AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

BIBLIOGRAPHIC INPUT SHEET

FOR AID USE ONLY
Batch 39

1. SUBJECT CLASSIFICATION
A. PRIMARY
TEMPORARY
B. SECONDARY

2. TITLE AND SUBTITLE
Summary report of activities of the advisory panel to the Ministry of Science and Technology of Korea

3. AUTHOR(S)
(101) National Research Council. Board on Science and Technology for Int.Development

4. DOCUMENT DATE	5. NUMBER OF PAGES	6. ARC NUMBER
1972	19p.	ARC

7. REFERENCE ORGANIZATION NAME AND ADDRESS
NAS

8. SUPPLEMENTARY NOTES *(Sponsoring Organization, Publishers, Availability)*

9. ABSTRACT

(Sci.& Tech.R&D)

10. CONTROL NUMBER	11. PRICE OF DOCUMENT
PN-AAC-519	
12. DESCRIPTORS	13. PROJECT NUMBER
	14. CONTRACT NUMBER: CSD-2584 GTS
	15. TYPE OF DOCUMENT

AID 590-1 (4-74)

Summary Report of Activities of the National Academy of Sciences Advisory Panel to the Ministry of Science and Technology, Republic of Korea

Seoul, Korea

10 - 21 January 1972

This is a report on the activities of the Advisory Panel to the Ministry of Science and Technology, Republic of Korea. The advisory panel, which performed its mission under the auspices of the National Academy of Sciences (Board on Science and Technology for International Development, Office of the Foreign Secretary) and with financial support from the United States Agency for International Development Mission in Korea, visited Korea for 2 weeks in January, 1972. The observations and recommendations of the panel were conveyed to officials of the Ministry of Science and Technology and of AID at meetings held in Seoul. This staff report is submitted to the Agency for International Development under contract AID/csd-2584, Task Order 8, for AID use and further distribution, if any.

TABLE OF CONTENTS

I

INTRODUCTION

In response to a request by the Korean Ministry of Science and Technology (MOST) to USAID/Seoul, the U.S. National Academy of Sciences (NAS) provided an advisory panel on science and technology in Korean development to the Ministry in January, 1972. The three-man panel, through financial support by the United States Agency for International Development Mission in Korea, visited the country January 10 - 21. Members of the panel were Dr. Roger Revelle, Harvard University (Chairman); Dr. Franklin A. Long, Cornell University; and Dr. Hubert Heffner, Stanford University.

Staff assistance was provided by Mr. John Hurley of the NAS Washington staff. Also participating in the visits and discussions of the panel was Dr. Newman A. Hall, AID Science Advisor in Korea. The panel's advice was sought for the following broad purposes:

1. To advise informally on the development of long-range policy for Korean science and technology;

2. To suggest ways in which the governmental structure for science and technology might be strengthened and improved; and

3. To review the organization and functions of research-and-development institutions and suggest modifications where appropriate.

The visit of the panel was timely in that the Government of the Republic of Korea has launched its third Five-Year Economic Development Plan. The plan stresses increasing exports of Korean manufactured products and

expanding and developing heavy industry, all of which require a greater scientific and technological capability for the nation. The MOST, which will play a key part in furthering this capability, has drafted a Five-Year Plan for Science and Technology; the advisory panel discussed the policy and implementation aspects of this proposed plan, as well as the long-range role of science and technology in meeting Korea's future social and economic goals.

In its advisory mission, the NAS panel spent many hours of discussion with the staff of MOST. Discussions were also held with staff of the Economic Planning Board, representatives of private industry, and economic and agricultural advisors of USAID. The Minister of Science and Technology, Dr. Choi Hyung Sup, met with the panel for lengthy discussions on four separate occasions.

In addition to interviews and discussions, the panel visited a great many of Korea's major research and educational institutions:

- Korea Institute of Science and Technology (KIST)
- Korea Advanced Institute of Science (KAIS)
- Korean Science and Technology Information Center (KORSTIC)
- Office of Atomic Energy Research Institutes
- Office of Rural Development (ORD) and Agricultural Research Institute
- National Industrial Research Institute (NIRI)
- Seoul National University, College of Arts and Sciences
- National Science Museum

These visits, along with private discussions and several pleasant social functions given by MOST and some of the research institutions, gave

the NAS panel the opportunity to talk with many Korean scientists, educators, and government officials at all levels, and to observe the work and facilities of the various institutions. The panel's agenda and itinerary are in Chapter III of this report.

The comments and recommendations of the panel were communicated during the visits and discussions, and especially in the meetings with Minister Choi. The panel kept the AID Mission informed of their observations by informal reports and by virtue of the full participation in all activities by Science Advisor Dr. Newman Hall.

II

CONCLUSIONS AND RECOMMENDATIONS

Following is a summary of the major conclusions and recommendations of the advisory panel.

Role of the Ministry of Science and Technology

MOST should be the most important agent for technological change in the Korean government. It should give priority to identifying long-range problems, formulating new programs for technological innovation, and strengthening the country's scientific and technological capability. To achieve these objectives, it needs to have greater influence over the budgets of governmental scientific-and-technological programs and should consider keeping certain operational functions that might permit greater leverage in developing innovative scientific institutions. More specifically, the following steps are recommended:

1. The strong national emphasis on technology-based industries in the drive for increased exports imposes a special responsibility on MOST; it should stimulate the government to support Korean industry in the acquisition and adaptation--as well as innovation--of technology. Possible mechanisms to stimulate these developments are

   a. Tax incentives to encourage industrial R & D;

   b. Governmental risk-sharing for technological innovations;

   c. Establishment of industrial standards and provision of testing-and-evaluation services;

d. Formation of survey teams to investigate overseas technologies of possible interest to Korea;

e. Establishment of joint government-industry study teams to provide a continuing analysis of industrial needs and opportunities; and

f. Assistance in the development of technological infrastructure.

2. More internal evaluation of the technical assistance for Korea is needed. The merits of joint planning by Korea and the donor for large-scale assistance programs should be considered. The Technical Cooperation Bureau of MOST has a potentially important role to play in coordinating overseas technical assistance. It should help develop fairly long-range national plans and priorities for this help. Planners should give greater weight to new modes of training technicians and skilled craftsmen, by utilizing, for example, the facilities of private industry--national and foreign--or setting up training programs during military service.

Scientific and Technical Manpower

Forecasts of future requirements for scientific and technical manpower at all levels, and estimates of the supply of such persons, indicate the probability that by 1976 Korea will have an oversupply of natural scientists and most kinds of engineers and a deficiency of technicians and craftsmen. Therefore, several changes in educational policies are needed:

1. Changes in university curricula in scientific and engineering fields to increase the usefulness of science and engineering graduates. Such changes should be based on a much greater collaboration between universities and industry and on more practical experience in industry for students. Further, the quota system in which equal numbers of students

are admitted to all university science and engineering departments should be abandoned or drastically modified to permit choice of fields that are most needed by industry and have the best employment prospects.

2. Much greater emphasis on secondary education. High school education increases the potential supply of more productive and flexible technicians and craftsmen and, by keeping young people in school longer, may also relieve the problems caused by the rapid increase in the labor force. Furthermore, an increase in secondary education could help provide teaching jobs for many college graduates who will find it hard to get jobs in industry.

3. New ways to increase the training of craftsmen and technicians. In addition to arranging new training possibilities through such avenues as military service and private industry, the government should be concerned with incentives for young poeple to enter technical and craft occupations.

Needs of Science and Technology in the Universities

University education in science and technology is weak. Among the reasons for this weakness are lack of research funds, poor equipment, poor salaries and promotion structures for faculty, and departmental staffs that are too small to function effectively in broad-ranging subjects that require a fairly high degree of specialization. Policies are needed to improve faculty quality, create more opportunities for problem-solving research by faculty and students, make available incentives and rewards for research accomplishment, and engage faculty and students in more and better research that is directed towards national needs.

MOST can help strengthen the universities in several ways:

1. Faculty salaries and student stipends for research should be supplemented.

2. Wherever possible, existing and future research laboratories should be integrated with universities.

3. MOST should seek funds for supporting research projects and providing grants to universities to establish "centers of excellence" in particular fields of science and technology.

4. A national organization should be formed to represent Korean technologists and scientists on both a national and international basis.

5. MOST should consider support for Korean scientific journals and a popular scientific journal.

6. One of the most effective ways by which MOST could increase the quality of university research and graduate education would be to broaden and expand its program of research awards, probably by establishing a Korean Research Foundation. Such a foundation, either governmental or independent, might support such programs as individual grants to research professors; university purchase of research equipment and reference books; graduate fellowships; development of "centers of excellence" in specific areas at specific universities; institutional grants for modest continuing support to selected university departments of science and engineering.

Scientific Institutions and Research

Two of Korea's most important agencies in science and technology, KIST and KAIS, have been established as autonomous institutions, and proposals are under way to give similar status to the Office of Atomic Energy. MOST

should be continuously aware of the program accomplishments and policy directions of these agencies and should consider establishing specific points of liaison within the Office of Research Coordination of the Ministry.

More specifically, MOST should weigh the following points:

1. KIST, KAIS, KDI, KORSTIC, and ADD--the institutions at the Science Park--form a potentially strong and useful center of research and graduate teaching. It would be sensible for them to share certain facilities and functions, such as purchasing, transportation, machine shops, libraries, etc. Of even greater importance, however, will be intellectual collaboration, possibly by means of joint staff appointments, joint seminars, interdisciplinary study and research efforts. MOST should encourage such collaboration.

2. The proposed emphasis on fuel reprocessing and fuel fabrication of the research-and-development program of the Office of Atomic Energy should be weighed. A different emphasis that might be more useful would be to broaden the responsibilities of the office to cover research, development, and analysis of environmental problems resulting from energy generation or consumption. Whatever direction is selected, the office needs to define an appropriate mission clearly.

3. Korea should give a stronger emphasis to marine science and technology. The country's continental shelves are already the basis of a large fishery and extensive aquiculture, but these shallow waters may also contain large unexploited resources. Bottom exploration over the entire shelf for shrimp and other invertebrates needs to be undertaken in conjunction with surveys of bottom sediment and studies of circulation of the overlying waters. Studies of the organic productivity of the sea should be carried

out to aid fishery management. The extensive tidal flats in the Inchon region represent an opportunity for reclaiming large areas of potential farm land, and the strong tides in the area may be a potential energy source for electric power generation.

4. Priorities and objectives in agricultural research should be carefully examined. A principal objective should be to raise farm incomes, not only by helping farmers increase yields of food grains, but also by helping them grow and sell high-value cash crops, particularly those that are suitable for export. As per capita income grows in Korea, dietary habits will change; agricultural research should help farm production and sales be ready to meet future requirements.

Foreign Expert Advice

There are several specific areas in which MOST might wish to seek foreign expert advice:

1. Organizing and determining the content of a foundation to support research and scientific education;

2. Analyzing barriers to technological innovation in Korean business and formulating the organization and programs of the proposed Korea Technological Development Corporation in the light of that analysis; and

3. Defining the mission and organization of the Office of Atomic Energy.

In addition to using outside expertise, however, MOST should increase its use of Korean scientists, engineers, and businessmen as advisors. Not only does this help to tap the best brains in the country, but it also provides feedback to people outside of government on what the important problems of the country are.

With respect to follow-up activities that might result from the recommendations of the advisory panel, the presence in Korea of AID Science Advisor Newman Hall should be beneficial. Dr. Hall will be able to provide helpful advice and serve as a useful communications link between MOST, AID, and overseas individuals and institutions that may be able to assist MOST in future planning and programs.

III

ITINERARY AND PARTICIPANTS

Itinerary of NAS panel, January 10 - 21, 1972

Jan. 10 (Monday)		
	MORNING	Discussion of Itinerary and Agenda
	AFTERNOON	Presentation by MOST on the basic Features of Science and Technology in Korea
Jan. 11 (Tuesday)		
	MORNING	Discussion on Draft Third Five-Year Plan for Science and Technology Development
	AFTERNOON	Call on Minister Choi of MOST
		Continuation of the Discussion on Third Five-Year Plan for S & T
Jan. 12 (Wednesday)		
	MORNING	Continuation of the Discussion on Third Five-Year Plan for S & T
	AFTERNOON	Visit to KORSTIC, Discussion on Science-Information Management
		Visit to KIST, Discussion on KIST activities
		Reception and Dinner hosted by Dr. Shim, President of KIST at KIST Guest House
Jan. 13 (Thursday)		
	MORNING	Discussion on Science & Technology Promotion Measures
	AFTERNOON	Continuation of the Discussion on Third Five-Year S & T Plan
		Briefing by Economic Planning Board on Third Five-Year Economic Development Plan
		Reception hosted by Mr. Adler, Director of USAID/Korea

Jan. 14 (Friday)		
	MORNING	Draft on Interim Report
		Visit to College of Liberal Arts & Sciences (SNU)
	AFTERNOON	Visit to National Industrial Research Institute (MCI)
		Call on Minister Choi of MOST
Jan. 15 (Saturday)		
	MORNING	Leave Seoul
		Arrive Suwon
		Visit to Office of Rural Development and Agricultural Research Institute
		Lunch hosted by Administrator of ORD (MAF)
Jan. 16 (Sunday)		Sightseeing
Jan. 17 (Monday)		
	MORNING	Visit to Office of Atomic Energy Research Institutes; Discussion on Future Organizational and Research Plan
		Lunch hosted by Dr. Youn
	AFTERNOON	Visit to Office of Geological Survey (Prof. Revelle)
		Call on Mr. In Wook CHUNG, President of Kangwon Industrial Company (Prof. Heffner)
		Call on Mr. Ip Sam KIM, Vice-President of the Federation of Korean Industries (Prof. Heffner)
		Call on Minister Choi of MOST
		Reception and Dinner hosted by Dr. Lee, President of KAIS at Korea House
Jan. 18 (Tuesday)		
	MORNING	Visit to KAIS and National Science Museum, Discussion on KAIS Development Plan and NSM Programs
		Discussion on Program Development and Promotion

	AFTERNOON	Discussion on Manpower Policy and Development Plan
		Departure of Prof. Long
		Report Writing
		Dinner hosted by Minister Choi of MOST at the Government Official Guest House
Jan. 19	(Wednesday)	
	MORNING	Discussion on Technical Cooperation Programs
	AFTERNOON	Report Writing
Jan. 20	(Thursday)	
	MORNING	Final Discussion with Staff of MOST
	AFTERNOON	Press Interview
		Call on Minister Choi of MOST
		Visit to Korean Academy of Arts & Sciences (Prof. Revelle)
Jan. 21	(Friday)	
	MORNING	Departure of Professors Revelle and Heffner

Participants

Roger Revelle, Chairman
Director, Center for Population Studies
Harvard University
Cambridge, Massachusetts

Franklin A. Long
Director, Program on Science, Technology and Society
Cornell University
Ithaca, New York

Hubert Heffner
Professor, Department of Applied Physics
Stanford University
Stanford, California

John G. Hurley
NAS staff

IV

HIGHLIGHTS AND COMMENTS

Organization

The work of the panel was greatly facilitated and their stay made enjoyable by the outstanding cooperation and hospitality of the Minister of Science and Technology and his staff, and by the directors and staff of the institutions visited. Particular tribute should be paid to Mr. Kim Hyung Ki, Information Management Director of MOST, the Ministry's liaison officer with the panel, who worked tirelessly and effectively to expedite the work of the team.

Excellent support was also provided to the advisory group by the USAID Mission in Seoul. Useful discussions were held with AID Director Michael Adler and various officers of the mission, which also gave administrative and logistical support whenever it was needed.

The discussions in which the panel took part were held in a cordial and candid atmosphere, and every effort was made to provide relevant information and background material to the group. The members of the advisory team greatly appreciate this support and the opportunity to participate in Korea's significant efforts to develop its scientific and technological capability.

In retrospect, it appears that perhaps too much of the panel's limited time was taken by briefings on the basic functions and operations of various agencies and institutions. If similar advisory groups are used in the future, it would perhaps be helpful to have a greater exchange of basis briefing

material well in advance of the group's visit, thereby enabling them to get more quickly to key issues and problems.

Given a limited time and a wide range of issues to be considered, a small advisory group must concentrate on certain key issues and cannot address them in great detail. Nevertheless, the NAS panel feels that they have raised some important basic issues for consideration by the Minister of Science and Technology and have identified specific areas that would benefit from further in-depth study.

Press Coverage

On January 20, at the end of the visit, members of the advisory panel and officials of MOST held a press conference. Fifteen members of the local press attended and asked questions about the panelists' impressions of science and technology in Korea. One of the resulting stories is contained on the following page.