

Indonesia

Science and Technology Manpower Development Program

Report Date: March 2001

Field Survey: August 2000

1. Project Profile and Japan's ODA Loan



National Map of Indonesia



Left: Studying Abroad
Qualification Test



Right: Studying Abroad Graduates

(1) Background

At the beginning of the 1980s, the Republic of Indonesia was strongly aware of the need to develop human resources in science and technology fields in order to build its ability for independent development and proceed with economic development under its own power. However, at that time the country could only produce around 3,400 graduates per year, and at the graduate school level it only became possible to earn Masters degrees and doctorates in the country in 1977. By 1983, Indonesia had only produced a total of 160 holders of graduate degrees (Masters and Ph.D). Further, as Indonesia's civil research agencies were under-developed, the government-affiliated research agencies took the initiative in research and development. However, the government-affiliated research agencies suffered from problems with budgets, and particularly with a shortage of human resources. Thus the government-affiliated research agencies needed funds to send their young researchers to universities and other institutions in developed countries, as a means of training and retaining the superior researchers who are essential for development of science and technology.

In this situation, the Indonesian government formulated a plan to increase the number of graduate-level engineers in the field of science and technology by 12,000 between 1987 and 1995. The World Bank responded to this plan by providing the Indonesian government with an overseas study loan, beginning in 1985, as part of its "Science and Technology Training Project". The loan was used to dispatch approximately 1,350 staff of government research agencies abroad for the purpose of acquiring scientific skills. They were sent to universities and other research agencies in Japan (approximately 300 students), the US and advanced European countries. However, the World Bank program stopped sending new students abroad after 1989. Therefore the Indonesian government demanded the Japanese government for the same kind of funding as it received from the World Bank, in order to carry on overseas study program.

(2) Objectives

The objective of this project was to educate and train scientists and engineers as a means of raising Indonesia's strength in these fields, and thereby to encourage its industrial development.

(3) Project Scope

1) The program for the dispatch of students to study abroad

This project used an ODA loan to cover the cost of overseas education to degree level for approximately 400 students within the planned target (see Table 1).

Table 1 Planned Increase in Staff of Each Academic Level for Six Government-Affiliated Research Agencies (increase in such graduates between 1987 and 1995)

Academic level	Planned increase in Indonesia (1987 ~ 1995)	Overseas qualifications			
		Planned increase	World Bank Loan	Shortfall	ODA loan
Graduate	8,000	955	259	696	220
Masters'	320	942	592	350	84
Ph.D	40	595	229	366	41
Diploma	-	1,350	270	1,080	55
Total	8,360	3,842	1,350	2,492	400

* A portion of the shortfall in the above table was expected to be covered by an additional World Bank loan and other sources.

The overseas education program included preparations for overseas study in Indonesia, (selection of students, training etc.), overseas study (language training and study at university or other institution), and orientation on return to Indonesia. The destination countries and the dispatched students were as follows:

- [1] Numbers of students dispatched: Approximately 400 (of whom approximately 240 studied in Japan).
- [2] Destination countries: Japan, the US, Britain and other developed countries.
- [3] Sub-programs: Graduate degrees, post-graduate degrees (Masters', Ph.D), and diploma.
- [4] Eligible students: Staff of six government-affiliated research agencies (LPND: The National Geographic Institute (BAKOSURTANAL), the Atomic Energy Agency (BATAN), the Technology Evaluation and Application Agency (BPPT), the Central Bureau of Statistics (BPS), the Space and Aeronautics Research Center (LAPAN) and the Scientific Research Center (LIPI)).

2) Consulting service

In combination with the above programs, management assistance was provided for the establishment of methods for the monitoring and evaluation of students, for the collation of result reports, and to strengthen the implementation scheme.

(4) Borrower/Executing Agency

Republic of Indonesia / Technology of Evaluation and Application (BPPT)

(5) Outline of Loan Agreement

Loan Amount/Loan Disbursed Amount	¥6,067 million / ¥5,731 million
Exchange of Notes/Loan Agreement	October 1988 / October 1998
Terms and Conditions	Interest rate: 2.7%, Repayment period: 30 years (10 years for grace period), General Untied (Partially untied for consulting services)
Final Disbursement Date	November 1997

2. Results and Evaluation

(1) Relevance

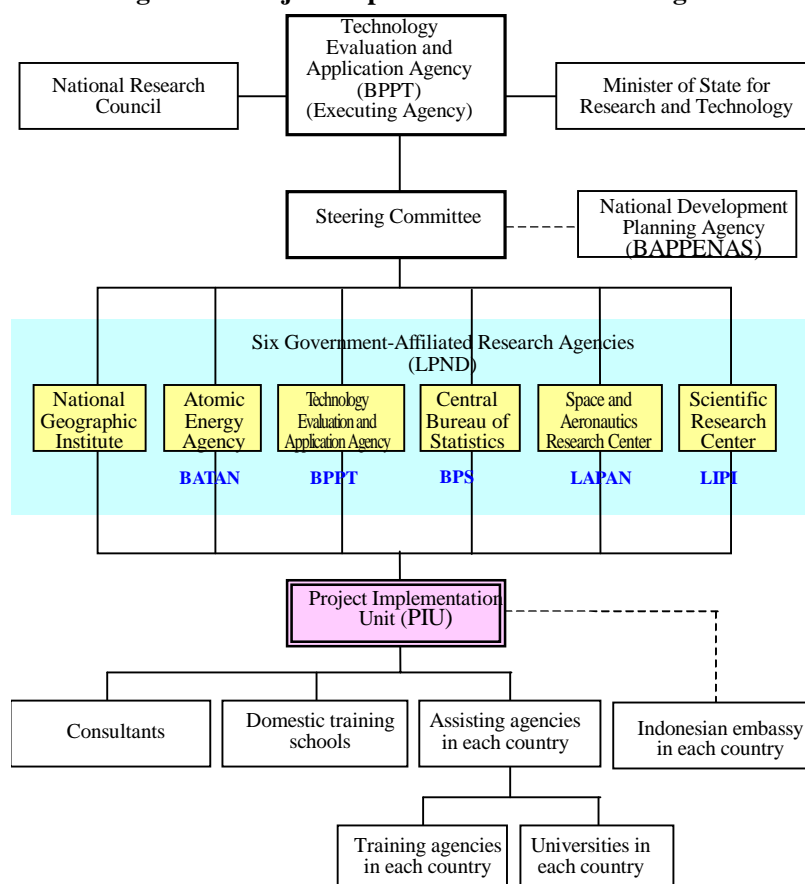
This project had a high priority for strengthening Indonesia's systems for independent economic development, and its aim of expanding the country's human resources in the field of science and technology remained relevant at the time of the evaluation.

This project scope was planned to cover approximately 400 students, but in the implementation stage it increased by over 50% to 608 students. As Table 1 shows, the planned number of overseas graduates was 3,842, of which 1,350 were trained under the preceding loan from the World Bank, leaving a shortfall of 2,492 students (65% overall). If this project had been implemented as planned, it would have left a shortfall of over 2,000 students, but exchange rate change at the implementation stage (devaluation of the Rupiah) expanded the contingency, which was used to reduce the shortfall.

(2) Efficiency

The Technology Evaluation and Application Agency (BPPT) was the executing agency for this project. A Steering Committee was set up under the BPPT to check and approve the student selection results and the operation of funds. Its members consisted of representatives from the six government-affiliated research agencies which dispatch students. A Project Implementation Unit (PMU) was established within the BPPT, which was the executing agency, to liaise with the students, handle the administration for remittance of their funds, and perform other practical works concerning dispatch of the students. The PMU also arranged language studies for students in their destination countries, assisted their university placements, and provided general help and monitoring in their studies and lives (Figure 1).

Figure 1 Project Implementation Scheme Diagram



There were no major changes in the implementation schedule, and the project cost and ODA loan amounts remained within their planned ranges. The project was implemented efficiently, overall.

(3) Effectiveness

1) Expansion of human resources and capabilities in the fields of science and technology

Table 1 shows the numbers of students who was sent abroad under this project, and the qualifications they obtained. As mentioned above, the number of students was increased by over 50% from the number envisaged at the time of the appraisal, and the number of graduates exceeded the plan by nearly 40% (547 persons by the end of November 1997). As the students study abroad at public expense, there are rules on their employment¹ on their return. Therefore all graduates return to their previous posts and are engaged in official duties.

¹ In the case when a public servant studied abroad, he or she is obliged to engage himself or herself in official duties for a period of at least "Year(s) of studying abroad x 2 - 1". Any who failed to do so would have been punished by measures including return of their scholarships.

Table 1 Actual Results of Number of Students Sent Abroad and Graduated

Academic level	Planned numbers at the time of the appraisal	Nos. of students sent abroad (%: /)	Graduates, as of 1997 (%: /)	Nos. returning to public posts (%: /)
Ph.D	41	31 (76%)	15 (48%)	15 (100%)
Masters'	54	177 (328%)	161 (91%)	161 (100%)
Graduate	250	256 (102%)	229 (89%)	229 (100%)
Diploma	55	144 (262%)	142 (99%)	142 (100%)
Total	400	608 (152%)	547 (90%)	547 (100%)

Based on BPPT data

When looking at academic level, the attainment rate of students sent abroad for Ph.D and the rate of graduation were both low, at 76% and 48% respectively. These figures suggest that it is difficult to take a Ph.D within 2 years of being sent abroad. At other degree and diploma levels, the numbers of students dispatched exceeded the targets, and the graduation rates and return rates to public posts were both high, exceeding 90%. As a result, the six government-affiliated research agencies together increased their Ph.D staff by 3.79 times, compared to the start of the project in 1989. Their staff with Masters' degrees increased 3.63 times, and those with graduate degrees by 1.67 times.

2) Evaluation by students previously dispatched abroad, and the organizations which dispatched them

[1] Evaluation by dispatching agencies

Interviews were conducted on two agencies, the Space and Aeronautics Research Center (LAPAN) and the Atomic Energy Agency (BATAN), of those which had dispatched members of their staff. Questions included "Changes in trainees' personal qualities between before and after their training", "evaluation from the point of view of contribution to the nation" and "overall evaluation". The responses are summarized in the table below.

Table 2 Evaluation by Dispatching Agencies

Dispatching agency	Evaluation of personal qualities	Contribution to the country	Overall evaluation
Space and Aeronautics Research Center (LAPAN)	Trainees did not gain as much innovative knowledge and skill as expected.	The content of the knowledge and skills gained through training abroad should have reflected the wishes of the dispatching agencies much more closely.	Satisfactory, but those who were dispatched for overseas study immediately after being hired still lacked job experience when they returned to the agency, and it took time for them to settle in.
Atomic Energy Agency (BATAN)	Trainees are involved in the evaluation of the technical training course and are working to improve the educational and training programs. The contribution to their work is valuable.	Research results (in the agency) are expected to make a contribution to the future development of the country. Therefore expert staffs who have received advanced education are important.	Very satisfactory. In a developing country such as Indonesia, the use that is made of human resources is the key to national progress. An overseas training program such as this one is valuable for the development of human resources.

Some opinions were expressed to the effect that it is important to select the skills and knowledge to be acquired by the trainees more carefully, but overall evaluations were at least satisfactory, and the importance of human resources development was reconfirmed.

[2] Evaluation by the dispatched trainees

With the cooperation of the executing agency, the Technology Evaluation and Application Agency (BPPT), a questionnaire survey was conducted to those who had been trained abroad under this project. Questions included personal content, such as how their professional positions and income had changed between before and after training, and what they had gained by training abroad, as well as evaluation of the project's contribution to Indonesia, from the viewpoint of a trainee, and an overall evaluation. There were eight respondents of 20 questionnaires sent out. Although the sample size was small, and the statistical significance should be evaluated with care, the comments of the beneficiaries are included below as reference material.

Most of the trainees returned to positions higher than those they occupied before their training, or to positions requiring more specialized skills. They referred to advantages of training abroad, such as "I was able to learn specialist skills and knowledge" and "International experience enabled me to broaden my perspective".

On the question of contribution to the country, there was an almost universal consensus that "We are taking on an important role in the social and economic development of Indonesia, and we are working to stimulate the information industry and other new industries, or tackling the deepening environmental problems".

Respondents were asked to give their overall rating of the project on a three-level scale, describing themselves as "highly satisfied", "satisfied" or "not satisfied". Five said they were highly satisfied and three were satisfied. All respondents were at least satisfied, but opinions were also stated such as "I did not gain enough knowledge and skills for the time I spent", and "It would have been better if there was a practical experience program, such as company training, in addition to the university study and training".

3) Opening the way for overseas study loans in Indonesia

This project was followed by the 'Professional Human Resource Development Project (I) and (II)' (based on loan agreements in 1990 and 1995 respectively), in which more advanced foreign study loans were provided. Those loans contributed to the reinforcement of Indonesia's systems for independent economic development. This project was effective as the basis for the series of subsequent overseas study loans.

(4) Impact

1) Environmental impact

This project dealt with the development of human resources, and as such it had no notable impact on the environment.

2) Social impact

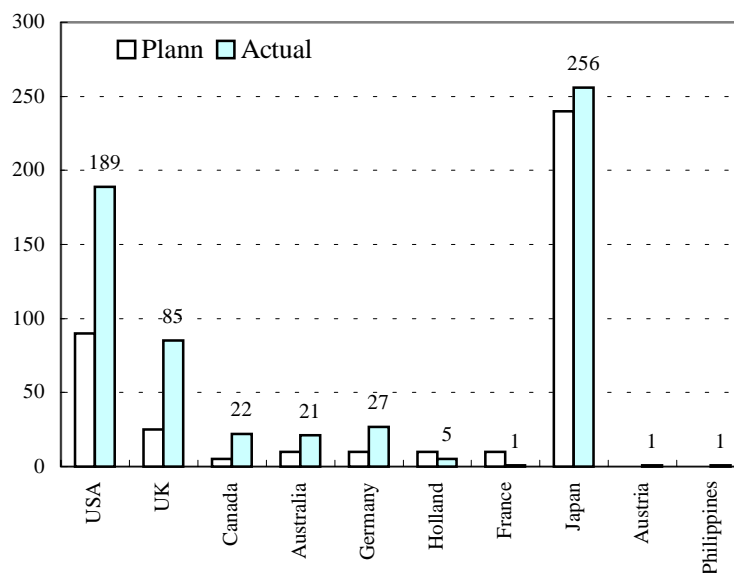
This project had no notable negative impact in the form of social problems such as resident relocation.

3) Promotion of international exchange through study abroad

The students sent to Japan attended public and private universities in Tokyo and elsewhere around the country. The relationships they built with their universities during their studies, and their contact with the Japanese way of life while they lived in various parts of Japan, broadened international exchanges between Japan and Indonesia, which is a valuable achievement. The same is true of the students who were sent to various other countries. This project can be regarded as having promoted international exchange in both science and technology and in ways of life.

Figure 2 Numbers of Students Dispatched to Each Country

* Based on BPPT data



(5) Sustainability

1) Operation and Maintenance

All the students involved in this project have already completed their studies and returned to Indonesia and to posts in their original agencies. Therefore the Project Implementation Unit that was established within the BPPT to implement the project and manage its operation and maintenance has concluded its duties.

2) Sustainability

The implementation of this project produced personnel highly specialized in the fields of science and technology. In doing so, it clearly made a contribution to the expansion of human infrastructure for Indonesia's economic development and progress. However, in the nature of the education sector, the subject of such projects (the investment targets) are people, and as such there are risks such as the following which could impede the sustainability of the effects.

- A) Do the personnel find themselves in a workplace environment where they can fully develop their careers after they return from overseas education and training?
- B) Is there any brain drain to other countries?

To prevent problem A and make the most of the personnel, it is important for the agency which dispatched its staff for education to maintain and build their morale after they return to their new, elevated career positions, by providing them with a suitable workplace and level of pay and other treatment. The findings of the interview survey of trainees and the agencies which sent them for training showed that the trainees were employed in positions where they could apply the knowledge and skills they gained through study abroad. It was not possible to grasp how satisfied they were with their salary, but their evaluations of their matters including current workplace conditions were generally good.

For problem B, as mentioned previously, the rules of overseas study for civil servants at public expense stipulate that students must work as civil servants on their return for a period of at least ((years of study abroad x 2) -1) years. Therefore the first batch of students who graduated in March 1993 would be obliged to remain in their posts until March 1998, while the second batch, who returned in March 1994, were obliged to stay on until March 1999. Within that mandatory period it would have been difficult for them to change jobs or retire. Now that their mandatory work periods have expired, their actions are being watched with some concern over the potential for brain drain, but the executing agency states that all those who studied abroad are still civil servants.

The mission of encouraging the country's economic development, which is this project's prime objective, is not something that can be achieved by a small group of technocrats who receive higher education through overseas study loans or other means. For the educational effects to be sustainable, with independent development potential, those educated people must be used to the full to build a system for the transfer of advanced education within the country. Such a system would raise the level of technology and knowledge throughout the country and provide a shortcut to the attainment of the project's goals.

After the completion of the project, the Project Implementation Unit (PIU) compiled ten points for review concerning the project. The points are summarized below to be of reference in the implementation of similar projects in the future.

- [1] It is important to implement the project without any gender or regional disparities, and therefore measures must be considered to increase the share of female applicants, and applicants from regions

outside Java (measures should include periodic review of the standards and processes for the recruitment and selection of applicants).

- [2] A wide-ranging survey of human development needs should be conducted to enhance the development of human resources. The survey should cover ministries and agencies, government affiliated agencies, and state-owned and private companies. Thorough consultation and confirmation should be carried out with the agencies which wish to dispatch staff for training, to check the goals and content of short-term training courses and other programs.
- [3] The numbers of destination universities and countries should be reduced to make project implementation more efficient.
- [4] Overseas study programs should include opportunities for training with companies in order to make the project effects more practical. This project targeted university graduates, but consideration should also be given to the introduction of vocational training and company training programs for high school graduates.
- [5] The transfer of returned students between agencies within the return program should be considered in order to mobilize personnel and talent between government-affiliated agencies.

3. Lessons Learned

Human development projects in the education sector should continue in order to produce highly specialized personnel, with improvements in both quality and quantity. It is important to build a working environment in which the trainees can be satisfied as they go about their work.

The Indonesian government's current financial position makes it difficult to provide a working environment with adequate facilities and equipment, as well as good terms of employment, such as salary. Nevertheless, for the sake of Indonesia's long-term national benefit, it is important to prevent brain drain and to preserve and raise the morale of the trainees. To that end, training graduates should be provided with workplace and career-related counseling services and other forms of follow-up which take their point of view.

For the second problem, it is important to provide ongoing opportunities for overseas study and other training, targeted on new personnel. Beyond just increasing the opportunities for study and training abroad, and thereby absorbing foreign skills and technology, it is also important to build a "domestic transfer system for advanced education" which will make the maximum use of expert personnel (those who have studied abroad) on their return. The executing agency (BPPT) is aware of this need, and is calling for the following improvements to the domestic education system.

- As well as strengthening domestic training functions, it is important, from the point of view of independent development, to eliminate dependence on overseas training. Stronger relationships between foreign and domestic universities (and companies) are also needed, including inviting the establishment of Indonesian campuses of foreign universities.
- It is important to make effective use of the skills, knowledge and expertise of returning students, and encourage the technology transfer within government agencies, and more widely through the country. At present there is a strong tendency for independent research and development to come to an end with the completion of overseas training. It would be valuable to provide some kind of science and technology training center to support continuing activity by students after they return from study abroad.

Comparison of Original and Actual Scope

Item	Plan	Actual
Project Scope		
1. Overseas training, pre-training and after-return program	<ul style="list-style-type: none"> • Total of 400 targeted trainees • Sub-program <ul style="list-style-type: none"> - Ph.D courses: 41 persons - Masters' courses: 84 persons - Graduate courses: 220 persons - Diploma courses: 55 persons • Developed countries receiving students <ul style="list-style-type: none"> - Japan, USA, UK and others 	<ul style="list-style-type: none"> • Total of 608 targeted trainees (as of end of November 1997) • Sub-program <ul style="list-style-type: none"> - Ph.D courses: 31 persons - Masters' courses: 177 persons - Graduate courses: 256 persons - Diploma courses: 144 persons • Developed countries receiving students <ul style="list-style-type: none"> - USA, UK, Canada, Australia, Germany, France, Holland, Austria, Philippines, Japan
2. Provision of services in Indonesia and abroad in connection with 1 above	<ul style="list-style-type: none"> • The project covered the six government-affiliated research agencies listed below <ul style="list-style-type: none"> - National Geographic Institute (BAKOSURTANAL) - Atomic Energy Agency (BATAN) - Central Bureau of Statistics (BPS) - Technology Evaluation and Application Agency (BPPT) - Space and Aeronautics Research Center (LAPAN) - Scientific Research Center (LIPI) 	<ul style="list-style-type: none"> • Same as left
3. Consulting service	<ul style="list-style-type: none"> • Total: 376 M/M 	<ul style="list-style-type: none"> • Same as left
Implementation Schedule		
1. Selection of trainees, pre-training	1) Jul. 1988 ~ Mar. 1989 2) Jul. 1989 ~ Mar. 1990	1) Same as left 2) Same as left
2. Overseas training	1) Apr. 1989 ~ Mar. 1994 2) Apr. 1990 ~ Mar. 1995	1) Apr. 1989 ~ Mar. 1993 2) Apr. 1990 ~ Mar. 1994
3. After-return program	1) Apr. 1994 ~ Sep. 1994 2) Apr. 1995 ~ Sep. 1995	The following were carried out, but the schedule was not confirmed. <ul style="list-style-type: none"> • Preparation and implementation of a second follow-up survey. • Discussions between returning students (May 1994)
4. Consulting service	Jul. 1988 ~ Mar. 1995	Apr. 1989 ~ Mar. 1995
Project Cost		
Foreign currency	¥5,954 million	¥5,531 million
Local currency	¥113 million	¥213 million
Total	¥6,067 million	¥5,743 million
ODA loan portion	¥6,067 million	¥5,731 million
Exchange rate	1Rp. = ¥0.075 (Jul. 1988)	1Rp. = ¥0.063