the NMO countries; feasibility of the proposals with the modest research resources available to IIASA; relevance of the proposals to IIASA; ability of the new proposals to be integrated within the IIASA research plan;
- Formulation of *research alternatives* as a basis for detailed discussions.

The following fundamental *alternatives* ranging from *global issues* over *universal/regional* research subjects to *universal/local (urban)* topics were presented to the participants for consideration, discussion, and evaluation.

### Alternative I

*Transport and urban development is a universal/local problem, integrating over the existing four research areas at IIASA that should be part of the Human Settlement and Services research area.*

The *objectives* are:

- Identifying the most advanced techniques for urban development and solution of urban traffic problems, taking into account such environmental impacts as air and noise pollution, resource conservation--e.g., energy and land-use, the role of new technologies, etc.
- Investigating these techniques by means of computer simulation, case studies, etc.

The expected results include contributing to IIASA's clearing-house function; and providing the NMOs with decision aids for urban development and traffic improvement strategies.

### Alternative II

*Transport and integrated regional development (IRD) is a universal/regional problem that should be a part of IIASA's IRD program.*



The objectives are similar to those for Alternative I, but more stress should be on facility siting, land-use aspects, socio-economic factors, etc.

The expected result is that the NMOs will be provided with advanced techniques as decision aids for IRD policies.

### Alternative III

*Transport of energy resources (e.g., oil, gas, and food) needed for transport is a global problem that should be a part of IIASA's Energy Research program.*

The objectives are evaluation of energy- and environment-conserving modes of transportation on a worldwide scale (e.g., pipe-line transport as opposed to super tanker oil transport, oil spills by super tanker accidents); transportation demand forecasting on a worldwide transportation systems; and transport and international trade.

The expected result is the comparison of development policies for worldwide transportation systems.

### PARTICIPANTS' EVALUATION OF THE ALTERNATIVES

The participants' written comments made on specially prepared evaluation sheets and the informal discussions are summarized below.

Almost all the participants agreed that Alternatives I and II should be considered highly significant for NMO countries. Alternative II should represent an important--perhaps the most important--part of IIASA's IRD program since, in principle, it is impossible to deal with regional development without considering problems of transportation.

The work in the direction of Alternative II should take into account the interrelationship between *transportation* and *communication*, and should focus on *socio-economic factors*. The work should be done mainly on an in-house basis; several participants agreed that 20 to 25 percent of the research resources of the IRD program should be devoted to transportation-oriented research activities.

Moreover, it was suggested that the work be oriented along the guidelines of Alternative I toward the problems of *technology assessment* and *transportation management*, with special attention being given to environmental and resource (energy) impacts on existing or planned urban transportation systems. In this sense, research proposals along the lines of Alternative I could represent a technology- and management-oriented complement to the socio-economic studies to be carried out within the framework of Alternative II.

It was felt that the activities connected with Alternative I should contribute to IIASA's clearinghouse function. Thus, those activities would be feasible with modest in-house research resources, i.e., the full-time services of a small number of senior scientists at IIASA. One of their tasks should be to continue the activities for linking together a network of research centers in NMO countries, with IIASA acting as an *international information exchange agency*.

Alternative III did not receive widespread support from the participants. Although the problems involved in this area are relevant and of interest to IIASA, it was felt that they are significant to only large NMO countries with very large and powerful transportation research centers. It was not possible to reach an agreement concerning the usefulness of IIASA research work along the guidelines of Alternative III. Therefore, global transportation problems have *not* been considered in the final proposals.

The participants were asked to supply additional alternatives. One proposal stressed the problems of large organization in transportation; however, this did not find support among the discussants.

#### THE PROPOSALS

As a result of the discussion of the three alternatives outlined above, the Workshop made two proposals for future work on transportation systems at IIASA.

Proposal 1: *Transportation, communication and integrated regional development (as a part of the IRD program);*

Proposal 2: *Environment- and resource-conserving urban/regional transportation systems (as part of the Human Settlements and Services research area and in close co-operation with the other IIASA research areas and the IRD program).*

#### Proposal 1: Transportation, Communication and Integrated Regional Development\*

##### Motivation

The current IIASA research plan includes a strong commitment to the IRD program. The extent to which a region is effectively integrated and the strength of its linkages with the rest of the nation and the world depend in large part on the characteristics

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\* This section has been prepared by R. MacKinnon, based on the discussions at the IIASA Planning Workshop.

of the underlying transportation and communication systems. The IRD program implies a major effort in transportation research. It is the purpose of this proposal to make recommendations concerning the appropriate focal points and methods that should be adopted to ensure the effectiveness of transportation research in this program.

### Objectives

The provision of transportation can be thought of as both a public service and a strategic means for controlling the configuration and magnitude of regional development. One of the objectives of transportation research within the IRD program should be to determine guidelines for designing transportation land-use plans that provide high levels of access to employment, commercial, social, and recreational activities. Given the mutual interaction between activity location and transportation, the degree to which transportation can be used as a control variable to guide the physical and economic development of a region should also be examined. Thus, the importance of transportation factors in influencing the location of economic activities of all types as well as housing should be investigated.

The expected results could be of several types. The study would provide a sounder basis for evaluating the importance and the character of transportation consequences, on a regional scale, in a variety of different political and economic contexts. In particular, emphasis would be given to studying the special problems of transportation in market, socialist, and less developed economies. For example, what savings are possible if the location of industrial and transportation facilities is jointly planned? Industries and other activities that are particularly sensitive to transportation costs would be identified. In addition the following topics would be investigated: the consequences of the no-cost characteristics of transportation systems; the substitutability of transportation and other activities; and the distribution of benefits and costs, both spatial and social, of changes in transportation systems.

### Research Plan

It is proposed that research on the role of transportation in regional development be structured in two phases. The first phase would consist in providing evidence on the relative importance of transportation decisions in structuring regional development. The second phase would be directed toward developing integrated simulation, planning, and evaluation models, and applying them in specific regional contexts.

Phase 1: It is frequently argued that transportation can be used as an important control variable to influence the magnitude and configuration of regional development. This is widely

accepted for two reasons. First, in all countries, major components of the transportation system are under the direct jurisdiction of government agencies. Thus, many decisions regarding both the physical infrastructure and the operations of transportation systems are directly controllable. In some situations, the control is less direct, but in all cases government regulatory agencies, at the very least, strongly condition the operational environment of transportation systems.

More contentious is the degree to which these transportation variables can be effective in influencing the form and magnitude of regional development. There are theories, some empirical evidence, and a widespread belief that transportation can be used in this way, but the evidence is fragmentary and somewhat inconclusive. More precisely, can we document how important transportation has been in these developmental contexts?

As the initial phase of transportation research in the IRD program, it is proposed to examine the degree to which the attainment of specific goals has been facilitated by transportation planning decisions. What goals have been identified as indirectly controllable through transportation decisions? What have been the measurable effects of transportation decisions in terms of the attainment of these objectives? What supporting controls have been used as complements to enhance the effectiveness of transportation decisions? How does this effectiveness vary depending on the institutional, economic and physical environment of the region? What specific economic and social activities are particularly susceptible to control by transportation decisions? Which modes of transportation have been demonstrated to be most influential in goal attainment? What have been some of the unintended and unanticipated consequences of transportation decisions? The research strategy for this initial phase of the proposed research task would consist in examining retrospectively a number of carefully selected case studies.

Case studies would be chosen so as to identify the effects of transportation on a broad range of economic and political environments. Reports by the World Bank and the Brookings Institution, for example, have documented experiences in this area in a number of less developed countries. Attempts to stimulate growth in relatively backward areas of economically advanced countries (as for example, in the Appalachia region of the US, and in the Atlantic Provinces in Canada) have also been studied. Some after-the-fact evaluation of urban and regional transportation plans is currently underway in the UK. Analyses would be made of the transportation impacts in the three regions being studied by the Resources and Environment group at IIASA--the GDR, the Rhône-Alpes region in France, and the State of Wisconsin in the USA. In addition to the published literature and government documents on this subject, it is anticipated that direct discussions and/or correspondence with members of government agencies would be required to provide convincing evidence of the nature and importance of the role of transportation in regional development.

Complementing this essentially inductive aspect of the first phase would be an extensive review of the theoretical and technical literature on the regional consequences of transportation systems. It is anticipated that this survey could be undertaken with modest resources in a relatively short period.

The final product of Phase 1 would be a critical state-of-the-art survey of the role of transportation in regional development planning. This document would include not only a summary and critique of the methodologies and theories that have been applied to this research area, but also a structured collection of empirical evidence on the subject. The estimated time needed for Phase 1 is the equivalent of one full year of a senior research scholar.

Phase 2: Based on this survey, a firm decision would then be made regarding the magnitude and character of the transportation research effort in the IRD program. Clearly, some transportation research is needed. Transportation as a public service is an important component of any regional planning activity. Insofar as transportation is judged to fundamentally affect the development of other activities in complex ways, the transportation research effort would be proportionately larger. It is anticipated that a major effort would be directed toward developing a *family of policy-oriented simulation models*, in cooperation with other researchers of IRD programs and IIASA scholars in the four research areas. In conjunction with local researchers, these models could then be applied to actual regional planning situations--for example, the Lublin-Vistula in Poland, and the southwestern regions of the USA.

The demands for transportation services are largely determined by the distribution of population and economic activities. These distributions themselves can be strongly conditioned by transportation decisions. Thus, transportation models would necessarily be linked, in an iterative way, to the present spatial demographic and econometric modeling activities of the Human Settlements and Services research area at IIASA. Similarly, the sensitivity of energy consumption to different transportation plans and technologies would necessitate a link to the models developed in the energy research program. These and other models would aid government agencies in experimenting with different policy options (of transportation and non-transportation types), different technological-price combinations, different levels of supply and demand, etc. It will be necessary to limit the detail of these models to a level that is commensurate with data availability, computational and technical constraints, and our level of theoretical understanding of the complex system interrelationships.

The empirical simulation and statistical models would be complemented in a modest way by *qualitative models of a theoretical type* that either help to structure the nature of the numerical models or, perhaps, more importantly, to provide broad guidelines for developing regional policies.

In view of the complex set of consequences arising from IRD planning decisions, special attention should be paid to applying and extending *evaluation methods* that can deal with multiattribute systems. This activity would build directly on research already completed by the IIASA Methodology project.

Some effort should be devoted toward developing *integrated location and transportation planning models of an optimization type*. Here, too, important IIASA methodological contributions in linear and non-linear programming approaches, decomposition and hierarchical control methods would be employed. Such normative models are particularly appropriate in centrally-planned economies, and may also be relevant to mixed economies in identifying the implied costs of inadequate planning.

The manpower needs for Phase 2 are clearly difficult to estimate at this stage, but it is anticipated that perhaps 20 to 25 percent of the research effort of IRD program would have a strong transportation orientation.

#### Closure

In summary, transportation research must play a strategic role in any IRD research program. Moreover, it should perform a critical integrative function, cutting across many, if not all, research areas at IIASA. In particular, transportation applications have been in the forefront of many important methodological developments and their applications. It is anticipated that many scholars from the System and Decision Science area would make important contributions to the proposed transportation activities in the simulation, theoretical, evaluation, and planning models suggested above. Clearly, a strong focus on the role of transportation systems within the context of regional development would enhance the role of IIASA as an information exchange center. The Workshop strongly advocates setting up a network of research institutes and individual scholars and planners with strong interests in this area.

#### Proposal 2: Environment- and Resource-Conserving Urban/Regional Transportation Systems\*

##### Motivation

All IIASA NMO countries are faced with serious urban and regional traffic problems characterized by an incredibly large number of accidents and fatalities--i.e., a decrease in traffic *safety*; an increase in time lost as a result of congestion--a decrease in *mobility*; the endangering of the urban *environment* by

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\* This section was prepared jointly by Horst Strobel and S.N. Baibakov, based on the discussions of the IIASA Workshop.

increasing levels of air and noise pollution, building vibrations and visual intrusions; and the increased corruption of *resources* in terms of energy (fuel consumption) and land used for traffic areas.

These *safety, mobility, environmental and resource* problems play a significant role in any decision process on either the urban, regional, or national level that deals with the restructuring of a large number of urban cities built up over the last centuries, especially in Europe, or with the establishment of development plans for new urban areas and regions. Thus one can state that most of the large national transportation research centers are almost exclusively interested in problems of their own countries; and there exists an *information gap* with respect to advanced planning methods and the experiences encountered in different countries.

Thus, there are possibilities for most of the NMO countries to learn from each other by means of comparative case studies. For example, in the USA and in most market economy countries, urban transportation is mainly oriented toward the use of the private car. But the problems caused by the increased use of the private car have created a certain positive change in the way of thinking with respect to supporting activities for improving existing and developing new public transportation systems. In the USSR and in most socialist European countries, public transportation is favored. In these countries there is also a remarkable increase in the use of motorcars in urban areas that has caused, or will cause, problems similar to those mentioned above, if future development is not carefully controlled.

An information gap with respect to transportation and urban development policies also exists between the industrialized and the less developed countries; especially the latter, characterized by fast growing cities--e.g., San Paulo, Bangkok--are faced with tremendous traffic problems. IIASA is considered a favorable place to contribute to the closure of this information gap.

#### Objectives, Subject and Expected Results of Proposal 2

The main aim of this research task should be to contribute to IIASA's *clearing house function* through the use of the Institute as an *international information exchange agency*. This would be done by creating a network for international cooperation among research centers in the NMO countries and international organizations such as members of the United Nations family--in particular, the Economic Commission for Europe (ECE), the Organisation for Economic Cooperation and Development (OECD), the International Federation of Information Processing (IFIP), and the International Federation of Operational Research Societies (IFORS).

Such activities can be developed with modest in-house research resources--one senior scientist full-time at IIASA and several (about 3 to 4) senior scientists spending only several (3 to 4) months a year at the Institute.

The subject of the research work would be to study the complex interrelationship between *urban development policies* and *urban transportation management and technology* with respect to *environment- and resource-conserving urbanism*, thus playing an integrating role over all four IIASA research areas and partly supporting the IRD program.

Urban Development and Urban Transportation Management: The objective of this aspect of the research is to study the role of transportation and traffic management in development policies for the creation of new and the redevelopment of existing cities, taking into account such factors as facility siting, and land-use strategies, as, for example, the construction of new residential areas, parking lots, and freeways. The work should consist in:

- Identifying advanced techniques for a comparative analysis of different urban and transportation development policies;
- Comparing and enlarging these techniques at IIASA;
- Applying these techniques to case studies of urban areas that are comparable with respect to population and size.

The choice of the case studies depends on a careful evaluation of the availability and quality of the data required. Vienna has been considered a possible candidate for a case study. This city seems to have some advantages because of the relative ease of contact between IIASA and the city administration. Moreover, Vienna is comparable in population and size with several other European cities. Already available are case studies of some US cities, e.g., San Francisco, Chicago;\* these could be useful candidates for comparisons with other cities as, for example, Alma-Ata and Leningrad in the USSR.

An expected result of this phase of Proposal 2 is to provide decision makers in urban or national governments with advanced techniques for judging different transportation-oriented urban development policies.

Therefore, urban and national government agencies are the expected users of the results and the possible supporters for the IIASA work (by means of external funds).

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\* See proposal by J.L. Schlaefli in Appendix I.



Urban Development and New Technological Options: In the past, new technologies such as the steam engine, the electric motor, and the jet engine created breakthroughs to entirely new modes of transportation, resulting in fundamental changes in the structure of regions and cities and the quality of urban living. It seems reasonable to ask whether the fundamental new technologies of our age, e.g., modern computer, automation, propulsion, guideway and vehicular technology, could contribute to a new breakthrough in urban transportation leading to new safety standards, a higher level of transportation services, a reduction in the consumption of resources (energy, land), and protection of the environment from air and noise pollution, etc., and a decrease in operating costs.

There are demonstration projects of completely new automated public transportation systems in several countries as, for example, in France, the Federal Republic of Germany, Japan and the USA. The Automated Guideway Transit (AGT) Systems, which are supposed to be able to create this breakthrough, are in the stage of development. But there is considerable controversy concerning the possible future of these new modes of urban and regional transportation with respect to the following: social and community impacts of the AGT systems; integration of the AGT systems in existing or planned transportation systems and urban structures; public acceptability; safety, reliability, and service dependability; and the effects of the AGT systems on crime and vandalism.

A systems analysis approach is needed to assist decision makers in urban and national governments in evaluating the possibilities and limits of the AGT systems with respect to the application of the systems in their cities. International cooperation is important, particularly at a very early stage since, at present, only a small number of highly industrialized countries are--or will--be able to develop these new systems; at a later stage, they could also be applied to cities in other countries.

IIASA should play its clearinghouse role in this technology assessment problem by preparing an in-depth state-of-the-art survey about these AGT systems; by identifying advanced techniques, i.e., computer simulation programs for answering and evaluating the different impacts of such new systems; and by using these techniques in case studies for urban cities in the East and West. City and national government agencies are likewise the expected users of the results of the work.

#### Working Plan

The proposed research subject should be considered a continuation of Task 4, Computerized Urban Transportation Systems of the research area of Human Settlements and Services, which will be completed in 1976. This continuation should be done in a much broader context. It is proposed to ensure a certain overlap with the work ending in 1976 and the proposed activities by

starting the new work in 1976 with a workshop on applied dynamic simulation for urban traffic management; this could provide a very valuable and concrete result and will, moreover, provide a possibility for specifying the activities that should follow in 1977. For this workshop, a special proposal has been worked out by J.L. Schlaefli.\*

The proposed workshop would deal with the DHTM (Dynamic Highway Transportation Model) developed in the Stanford Research Institute; this represents one of the most advanced simulation techniques available. The program could be implemented using IIASA's computer facilities; and the practical application of the program from the viewpoints of the decision maker and the computer programmer will be illustrated, using data from case studies of US cities, as for example San Francisco.

The program can then be used by the NMOs either at IIASA, using data from their own cities, or in the different NMO countries

The proposed workshop could, among other things, prepare a more detailed research plan, e.g., with respect to an identification of cities as possible candidates for case studies as described above, either on an external basis whereby all activities are developed in NMO countries, or by using certain small in-house research resources.

If the case studies are judged feasible, then it is proposed to hold at IIASA in 1977 several meetings that would allow an exchange of experience and make recommendations for improving and enlarging simulation techniques and for solving such problems as selections of cases, data collection, and preparation.

Significant initial results for both the management and the technology parts, of Proposal 2 could be expected in the form of a state-of-the-art survey, to be completed by the end of 1978 if the corresponding scientific recruitment problems are solved by the end of 1976. These results would then be present at another workshop on the application of simulation methods for the evaluation of different policies for the development of urban transportation systems connected with city planning in general, to be held at the end of 1978.

### Closure

Along the lines of Proposal 2, effort would be made to coordinate the research activities with models for broader developmental policy issues, to be studied within the IRD program. Thus the physical and economic impacts of changing the management and technology of urban transportation systems would be explicitly

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\* See Appendix 1.

considered. It has been stressed by several participants that the proposed research work would bring together a panel of scholars to cooperate with representatives of selected cities from the East and West in proposing a transport policy strategy for them. This has to be considered a long-term objective which can not be reached within one or two years. On the other hand, the research task described above may be independent of this long-term objective.

#### THE NEXT STEPS

The Workshop participants strongly supported the statement that the Workshop be considered a first step in bringing together transportation research centers for an exchange of information and experience on transportation systems analysis. They agreed to recommend transportation experts and institutions that could play a key role in fostering cooperation.

Participants' comments on a draft conference report were received at IIASA and have been incorporated in the final report.

The Workshop suggested that a final decision be made by the middle of 1976 about including the proposals described above in the 1977 IIASA research plan, so as to ensure continuity in the research work on transportation.

#### Acknowledgments

The editor wishes to thank Professor Howard Raiffa, former Director of IIASA, for his encouragement of the Workshop; Olivia Carydias and Ilse Beckey for their work in organizing the Workshop; and Jeanne Anderer for editorial assistance in preparing this Report.

## Appendix 1

### Methodology Transfer Proposal: Applied Dynamic Simulation for Urban Traffic Management\*

#### The Problem

Transportation in an urban area involves a large system with many interacting elements. To a large extent, approaches to urban traffic improvement throughout the world tend to consider these elements *individually* rather than as a *system*. What is needed is an approach that views an *entire system* of traffic elements and seeks to design and manage the individual elements so that they complement each other and function as a system, with the objective of optimizing total urban area movement and development.

Methodologies that include direct evaluation of technical traffic control and operation recommendations, as well as consideration of the political and administrative actions involved in urban traffic management are essential. Computer simulation can play an important role at IIASA and in the NMOs in developing better understanding of, and solutions for, problems of urban traffic management.

#### Relationship to IIASA Research

Previous research programs at IIASA have recognized the importance of transportation and traffic management; in fact new programs have been developed that assign high priority to contributing to the work of the NMOs in the transportation and traffic management field. Applied systems analysis work that could contribute to solving problems in this area is not readily available. Yet there have been developments that can be taken advantage of now--as, for example, the Dynamic Highway Transportation Model (DHTM). The further development and application of the DHTM to traffic management on the international level could contribute significantly to IIASA's research in this area.

#### The Proposal

It is proposed that *the DHTM simulation tool for evaluating*

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\*Prepared by J.L. Schlaefli.

*traffic management approaches be made operational, and its use demonstrated at IIASA, and in turn, that it be made available for application in the NMOs.* The DHTM is a large-scale simulation model written in FORTRAN IV and, at present, documented and operational on a CDC 6000 series computer. The DHTM technology can be effectively transferred to IIASA through a set of detailed working sessions with potential users. These sessions would be organized and conducted by J.L. Schlaefli and R.C. Sandys, who have been responsible for the development of the DHTM over the past ten years. As envisioned, there would be two types of participants at the technology transfer sessions. First, a group of invitees from IIASA and the NMOs (from 5 to 15 people) to discuss and learn about the structure of the DHTM, its uses, and potential extension. A second group of participants, who would also be members of the first group, should be small (from 2 to 5); they would learn the programming details of the DHTM and actually determine how to develop data, debug and run the simulation

#### Proposed Agenda

- Approximately ten three-hour sessions are envisaged:
- Session 1: Introduction to the Traffic and Transportation Simulation Problem.
  - Session 2: Structure and Techniques used by the DHTM.
  - Session 3: DHTM Case Study Examples--San Francisco, Chicago Traffic Control, Air Quality and Energy Reduction.
  - Session 4: DHTM Data Preparation, Computer Operations, Errors, Data Checking, Interpreting DHTM Results.
  - Session 5: Description and Demonstration of other Traffic Management Tools.
  - Session 6: DHTM Demonstration (Hands On Operation), Attended CDC 6000 Run.
  - Session 7: Definition of IIASA Test Problems (One for Each of the Operational Participants).
  - Session 8: Terminal Operation and DHTM Evaluation. Reprogramming as Necessary. Data Preparation for Test Problems.
  - Session 9: Running Test Problems and Evaluating the Results.
  - Session 10: Reserved for Follow-up Actions on Previous Sessions and Critique.

Expected Results

The first group of participants should acquire a general understanding of why the DHTM is a unique traffic management evaluation tool, and how it has been or could be applied. Hopefully, case studies will be developed in several NMOs. The second group of participants should obtain a detailed knowledge required to run the DHTM on the computer facilities available to IIASA. In this case, IIASA could support NMOs directly in studying traffic management alternatives.

Appendix 2

Agenda

Monday, 16 February

- 10:00 - 10:15 Introduction and Welcome: A. Butrimenko
- 10:15 - 11:30 Transportation Systems Analysis at IIASA:  
Past and Present
- The New Matrix Structure of IIASA's  
General Research Strategy: J. Miron
  - Previous and Present Transportation  
Research Activities: Computerized  
Urban Transportation Systems:  
H. Strobel
  - Concepts for Future Activities:  
R. MacKinnon and H. Strobel
- 13:00 - 13:45
- Transportation Related Work in the  
IIASA Ecology Project: R. Dennis
  - Transportation Related Work in the  
IIASA Energy Project: C. Marchetti
- 13:45 - 17:30 Transportation Systems Analysis at IIASA:  
Proposals for Future Activities
- Transportation and Regional and Urban  
Development
  - Transportation, Management and Tech-  
nology
  - Transportation, Resources and Environ-  
ment
  - Transportation, System (Computer) and  
Decision Sciences
  - Discussion

Friday, 20 February

- 9:00 - 10:00 Japanese Experience in Computerized Traffic  
Control: T. Hawegawa
- 10:00 - 11:30 Transportation Research Alternative for IIASA
- Summary of Research Proposals; Results  
from Previous Discussions: R. MacKinnon,  
H. Strobel, and J.L. Schlaefli
- 13:00 - 15:00 Final Discussion

Appendix 3

List of Participants

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