

Technion - Israel Institute of Technology

**THE SAMUEL NEAMAN INSTITUTE FOR  
ADVANCED STUDIES IN SCIENCE AND TECHNOLOGY**



הטכניון — מכון טכנולוגי לישראל

מוסד שמואל נאמן  
למחקר מתקדם במדע ובטכנולוגיה

# ANNUAL REPORT

1983/84





This report is being submitted to the Board of Directors of **The Samuel Neaman Institute**, to the Senate of the Technion - Israel Institute of Technology, and to the Board of Governors of the Technion.

G. Hetsroni  
Director

March 1984

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Samuel Neaman, founder of the Samuel Neaman Institute for Advanced Studies in Science and Technology, is a businessman and philanthropist committed to the concept that the creative exchange of information and ideas is the key to improving Israel's economy and quality of life. Mr. Neaman has received an honorary doctorate of science and technology from the Technion.

The Samuel Neaman Institute serves Israel as a "think tank" that permits the Technion to marshal the best minds available to grapple with problems of national importance. By developing interdisciplinary academic task forces that will tackle broad issues, we hope to augment, and even initiate, policy planning in specific areas.

Several projects of the Samuel Neaman Institute have already borne fruit in Israel. This visionary research and planning would not have been possible without the perception of the Institute's founder, Sam Neaman, whose concern for Israel has helped the Technion to widen the scope of its research efforts.

Professor Josef Singer  
President, Technion -  
Israel Institute of Technology

July 1983

THE SAMUEL NEAMAN INSTITUTE  
FOR ADVANCED STUDIES IN SCIENCE AND TECHNOLOGY OF THE TECHNION

Report on the Institute's Activities

1. General

The Samuel Neaman Institute for Advanced Studies in Science and Technology was founded at the Technion according to an agreement between the initiator, Mr. Samuel Neaman, the Noon Foundation, the American Society for the Technion and the Technion - Israel Institute of Technology, on February 7, 1975. This agreement was ratified by the Senate of the Technion on February 5, 1978. The Institute was registered as a company limited by guarantee and not having a share capital, with the Registrar of Companies, on May 4, 1979.

The objectives for which the the Samuel Neaman Institute was incorporated are:

- (1) To assist in the search for solutions to national problems in the fields of economic, scientific and social development in the State of Israel, the raising of the standard of living of its citizens, and the search for methods of facilitating Israel's integration into the Middle East by the following means:
  - (a) Providing aid for the enhancement of advanced research in subjects that will be chosen from those areas in which the Technion - Israel Institute of Technology maintains academic activity.
  - (b) The organizing of scientific and academic meetings on an international scale and appropriate level in whose frameworks scientists from the Technion will collaborate with academic visitors from Israel and abroad for the advancement of human knowledge and with a view to implementing this knowledge in the interests of the State of Israel.

- (c) Providing the means and creating the atmosphere in which scientists from outside, together with those from the Technion, will conduct research and contribute towards Israeli society, economy and industry.
- (2) To search for medium and long term solutions to the problems of the State of Israel while utilizing the resources of scientific and technological personnel at the Technion and mobilizing teams composed of Technion personnel and personnel from outside the Technion for limited periods of time, who will devote their efforts to the subjects selected.
- (3) To organize workshops on topics of significance for the development of the State of Israel and the solution to its problems, in which both scientists, technologists and businessmen will be invited to participate and to utilise these workshops, inter alia, as aids to formulate research projects with which the Neaman Institute will deal.
- (4) To do research in all fields of science, technology, economics and social sciences.
- (5) To facilitate the absorption and integration into the academic community of the Technion of scientists and technologists from all parts of the world.

By publication of the results of its activities, the Institute hopes to make both state officials and the general public, more aware and better informed of the problems and of the proposed solutions.

The Institute's activities are financed from the fruits of the Samuel Neaman Fund which is administered by the American Society for the Technion. This guarantees the Institute's freedom and independence. The Institute also enters into contractual relations for financing projects as long as the principle of independence of the Institute is not violated. During the period 1978 to 1984 the Institute's total budget was about 2.3 million U.S. dollars, of which about 1.8 million came from the Samuel Neaman Fund.

## 2. Organization

The **Samuel Neaman Institute** is organized as a non-profit corporation in the State of Israel and operates adhering to the rules and procedures of the Technion. The Institute is administered by a Board of Directors that formulates its policies, approves its annual and long term programs and oversees its financial affairs.

The Chairman of the Board, Mr. Samuel Neaman, is involved in the long range planning and in special projects, and takes an active interest in the **Institute's** daily operations.

The Director of the **Institute** is appointed by the President of the Technion in consultation with the Board of Directors of the Institute. He is responsible for the Institute's day-to-day operation, prepares detailed programs for Institute projects and is responsible for the recruitment and appointment of project staff. The Advisory Council assists the Director in evaluating the research projects, for the Board's final selection. The Council consists of twelve members - including six members of the Senate of the Technion and six public figures.

There are about 100 researchers taking part in various projects. These include members of the Technion staff, distinguished academicians from other institutions of higher learning in Israel and abroad, and researchers employed directly by the **Samuel Neaman Institute** on a full or part time basis. Researchers are also recruited from among leaders in public administration, industry and finance.

Project ideas may be initiated by the **Institute**, or by the researchers, government agencies, industry or other concerned institutions. Project research is performed by a staff under the leadership of a Project Coordinator; appropriate facilities and resources are provided by the Institute for the pursuit of the project's goals. The project team can utilize the technological environment of the Technion including its scientific and technical personnel, research facilities, laboratories, libraries and computers throughout the course of developing the projects.

Recently a team from the S. Neaman Institute was invited to make a presentation before various participants from the US Congress on alternatives in water policy. Professors J. Bear, G. Hetsroni and U. Shamir made the presentation on Capitol Hill and met with Senators Mark Hatfield, Dennis DeConcini, J.R. Packwood and with Representatives Mel Levine, James Scheuer and Bill Green. During the discussion the two sides explored modes of further cooperation and what ways and means are required to help the U.S. benefit from the Israeli experience in water policy.

A team from the S. Neaman Institute was invited to make a presentation on alternative energy policies in Israel before a special session of the Knesset's Energy Committee. Professors M. Avriel and G. Hetsroni, Dr. N. Arad and R. Karni and Mr. A. Breiner made this presentation. Following the presentation, there was a discussion and further explanations by the team. The committee's Chairman, M.K. M. Harish, requested that the team conduct a study on alternatives for Oil Exploration Policies in Israel.

### 3. Budgets

The Institute's total budget, as approved by the Board of Directors is summarized in table 1. These budgets include sums allocated by the Institute, and also participation of clients such as government ministries and other agencies.

Since 1983 the Institute has become an independent administrative unit, handling its own accounting. This results in considerable saving of expense, and enables us to provide the research coordinators with up-to-date information regarding the budget at their disposal.



**The Samuel Neaman Institute for Advanced Studies in Science and Technology**  
**Budget for the period 1.4.78 to 30.9.84 (in U.S. Dollars)**

No.	Project	1.4.78 30.9.80 Budget	80/81 Budget	81/82 Budget	82/83 Budget	Total budget 1.4.78- 30.9.83	83/84 Budget*
100	Administration	31,000	42,840	85,000	85,500	244,340	85,500
101a	Neighborhood Rehabilitation	44,000	57,800			101,800	
101b	Self-help housing rehabilitation			36,400		36,400	
102	Evaluation of Project Renewal			150,000	150,000	300,000	67,400
103	Agricultural Aviation		25,000	54,400	22,700	102,100	
104	Water Policy	73,660	42,800	51,100	64,500	232,060	26,000
105	Mathematics in Industry			10,000	10,300	20,300	
106	Simulation Systems			10,000		10,000	
108	Productivity Measurement	12,250	28,600	28,000	14,000	82,850	10,000
109	Energy Policy	45,400	85,600	97,000	82,125	310,125	98,000
113	Advanced Communication on location			31,500		31,500	
114	Government Policy on R & D				16,200	16,200	
115	Blood Substitutes				110,000	110,000	
116	Transportation policy				21,350	21,350	
117	Primary community health						95,000
190	Miscellaneous projects	51,900	60,000			111,900	
191	Minerals in Israel's economy	9,150	57,200			66,350	
118	Data Base - Energy						35,000
119	High Technology Industry - Performance						35,400
120	Evaluation of National projects						30,000
121	Underground Layout						25,000
123	Introduction of CAD						37,000
		267,360	399,840	533,400	608,175	1,797,075	544,300

\* This is a partial budget and may be changed subject to Board of Governors approval.

#### 4. Visitors

The institute invites from time to time distinguished persons from abroad to interact with the research teams of the Institute, to lead special workshops and seminars and to contribute from their knowledge and experience. Some of these visitors:

Martin Greenberger, Professor of Mathematical Sciences  
The John Hopkins University, Baltimore  
December 1978

Edgar A. Rose, Professor of Architectural Planning and Urban Studies,  
University of Aston in Birmingham, U.K.  
(Dec. '79 - Jan. 80)

Chester Rapkin, Professor of Urban Planning  
Princeton University, Princeton N.J.  
(Dec. '79 - Jan. '80).

Richard Zeckhauser, Professor, Kennedy School of Government  
Harvard University, (Jan. 1980)

Harold J. Barnett, Professor of Economics,  
Washington University, St. Louis, Mo.  
(April - July 1980)

Ernest R. Alexander, Professor of Urban Planning, University of  
Wisconsin, Milwaukee (Oct. 79 - Aug. 80)

W. Marcuse, Professor and Head, Economics Division  
Brookhaven National Laboratory (Jan. - May, 1980)

Bernard J. Frieden, Professor, Department of Urban Studies and Planning  
M.I.T. Cambridge, Mass. (July - Aug. 1980)

Julius Aronofsky, Professor, School of Business Administration,  
Southern Methodist University, Dallas, Texas  
(May - Oct. 1980)

Herbert J. Gans, Professor, Department of Sociology  
Columbia University, New York (June 1981)

Harvey Brooks, Professor, Kennedy School of Government Harvard  
University, (June 1983)

Edward Shils, Professor, Committee on Social Thought  
University of Chicago, USA (June 1983)

Sir Bruce Williams, The Technical Change Centre  
London, England (June 1983)

Jack L. Zakin, Professor and Chairman, Department of Chemical Eng.  
Ohio State University (December 1983)

Donald S. Remer, Professor, Director of the Energy Institute  
Harvey Mudd College, Claremont, California  
(October '83 - January '84).

## 5. Research Projects

Most projects result in publication issued by the Institute, which are distributed to interested groups and individuals, to decision makers etc. Thusfar there were some 70 reports published and distributed in about 7,000 copies. Results of the research projects are also publicized in the professional-scientific literature, as well as through lectures, workshops, seminars and other means in order to bring these results to the attention of the decision makers and the public at large. A list of the Institute's publications (in Hebrew and in English) is enclosed.

Some Research Contracts:

**Mathematics in Industry - Technion**

**Mineral Resources - National Council for R & D**

**Regulation of Daily Activity Hours - Ministry of Energy and Infrastructure**

**Self-Help Housing Rehabilitation - Ministry of Housing**

**Evaluation of Project Renewal - Jewish Agency and Ministry of Housing**

**Water Policy for Israel - Water Commissioner**

**Alternative Energy Policies for Israel - Ministry of Energy and Infrastructure**

**Advanced Communication - Ministry of Communication (approved, not yet signed)**

**Low Cost Transportation Management - Ministry of Transportation**

**Health Services - Kupat Holim (approved, not yet signed)**

### Ongoing Research Projects

#### 101b Self-Help Housing Rehabilitation in Israel

Research coordinator: Dr. N. Carmon

The research objectives are:

- (a) to assist the Ministry of Housing in locating means to improve the situation of the national housing stock, especially publicly built apartments, at the lowest national cost possible.
- (b) to point to suitable ways to improve living conditions of low-income families.

To achieve these goals, the following research stages were carried out:

- First stage (1981) - exposing the potential hidden in encouraging self rehabilitation of apartments as a means to obtain the two above goals.
- Second stage (1982) - methodical comparison of the common methods used in Israel to solve the housing problems of low-income families.
- Though it is currently not budgeted, the project is being continued in the third stage (1983-84) - study the factors which might influence low-income families to join the self-rehabilitation processes and thus achieve the two above mentioned goals.

During the research period, the research team maintained close contact with the Ministry of Housing:

- Meetings and consultations were held with the Deputy Minister, Parliament Member M. Katzav, and the various departments of the Ministry. These meetings served to formulate the research stages, to report on the findings and transfer our recommendations.
- The work was presented in a series of conferences and workshops organized by the Ministry.
- The main conclusions of the research were adopted by the Ministry and are being carried out.

- A government proposal was submitted for a law destined to encourage self-help housing rehabilitation of low-income families. This proposal mentions the research as the motivation for the formulation of this law.

This project was supported also by the Ministry of Housing.

## 102. Evaluation of Project Renewal in Israel

Research coordinators: Professor M. Hill, Dr. N. Carmon and Dr. R. Alterman

The research team included also Dr. A. Churchman, Mr. A. Frankel and a team of about twenty field workers.

The study project aims at providing a comprehensive evaluation of the National Project Renewal which has been carried out by the Government of Israel and the Jewish Agency since 1977. The researchers are engaged in identifying the inputs, outputs and results of Project Renewal, and evaluate their compliance with the Project's goals and guidelines.

The research uses the Integrative Evaluation method, developed by the project coordinators. This method encompasses the following evaluation tasks:

- Process evaluation - description of the planning and decision making processes in Project Renewal, and their evaluation from two main aspects: their compliance with the project's goals especially with regard to public participation in planning and performance, and their administrative effectiveness.
- Performance evaluation - description of activities carried out in the various areas: housing, education, welfare services etc. Follow-up of execution of approved programs and the extent to which they reach their target population.
- Cost evaluation - identification of the Project's cost, who pays for what, and cost effectiveness analysis.
- Impact evaluation - evaluation of the planned and non-planned outcomes of Project Renewal in the light of the professed goals, the

inhabitants' goals and the overall social goal: minimization of gaps within the Israeli society.

The researchers gather data in 10 neighborhoods, which represent the 80 neighborhoods included in Project Renewal.

The research team is now engaged in writing the final report which will include 10 neighborhood reports and a summary comparative report to be presented in June 1984.

The project was initiated by the Government of Israel (Office of the Deputy Prime Minister) and the Jewish Agency through the "International Committee for Project Renewal Evaluation". The researchers maintain constant touch with these agencies. At their request a summarizing workshop will be organized after submission of the final report.

The project is being supported also by the Jewish Agency and the Ministry of Housing.

#### 104. Water Policy for Israel

Research coordinators: Professor U. Shamir and Professor J. Bear

The research objectives are:

- (1) Development of a methodology for definition and analysis of water policy alternatives for Israel, which can be applied on a continuing basis, and
- (2) Implementation of this methodology to prepare a range of alternative water policies for decision making under the present conditions.

The research team included also the coordinator - Dr. Nathan Arad (Consultant), and - Prof. Yitzhak Gal-Noor (The Hebrew University), Mrs. Nina Selbst (The Water Commission), Mr. Yaacov Vardi (Tahal). Other experts have been engaged in carrying out supporting studies, under guidance of the research team, to provide information and analysis on specific policy areas.

The research has partial support from the Water Commissioner, with whom the research team has continuous and full cooperation.

The methodology which the research team has developed includes the following main components: identification of the water system, its objectives, the measures by which the achievement of these objectives are evaluated, the policy areas, their components, alternatives for each component, evaluation of comprehensive policies, analysis and presentation of results, multi-objective decision making.

Many workshops and discussions have been conducted - with experts, interest groups and the Water Commissioner.

Lately the research team has held a press conference, together with the Water Commissioner, where the research project was described and the Commissioner detailed the actual benefits derived from this project.

The team also appeared before various committees of the U.S. Senate and held a joint workshop with Resources for the Future in Washington D.C.

This year the research concentrates on four main policy areas:

- (1) The level of extraction from all the sources and operation of the main reservoirs.
- (2) Water quality in the sources and the main water systems.
- (3) Allocations and pricing of water for agriculture, and
- (4) The legal basis and the institutional structure of the water sector.

## 108. Productivity Measurement

Research coordinators: A/Prof. Y. Roll and A/Prof. S. Maital

### 1. Inter-plant comparison by means of productivity indexes

Following the development of the engineering approach to productivity measurement, a framework for a detailed interplant productivity comparison was prepared. This comparison is carried out by means of productivity indexes, as well as through determination of productivity gaps. These two means of comparison each emphasize a different aspect of the productivity issue. The numerical values of productivity gaps depend on 'global standards', which represent the

most advanced technology known in the specific sector to which the compared plants belong.

Comparisons carried out by applying the proposed framework yield several indicators that point to the state of the compared plants. By comparing the local standards of the plants under comparison, the gaps relative to the global standards can be assessed. Comparison of local productivity indexes serves as an indicator of management success in the respective plants. The combined result of the above factors -- productivity relative to the global standard -- indicates the competitive position of the plants under study. The analysis gains an additional dimension when data are available for several points in time, for each of the plants.

To demonstrate the proposed comparison framework, a productivity analysis was carried out in a second spinning mill. Data from the two plants formed the basis for a detailed numerical example of the proposed approach. Results of this research work are now in press.

## 2. Application of theory of games to the analysis of productivity.

One of the most interesting recent developments in the study of productivity is the application of game theory to the description and analysis of social organizations and institutions that abet or hinder productivity growth. The "game" of productivity occurs in at least two distinct settings:

- a) When production work occurs in teams, each member of the team must choose the level of effort which he or she exerts. The effort level of each team member will depend, among other things, on that person's expectation of how much effort other team members will put forth. The result is a game in which joint effort may be very high, or very low, depending on the game structure.
- b) When opportunities arise for boosting productivity, by means of new technology or improved methods, conflict may arise between workers and management over how to divide up the gains from the productivity improvement.

The research proposed here supplies a practical and simple framework for determining the precise nature of the productivity game being played, in specific situations. This framework will supply answers to the following questions:

- \* Is this equilibrium stable or unstable?
- \* Is it Pareto-efficient?



- \* If the equilibrium is unstable, what are the sources of the instability?

A report is in print.

## 109 Alternative Energy Policies for Israel

Research coordinators: Professor M. Avriel, Dr. N. Arad, Dr. R. Karni

Policy making on a national level in the energy area is a collection of decisions to be made with regard to the functioning of the energy system in order to advance it towards the achievement of a given set of energy goals. The energy system is very complex, being affected by technological, economic, social, political, geo-political and ecological factors. Recognition of this decisionmaking environment has led the Samuel Neaman Institute, in conjunction with the Ministry of Energy and Infrastructure, to create a formalized, but workable, approach to the formulation of energy policy. Two aims of the approach were stressed - that it would be understandable by energy policymakers; and that it would support policymaking efforts, and not supplant them (by dictating a single "optimal" policy).

The methodology is made up of four main components:

- (1) Development of a hierarchy of goals at the national level, from which energy goals are derived. In order to describe these goals in more detail, and to measure levels of goals achievement, several measures have been formulated for each goal. Finally, the policymaker indicates the relative importance of the various goals and measures, thus indicating his own value judgements concerning the nature of success attainable by any policies formulated.
- (2) Determination of a series of policy areas in energy from a consideration of the structure and nature of the energy system, and the necessity to make decisions regarding that system. Each area is broken down into individual policy actions - the decisions to be taken. Alternatives are then proposed for each policy action, expressing different ways in which it could be implemented. These alternatives provide the possibility for developing alternative policies.

- (3) Development of a policy alternative by selecting one policy action alternative (at the most detailed level), and combining them to form an overall policy. A set of values is then given to the goals measures, being the expected result deriving from the actual or possible implementation of all the decisions constituting that policy.
- (4) The aggregate achievement of the policy alternative is computed from the values assigned to each of the measures. For several policy alternatives, these aggregate achievements enable the policies to be ranked according to their attainment levels, and a preferred policy selected.

In the course of the research, 13 energy goals and 50 associated measures have been developed. 18 energy policy areas and 80 individual actions have been detailed - with 3-4 proposed alternatives for each action. At the policy area level, several alternative policies ("themes") have been proposed, and their aggregate achievements obtained from values given to the goal measures. At this stage, then, the methodology has been tested and evaluated at the policy area level.

In addition to the research team, experts in each of the policy areas provided information on implementable alternatives, and evaluations of the various themes selected. The policy areas, actions, alternatives and evaluations were presented, on a regular workshop basis, to groups of invited researchers and experts in the energy field, in order to obtain feedback on the methodology, the proposed policy alternatives and the relative importance of the various goals and goal measures. This workshop exposure of the research provided invaluable insight into the achievements and applicability of the approach, indicating that it indeed constitutes a workable means of formulating energy policy and evaluating its effects.

Towards the end of the project, a special workshop was held for directors general of several ministries and of the largest companies associated with energy (e.g. IEC, Paz, Sonol, Delek etc.)

The project was also presented at a special session of the Energy Committee of the Knesset.

The results of the project were presented at:

1. First Asia-Pacific Conference on Operational Research, Singapore, November 1982
2. International Federation of Operations Research Societies Conference on Modelling of National Economies, Washington D.C. June 1983.

and were published at:

1. Avriel, M. Arad, N. Karni, R. and Breiner, A. "A structural approach to resource policy making on a national level" in **Operational Research for National Development**, Paul, H., Goh, T.N. and Chew K.L. eds, Operational Research Society of Singapore, 711-725, 1982.
2. Avriel, M. Arad, N. Karni, R. and Breiner, A. "A rational decision-making process for resource policy making" in **Modelling and Control of National Economies**, Pau, L. and Basar, T. eds. Pergamon Press, to appear.

This year, the project concentrates on:

- pricing policy for oil and its derivatives
- pricing policy for coal
- policy for electricity rates

### 113. The Impact of Advanced Communications on Industrial Location in Israel

Research coordinators: A/Prof. D. Shefer and Mr. D. Stein.

This project is intended to test empirically the degree to which the nature of availability of advanced communications systems affects the choice of location of industries in Israel. Public policy has long encouraged industry to locate in development areas, away from the major urban centers. In order to induce industries to locate in development areas, the government established a program of subsidies to capital, infrastructure, and sometimes to labor as well. Recently, there has been a growth in interest of the so-called high technology or science based industries to locate in development areas. These industries are known to be heavy consumers of communications services, suggesting that the extension of the communications network into rural areas and small towns has in fact helped to overcome their traditional disadvantages.

In order to test this hypothesis, the study will investigate the history of locational decisions of firms in Israel. In particular, it will look at the pattern of the establishment of manufacturing concerns and branch plants (including relocations of existing plant) with regard to their locational choice of particular geographic zone (center vs. periphery on both the metropolitan and national scales), branch of industry and year of establishment. Following the analysis of the broad statistical patterns, a sample of firms in both manufacturing and service industries will be drawn. This sample will represent the universe of Israeli firms. The firms will be interviewed in detail to determine the practical effect that the availability of various factors, including advanced communications, had on the choice of location. Current assessments of the needs of the firms for additional or alternative forms of communications will also be obtained.

#### 114. Government Policy toward Research and Development

Research coordinators: Dr. B. Bental and Dr. S. Plaut

Theoretical literature on the "optimality" of market efficiency with respect to R & D activity was reviewed. To what extent is government intervention called for and in what form? There are several schools of thought concerning the nature and direction of externalities in R & D activities. There is also a lot of "fuzziness" in defining and characterizing the R & D process. There is debate over the extent to which R & D may be influenced by market incentives. There exists an extensive literature about diffusion of technology. There is a much sparser literature on empirical analysis of the returns on investment in R & D.

The second chapter for which a draft exists, concerns actual public policies toward R & D around the world. Government involvement in R & D in industry is common in virtually all developed countries. However, formal analyses of government performance in this area are rare. This probably is a reflection of the lack of clarity faced by both policy makers and theoretical researchers in analyzing R & D. There seems to be a ubiquitous "feeling" that governments should be involved in some way, but the rationales and hence specific objectives and means are at best vague. Indeed, the studies have been carried out at the macro level (mainly in England) cast severe doubt on the effectiveness of government support for high-tech industries. Other studies at the micro level have attempted to assess the government's

role as judged by industrial managers. These studies too point out that industrialists often dislike government involvement and programs, preferring that government restrict itself to the macro level, avoiding "fine tuning" at the micro level.

We have outlined the main sections of the policy chapters of the paper, after having spent considerable time debating the issues among ourselves and with outside parties. As in all such exercises, considerable thought must be devoted to defining the problem. We will pay particular attention to applied R & D activity in small countries. Clearly optimal policy for Israel will be different from policy, in, say, the United States, and will be different for basic research as opposed to applied research.

It is anticipated that the evidence collected will provide the first empirical indication of the role of advanced communications systems in altering the production processes and thus the efficiency of the firms in their new location. The results of this investigation will be valuable to the Ministries of the Government responsible for planning the spatial distribution of industrial facilities and the communications infrastructure.

The project has been submitted to the Ministry of Communications and the National Council for Research and Development for joint funding.

#### **115. Development of Blood Substitutes and Blood Plasma Substitutes**

Research coordinator: Professor S. Sideman

The research team included also A/Prof. N. Lotan, Dr. A. Ilan and Dr. V. Gutfrid.

The research program is aimed to develop blood substitutes and blood plasma substitutes which can perform as oxygen carrier, blood volume expander and anti-sludge material.

Extensive blood losses are life threatening, since they decrease the blood volume and pressure, limit the oxygen supply to tissues and slow the metabolic processes. Transfusions of blood plasma or whole blood are established medical practice. However, matching between the donor and recipient's blood types as well as storage and transport in

the field pose rather difficult problems to emergency medical care in the field. Blood and blood plasma substitutes are needed so as to eliminate such problems. Unlike blood plasma substitutes, the blood substitutes can carry the oxygen and carbon dioxide.

The plasma substitutes commonly used today are mainly of the colloid type (solutions of high molecular weight organic polymers, which are biodegradable under physiological conditions) and, to a lesser extent, of the crystalloid type (solutions of low molecular weight compounds such as carbohydrates and inorganic salts). The former provide a more prolonged blood-volume expanding effect than the latter. Oxygen and CO<sub>2</sub> - carrying fluorocarbon emulsions give undesired side effects, as they are not metabolized in vivo. Moreover, they must be administered only with pure oxygen or, oxygen-enriched air.

The present research program concentrates on the use of hemoglobin derivatives for oxygen-carrying, with no limitations of blood typing.

The research program includes the following goals:

- a) preparation of stroma - depleted hemoglobin (SDH)
- b) development of biopolymers as carriers for SDH and blood plasma substitutes
- c) binding of modified SDH to the biopolymers
- d) quality control of intermediate and final products, as well as process control of large scale preparations.

The plan for the next stages calls for preparation of SDH in larger quantities; chemical modification of SDH; preparative scale binding of SDH to biodegradable carriers; development of a physiological in vivo set-up for quality control of the products.

The project is also supported by the Ministry of Defence.

#### 116. A Model for Evaluating Low Cost Transportation Management Strategies For City Centers

Research coordinators: Dr. Y. Gur and Dr. Y. Prashker

The rise in the rate of motorization of city dwellers, coupled with the city growth, creates a set of problems and opportunities in the management of the city transportation. This phenomenon is well

known in urban areas around the world, and is especially acute in Israel in the early 1980's. The purpose of the project is to develop tools for the evaluation of low cost traffic management solutions, emphasizing the problems of city centers.

The approach is based on the axiom (very well documented) that traffic congestion in city centers cannot be eliminated using politically and economically feasible solutions. Thus, the objective of effective transportation management is to find how to best live with it, rather than try to fight against it.

Using a set of computerized models, we quantify the relationship among the major elements of the transportation system, and find the desirable equilibrium among them. These elements include:

- \* Balancing roadway capacity and parking supply.
- \* Balance between the need to encourage public transportation through traffic restraints, and the desire to attract non-work activities.
- \* Balance between volume, capacity and level of service across the cordon around the city center, and inside the center, and between through traffic and visiting traffic.

The project deals also, in a mere qualitative way, with the effect of transport capacity and level of service on the amount and type of activities at the center.

Major tasks of the project include:

- \* Developing the concept and theory into a computational procedure, using, where possible, existing tools.
- \* Developing a sketch planning computer model which will perform the calculations.
- \* Testing the model and demonstrating its operation using data from the City of Haifa, Israel.

This project is supported also by the Ministry of Transportation.

### 117. Primary Community Health Services

Research coordinator: Dr. L. Epstein

The primary health service is the service provided a person when he first requires medical assistance. This service is mainly provided by the local community clinics.

Secondary and tertiary services, even if they are highly developed, cannot replace the primary service. They are also expensive. The national expenditure for health in the U.S. amounts to about 10% of the GNP. In 1977 Israel has spent about 7.4% of the GNP on health.

The primary health services in Israel are over-employed (9.4 visits to the doctor per person in 1975), but the service is not efficient.

The community program to be implemented in the infirmaries will be based on the following model:

1. Gathering of past data, physical and laboratory check-up in order to ensure timely diagnosis. This checkup will be performed on each person applying to the infirmary for whatever reason, during the first year the program will be implemented. The data will be gathered by a nurse or a medical secretary.
2. Every positive finding will be brought to the attention of the team member responsible for that area.
3. All findings will be fed to a computer and invitations will be sent for further checkups, the response followed and reminders sent to those who did not show up. It is assumed that during the first year about 70% of the patients will be checked. Those who are not - will be summoned during the second year. As from the second year it will be possible to assess the efficiency of the program.

The project will be supported also by Kupat Holim.



#### 118. Data Center on Energy

Research coordinator: Dr. A. Mandel

An up-to-date comprehensive data center will be established on all topics related to energy in Israel. In the first stage information will be gathered on energy prices - crude oil, petroleum products and coal and a report will be prepared on energy prices in Israel and abroad. A bulletin related to energy in Israel in the years 1973-1983 will also be prepared.

During the second stage information will be gathered on electricity prices in Israel and abroad and a report prepared on electricity prices for the period 1958-1983. A bulletin describing the general trends of energy prices in Israel and all over the world will also be prepared.

#### 119. Israel's High Technology Industry - Performance

Research coordinator: Dr. M. Teubel

This research is intended to describe the relative advantages of the State of Israel regarding high technology industries, since the Six Day War. For this purpose a different data base should be constructed based on different material than that published by the Israel Bureau of Statistics. This data base will serve as infrastructure for further studies in the field of high technology industry in Israel.

This project is partially supported by the Jerusalem Institute for Israel Studies.

#### 120. Evaluation of National Projects

Research coordinator: Professor Donald S. Remer

The research objectives are:

1. Techno-economic analysis of potential energy projects in Israel
2. Preparation of economic sensitivity curves to help policy makers see how their assumptions would impact economic figures of merit for the projects.
3. Make recommendations for further techno-economic analysis, if necessary.

The first project selected was the Mediterranean Dead Sea Hydroelectric Project. First, the economic evaluations done by the Mediterranean-Dead Sea Co. Ltd. and the Israel Electric Corporation were reviewed. Second, economic calculations including a sensitivity analysis were completed for the project. Third, results are presented graphically so policy makers can see how their assumptions for major parameters such as discount rate, future fuel rates, and project investment costs impact the rate of return and payback period for the project. A report is being prepared and should be completed in early 1984.

#### 121. Underground Layout in Israel

Research coordinators: Professor A. Wachman and Dr. Y. Zimmels

This projects deals with investigating the possibilities of using underground layouts for the future development of the country. Such a layout may serve for purposes of storage, transportation and various other uses in times of peace as well as in times of war. Various models will be investigated, checking land and topographic conditions, and an economic analysis will be performed.

## Completed Research Projects

### 101a Neighborhood Rehabilitation

Research coordinators: Dr. N. Carmon and Prof. M. Hill

The research team included also Prof. A. Alexander, Dr. R. Alterman, Dr. A. Borukhov, Dr. A. Churchman, Dr. A. Gonen, Dr. H. Law-Yone, Architect M. Meyer-Brodnitz, Dr. R. Oxman, Prof. Ch. Rapkin Prof. E. Rose and A/Prof. D. Shefer.

The research project was active for about two and a half years and the team, together with visiting researchers from other universities and from abroad, produced a series of research reports dealing with policy issues connected with neighborhood rehabilitation in Israel. The topics were selected together with the Office of the Deputy Prime Minister, The Ministry of Housing, and the Ministry of Labor and Welfare. Among these were: the causes for neighborhood deterioration and means to prevent deterioration; the administrative-organizational aspect of Project Renewal; self-help housing rehabilitation; public participation in planning; services for the elderly; emigration to and from distressed neighborhoods; and lessons from urban renewal experience in U.S.A. and England (see list of publications).

This project was partly funded by the Ministry of Housing and the Ministry of Labor and Welfare.

### 103. Agricultural Aviation

Research coordinator: Professor S. Merhav

The research team also included Prof. D. Weiss, Prof. A. Sigal, Dr. A. Grunwald and Mrs. A. Merari-Farbman

#### 1. Flight Safety and Control

##### a. Simulation experiments

A series of flight control experiments was carried out with the purpose of determining the relation between "vision narrowing" or "tunnel vision" and the difficulty of the control task in the low-altitude agricultural flight. The "conus of attention" was measured by

aircraft drag and increasing efficiency). Also, the effectiveness of various add-on kits, presently available can be assessed with our program.

A final report is in print.

#### 105. The Use of Mathematics in Industry

Research coordinator: Professor A. Zaks

The research team included also A/Prof. A. Berman, A/Prof. M. Pollatchek, and Dr. Z. Rozberg.

The research team conducted a research the amount of saving to be gained by central storage. This was done using the game theory methods. At the same time preparations were made for centralizing the storing at the Technion chemical store and the electronic parts store.

Reports are being prepared including existing computer programs for inventories, description of the existing ordering procedures, and discussion of possible improvements.

The project was partially supported by the Technion.

#### The Use of Coal as a Substitute for Oil in Industry in Israel

Research Coordinator: Professor A. Stotter

Since oil is bound to become more scarce and hence more expensive in future years, the research team has undertaken a survey of the possibilities of using coal instead of oil for various industries. The team has studied the problems involved in the substitution, such as sources and availability, inland transportation, ash disposal, combustion, ecological problems, etc.

This project was part of the project on alternative energy policies. A final report was issued.

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This project was part of the project on alternative energy policies. A final report was issued.

### 191. Mineral Resources in Israel's Economy

Research Coordinator: A/Professor M. Shechter & A/Professor I. Lin

This research projects has investigatd the different minerals produced and/or imported to Israel, the results expected from scarcity in these minerals, their cost and uses under different political and economic situations. Substitutes for the minerals have been investigated, as well as alternative manufacturing processes. The recycling aspect has also been researched. A comprehensive report has been published concentrating on two important minerals: phosphates and cement.

A final report was issued.

### 190a. A Framework for the Formulation of Income Policy in Israel

Research Coordinators: Mr. A. Wiener & A/Prof. E. Rosenstein

This research examined the characteristics of a new institute aimed at a participative determination of incomes policy in Israel. This new institute will constitute the framework for discussion, negotiation and joint decision-making for thee representatives of government, the Histadrut and the employers. During negotiations the parties will be supplied with systematic and updated data concerning the expected socio-economic implications of their demands on the economy. The report contains also appendices destined to complement the lines of thought.

### 190b. Developing a Methodology and Experimental Application of Preventive Intervention in Labor Relations

Research Coordinator: Professor B. Mannheim & Professor E. Rosenstein

The major purpose of this research was to develop, test and introduce a method of preventive intervention in labor relations at the organization level, based on a cooperative process which would run parallel to and supplement the existing collective bargaining processes.

A model was formulated and tested in certain organizations. Further tests are recommended in order to finalize the conclusions. A final report was issued.

Currently, since the subject became very timely, the team is again looking into applying the method.

#### 190c. Institutional Feeding in Israel

Research Coordinators: Professor Ch. Mannheim & Professor Z. Berk

Eating patterns are changing rapidly in modern society as a result of the fact that more people are working and unable to eat meals in the traditional home environment. The research team has carried out a preliminary investigation of institutional feeding patterns in schools, factories, universities, hospitals etc. A workshop was organized with the participation of many of the people dealing with various aspects of the problem from government and private enterprises. Preliminary recommendations for a broader study have been formulated and published in a final report.

#### 190d. Vocational and Technical Education in Israel

Research Coordinators: Professor S. Avital & Professor A. Bar-Lev

The importance of suitable vocational education for the development of the State of Israel is recognized by all. The research team has conducted a preliminary study to determine the problems facing vocational education in Israel today and define the aspects to be studied, such as: what are the objectives of vocational training in Israel at the level of grades 10-12; what are the needs of the Israeli society with regard to her vocational education; what system of vocational education in other countries can serve as a model for Israel.

#### 190e. Regulation of Daily Activity Hours

Research Coordinator: Ing. E. Kally

This research has been initiated in response to a decision the Economic Cabinet of the Government, according to which the idea of regulating daily activity hours was to be examined as a means for more efficient utilization of resources, while improving convenience of the population.

An interdisciplinary research team has examined various aspects of this issue such as: Passenger use of public and private transportation; distribution of daily "work-start" times in industry; peak hour demand for electricity and possibilities for its reduction; analysis of population preferences regarding shopping, personal and public services etc. A final report was published.

#### 190f. Improvement of Policy-Making in Israel

Research Coordinator: Professor Y. Dror

The study attempts to formulate recommendations for the improvement of policy making in Israel while examining the experience of other countries. The research team claims that Israel has significant opportunities to influence its future with the help of deliberate policy making, but at the present time it is inadequately equipped for high quality policy making. Therefore, the team formulated a series of recommendations, some of them of a long-range value, to be adopted in order to improve policy making procedures. A final report was published.



## **Courses and Workshops**

### **Short Advanced Course in Policy Analysis and Policy Planning**

Professor R. Zeckhauser - Harvard University (Jan. 1980)

The Neaman Institute held a short advanced course in policy analysis for a select group of officials who are involved in directing policy planning units, with the aim of bringing to the attention advanced methods for managing complexity and handling uncertainty.

### **Workshop on the Implications of Peace for the State of Israel**

Coordinator: Professor S. Freier (Jan. 79)

The workshop took place in January 1979 in view of the impending peace with Egypt. Six interdisciplinary groups, each studied one aspect of the implications of the peace on various problems of the State of Israel. The workshop's recommendations were published both in English and in Hebrew and brought to the attention of the Prime Minister and leading governmental officials.

### **Workshop on Hemoperfusion**

Coordinator: Professor S. Sideman (Aug. 1979)

The objective of the workshop was to create a framework for future developments and clinical applications of this new medical tool for blood purification, define operating standards and recommend reliable procedures. A group of the leading scientists in the field, gathered to issue drug recommendations for therapeutic hemoperfusion treatment, a list of general clinical indications and contra-indications for hemoperfusion in drug toxicity etc.

### **Workshop on Approximation Theory and Its Applications**

Coordinator: Professor Z. Ziegler (June 1980)

About 25 scientists from all over the world gathered to study problems related to optimal recovery and image reconstruction. The symposium was attended by about 100 people from Israel and the exchange of information was fruitful.

### **S. Neaman Workshop on Neighborhood Rehabilitation in Israel**

Coordinators: Dr. N. Carmon and Prof. M. Hill (Feb. 1979)

The goal of this two-day workshop was to discuss Project Renewal objectives and the ways in which the research team could assist the Project. The 54 participants were researchers from various high education institutions in Israel, as well as decision makers from all the government ministries involved in Project Renewal (the Deputy Prime Minister, Ministry of Housing, Ministry of Education, Ministry of Labor and Welfare, Ministry of Health, Ministry of the Interior and the Ministry of Finance). A report was published both in Hebrew and in English to serve as basis for the discussions.

### **S. Neaman Workshop on Public Participation in Project Renewal**

Coordinators: Dr. R. Alterman, Dr. H. Law-Yone, Dr. A. Churchman (May, 1980).

The objectives of this workshop were to define the problems involved in encouraging public participation in planning of their own neighborhoods. One of the aims was to hear what other people, from different backgrounds and experience thought about this matter, and convey to those engaged in the emplementation of Project Renewal attitudes and methods for participation. The method of simulation games as a means for public participation in decision making was examined. About 40 officials participated in this workshop, engaged in various capacities in Project Renewal. The coordinators gave an introductory lecture, followed by a guest lecture by Professor Sanoff of the University of North Carolina, and then a simulation game was carried out, in which all the participants took part.

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