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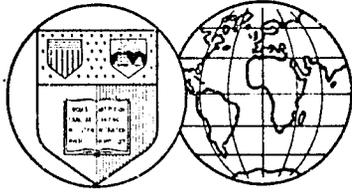
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PROGRAM ON POLICIES FOR SCIENCE
AND TECHNOLOGY IN DEVELOPING NATIONS

PROGRAM ON POLICIES FOR SCIENCE
AND TECHNOLOGY
IN DEVELOPING NATIONS
ANNUAL REPORT
1973-1974

Grantee: Cornell University
Ithaca, New York
Program Director: Edmund T. Cranch
Dean
College of Engineering
Cornell University
Reporting Period: 8/11/73 to 8/10/74

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Part I: OVERVIEW

STATISTICAL SUMMARY

Period of Grant	:	8/11/71 to 8/10/76
Amount of Grant	:	\$580,000.00
Expenditures for Report Year	:	\$104,159.99
Accumulated	:	\$296,137.13
Anticipated for Next Year	:	\$160,000.00

NARRATIVE SUMMARY

The objective of the Grant is to enable Cornell to develop institutional strength in the area of policies for science and technology in developing nations. It was envisioned that the development of teaching and research would stimulate new contributions to knowledge, new opportunities for education in this field, and the development of new capabilities for responding to requests for professional service.

In pursuit of these objectives, Cornell established the Program on Policies for Science and Technology in Developing Nations (PPSTDN). This Program provides opportunities and support for both study and research on science and technology policy in developing nations. It fosters the development of relevant courses, publishes teaching and research materials, and sponsors seminars, conferences and symposia.

Program Focus

Over the past year, PPSTDN's activities have grown substantially. This has resulted in increased Program participation by faculty members, and has enabled PPSTDN to focus on science and technology policy issues in specific problem areas. These areas include:

- agricultural production (particularly food processing);
- industrial production;
- regional development (particularly low-cost housing and transportation policies);
- education (particularly science and engineering at the university level); and
- natural resource management (particularly water).

Within each of these problem areas, researchers are examining several policy issues. These include: demand for technology; supply of technology (sources and control); linkages between producers and users of technology; socio-economic impact of alternative technologies; and institutional infrastructure for designing and implementing national science and technology policy.

Program Activities

The activities of the Program are designed to:

- provide opportunities for graduate study;
- provide research opportunities for students, post-doctoral fellows, and faculty;
- develop new courses;
- publish and disseminate teaching and research materials;
- create, through seminars, conferences and symposia, an environment conducive to the advancement of knowledge in the field; and
- assemble, at Cornell, the capability to respond to requests from developing countries for professional assistance.

Program Accomplishments

Graduate Study Degree Options: The Program has progressed toward the establishment of a formal graduate degree for students of policies for science and technology in developing nations. A proposal for the creation of a new degree option for science and technology policy (S/TP) has been prepared and submitted to the Field of International Development.* The proposal will be considered at the first Field meeting this Fall. If approved, students would be able to enroll in a degree program leading to the Master of Professional Studies in International Development with a concentration in S/TP.

The new degree option would complement existing programs in the Field of Public Policy under which it is possible to receive a graduate minor in S/TP at either the Masters or Ph.D. level.

Courses: As a sequel to the first low-cost housing course which was offered under PPSTDN sponsorship in Spring, 1973, a more specialized seminar, primarily for architects and engineers, was offered in Spring, 1974. It was well received, and under current plans, the two courses will be alternated with one being given each spring. Both courses were developed by a multidisciplinary team of faculty members.**

Low-cost transportation is a new area of Program activity. Work began in early 1974 to develop a course, "Transportation Policies for Developing Nations - With Emphasis on Low-Volume Roads". This course will be offered in Fall, 1974 by

*At Cornell, the term "Field" denotes an administrative unit of the Graduate School in which a student may take a major or minor.

**Franklin J. Ahimaz, Peter S. Chi, Peter Cohen, James Converse, MaryAnn Griffin, David B. Lewis, Henry Richardson, Floyd O. Slate, and Darrell Williams (Note: For the Departmental affiliation of Program Participants, please see pages 59-62).

a team of professors from three departments.* In preparation for the course, PPSTDN sponsored a seminar series (Spring 1974) which brought transportation experts to speak on campus. Simultaneously, the compilation of an annotated bibliography on low-cost transportation was begun. It is due for publication next year.

PPSTDN sponsored a seminar on "Science, Technology and International Relations", taught by Milton J. Esman and Aaron Segal. This course investigated the effects of modern science and technology on international relations, particularly among advanced industrialized countries. Guest speakers lectured on selected topics.

David B. Lewis offered a course on "Advanced Planning Analysis with Selected Applications to Development Problems in the Third World" in Spring 1974. The objective of the course was to enable students of policy planning to develop the capability to use advanced analytical techniques for specific problems of development.

Research: The Program sponsored several research projects. Among the major studies completed were: Toward an Andean Common Market for Science and Technology, by Robert N. Seidel, and Quo Vadis Cybernetic Civilization? National Policies for Science and Technology and Industrial Democracy: A Hypothetical Model for an Industrially Semi-Developed Country, by Karel Stregl.

The Program also supported a number of student research projects which were completed this year. The resulting reports are listed under Publications and Reports, pp. 5-6.

In the area of continuing research, Professors Chi and Griffin are studying housing policy alternatives for squatters in Limon, Costa Rica. They are conducting surveys of the squatters and the inhabitants of public housing in the city. The results of this survey will form the basis for recommendations for an experimental action program to be carried out by local agencies. The field work for this project began in August, 1974.

*Gordon Cummings, Lynne Irwin, and Darrell Williams.

Professor Henry Richardson is continuing his work on basic housing production systems in Ghana. The major objective of this study is to empirically document the structure of different housing production and delivery processes used in urban areas and the institutional and technological constraints which operate on these processes. It is expected that this study would serve as a basis for developing guidelines for formulating national housing policy.

Professors Tom Davis of Cornell and Loretta Good of the University of Wisconsin (Lacrosse) are collaborating on a science and technology policy study in Mexico. They are investigating the effectiveness of alternative policy instruments in influencing the behavior of manufacturing firms. The field work was completed this Summer, and two monographs will be prepared in the Fall 1974. The design of this study will be used as a prototype for a comparative international study of technology choice among manufacturing firms in developing countries.

In support of its research activities, the Program maintains a modest Documentation Center containing materials relevant to science, technology and development. Over the Summer 1974, the entire collection was transferred to a new and more convenient location. New materials which had been forced into storage, due to space constraints in the old location, were catalogued and integrated with the rest of the collection.

Publications and Reports: Over the year, the Program has issued a number of publications and reports; they include:

Publications

Toward an Andean Common Market for Science and Technology, by Robert N. Seidel

Low-Cost Housing for Developing Countries: An Annotated Bibliography 1950-1972, by Floyd O. Slate

Social Injustice and Optimal Space-Time Development: Extensions and an Application to the Minimata Mercury Pollution Case, by Yoshifusa Kitabatake

The Urban Freight Transportation Planning Process:
An Input-Output Approach to a Methodological
Framework, by Kang-Won Lim (published through
the Graduate Field of City and Regional Planning)

Reports

Quo Vadis Cybernetic Civilization? National Policies
for Science and Technology and Industrial Demo-
cracy: A Hypothetical Model for an Industrially
Semi-Developed Country, by Karel Stregl

Unemployment in Jamaica and the Contribution of
the Bauxite-Alumina Industry to the Employment
Problem, by L. George Nelson

Preliminary Study of the Water Resources of the
Atlantic Coast, Costa Rica, by Jorge de la Guardia

The Natural Resource Potential for Regional Development
of Limon Province: A Preliminary Survey, by Cornell-
Costa Rica Team

Diagnostico del Sistema de Educacion Cientifica y
Tecnologia de Costa Rica y Bases Para su Plani-
ficacion a Largo Plazo, by Mariano Ramirez Arias,
Jose Brenes Andre, and Oscar Torres Padilla

Information Management in Development Administration:
On Technology's Promise for Policymaking in
Developing Countries, by Daniel H. Dumas

Other

Directory of Courses related to Policies for Science
and Technology in Developing Nations, 1974-75,
by Nancy Gallant

Seminars: The 1973-74 Seminar Series focused on Program sponsored research. The seminars provided a forum for a review of research results and the exploration of new ideas. These discussions served to help link the Program with the broader Cornell community. The reports of Program participants were complemented by the presentations of several outside professionals who were invited to Cornell to speak on their activities in the area of policies for science and technology in developing nations.

In addition to its regular seminars, the Program sponsored a second, more specialized seminar series, dealing solely with transportation policies for developing countries. These meetings were preparatory to the new course on transportation planned for Fall 1974. The seminars helped to acquaint the Cornell community with transportation policy issues in develop-
ing countries.

Professional Service: In addition to other work, several Program Participants have been active in professional service activities. During the summer 1973, Professor Floyd Slate participated in a Low-Cost Housing seminar at the East-West Center in Hawaii. He was subsequently asked to contribute to a Roving Workshop on Low-Cost Housing in Asia, scheduled for January 1975.

Professors Slate, Cohen and Richardson attended the Third International Symposium on Lower-Cost Housing Problems, held in Montreal, May 1974. There, Professor Slate chaired the session on "Industrialization" (of housing production). Prof. Richardson presented a paper, "Housing Strategies for a Developing Economy", based on his PPSTDN-sponsored research in Ghana.

The entire Low-Cost Housing Team presented a seminar at AID/Washington on the necessity for a multidisciplinary approach to low-cost housing policy.

In the area of education, F.J. Ahimaz has been working with groups in Costa Rica on technical education in that country. One of the groups working at the University of Costa Rica prepared a report on the status of science and engineering education in Costa Rica. The report has been published in Spanish. It includes several policy recommendations.

In the last Annual Report, it was noted that work under a sub-contract from AID for research on science policy in Costa Rica had led to a report on The Natural Resource Potential for Regional Development of Limon Province: A Preliminary Survey. Since then, there have been a number of follow-on activities. In Spring 1974, the Government of Costa Rica convened a "Seminar on the Role of Science and Technology in the Development of Limon". The report was discussed and used as the basis for planning future work in the development of Limon Province. F.J. Ahimaz led a Cornell team (10 members) in assisting Costa Rican counterparts with the development and execution of this seminar. Frequent contact with Costa Rican groups has maintained Cornell's involvement in the province, and PPSTDN expects to continue working there.

Under a purchase-order, AID contracted PPSTDN to revise and update the OST publication, Science and Technology in International Development: A Selected List of Information Sources in the United States. The work on this project was begun in August and is scheduled for completion by November 1974.

Other professional services were provided by individual Program participants. F.A. Long is an advisor to the Ministry of Science and Technology in Korea and headed the U.S. advisory team which went to Korea in November 1973; he also participated in the U.S.-India bilateral Pugwash Conference in January 1974 which analyzed a number of possible areas for collaborative research.

F.J. Ahimaz participated in the inaugural meeting of the new Regional Development Council for Limon Province. Milton Esman, under contract with USAID, visited Brazil to research material for a report on the National Academy of Sciences project there. James Liggett is in Colombia, working at the Universidad del Valle and the Corporacion Autonoma Regional de la Cauca. William Goldsmith participated in evaluating the Office of Education Grant to the Program on Comparative Urbanization at UCLA. Barclay Jones is working on a project in Yugoslavia for the regional development of disaster areas. Jim Converse has been working on a USAID funded project in the disaster relief area of Nicaragua.

Part II: DETAILED REPORT

I. General Background of the Grant

There is a growing realization among scholars and practitioners that science and technology policy (S/TP) is a fundamental component of development policy. A substantial number of developing countries and regional organizations have already established high-level planning groups with explicit charters to prepare S/TP strategies and proposals. Similarly, UNESCO, ILO, OECD, and other international organizations have focused increasing attention on this matter.

Despite the growing interest, however, there are very few schools (either in the U.S. or abroad) offering a comprehensive program of study and research in the area of S/TP.

Responding to the need for a focused effort in this area, Cornell undertook a major commitment to the subject, and with the AID grant established (1971) the Program on Policies for Science and Technology in Developing Nations (PPSTDN). It is jointly sponsored by the Program for Science, Technology and Society, the Center for International Studies, and the College of Engineering. PPSTDN sponsors the development of new courses and seeks to provide opportunities for Cornell faculty and students to engage in collaborative research with S/TP professionals in developing countries.

II. Objectives of the Grant

Objectives Restated

The objectives stated in the contract were to:

increase...competence and breadth of interest on problems of science, technology and public policy relevant to developing nations...;

produce a body of trained people, knowledgeable in the application of science and technology to societal problems and desirous of working with groups within developing nations on these efforts;

produce a body of new research-based knowledge relevant to this subject (science and technology);

study the policies and practices which influence the development of indigenous science and technology in developing countries, and the ways in which this as well as imported science and technology can, by appropriate adaptation, be applied to the social and economic development of these countries;

make in-depth research and case studies, involving the joint participation of personnel from both Cornell and the developing nations;

identify areas where the lack of information or analysis is a crucial limiting factor to establishment of rational policies by the less developed countries...;

provide...a "core faculty" and coordinating center around which expanding efforts will arise and attempts will be made to solicit support for and to maintain a common, coordinated approach to problems of science and technology policy...; and

develop a central library of reference material on science policy.

Review of Objectives

The contribution of PPSTDN to the increasing capabilities in S/TP at Cornell is being accomplished primarily through course development and research. To date, five new courses have been created and two more will be taught for the first time in 1974-75. These courses deal with selected problems, potential solutions, and the relationship of policy to other

aspects of development -- particularly the social and economic consequences of S/TP decisions. Through these courses, the Program encourages students, especially those from LDC's, to study science and technology policy and seeks to prepare them to deal with projects and problems in the field.

By sponsoring carefully selected research projects, the Program has made it possible for a number of scholars to extend their professional competencies into the field of science and technology policy. Typically a faculty member in a relevant discipline such as engineering or education will have worked almost exclusively on U.S. domestic problems. Through research sponsorship, the Program has been able to encourage a number of such individuals to expand their scope of professional interest to include S/TP problems in developing countries. In other cases, Program sponsored research has enabled scholars already engaged in the problems of developing countries, to extend their work to S/TP.

As an outgrowth of the research activities, the Seminar Series enables Program participants to report on their work. It also provides a forum for professionals from outside the University to discuss their projects with Cornell faculty members and students.

The activities of the Program have been developed to meet the objectives stated above. Through course development, research, seminars, in-depth case studies, and publications, PPSTDN is enhancing Cornell's competence in the area of science and technology policy and providing an opportunity for students and faculty to become more expert in the field. Through its linkages with development institutions and organizations outside the University, the Program is assisting professionals working with science and technology policies in developing countries.

III. Accomplishments

Degree Programs

The Program has made substantial progress toward the establishment of a formal graduate degree for students of policies for science and technology in developing nations. More than a year of preparatory work culminated in May when the PPSTDN Executive Committee voted to apply to the Field of International Development for the creation of a new degree option for science and technology policy.* The proposal has been prepared and submitted for consideration at the first Field meeting this Fall. If approved, students would be able to enroll in a degree program leading to the Master of Professional Studies in International Development with a major concentration in Science and Technology Policy. A unifying element in the new option would be a two-semester seminar sequence: "Policies for Science and Technology in Developing Nations" and "Science, Technology and Development". These basic courses would be complemented with both more specialized offerings related to S/TP and others drawn from the general core of the program.

This new degree option would complement existing programs under which it is already possible to minor in S/TP at either the Masters or Ph.D. level.

Courses

The Program seeks to foster the expansion and enrichment of course offerings in areas related to science and technology policy. This is accomplished by course development grants individual professors or teams of professors who wish to prepare new courses related to S/TP or to modify existing courses to make them more relevant to this topical area. The new courses offered in 1973-74 are described below.

*At Cornell, the term "Field" denotes an administrative unit of the Graduate School in which a student may take a major or minor.

Low-Cost Housing for Developing Nations - Workshop for Physical Planning, Site Selection and Design. This was a new course, offered for the first time in the Spring semester of 1974. It was offered primarily for architects and engineers, and dealt specifically with the technical aspects of low-cost housing. The course was developed to complement the policy perspective approach of the first low-cost housing course given in Spring 1973. Three faculty members organized and taught the course.* The sixteen students who took it were organized into four study groups; each worked on a particular problem in a specific country. The project topics were:

design of earth houses to better withstand earthquakes in Iran;

housing development plan for resettling squatters in Limon, Costa Rica;

housing development plan for Tema, Ghana;

redevelopment plan for housing in the Lyari area near downtown Karachi, Pakistan.

Although PPSTDN sponsored development of this course, no funding was required. It was a direct outgrowth of the first low-cost housing course and was built on the experience of the faculty, both in leading a multidisciplinary course and in working with low-cost housing in developing countries.

*Floyd O. Slate, Henry Richardson, and Peter Cohen.

Science, Technology and International Relations. This course was offered in the Spring semester 1974, through the Government Department and the School of Business and Public Administration. It was taught by Milton J. Esman and Aaron Segal. The course investigated the effects of modern science and technology on international relations, especially among the advanced industrialized countries. In particular, it focussed on the international implications of the science policies of several major powers (among them, Japan, the USSR, and the European Economic Community) and illustrated these relationships by exploring problem areas such as arms control, communications satellites and the international politics of oceans. Guest lecturers spoke on specific topics:

T. Dixon Long, Case-Western Reserve University
Science Policy - Japan

Lawrence Scheinman, Professor, Government, Center for
International Studies
Science Policy - The European Economic Community

Karel Stregl, Senior Research Associate, PPSTDN and
Center for International Studies
Science Policy - USSR

Peter Auer, Director, Mechanical and Aerospace
Engineering
Energy and International Relations

George H. Quester, Director, Peace Studies, Center for
International Studies
Science, Technology and Arms Control

Steven Levy, Ph.D. Student, Government
INTELSAT and Communications Satellites

Daniel S. Cheever
International Politics of the Oceans and Deep Seas

Transportation Policies for Developing Nations - With Emphasis on Low-Volume Roads. This course was planned and prepared over the Spring and Summer 1974. It will be offered in the Fall 1974 semester by Lynne Irwin, Gordon Cummings, and Darrell Williams. The course is a multidisciplinary survey of the processes of policy formulation for, and planning of, transportation facilities in developing countries. The areas of concern include the policy-making process and strategy of policy implementation, economic policy and analysis methods, sociological considerations, and the technology of road building.

In preparation for the course, PPSTDN sponsored a seminar series in Spring 1974. This series helped to introduce the topic of low-cost transportation to the Cornell community and to identify a group of interested students for the course. A list of the speakers and their topics may be found on p. 27 under "Seminar Series".

Advanced Planning Analysis with Selected Applications to Development Problems in the Third World. This course was given in the Spring semester 1974 by David B. Lewis. The objectives of the course were to enable students of policy planning to develop the capability to use a number of advanced analytical techniques and to indicate how these techniques might be applied to particular problems of development. The topics covered included welfare economics, simulation modelling, linear programming, network analysis, cost/benefit and cost/effectiveness analysis, and financial analysis. Practical applications were emphasized with examples drawn primarily from developing countries.

Research: Completed

This section covers research funded directly from the 211(d) Grant. Other Program related research is described in Section VI., "Other Resources for Grant-Related Activities".

Toward an Andean Common Market for Science and Technology,
by Robert N. Seidel, Ph.D

This study explores a number of historical reasons for the present concern with science and technology policies in the Andean Group. The research focuses on the question of whether the combined efforts of developing countries can enhance the possibilities for effective policy. These possibilities are beset by numerous hazards because of the diversity both of the challenges facing policy-makers and of their response to these challenges. Moreover, in the Andean Common Market, explicit science and technology policy is just in its formative stages.

The study identified three reasons for the current focus on science and technology policy. The first is the failure of universities and research institutes in developing countries to fulfill expectations for their contribution to economic and social development. The new goal for these institutions is to develop into a domestic infrastructure which produces technical manpower and research, and thus helps relieve dependency on outside sources.

Second, is the question of technology transfer, in which two problems stand out: the price or terms of transferring proprietary technology, and the reluctance of trans-national firms to perform research and development in host countries. The technology transfer problem is a manifestation of Latin America's balance of payments difficulties.

The role of governments is the third factor. In the last decade, governments have been motivated by the two reasons cited above to take more explicit actions in regard to science and technology policy. Also, because national governments purport to represent national or social welfare interests, they have been increasingly concerned with defining and administering more comprehensive science and technology policies.

The Andean Group is an incipient common market composed of Bolivia, Chile, Colombia, Ecuador, Peru and Venezuela. It has been noted particularly for vigorous activity in regard to

tariffs and industrial development. Perhaps its most notable accomplishment has been the elaboration of the yet to be fully implemented code for the importation of foreign capital and technology -- the "Andean Foreign Investment Code".

In the research report several of the regional institutions of the Andean Group are described in relation to policies for science and technology. Some problems of elaborating a regional common market policy for science and technology are suggested in a discussion of the national intellectual and institutional environment for science and technology policy in the cases of Colombia, Peru and Venezuela. It is suggested that regional integration can be an effective instrument for economic and social development, and that policies for science and technology can be vital components of this instrument. But national systematic differences, the responses of the multi-national corporations, and the strength of various linkages between Andean institutions and those outside the region are inhibiting progress in the short run. As a result, the initiatives for an Andean common market for science and technology have been weak and the prospects for further success are not bright.

The study has identified two major intellectual and institutional systems which describe conceptual approaches to science and technology policy: "liberal-scientific" and "technico-economic". These systems define how various actors - national, regional and international - interact in science and technology policy-making. They serve as a conceptual tool in studying both policy-making in developing countries and their regional organizations, and the approaches used to cope with the various systems and forces that contribute to regional fragmentation.

Quo Vadis Cybernetic Civilization? National Policies for Science and Technology and Industrial Democracy: A Hypothetical Model for an Industrially Semi-Developed Country, by Karel Stregl, Ph.D.

This exploratory paper is both a philosophical and a normative work. It presents a national development scheme that seeks

to reconcile science and technology, and the driving forces of modernization and industrialization, with the physical, social and psychological needs of human beings. It is based on the theme that the citizens of a country should have as much control over their own lives and the course of development as possible; at the same time, limited individual and group perceptions would be moderated by governmental guidance toward the achievement of national goals by fostering a participatory "industrial democracy" and laying down "rules of the game". In the detailed elaboration of the model, the author spells out the relationships of science and technology policy to the major developmental sectors and institutions.

Unemployment in Jamaica and the Contribution of the Bauxite-Alumina Industry to the Employment Problem, by L. George Nelson, Masters of Science Thesis, June 1974.

Unemployment has been and continues to be one of the greatest problems facing Jamaica. Despite governmental programs aimed at reducing its severity, the problem persists; unemployment increased from 13.5% in 1960 to 22.5% in 1972.

The Jamaican Government has concentrated efforts on reducing the supply of labor (through family planning and emigration programs), but has done relatively little to increase the demand for labor. This study was designed to explore the possibility of attacking the problem from the demand side. The bauxite-alumina industry, as the most important single industry in the post-war economic growth of Jamaica, was chosen for study. Exports from this industry account for 68.8% of the value of all domestic exports. However, less than 50% of the value of output from this industry accrues to domestically owned factors of production.

While it would be unrealistic to expect any one industry to absorb all, or even most, of the unemployed labor force, the extension of the bauxite-alumina industry to include aluminum production within Jamaica would be expected to have a substantial impact. It would also increase government revenues considerably and if these funds were used for investment

in other industries, additional employment would be created. When these secondary effects are considered, expansion to the aluminum stage would be expected to increase employment significantly. However, the study notes that the decision to extend processes performed in Jamaica rests with the multi-national corporations which dominate the sector. The focus of this decision capability highlights the potential conflict between the national government interests and those of the multi-national corporations.

Preliminary Study of the Water Resources of the Atlantic Coast, Costa Rica, by Jorge de la Guardia, Master of Science Project.

This report was prepared as an input to the larger PPSTDN study on natural resources in Limon Province, Costa Rica. It integrates and summarizes data collected from several different agencies. The data are presented in a graphical form which facilitates their use and analysis in larger studies on water resources. The report describes the general climatology, hydrology, and the particular problem of sedimentation of the Atlantic coast of Costa Rica. It includes calculations of the sediment transport by the primary rivers of the region and makes preliminary recommendations on methods to control the sediment flow.

Social Injustice and Optimal Space-Time Development: Extensions and an Application to the Minimata Mercury Pollution Case, by Yoshifusa Kitabatake, Ph.D. Dissertation, May 1974.

This dissertation considers the joint distribution over space and time of both the benefits and the pollution related costs generated by a growing dual-economy in a closed region where external diseconomies can be internalized by a competitive market. The dual-economy is characterized by a situation in which a modern industry and a traditional industry coexist and in which the former discharges waste into an environment upon which the latter depends for its production.

The analytical model is applied to the mercury pollution case that occurred in Minimata, Japan. The modern sector is a chemical industry with its chemical product. This sector discharges waste mercury into the sea. The traditional sector is a fishery producing fish. The pollution related costs are associated with fish contamination by the mercury.

The Urban Freight Transportation Planning Process:
An Input-Output Approach to a Methodological Framework, by
Kang-Won Lim, Ph.D. Disseration, June 1974.

The purpose of the study was to identify and define the problem areas in urban freight transportation today, and to develop a conceptual and methodological framework for urban goods movement studies. The scope of the study was restricted to the descriptive investigation of the problem and the logical reasoning behind the development of a general linear systems model for freight Urban Transportation Planning (UTP).

This study elaborates a linear system model based on a social accounts approach and recommends various alternatives for urban freight transportation using the present state of technology. The strategy of freight consolidation is analyzed in depth.

A new approach is introduced, derived from theories of production, consumption and consumer behavior, business management, location and transportation. It is argued that if this new approach is pursued for studies of the urban goods movement problem, not only will higher returns be achieved in development of, and investment in transportation facilities, but also the economic and ecologic problems of the total system can be evaluated in a single procedure which will facilitate more comprehensive planning.

Research: In Progress

Science and Technology Policy in Mexico. This on-going research project is being conducted by Tom Davis and Loretta

Good. Two monographs based on the research are scheduled for completion in the Fall. The first will present a detailed description of science and technology policy in Mexico as it is applied to the regulation and promotion of both Mexican and foreign-owned industry. It will also describe the network of Mexican research institutions which might become centers for cooperative efforts designed to strengthen Mexico's indigenous research and policy formulation capabilities.

The second monograph will present an empirical analysis of the impact of Mexico's science and technology policy on manufacturing firms, contrasting a group of joint venture firms which have substantial U.S. equity participation with a matched group of Mexican-owned firms. It should identify the chief obstacles encountered by firms in their search for technology, and should suggest ways in which information channels can be better adapted to needs which may be industry-specific. Questions to be explored will include the following: What have been the sources of technology information most often used by each group? What impact does the degree of vertical integration have on the dissemination of technology information? What are the structural characteristics of firms which pay large amounts in royalties, in contrast to those which spend large sums on their own R & D?

This research is part of an on-going analysis of manufacturing in Mexico. The first data was gathered for a research project begun in 1969 under the sponsorship of the Foreign Area Fellowship Program, for a Doctoral dissertation in Economics. In order to obtain information on the most recent innovations in science and technology policy for industry, interviews were conducted in Mexico, D.F., with the Mexican Central Bank, the Ministry of Industry and Commerce, the Colegio de Mexico, the commercial section of the U.S. Embassy, and the American Chamber of Commerce. Interviews were also conducted in Monterrey, with the State Chambers of Industry and Commerce, the Monterrey Institute of Technology, the University of Nuevo Leon and its research institute, and the Center for Economic Investigation. On the basis of the data collected, it should be possible to identify important linkages in the network of research

institutions. An understanding of this system is essential to an analysis of policies designed to help improve Mexico's own R & D base and focus research activities more sharply on areas which will maximize the developmental impact of these R & D expenditures.

Personal interviews were conducted with general managers of firms to update information initially collected in 1969. To provide continuity, the questions asked were similar to those from the previous investigation, however, additional emphasis was placed on evaluating the reactions of the industrialists to different policies established to aid the transfer of technology. This study should provide detailed information on the R & D capabilities of firms and returns to R & D in terms of profitability and growth at the firm level.

It is expected that this study will be extended to include comparative sites in Colombia, Venezuela, and Brazil. The possibility of two or three sites in Asia is also under consideration.

Housing Policy Alternatives for the Squatter Settlement in Limon, Costa Rica. Peter Chi and MaryAnn Griffin are studying housing policy alternatives for the squatters in Limon, Costa Rica. The purpose of this research is to evaluate existing public housing projects in Limon Province and to formulate policy alternatives for low-cost housing for the squatter settlement of Limon City.

Working in conjunction with CONICIT (Institute for Science and Technology for the Development of Costa Rica), the investigators are conducting two small scale surveys: one of 50 families living in public housing; and one of approximately 250 families in the squatter settlement. Community leaders of the squatter settlement will also be interviewed to determine their perception of the need for various government programs and the extent to which they are willing to participate in such programs. The questionnaire to be used is being formulated in cooperation with the National Institute of Housing and Urbanization (INVU), the University of Costa Rica and the University of

Heredia. The interviews will be carried out by Costa Rican students and local residents.

The recommendations which grow out of the study would ideally lead to the implementation of an experimental action program conducted by local agencies. The evaluation of resident satisfaction with current public housing should provide a basis for either modification or continuation of the existing policies. A comparative cost-benefit analysis of various policy alternatives may also be explored.

The participants in this study are:

From Cornell University:

Peter S. K. Chi (Co-Principal Investigator)

MaryAnn Griffin (Co-Principal Investigator)

Floyd O. Slate (Investigator)

Darrell Williams (Investigator)

From Costa Rica:

Roberto Villalobos (Co-Principal Investigator)
Architect, University of Heredia

Roland Coward (Investigator) INVU Representative
for Limon Province

Rodrigo Orozco (Investigator) Dean of Engineering,
University of Costa Rica

The work on this project began in Summer 1974.

Basic Housing System in Ghana. The major objective of this study, undertaken by Henry W. Richardson, is to empirically document the structure of different housing production and delivery processes used in urban areas and the institutional and technological constraints which operate on them. This knowledge would serve as a basis for developing guidelines for the formulation of national housing policy in Ghana.

The study is organized into four main sections:

- 1) a socio-technical analysis of selected housing production-delivery processes in the public, private and popular sectors, including self-help, indigenous jobber contracted housing, conventional "project" housing, cooperative housing, and semi-industrialized core housing;

- 2) a review and analysis of the resource base of the housing sector: the construction and building materials industries, human and technical resources;
- 3) a review and analysis of implementation mechanisms: institutional arrangements for public, private and popular sector housing, building codes and standards and key housing related policies; and
- 4) a discussion of support structures for production and delivery networks for housing, and their implications for policy.

Drafts of the first three sections as well as a statistical abstract covering pertinent housing data in Ghana from 1950 to 1970 have been completed. The last section is in preparation.

The principal conclusions of this project are that the central problem in urban housing in Ghana derives more from problems of misapplied and untapped resources and less from problems of limited resources. Extensive production and delivery networks for housing exist outside formal institutions. Existing institutions in the public and private sectors and public policy have generally overlooked these networks, or been completely unresponsive to them.

A view of housing which emphasizes product rather than process has led to policies and programs which funnel most public sector resources for housing into the building of a limited number of housing estates and projects for a small fraction of the urban population, mostly high and middle income groups.

Government housing policies need to shift away from direct production and delivery of housing to the provision of support structures for stimulating private sector efforts in housing.

An Industrial Policy for an Economically Integrated Commonwealth Caribbean. This project is the dissertation research of Vincent A. Richards. The objective of the project is to develop an industrial policy for the Caribbean countries within the framework of the regional economic integration

structure which the governments of these countries have adopted. The practical manifestations of this commitment are the establishment of the Caribbean Free Trade Association (CARIFTA) and the Caribbean Development Bank, as well as other regional institutions.

An industrial programming model is being developed that will identify several projects or industries that can be introduced in the region on an economically efficient basis. The optimal location(s) for each of the industries will be developed subject to a distributional constraint to ensure that all members of the union share the benefits equitably.

The study will attempt to identify industries that can be economically feasible in the Caribbean given regional resources and projected regional demand. Linear programming and related techniques are being applied to the problem. The results of the policy recommendation will be applied to Antigua, one of the smaller and poorer members of the economic union. Work on this project was begun in 1973 and is scheduled for completion by February 1975.

Machine Recognition of Hangul: Systems Approach. This is a joint project of Myunghwan Kim, Associate Professor, Electrical Engineering, Cornell, and Chan Mo Park, Associate Professor, Department of Basic Science, Korea Advanced Institute of Science (KAIS). Responding to the need in Korea for more effective ways of man-machine communication with digital computers, this research project is exploring the design possibilities for a system which will machine-read Korean characters.

Soybean-based Protein Beverage Preparation for School Children in Korea. The principal investigator is Dr. Jong Rak Chung, Associate Professor of Biological Science at KAIS. He will be cooperating with the Food Science Department of Cornell at Geneva, N.Y. The study is directed toward the development of an "instant" soybean substitute for milk.

Seminar Series

The 1973-74 Seminar Series concentrated on a review of key research efforts in the area of science and technology policy studies. The speakers included both Program participants and researchers from outside the University.

The speakers and their topics:

Milton J. Esman, John S. Knight Professor of International Studies and Director, Center for International Studies

"Elements of Science Policy"

William F. Whyte, Professor, Industrial and Labor Relations

"Organization Strategies for the Development of Science and Technology"

Edmund T. Cranch, Dean of Engineering and Director, PPSTDN

"Education for Technology Enhancement in LDC's - Issues and Policies"

Franklin A. Long, Henry R. Luce Professor of Science, Technology and Society, Program on Science, Technology and Society

"Science Policy Development in South Korea: The Role of the Ministry for Science and Technology"

Tom E. Davis, Professor, Economics and Director, Latin American Studies Program

James Converse, Assistant Professor, Rural Sociology
Gordon Cummings, Professor, Rural Sociology

"Methodological Considerations Relevant to the Comparative Study of Science and Technology Policy"

Oktay Ural, Founding President, International Association for Housing Science and Director, Institute for Interdisciplinary Housing Studies, University of Missouri

"Interdisciplinary Concepts of Housing Planning Around the World: An Overview"

Robert N. Seidel, Research Associate, PPSTDN

"Toward an Andean Common Market for Science and Technology"

Henry W. Richardson, Assistant Professor, Architecture

"Technological and Organizational Strategies for Basic Housing in Ghana"

David Wall, Lecturer in Development Economics, Director of Graduate Studies (Development Economics), University of Sussex, England; Director of Collaborative Research Project between the World Bank, the Government of India, and the University of Sussex
"Problems with the Concept of Technology Transfer"
(jointly sponsored by India Discussion Group with M.N. Srinivas, Andrew D. White Professor at Large)

In preparation for the course on transportation policies, PPSTDN sponsored a separate seminar series on transportation in developing countries. This series took place only during the Spring 1974 semester. The speakers and their topics:

Lynne Irwin, Gordon Cummings and Darrell Williams
"Proposed Program on Transportation Policies for Developing Nations - An Introduction"

Clell G. Harral, Chief, Transport Research Division, Transportation and Urban Projects Department, IBRD-World Bank
"Highway Design Standards, Construction Technology, and Employment for Developing Countries"

E. Walter Coward, Assistant Professor, Rural Sociology
Gordon Cummings
"The Interaction of Organization and Technology in a Transportation System: Policy Complications"

Ta Liang, Professor, School of Civil and Environmental Engineering
"Locating Transportation Facilities in Developing Nations"

Richard L. Thornton, Manager, General Motors Overseas Operations
"General Motors Basic Transportation Vehicle: Is This the Vehicle for the Less-Developed Countries?"
(co-sponsored with the Agricultural Economics Seminar Series)

Vincent W. Hogg, Economic Development Institute, World Bank
"Transport Policy: A Case Study of a Developing Country"

IV. Impact of Grant Supported Activities in Developing Institutional Capabilities

PPSTDN's principal impact at Cornell has been in the generation of increased teaching, research, and professional service in the area of policies for science and technology in developing nations.

Degree Programs

The proposed new Master of Professional Studies degree for science and technology would create an entirely new opportunity for people seeking specialized study in this field. It would complement the recently established option for graduate students (Master's or Ph.D. level) to minor in S/TP. Together, the new degree options are expected to substantially strengthen Cornell's study program in science and technology policies for developing countries. For a detailed description, see pp. 46-47.

International Studies in Regional Planning

PPSTDN has fostered the establishment of a new program in International Studies in Regional Planning (ISRP). Directed by William W. Goldsmith, ISRP focuses on three major areas: 1) study of sub-national development patterns; 2) application of analytical methods to policy formulation; and 3) innovation in housing policy. The PPSTDN grant to ISRP has been applied mainly to the third area.

The activities of ISRP involve course development, a lecture and seminar program, and research. Courses supported by the program include a course in Urban Economics, taught by Thomas Vietorisz, Professor of Economics at the New School for Social Research and Visiting Professor in PPRA. Planning Techniques for Developing Regions and Small Nations was taught by Shoukry Roweis, Instructor and Ph.D. candidate in Planning at MIT. David Arbeit, Instructor and Ph.D. candidate at Cornell, offered Regional Planning in Developing Countries.

The seminar series speakers included:

Lisa Peattie, Professor, Department of Urban Studies
and Planning, MIT

David Lewis, RAND Corporation (now with PPSTON)

Robert R. Mayer, Professor, City and Regional Planning,
University of North Carolina

John P. Robin, Ford Foundation

Thomas P. Reiner, Professor, Department of Regional
Science, University of Pennsylvania

Robert Lewis, Professor, Department of Economics,
Ohio University

Salvador M. Padilla, Professor and former Director,
Graduate Program in Planning, University of Puerto
Rico, Rio Peidras

A series of other lectures and seminars involved participants from Cornell itself. Among them were James Converse (Rural Sociology), Frank Young (Rural Sociology), Tom Davis (Economics and Latin American Studies Program), Rose Goldsen (Sociology), Davydd Greenwood (Anthropology), Thomas Victorisz (PPRA), Pablo Traklli, Jaroslav Vanek (Economics), Norman Uphoff (Government), and John Mellor (Agricultural Economics).

Research sponsored by ISRP focuses on aspects of urban and regional planning in poor regions of the world. Current faculty interests are illustrated by the following: William Goldsmith recently published research (with Mario Rothschild) on regional specialization in Chile, and (with Pierre Clavel, Associate Professor, PPRA) on Public Planning in Puerto Rico. Professor Goldsmith, together with Stuart W. Stein and Kermit C. Parsons, is working on a regional development project in Trinidad and Tobago. Sidney Saltzman worked at the Center for Environmental Studies in London, England. Darrell F. Williams and Henry W. Richardson are studying the structural characteristics and production capabilities of the urban housing sector in Ghana. Barclay Jones is working on disaster relief and regional development in Yugoslavia.

Recently completed and current Ph.D. theses deal with migration, urbanization and underdevelopment in Upper Volta, regional development in Chile, income disparity and regional development in Peru, colonialism and the distribution of city sizes in countries throughout the world, and river basin development in Puerto Rico. Graduates are now working in planning agencies and universities throughout the world.

Through ISRP, Professor Goldsmith was able to obtain external funding for research in Colombia. He spent a sabbatical semester in Bogota teaching and researching the relative growth rates of Colombian cities. This work was in part funded by COLCIENCIAS (Fondo Colombiano de Investigaciones Cientificas) and Fulbright. Goldsmith examined the effect of different national policies on the pattern of growth of cities and urban institutions among the approximately 150 largest cities. The national policies examined included the development of highways, the location of government expenditures, bank fund movements, the locational distribution of taxes and price changes, and industrial location. Professor Goldsmith has provided Cornell and PPSTDN with a strong link with COLCIENCIAS, and he will continue to work with them.

Low-Cost Housing Program

The newly proposed program on low-cost housing is another example of how PPSTDN supported activities can develop into independent programs. PPSTDN has encouraged and facilitated the growth of substantial expertise in the field of low-cost housing at Cornell. The professors concerned with the topic have decided to expand their efforts and coordinate in a more formal organization. Accordingly, they are seeking outside funding to create a new program in this area. The object of this intensified effort is to make Cornell a center of excellence for the study of policy on low-cost housing. This effort will be complementary to ISRP which has considerable interest in housing policies. Some faculty participants in ISRP are also on the PPSTDN housing team, e.g., Williams, Richardson and Lewis. (See Section VII, p. 56 for details of the Low-Cost Housing Program Proposal).

Fellowships

To fulfill the objective of educating policy decision makers from LDC's, PPSTDN has established a modest fellowship program. This last year PPSTDN worked jointly with Cornell's Program on Science, Technology and Society to support a year of graduate study for Mr. Luis Torres, a science policy planner from Colombia.

Mr. Torres, of COLCIENCIAS, was granted a leave of absence by his organization to come to Cornell for advanced study; the fellowship made it possible for him to take advantage of this opportunity.

Over the 1974-75 academic year, PPSTDN will be supporting a research assistantship for Mr. Ramesh Vaidya, a Ph.D. candidate in City and Regional Planning. Mr. Vaidya is from Nepal and has recently completed his Masters degree at MIT. He will be working on a research project for PPSTDN (see Section VII, p.49 for more details).

Services to Graduate Students

One of the more significant indicators of the increasing institutional capabilities developed through PPSTDN is the range of service afforded to graduate students by faculty member Program participants. To illustrate the breadth of this range, two examples have been selected. Stephen McRae, in the Department of Natural Resources, is studying rural peasant ecological systems in the Andes, particularly the impact of technology choices. David Lewis was asked to be a member of Mr. McRae's doctoral committee to help him with the policy issues involved. Stephen Rochereau, a Ph.D. candidate in City and Regional Planning, is studying the problem of trade-offs between mariculture and coastal-zone industrial development. PPSTDN has provided technical input to his research and, through its linkage network, has also been able to put him in contact with Ignacy Sachs of the Ecole Pratique de Hautes Etudes in Paris. Professor Sachs has been working with a graduate student of his own on the impact of a petroleum refining facility in the Bay of Brest, and these two students are now able to benefit from each other's resources and research.

Linkages

Cornell's growing research capabilities are reflected in its growing network of collaborative relationships with institutions, governments and individuals, particularly in developing countries. Already mentioned above in Section III are the research projects of Jorge de la Guardia, Professors Davis and Good, Chi and Griffin, and the activities of ISRP. Further activities include established and incipient relationships in Korea, Peru, Costa Rica, Ghana and Brazil. Only one of these linkages (Korea) has been formalized, but the others are operational in facilitating research collaboration.

The first linkage was established in 1972 with a memorandum of Understanding for Joint Program of Study and Research between the Korea Advanced Institute of Science (KAIS) and Cornell University. The purpose of this joint program is to foster mutual work in developing and teaching interdisciplinary courses, short term study and research efforts, assistance in workshops and institutes on both camps, and the development and accomplishment of interdisciplinary research programs in Korea and in East Asia generally.

Two research projects have developed from this cooperative effort: Machine Recognition of Hangul: Systems Approach and Soybean-based Protein Beverage Preparation for School Children in Korea (see Section III, Accomplishments, Research in Progress, p. 25 for details).

Recently (July 1974), Woon Sou Jeong, Senior Councilor, Ministry of Science and Technology, Korea, visited Cornell. Hosted by the Program on Science, Technology and Society, Mr. Jeong met with members of PPSTDN to discuss a number of current issues of science and technology policy in Korea. He is particularly interested in the analysis of policies for the support of basic science. Mr. Jeong has been President Park's Secretary for Science and Technology and he was involved in the creation and development of KAIS.

Through Professor William F. Whyte, PPSTDN has maintained contact with ENCA (Encuesta Nacional de Consumo de Alimentos - National Survey of Food Consumption) in Peru. ENCA has collected a substantial amount of data which is potentially valuable for S/TP research in Peru. Professor Whyte visited Peru in early 1974 to study ENCA as an organization whose resources might be used for multiple purposes. Professor Whyte has proposed a research project on the science policy aspects of ENCA. This may involve a substantial level of PPSTDN/ENCA collaborative research during the 1974-75 academic year.

In addition to the education and regional planning studies in Costa Rica (see page 36), PPSTDN has supported policy case studies of two development organizations. The work was conducted under William Whyte and Milton Esman. One case study deals with the consolidation of housing services and the other with the consolidation of farm services. The reports have been published in Spanish and will be available from PPSTDN.

PPSTDN has an informal working relationship with Ghana. It grew out of the research on housing systems by Henry Richardson. Professor Richardson is himself Ghanaian, and is therefore familiar with many aspects of S/TP in that country. On his last trip to Ghana, he surveyed the state of science and technology research and policy, and the possibilities for additional cooperation with various institutions. The conclusions of this inquiry were that, although Ghana has several institutions working on research, there exists a persistent problem of transfer of knowledge from the research stage to the user level. This problem relates to PPSTDN's interest in the question of supply of and demand for science and technology. Two institutions in particular were identified for their interest in future cooperative efforts with PPSTDN. They were the University of Science and Technology at Kumasi and the Building and Road Research Institute of the Council for Scientific and Industrial Research.

PPSTDN is exploring the possibilities of establishing linkages with the University of Bahia in Brazil. Brazil has become increasingly concerned with the role of education in this area. The University of Bahia is especially concerned with urban and rural development. In January 1974, Milton Esman visited Brazil to investigate the potential of University-wide cooperative activities. Brazil is developing an advanced and sophisticated science and technology system, and it would seem to be an appropriate collaborative partner for the study of research institutions and allocations, linkage problems, and policy incentives.

Tom Davis is the Director of the Latin American Studies Program. His association with PPSTDN has provided a link between the two Programs. This has greatly facilitated PPSTDN in working in Latin American countries. As reported under the Accomplishments Section, Professor Davis is involved in research in Mexico.

Professional Service

One of the main objectives in establishing the Program was to develop the capability to provide professional service in the area of S/TP. The next section ("Utilization of Institutional Resources in Development") cites a number of examples which illustrate the substantial progress toward accomplishment of this objective. These examples also reflect the impact of Grant supported activities in developing institutional capabilities. To indicate the breadth and depth of these capabilities, two cases are noted below.

Nancy Schwartz, a doctoral student in Cornell's Department of Economics, managed a research project for the World Bank this summer. She was studying technology contracts, and their role in technology transfer. The research addresses the issue of how host government agencies can increase their influence and control over the details of transfer from private foreign firms.

(This effort is expected to complement the work of Professors Davis and Good, described on p. 20).

James A. Liggett is being sent to Colombia for a year by the National Science Foundation and the Fulbright-Hayes Program. He will divide his time there between the Universidad del Valle and the Corporacion Autonoma Regional de la Cauca (CVC), in Cali. At the University he will participate in teaching, research programs, special lectures, and discussions, and aid in planning curricula and research programs. In addition, he will give assistance to the newly created Center for Natural Resources, specifically in the area of water resources. At CVC he will serve as a consultant on a variety of engineering problems, particularly hydraulic engineering and water resources. He will focus on sedimentation, erosion and landslides in Colombia and unsteady flow and river dynamics, including pollution and flooding of the Cauca River.

V. Utilization of Institutional Resources in Development

PPSTDN serves not only the academic community of Cornell, it also assists developing countries (either directly or through international organizations) in their work on science and technology policy. This assistance takes many forms, including direct cooperation and consultation, the education of students from those countries, and the dissemination of research findings through seminars and Program publications.

Through its linkage relationships and research efforts, PPSTDN has provided services in many areas of development related to science and technology. However, service and consultation normally cannot be provided without at least some preliminary study of the problem. Because the field of science and technology is so broad, and at this point, so unresearched, policy problems frequently require considerable background research. As a result, the research and service activities of this Program are often inextricably bound together.

Costa Rica

The Project on Science Policy in a Small Developing Nation (Costa Rica) represents a direct input into the development planning of Limon Province, particularly with regard to the use of natural resources. In 1973, a project team from Cornell worked in Costa Rica and prepared a report on The Natural Resource Potential for Regional Development of Limon Province: A Preliminary Survey. In the Spring of 1974 a "Seminar on the Role of Science and Technology in the Development of Limon" was called in Limon to review the report and to begin establishing priorities for further development studies. Cornell was requested to send a team of resource persons to the seminar.

The topics and projects identified were:

- a) the need for agricultural diversification, since the economy of the Province is mono-cultural. Promising opportunities include the development of the African palm, plantains, rice, cocoa, buffaloes, and the green turtle;
- b) ecological studies leading to land use maps, important because the region is flat and swampy and consequently susceptible to pollution with increased industrial activity;
- c) plans for the conservation of the green turtle;
- d) projects to assist in the formulation of legislation for the establishment of national parks;
- e) projects in the field of tourism;
- f) an industrial park in Limon;
- g) an integrated program for low-cost housing using the squatter colony in Limon City as the basis for future policy;
- h) regional centers for technological training, professional formation, and university level education;
- i) a number of specific industrial projects such as pulp mills, feed-processing plants and factories to utilize agricultural by-products .

If and when decisions are made to implement these recommendations, additional research will be undertaken before actual implementation. Cornell will act as consultant in these studies which would then serve as data bases for the formation of a Regional Development Plan.

Work has already begun on the study of low-cost and public housing in the squatter settlement of Limon City (in relation to (g) above). This research is being carried out by Professors Peter Chi and MaryAnn Griffin from Cornell, in collaboration with various Costa Rican professionals. A more detailed description of this project is given under Section III, Accomplishments, Research in Progress, p.22.

PPSTDN is also assisting in a study of technical education in Costa Rica. The project will provide diagnostic data on the state of science education in a developing country, and is expected to help elucidate the problems and potentials of the education system. Mariano Ramirez (Director of the Office of University Planning of the University of Costa Rica), E.T. Cranch and F.J. Ahimaz prepared a preliminary document on "Long-Range Planning for Scientific and Technological Education in Costa Rica." This report served as the basis for clarification of the objectives and scope of a larger study undertaken by Mariano Ramirez, Oscar Torres (consultant on Human Resources for the Office of University Planning at the University of Costa Rica), and Jose Brenes (Assistant to the Director). The report is entitled "Study of the Scientific and Technological Education System of Costa Rica and Bases for its Long-Range Planning" (January 1974). It covers the national education system, its achievements, structure, finance, course content, and provides recommendations for its improvement. This report has been published in Spanish, and is available from PPSTDN.

The projects described above are long-term and will provide linkages between Cornell and Costa Rican Groups. These groups, especially CONICIT and IFAM*, have expressed a desire to maintain a continuing relationship with PPSTDN.

Korea

The Program's affiliation with the Korea Advanced Institute of Science (KAIS) serves to aid that Institute in its program development and research. This interaction between the two programs has been beneficial to both, in helping PPSTDN to further understand and study science and technology problems in an LDC, and in the service to KAIS from Cornell expertise. Also

*CONICIT - Consejo Nacional de Investigaciones Cientificas y Technologica - National Council of Scientific and Technological Investigations
IFAM - Instituto de Fomento y Asesoría Municipal - Institute for Municipal Development.

in Korea, Frank Long maintains a continuing advisory relationship with the Ministry of Science and Technology (MOST). In late 1973, Professor Long headed a U.S. advisory team which went to Korea to join with their Korean counterparts and advise MOST on science and technology policy issues. The same joint group will meet again in Washington, D.C. in September 1974.

Yugoslavia

Professor Barclay Jones' work in Yugoslavia on post-disaster reconstruction planning and regional development is also a direct contribution to the development of that country. Professor Jones is working closely with professionals in Yugoslavia to formulate a method of analysis useful for public policy decisions in post-disaster situations. It is expected that the results of this research will be relevant and applicable to many other areas of the world, including lagging regions of the U.S.

Colombia

Professor James Liggett has been invited to spend his sabbatical year in Colombia. There he will contribute to research and program development in water resources at both the Universidad del Valle and the Corporacion Autonoma Regional de la Cauca (CVC) in Cali. He will assist the new Center for Natural Resources at the Universidad del Valle and consult on engineering problems at CVC.

National Academy of Sciences

John D. Montgomery* and Milton J. Esman were contracted by the Office of Science and Technology of AID and the American Institutes of Research to examine development-related activities of science policy-makers in five locations.** The report, en-

*Harvard University
**Taiwan, Indonesia, Ghana, Colombia, and Brazil.

titled Science Policy-Making for Development-Reflections on Five Case Studies, considers how various elements in society become "clients" or "users" of science and technology, and how the National Academy of Sciences Program interventions affected these activities and relationships. The study considers whether and how experience could point the way to improvements in science and technology efforts in these five countries, and concludes that science policy is as much an outcome of the processes of participation in national development as the substance of the research undertaken. In addition to the conclusions on the role of science and technology, the report is significant to PPSTDN because it deals with three particular countries in which the Program is interested and active, Ghana, Colombia and Brazil.

OECD

William F. Whyte was asked by the OECD Development Center to review the preliminary research design for a study on the role of engineering consulting firms in developing countries. Although not a major task, this effort serves as an example of how other development organizations are making increasing use of Cornell's growing capability in the area of policies for science and technology.

Office of Education

William Goldsmith served on an evaluating committee for the Office of Education in reviewing a grant to UCLA's Program on Comparative Urbanization. He spent four days in May, 1974 interviewing UCLA faculty and graduate students and reviewing the curriculum.

USAID

PPSTDN is currently revising and updating the Office of Science and Technology (AID) publication, Science and Technology for International Development: A Selected List of Information Sources in the United States. This publication will serve as

a reference guide for professionals working in development. The compilation of this revised version relies heavily on the resources, both in personnel and in literature and information accumulation, that PPSTDN has developed.

Other

PPSTDN has made modest study grants available to graduate students from LDC's studying subjects related to science and technology in development. These grants are made on a case by case basis. The objective is to use Cornell's capabilities to assist developing countries in building their S/TP capabilities by providing relevant educational opportunities for individuals who will be working on these problems. For examples, see Section V. Impact of Grant Supported Activities in Developing Institutional Capabilities, subsection "Fellowships", p.30.

The Low-Cost Housing Team members have been asked to contribute to a number of seminars and symposia outside of Cornell. In this manner, they share the results of their work and experience with others working on low-cost housing problems. The LCH Team presented a seminar at AID/Washington on "The Need to Formulate Low-Cost Housing Policies Employing a Multi-disciplinary Team Approach". This seminar was based on the Team's experience both in teaching LCH courses at Cornell and on their personal research and work in developing countries. Professor Slate chaired the session on "Industrialization" (of housing production) at the Third International Symposium on Lower-Cost Housing Problems, held in Montreal, Spring 1974. At this same meeting, Professor Henry Richardson presented a research paper on "Housing Strategies for a Developing Economy - A Comparative Analysis and Evaluation of Housing Production Systems in Ghana". F.J. Ahimaz contributed to the "International Seminar: New Trends in Lower-Cost Housing Production", jointly sponsored by Florida International University and the American Society of Civil Engineers at Miami, May 20-23, 1974.

F.A. Long presented an invited paper on "Science, Technology and the Development Process" at an international conference in Tokyo, November 1973. The paper is published in "Modern Science and Moral Values", pp. 535-544, International Cultural Foundation, Tokyo, 1974.

VI. Other Resources for Grant-Related Activities

To complement the 211(d) grant resources, PPSTDN and its participants have been successful in obtaining outside funding for certain program-related projects. Many projects directly or indirectly connected with the Program are funded entirely from outside PPSTDN. These external funds contribute to the growth of capabilities and accomplishments of the Program.

Science Policy in a Small Developing Country (Costa Rica) (\$64,000.00).

PPSTDN received a contract from AID to study "Science Policy in a Small Developing Nation (Costa Rica)". The purposes of this contract are two-fold: the research objective is to develop a methodology for relating science and technology opportunities to development -- particularly natural resources development; the service objective is to develop a strategy by which Costa Rica can accelerate its rate of growth through the application of science and technology.

The first activity under this contract was the study of the natural resource potential of Limon Province. The report which was published in 1973 is entitled, The Natural Resource Potential for Regional Development of Limon Province: A Preliminary Survey and was noted in the PPSTDN 1972-73 Annual Report.

As a result of the Preliminary Survey, a "Seminar on the Role of Science and Technology in the Development of Limon", was held in the Spring of 1974. The project team from Cornell was invited to attend the seminar in Limon City to discuss the report and to work on the establishment of priorities for further research and study (see pp. 36-37).

Also funded by this contract is a project to examine scientific and technological education in Costa Rica. The purpose is to study the use of educational technology and modern educational innovations in LDC's as a means of reducing the education costs and improving the efficiency of the provision of higher education. Alternative education policies are explored in order to reduce the cost of providing relevant science and engineering education in small countries like Costa Rica (see p.38).

Science and Technology for International Development: A Selected List of Information Sources in the United States.

PPSTDN recently received a purchase-order from AID for \$2,480.00 to revise and update the publication Science and Technology for International Development: A Selected List of Information Sources in the United States (TA/OST/72-7). First published in March 1972 by the Office of Science and Technology of AID, the report provides a list with relevant information for the use of various libraries and sources of documents on science and technology located in the United States. It also includes a selected bibliography of publications by major development organizations, the United Nations, OECD, AID, and others.

Mary Acton, a doctoral student in the Field of City and Regional Planning, is working on updating the information (both information sources and bibliography) contained in the publication. The revised edition will contain information on new sources and publications. The issues of industrialization, small-scale industries for rural areas, and the transfer of technology will be emphasized. To facilitate its use, the revised edition will be cross-referenced by topic as well as by sponsoring organization. The work on this publication should be completed by November 1974.

Grant from the Center for International Studies (Cornell)

PPSTDN has received a grant of \$5,000.00 from Cornell's Center for International Studies to be used for expenses not covered by the 211(d) grant from AID. This money is used to pay for office furniture, and for pertinent travel and research projects outside the scope of the agreement with the Agency for International Development.

Other

In addition to the above funds which were granted directly to the Program, other outside grants supported projects associated with PPSTDN. They were:

- 1) Barclay Jones - Regional Analysis for Development Planning in Disaster Areas (Cooperative Research between Cornell University and the University of Sarajevo) - \$91,200.00 from the National Science Foundation (see p. 52).
- 2) William Goldsmith - Sabbatical semester and research in Colombia - total of \$21,500.00 from Fulbright, COLCIENCIAS, the Social Science Research Council and Cornell University grants (see p. 30).
- 3) Milton J. Esman and John D. Montgomery - Science-Policy Making for Development - Reflections on Five Case Studies - supported by the Office of Science and Technology (AID) and the American Institutes of Research (see pp. 39-40).
- 4) James Liggett - Sabbatical year in Colombia - supported by the National Science Foundation and Fulbright-Hayes (see p. 35).
- 5) Sidney Saltzman and Jamlong Atikul - Econometric Model of Thailand - Tuition, fees and stipend for Mr. Atikul from the Ford Foundation (see p. 51).
- 6) Nancy Schwartz - "Unbundling Packaged Technology" - Summer of research at the World Bank - \$2,200.00 from the World Bank (see pp. 34-35).
- 7) Kang-Won Lim - The Urban Freight Transportation Planning Process: An Input-Output Approach to a Methodological Framework - tuition, fees and stipend from the Asia Foundation and Cornell University (see p. 20).
- 8) Yoshifusa Kitabatake - Social Injustice and Optimal Space-Time Development: Extensions and an Application to the Minimata Mercury Pollution Case - tuition, fees and stipend from the Ford Foundation, the Japan Center for Area Development Research and Cornell University (see pp. 19-20).

VII. Next Year's Plan of Work and Anticipated Expenditures

PPSTDN's planned activities for the year 1974-75 include both the continuation of current projects and the inauguration of new activities. The proposed new activities will complement continuing efforts.

Degree Programs

A proposal has been submitted to the Field of International Development for the creation of a science and technology policy degree option in the Master of Professional Studies/International Development program (MPS/ID). The creation of this degree option would significantly increase the capability of Cornell to meet the needs of mid-career professionals from developing countries who wish to concentrate on the study of science, technology and development. Since there are very few institutions in the world offering a comprehensive program of study and research on this topic, the creation of this new option would be of considerable significance.

As an area of policy study, science and technology in the MPS/ID program would address a number of considerations:

- producing, motivating and retaining manpower capable of meeting national goals in a changing technological environment;

- establishing criteria for national investment in scientific and technological research and development (R&D);

- selecting, building, and guiding institutions for science and technology development;

- relating R & D activities to the needs of users and potential users, and of inducing the latter to make use of existing R & D capabilities;

- evaluating the social impacts of alternative technologies;

- choosing channels of transfer and terms for reception of technology from abroad.

A unifying element in the new option would be a two-semester seminar sequence: "Policies for Science and Technology in Developing Nations" and "Science, Technology and Development". These basic courses would be complemented with both more specialized offerings related to S/TP and others drawn from the general core of the MPS/ID program.

Courses

Low-Cost Housing Primarily for Developing Nations - This course will be offered in the Spring semester 1975. It will consist of basically the same material and follow the same format as the course offered in Spring 1973. Also, it will be lead by virtually the same professors, who will be building on their previous experience in teaching such a multidisciplinary course. The Low-Cost Housing Bibliography will be available for use by the students.

Science, Technology and Development will be offered by Professor Milton J. Esman in the Spring 1975 semester, through the Government Department. The purposes of this course will be to (1) identify and analyze the positive and negative contribution of modern science and technology to the social, economic and political development of low-income countries, (2) analyze and discuss the various channels and processes of cross-national technology transfer, (3) identify and appraise criteria for the appropriate choice of technology, and (4) review alternative strategies to strengthen national scientific and technological capabilities and apply them to problems of development. Faculty members associated with PPSTDN will participate in the course as lecturers and as leaders of discussion sections.

Transportation Policies for Developing Nations - With Emphasis on Low-Volume Roads will be offered in the Fall semester 1974. For a description of this course, see Section III, Accomplishments, Courses, p.15.

Seminar on Policies for Science and Technology in Developing Nations. This course, taught by David B. Lewis and Robert N. Seidel, will focus on current issues related to policies for science and technology in developing countries. It will consider these policies on the macro level, explore the institutions and sectoral policies promulgated in various countries, and survey contemporary research on the subject. Study teams will be formed to delve into the context and problems of specific science and technology policies in selected countries.

Water Supply Systems for Rural Areas of Developing Countries - Peter Murphy, an incoming faculty member in the Department of Environmental Engineering of the Cornell College of Engineering, plans to develop a course on small-scale water supply systems for rural areas of developing countries. He has had several years experience teaching and conducting research on hydraulics at the University of Cali, Colombia through a grant from the Rockefeller Foundation. He will work on course development and preparation during the coming year in order to offer the course either in Spring or Fall 1975.

Research Staff

Jerry Ingles, who has recently completed his Ph.D. dissertation defense in Economics at Cornell, will join the Program on September 1, 1974 as a Research Associate. His dissertation, Urbanization and Regional Development in Venezuela, dealt with the social impact of technology policy; particularly the potential effects of industrial decentralization policies on the structure and performance of the Venezuelan manufacturing sector.

Mr. Ingles' first responsibility with PPSTDN will be to develop the comparative international science policy project following the Monterrey study of Loretta Good (see p.20). This proposed project will build on the Mexico S/TP study of Professors Davis and Good, and will include additional sites in Colombia,

Venezuela and Brazil. Mr. Ingles is also in the process of formulating a comparative study of delivery systems for agricultural technology in Latin America.

Benedict Stavis (Ph.D., Columbia University, 1973) will also join the Program in the Fall 1974. He specializes in Chinese studies, with emphasis on rural development. In the past year, he has completed three monographs dealing with different aspects of rural transformation in Mainland China and Taiwan. These monographs have, in different ways, examined the interaction between political and institutional policies, on one hand, and development and popularization of modern agricultural technology, on the other. The monographs are based on documentary materials and data collected personally when he traveled to Mainland China in spring 1972 and to Hong Kong and Taiwan in 1972 and 1973.

This year, with support from PPSTDN and the Rural Development Committee of the Center for International Studies, Mr. Stavis will complete a book on agricultural mechanization policies in China. The Chinese have been especially sensitive to the social and political consequences of technological choices in the field of agricultural mechanization, so their experiences should be of great interest.

In addition to his research work, Dr. Stavis will be teaching a seminar in the Government Department.

Ramesh Vaidya has been appointed PPSTDN Research Assistant for the academic year 1974-1975. He is a Ph.D. student majoring in Planning Theory and Systems Analysis. Mr. Vaidya is from Nepal and has had considerable research experience in the area of technology choice for civil engineering projects, particularly with regard to the effectiveness of labor-intensive technology for road construction. While at Cornell, he will be doing research in the area of policy for technology choice.

Research Projects

Science and Technology Policy in Mexico - Conducted by Professors Tom Davis and Loretta Good, this project investigates the effectiveness of alternative policy instruments in influencing the behavior of manufacturing firms in Mexico. This work will continue into fall 1974, although the bulk of the work will have been completed by the end of the summer. (See Accomplishments, Research In Progress, p.20 for a more detailed description of this project.)

Housing Policy Alternatives for the Squatter Settlement in Limon, Costa Rica - This study of housing policy alternatives is led by Professors Peter Chi and MaryAnn Griffin. Results of a user survey will be the basis for the formulation of recommendations for an experimental action program in Limon City. (See Accomplishments, Research In Progress, p. 22 for a more detailed description of this project.)

Basic Housing Systems in Ghana - Professor Henry Richardson will continue his study of housing production systems in Ghana in order to develop guidelines for the formulation of a national housing policy for that country. (For further details, see Accomplishments, Research In Progress, p.23.)

The Impact of Technology Policy on Regional Development: A Study of Agricultural Processing Industries in Colombia - William Goldsmith has proposed to study the impact of national technology policy on patterns of urban and regional development. This is an extension and elaboration of on-going research on regional development in Colombia, funded by the Social Science Research Council and the Center for International Studies at Cornell. Goldsmith would seek to test the proposition that increased use of basic, small-scale technology in rural areas,

through a series of sequential relationships, can ease in-migration pressures on metropolitan areas, thus saving transport costs, reducing rural-urban imbalance and encouraging innovative feedback to farmers. Specifically examined would be the effect of technological sophistication on the integration of the city with its hinterland, both smaller towns and villages and ultimately, rural areas.

For this project, Professor Goldsmith proposes to study the components of the food-processing industry in approximately 150 of the largest Colombian cities. The food-processing industry was chosen because of its ubiquity and the fact that it is subject to strong influence from both foreign and national firms. This industry is particularly appropriate because the components vary with the complexity of technology employed, and the process follows a fairly direct path from rural to urban areas. This research would take advantage of nationally available statistics on population, economics and social structure of Colombian cities. Detailed case studies of medium and small cities would also be used. Professor Goldsmith has already engaged a small group of research assistants to begin collecting data in Colombia. The total cost of the project, through August 1975, would be \$25,000.00. Of this amount, PPSTDN will be asked to contribute \$8,000.00. The balance of the funding will be sought from the Social Science Research Council, the Center for International Studies and the College of Architecture at Cornell.

Econometric Model of Thailand - Professor Saltzman and Mr. Atikul are in the preliminary phases of a research project to build an econometric model to study the impact of technology on economic development in Thailand. They will present a formal proposal to PPSTDN in Fall 1974. As Mr. Atikul has full support from the Ford Foundation, PPSTDN's contribution to this project will be limited to the marginal costs of data collection and processing.

Regional Analysis for Development Planning in Disaster Areas
(Cooperative research between Cornell University and the University of Sarajevo) - Professor Barclay Jones is conducting a National Science Foundation funded comparative study of adjustment to natural disasters and the development of methods of analysis which would be useful for public policy decisions in post-disaster situations. In this study, attention is focussed on measuring the levels of technological development in lagging regions and on identifying the implications for public decisions after disasters occur. The methods are being developed in research on Yugoslavia, concentrating on an earthquake prone region. A comparative study is simultaneously under way for a similar situation in the United States. While this project does not involve any funding from PPSTDN, it represents the type of independent research work related to science and technology policy that PPSTDN seeks to encourage. It is expected that the results of this project will tie in with several different areas of Program interest, including criteria for choice of technology, the economic impact of technology choices, and low-cost housing.

Research on International Agriculture Centers - Professor William Whyte has requested funds from PPSTDN (\$1,976.00) for travel to Peru, Mexico and Colombia in a continuation and expansion of earlier exploratory research on international agriculture centers. These centers are key organizations involved in the development and application of science and technology around the world. The objective in studying them would be to improve understanding of selected problems of science and technology development in the developing countries and also to explore how behavioral scientists might fit into this effort more effectively. Professor Whyte is

concerned with four general and interrelated problem areas:

- the generation and flow of information in science and technology among the key organizations involved in R & D in the three countries;
- the dynamics of government bureaucracies in agricultural development;
- problems of inter-disciplinary collaboration in agricultural development; and
- problems of successful application of knowledge in agriculture among farmers.

He proposes to spend time between January and April 1975 with the International Potato Center in Peru, with CIMMYT (corn and wheat) in Mexico, and with CIAT (tropical agriculture) in Colombia to investigate the above problems. Professor Whyte is interested in exploratory field work designed to lead to diagnosis of theoretical and practical problems and to stimulate colleagues and students to undertake more intensive field work.

Publications

PPSTDN will continue to publish scholarly material generated through its activities. Currently anticipated publications include the annotated bibliography on low-cost transportation and the two monographs on S/TP in Mexico by Professors Davis and Good. Other monographs will be published when appropriate as research projects are completed during the year.

Seminar Series

The Program Seminar Series will continue in 1974-75 with an increased focus on current research projects. This emphasis will allow Program participants to report on their work and solicit review comments from their colleagues. The Seminar Series will also act as a catalyst for the development of new research projects.

Conferences

To complement the Seminar Series, the Program is considering a series of "mini-conferences". These would take place over a weekend and would be subject-specific to allow for in-depth discussion and analysis of the topic. The proposed plan is to have two or three of these conferences over the year with the presentation of four papers at each. These papers would then be published after the meeting.

The first conference is tentatively scheduled to focus on "Measuring the Impact of Science and Technology Policy". The papers to be presented are those of Tom Davis and Loretta Good on their summer's research in Mexico (see description under Research In progress) and Sidney Saltzman and Jamlong Atikul on a proposal for an econometric model of Thailand. These two papers will be complemented by two other papers from agriculture to balance the agenda.

The topics for the second and third conferences will be selected in response to emerging interests of Program participants.

Summer Institute

In order to take advantage of the growing interest and competence in science and technology policies at Cornell and to make these accessible beyond the University community, a program of Summer Institutes has been proposed. The annual Institute would be directed by PPSTDN and would bring together participants from international development organizations and LDC's.

The curriculum would emphasize selected aspects of science and technology policy, particularly:

choice of criteria for determining the scale of national investment in science and technology research and for the allocation of these scarce resources among competing claimants so that they may be effectively used in pursuit of national social and economic priorities;

selection, building and guidance of institutions and networks of institutions for science and technology development, along with the creation of incentives and methods for relating research and development activities to the needs of users and potential users, and of inducing the latter to make claims on existing R & D capabilities;

consideration of social impacts (including employment) and trade-offs involved in establishing criteria for selecting technologies;

development of a manpower system, including educational institutions and government agencies, that will produce, motivate and retain a supply of appropriately qualified personnel sufficient to meet national goals in a changing technological environment;

choice of channels and terms for the transfer and reception of technology from abroad.

The format of the Institute would consist of lectures and discussions led by Institute faculty and outside experts, background reading of basic works, and analysis and discussion of current case studies brought to the Institute by participants. The tone would be one of a policy task-force charged with the responsibility of doing background work for policy decisions and then recommending appropriate government action.

The participants would be selected on the basis of continuing professional commitment to one or more aspects of science and technology policy development or application, and the possession of qualifications to benefit from participation in this type of educational experience.

The Institute would contribute to Cornell's development as a center for training and research in the area of science and technology policy. The feedback from Institute participants should provide valuable insight into the possibilities for improving the University's curriculum and research activities in the field of science and technology policy. The Institute would also strengthen linkages between the University and other groups working on S/TP, would stimulate development of the advisory capabilities of Cornell personnel, and would aid in the diffusion of knowledge.

Currently, the Institute is still in the proposal stage, detailed planning would not be completed until Fall of 1974. Implementation would commence in Spring 1975, so that the first Institute could take place in Summer 1975.

Other Special Projects

Low-Cost Housing Program - As a result of PPSTDN support, the activities of the low-cost housing group at Cornell have now grown to the point where the group has prepared a proposal for the establishment of a Program on Low-Cost Housing at Cornell. The group is seeking outside funding for this new Program -- the estimated cost being \$150,000.00 per year for five years. This Program would build on the existing competence at Cornell, but would also endeavor to increase the institutional capabilities on the subject of housing for low-income families.

The members of the low-cost housing group are:
Franklin J. Ahimaz, Peter S.K. Chi, Peter M. Cohen, James W. Converse, MaryAnn Griffin, David B. Lewis, Henry W. Richardson, Floyd O. Slate, and Darrell F. Williams.

The proposed goals of the low-cost housing program are the following:

- to develop and offer courses, seminars and workshops, on housing for low-income families in developing countries;
- to enable Cornell faculty and students to conduct research on various aspects of low-cost housing;
- to conduct specialized training programs or summer institutes for professionals, especially those from developing countries;
- to act as consultants and work with counterparts from LDC's;
- to participate in a network of low-cost housing groups;
- to disseminate information obtained from research studies and projects connected with the Program;
- to provide opportunities for researchers from LDC's and/or experts from the developed world to further existing knowledge;
- to assist developing countries in efforts to identify and develop indigenous materials for building construction.

Roving Workshop on Low-Cost Housing - Floyd O. Slate has been invited by the East-West Center to help conduct a "Roving Workshop" on low-cost housing, sponsored by the Technology and Development Institute of the East-West Center in Honolulu. This invitation is an outgrowth of his participation last year (Summer 1973) in the seminar on low-cost housing held at the East-West Center. The traveling seminar, with 20-50 participants from Thailand, Indonesia, the Philippines and South Korea will spend 2-3 weeks investigating low-cost housing problems and projects on site in Thailand and Indonesia during January 1975. It has been tentatively agreed that PPSTDN will cover one-third of the expense for Professor Slate's participation.

PPSTDN activities have gained increasing momentum over the past three years. This effort has led to a strong, interesting, and coherent program of activities for the coming year. While many activities are already planned, the Program remains flexible in order to respond to new proposals.

APPENDICES

Appendix I

Program Participants

A Program Participant is a person (faculty, staff or student) who is involved in PPSTDN related activity. The projects of these individuals are not necessarily all funded by the Program, but they do relate to science and technology policy issues and they are linked in with on-going PPSTDN efforts.

Executive Committee

Franklin A. Long, Chairman
Henry R. Luce Professor of Science and Technology
Professor of Chemistry

Edmund T. Cranch
Director, PPSTDN
Dean of Engineering

Franklin J. Ahimaz
Assistant Director, PPSTDN
Assistant Dean of Engineering
Professor of Engineering, Basic Studies

David B. Lewis
Assistant Director, PPSTDN
Assistant Professor of Policy Planning and
Regional Analysis

Tom E. Davis
Professor of Economics
Director, Latin American Studies Program

Matthew Drosdoff
Professor of Soil Science
Director, Tropical Soils Project

Milton J. Esman
Professor of Government
Professor of Public Administration
John S. Knight Professor of International Studies
Director, Center for International Studies

Gilbert Levine
Professor of Agricultural Engineering
Director of Water Resources and Marine Sciences

Daniel Loucks
Associate Professor and Chairman of Environmental
Engineering

Vithala Rao
Associate Professor of Marketing and Quantitative
Methods

Floyd O. Slate
Professor of Structural Engineering

William F. Whyte
Professor of Industrial and Labor Relations
Director, Program on Employee Participation in
Ownership and Management

Other Faculty

Richard Arnold
Associate Professor of Agronomy

Lee Y. Chang
Assistant Professor of Food Science

Peter S. Chi
Assistant Professor of Sociology and International
Population Program

Peter Cohen
Adjunct Associate Professor of Rural Sociology

Howard Conklin
Professor of Agricultural Economics

James Converse
Assistant Professor of Rural Sociology

Loy V. Crowder
Professor of Plant Breeding and Biometry

Gordon Cummings
Professor of Rural Sociology

William W. Goldsmith
Associate Professor of Policy Planning and Regional
Analysis
Director, Program on International Studies in
Regional Planning

Loretta Good
Associate Professor of Economics
(University of Wisconsin at LaCrosse)

MaryAnn Griffin
Instructor of Consumer Economics and Public Policy

Lynne Irwin
Assistant Professor of Agricultural Engineering

Barclay G. Jones
Professor of Policy Planning and Regional Analysis

Myunghwan Kim
Associate Professor of Electrical Engineering

Ta Liang
Professor of Civil and Environmental Engineering

James A. Liggett
Professor of Structural Engineering

Henry W. Richardson
Assistant Professor of Architecture

Sidney Saltzman
Professor and Chairman of Policy Planning and
Regional Analysis

Joseph Saunders
Associate Professor of Entomology

Aaron Segal
Visiting Associate Professor of Government and
International Population Program

Sho C. Tsiang
Professor of Economics

Darrell Williams
Assistant Professor of Policy Planning and
Regional Analysis

Research Associates

Jerry Ingles
Research Associate, PPSTDN

Robert N. Seidel
Research Associate, PPSTDN

Benedict Stavis
Research Associate, PPSTDN and CIS

Karel Stregl
Senior Research Associate, PPSTDN and CIS

Students

Mary Ann Acton
Ph.D. candidate, City and Regional Planning

Marlene Ahimaz
Ph.D. candidate, Business and Public Administration

Patrick Alleyne
Ph.D. candidate, Education

Jamlong Atikul
Ph.D. candidate, City and Regional Planning

Daniel H. Dumas
Graduate student, Business and Public Administration

- Nancy Gallant
Graduate student, Business and Public Administration
- Jorge de la Guardia
Graduate student, Structural Engineering
- Yoshifusa Kitabatake
Ph.D., City and Regional Planning
- Daniel Kops
Graduate student, Policy Planning and Regional
Analysis
- Steven Kraft
Graduate student, Agricultural Economics
- Stephen McRae
Ph.D. candidate, Natural Resources
- L. George Nelson
Graduate student, Industrial and Labor Relations
- Fernando Nasmyth
Graduate student, Law
- Vincent Richards
Ph.D. candidate, Economics
- Stephen Rochereau
Ph.D. candidate, City and Regional Planning
- Nancy Schwartz
Ph.D. candidate, Economics
- Luis Torres
Graduate student, Policy Planning and Regional
Analysis
- Ramesh Vaidya
Ph.D. candidate, City and Regional Planning

Table I

Distribution of 211(d) Grant Funds and Contributions from Other Sources of Funding¹

Review Period: September 1, 1973 to August 31, 1974

Grant Related Activities	211(d) Expenditures				Non 211(d) Funding for Program Related Activities	
	Period Under Review	Cumulative Total	Projected Next Year	Projected to End of Grant	PPSTDN Administered	Other
Research	34,091.30	88,086.30	70,000.00	40,000.00		116,700.00 ⁶
Teaching	22,419.99	73,414.99	30,000.00	30,500.00		
Libraries	500.00	5,092.00	3,000.00	4,000.00		
Consultation		500.00	2,000.00	2,000.00		51,700.00 ⁶
Publication	2,311.17	3,006.17	5,000.00	6,000.00	2,480.00 ²	
Other (inc. Administration, Office expense, some travel)	44,658.79	119,713.93	40,000.00	36,362.87		
Seminars, Work-shops	178.74	6,323.74	5,000.00	5,000.00	23,500.00 ³	
Case Studies			5,000.00		64,000.00 ⁴	
Special Exp.					5,000.00 ⁵	
TOTAL	104,159.99	296,137.13	160,000.00	123,862.87	94,980.00	168,400.00

¹These figures are our best estimates.

²OIST - Selected List of Information Sources

³OIS Symposium

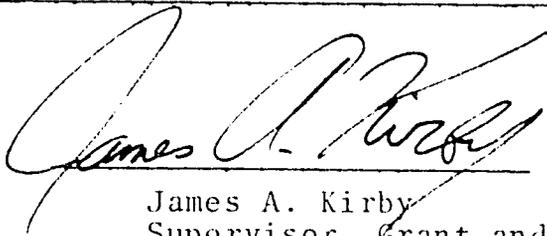
⁴Costa Rican Contract

⁵Center for International Studies Grant

⁶See p. 45 for details.

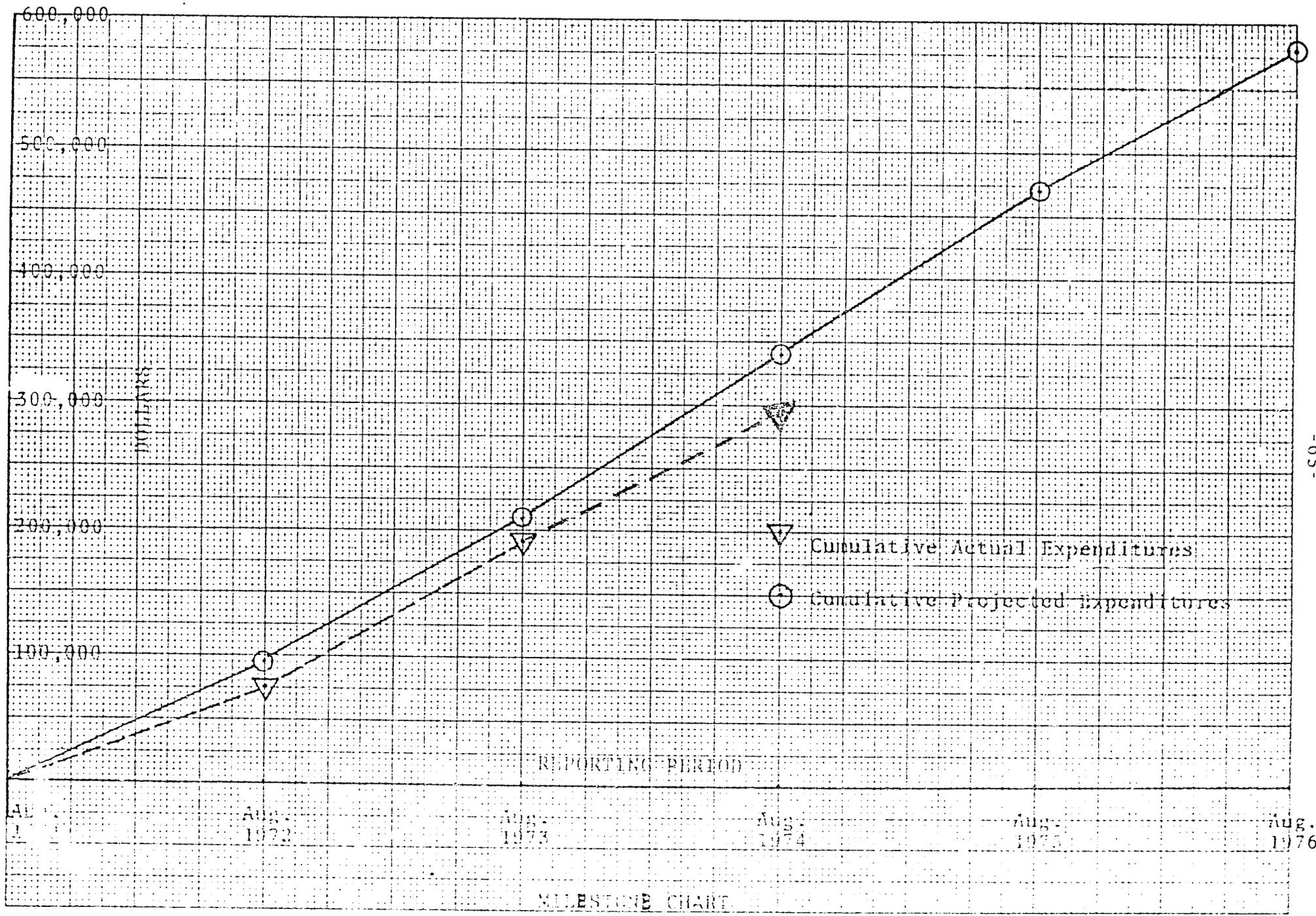
Table II
 Expenditure Report
 (Actual and Projected)
 Under Institutional Grant #AID/csd - 3158
 Review Period 9/1/73 to 8/31/74

(Line Items to Conform to Budget in Grant Document)	Expenditures to date		Projected Expenditures				Total
	Period Under Review	Cumulative Total	2	3	4	5	
			(Projected Expenditures \$115,000.00)				
e.g. Salaries	67,086.08	190,375.88					
Travel	10,566.52	47,730.94		150,000.00	160,000.00		125,862.87
Other Fringes	7,239.68	17,396.55					
Communications	4,047.86	6,532.15					
Rentals	1,160.91	1,955.46					
Outside Services	2,867.68	5,009.58					
Supplies & Materials	6,582.70	15,608.23					
Conf. & Seminars	178.74	5,264.60					
Employment Expenses	Ø	212.89					
Publication Costs	2,311.17	3,002.40					
Other	1,298.35	2,178.45					
Student Aid	820.00	820.00					
TOTAL	104,159.99	296,137.13					



James A. Kirby
 Supervisor, Grant and Contract
 Accounting

10/9/74



MILESTONE CHART

Appendix III

Cumulative List of Program Publications and Reports

The Need to Formulate Low-Cost Housing Policies Employing a Multidisciplinary Approach by F.J. Ahimaz

Diagnostico del Sistema de Educacion Cientifica y Tecnologia de Costa Rica y Bases Para Su Planificacion a Largo Plazo by Mariano Ramirez Arias, Jose Brenes Andre, Oscar Torres Padilla.

Preliminary Linear Programming Analysis of Colombia by Joel Brainard

Selected Problems of Developing Countries by Joel Brainard

Cornell-KAIS Workshop--Curriculum Planning, Inter-Disciplinary Research and Technology Transfer by KunMo Chung

The Natural Resource Potential for Regional Development of Limon Province: A Preliminary Survey by the Cornell-Costa Rica Team;

Information Management in Development Administration: on Technology's Promise for Policymaking in Developing Countries by Daniel Dumas

Directory of Courses Related to Policies for Science and Technology in Developing Nations 1974-1975 by Nancy Gallant

Preliminary Study of the Water Resources of the Atlantic Coast, Costa Rica by Jorge de la Guardia

Social Injustice and Optimal Space-Time Development: Extensions and an Application to the Minamata Mercury Pollution Case by Yoshifusa Kitabatake

The Urban Freight Transportation Planning Process: An Input-Output Approach to a Methodological Framework by Kang-Won Lim

Unemployment in Jamaica and the Contribution of the Bauxite-Alumina Industry to the Employment L. George Nelson

Policies for the Application of Science and Technology to Development by the OST Symposium, May 7-10, 1973

Housing Strategies for a Developing Economy, A Comparative Analysis and Evaluation of Housing Production Systems in Ghana by Henry W. Richardson

Toward an Andean Common Market for Science and Technology by Robert N. Seidel

Low-Cost Housing for Developing Nations--A New Course at Cornell University by Floyd O. Slate

Low-Cost Housing for Developing Countries, an Annotated Bibliography by Floyd O. Slate

Energy Subsidy as a Criterion in Food Policy Planning by Malcolm Slessor

Review of the Soviet Chemical Industry for the American Scientist by Karel Stregl

Science-Technology Policy and Industrial Democracy: A Hypothetical Model for an Industrially Semi-Developed Country by Karel Stregl