BASIC DESIGN STUDY REPORT
ON
THE IMPROVEMENT PROJECT
FOR
VOLCANIC SABO TECHNICAL CENTRE
IN
THE REPUBLIC OF INDONESIA

JULY 1986

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to the request of the Government of the Republic of Indonesia, the Government of Japan has decided to conduct a basic design study on the Improvement Project for Volcanic Sabo Technical Centre and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Indonesia a study team headed by Mr. Tadahiro Matsushita, Chief Engineer for Debris Flow Control, Department of Erosion and Sediment Control, Ministry of Construction from March 6 to March 29, 1986.

The team had discussions on the Project with the officials concerned of the Government of Indonesia and conducted a field survey in Yogyakarta area. After the team returned to Japan, further studies were made, a draft report was prepared and a mission to explain and discuss it was dispatched to Indonesia. As a result, the present report has been prepared.

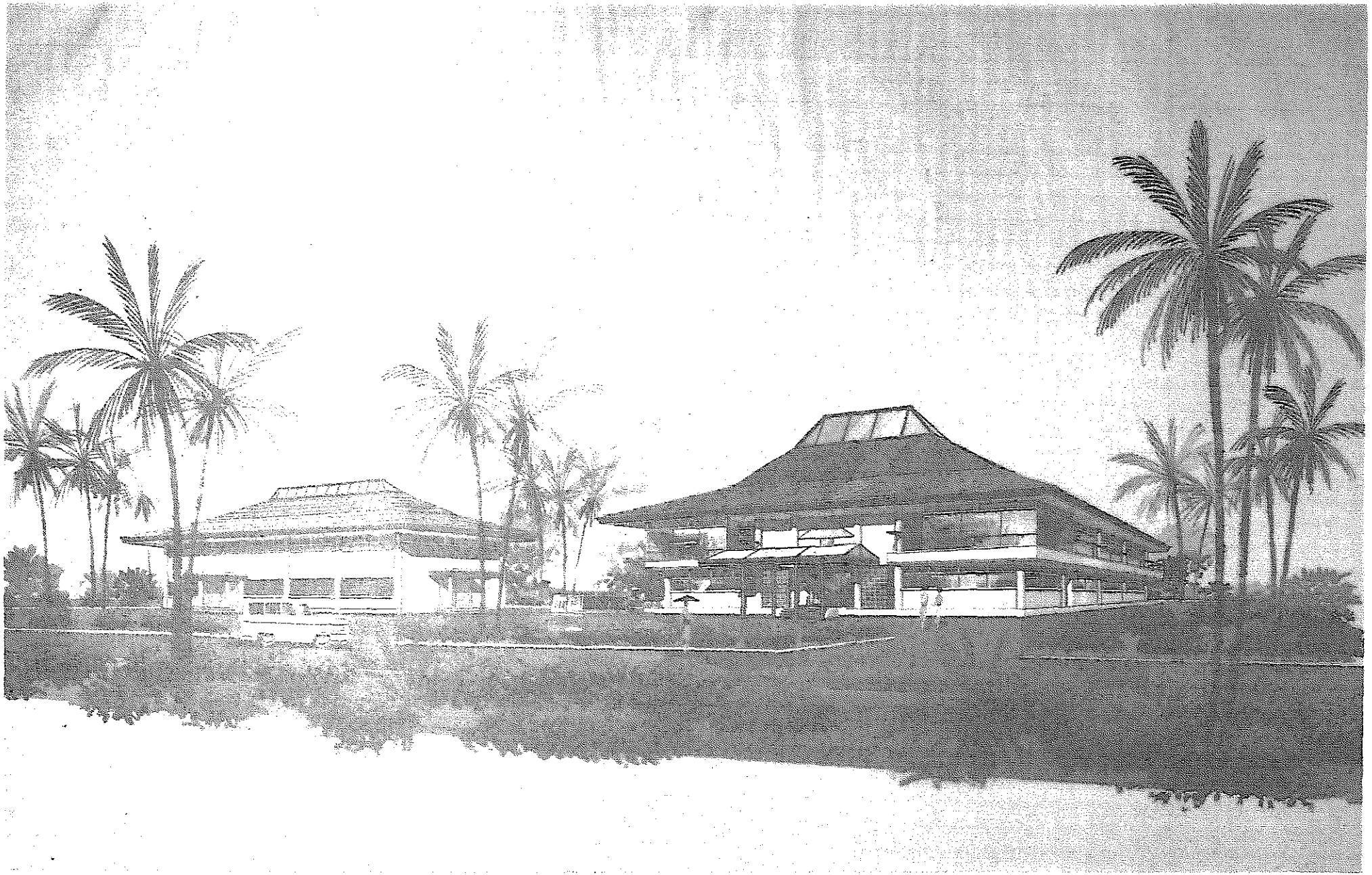
I hope that this report will serve for the development of the project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

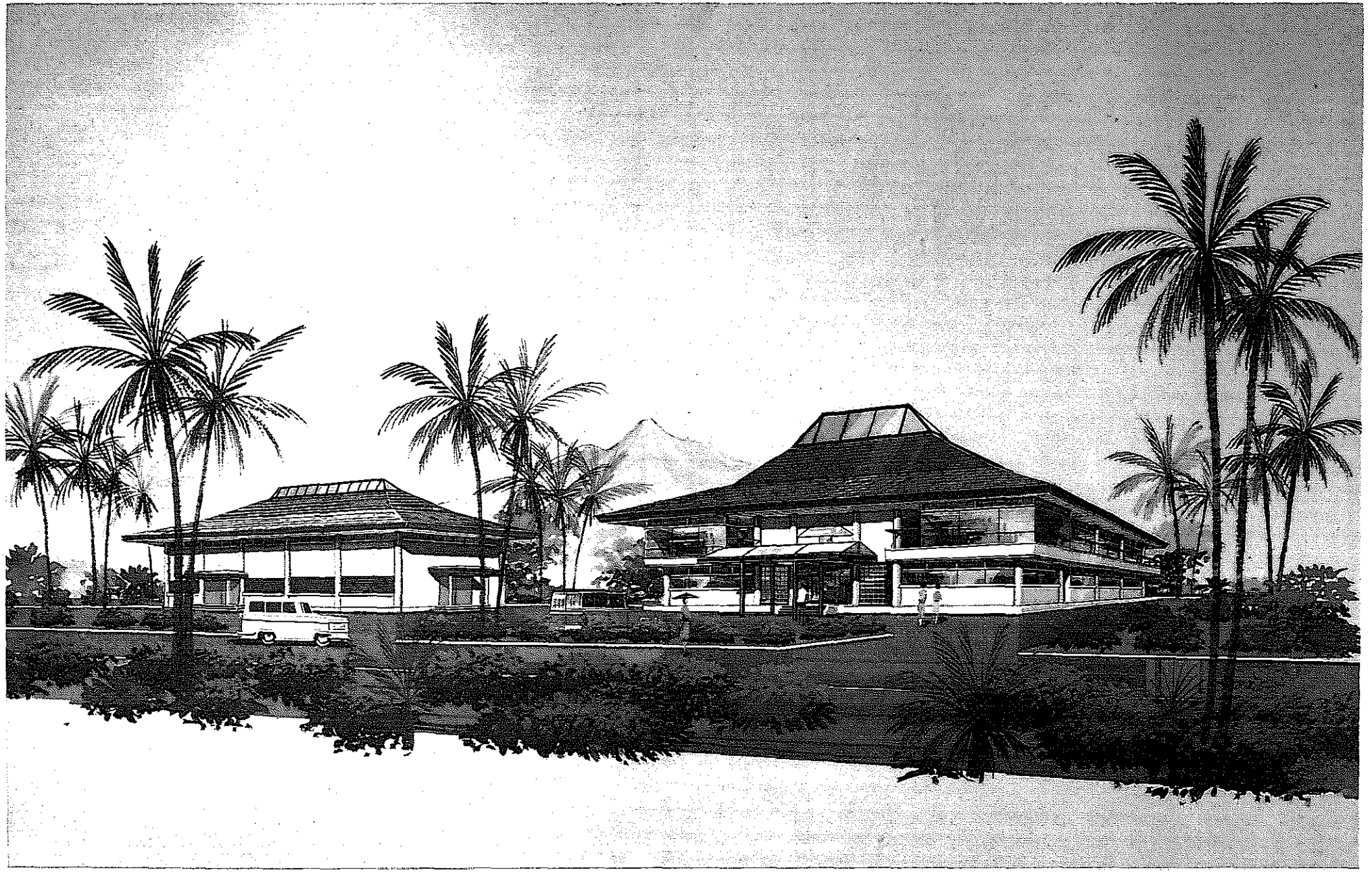
July 1986

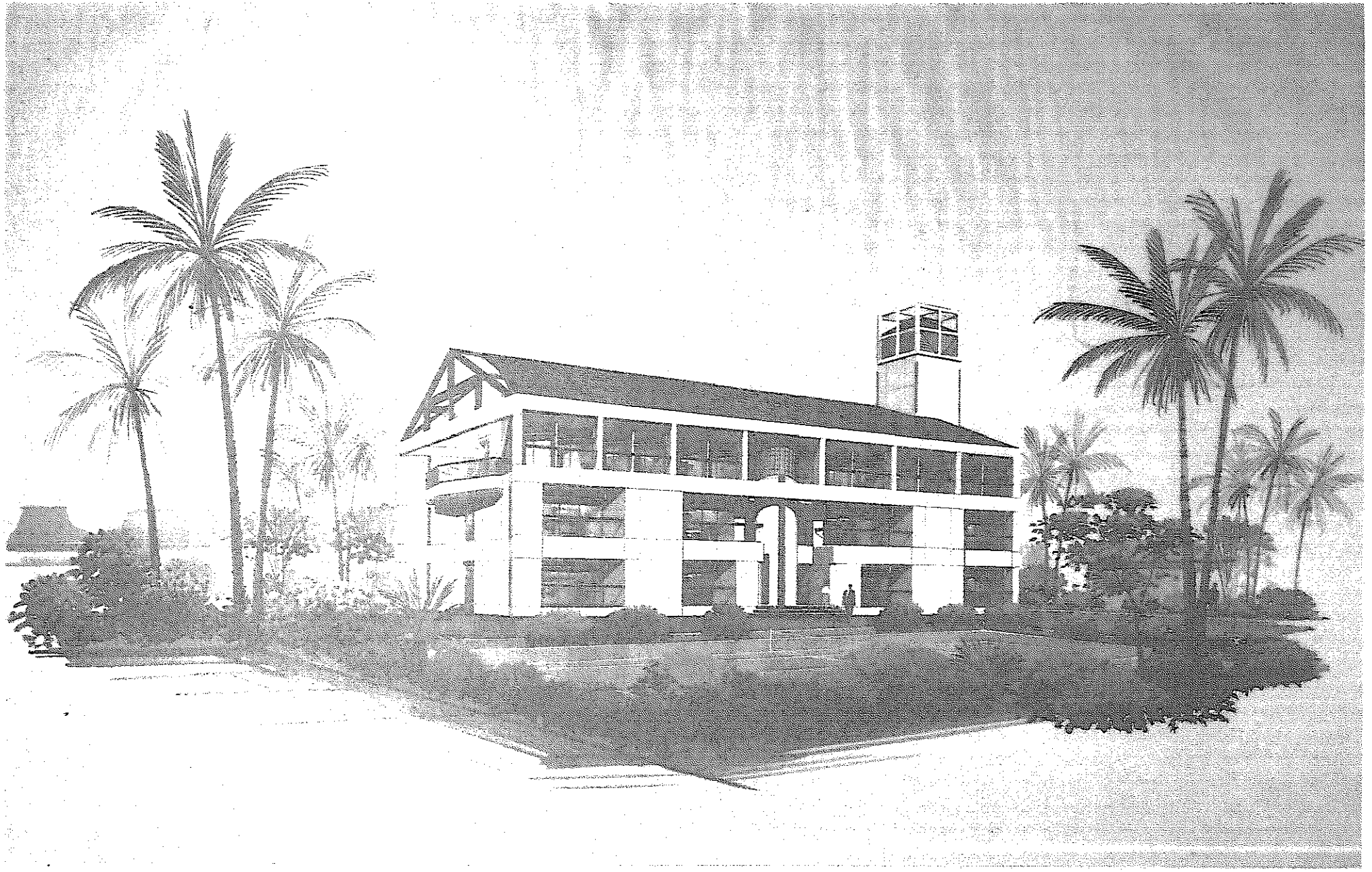
Keisuke Arita

Keisuke Arita
President
Japan International Cooperation Agency



Sabo Information Centre & Lahar Laboratory





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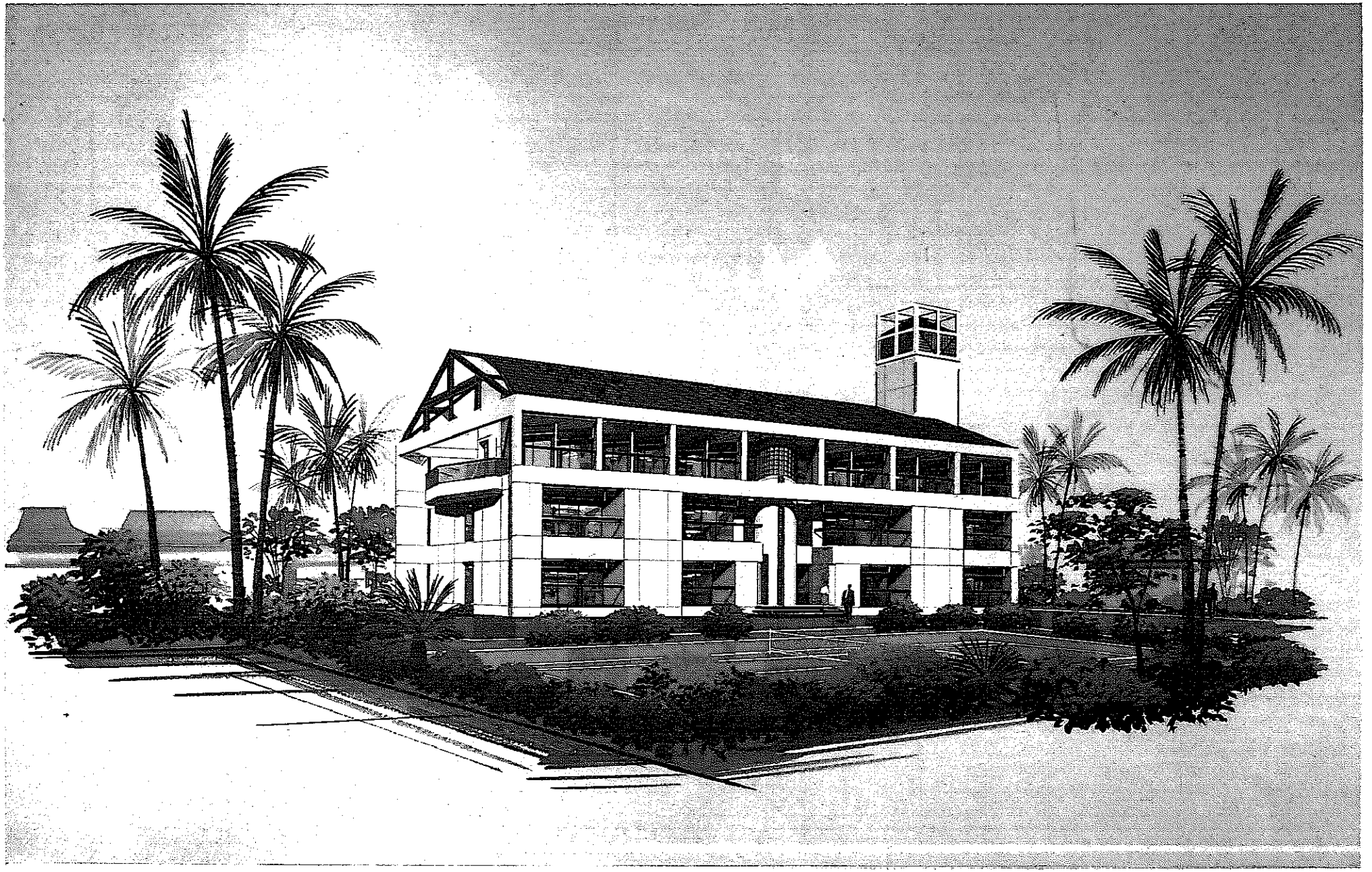
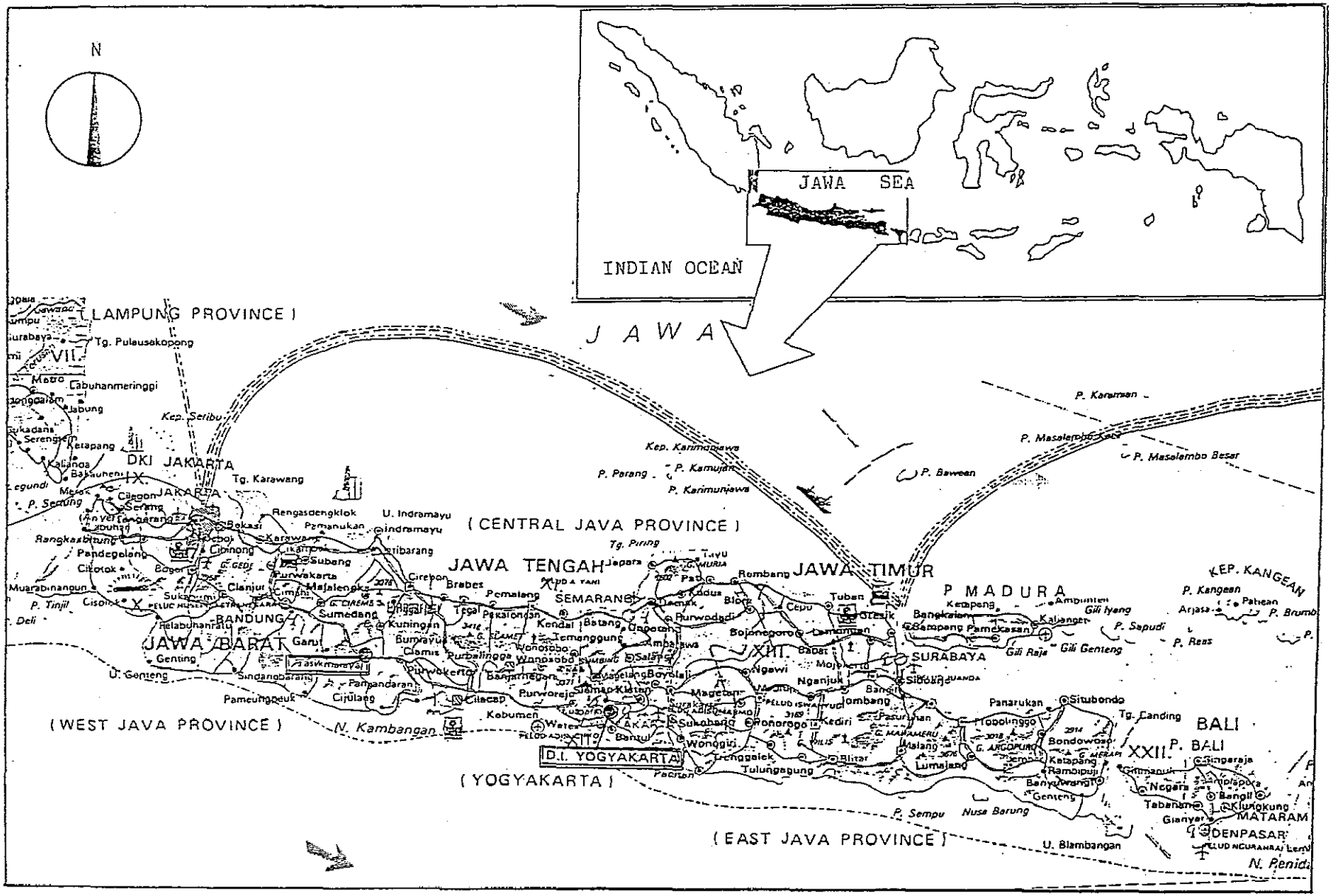
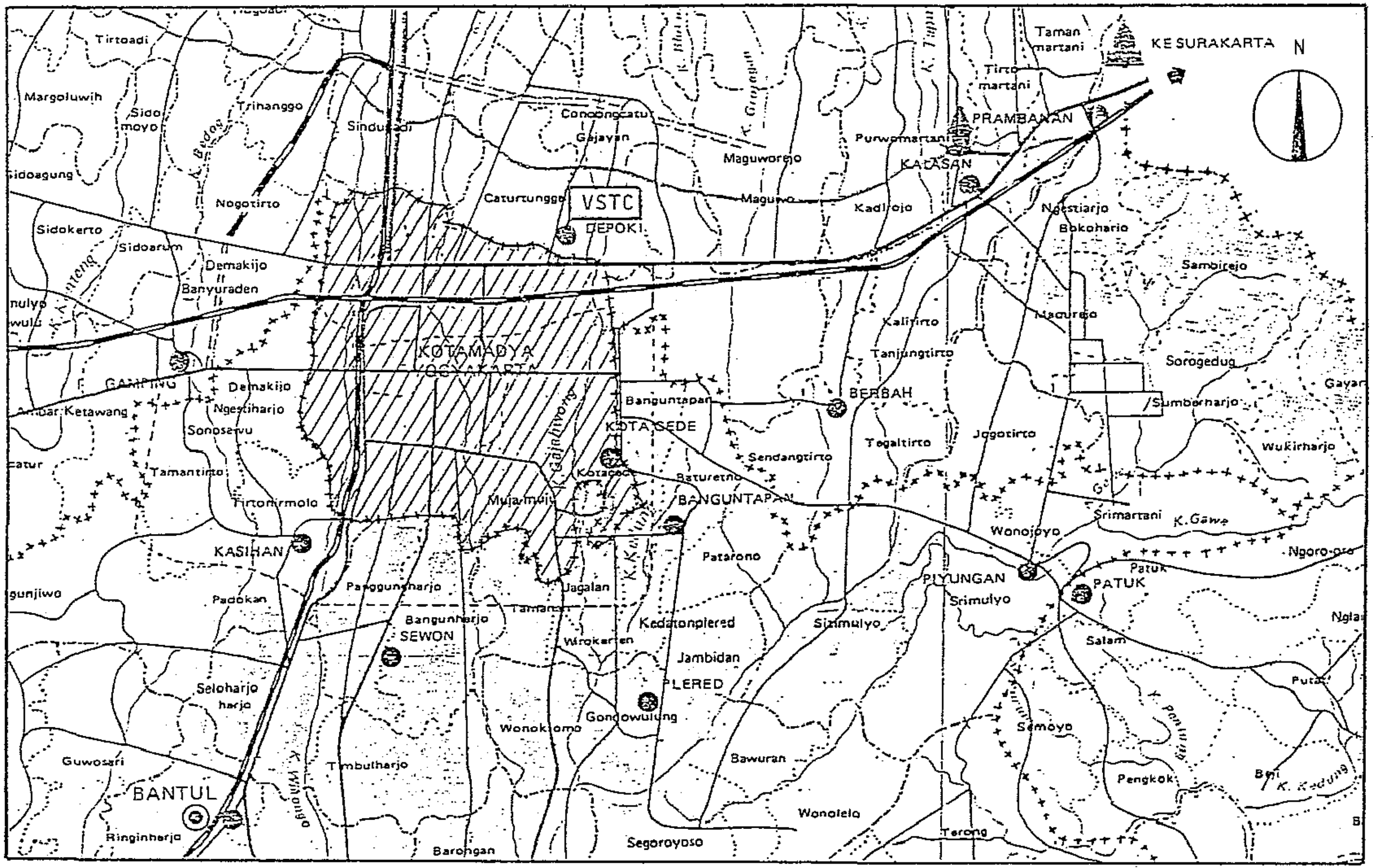




MAP OF INDONESIA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Bokoharjo
Sambirejo
Madurejo
Sorogedug
Sumberharjo
Wukirharjo
Ngoro-oro
K. Gawe
K. Wihongo

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SUMMARY

SUMMARY

The Republic of Indonesia, located along the circum-pan-Pacific earthquake belt, is one of the most volcanically prominent countries, with 78 of its 128 active volcanoes continuing to sporadically erupt, piling up abundant volcanic depositions at their bases.

Another feature of the country is that it lies in the tropical rain forest zone, with most of the annual rainfall of 2,000 m/m being concentrated in the rainy season (October to March). A characteristic of this type of rainfall is that in many cases the rain may be localized, continuing for a long period over a small area, with a large hourly precipitation.

While the volcanic soil and abundant rainfall of the country have been contributory to its wealth, particularly in the development of agriculture in Java, they have frequently been the cause of lahar and debris flows, resulting in numerous disasters for the regions of dense population and high land utilization. Decreasing the damage caused by such disasters has been an important and urgent task for the Indonesian government.

In view of the urgency for disaster countermeasures and because the country is now ready for the development of Sabo technology, the Republic of Indonesia has been requesting technical cooperation from Japan for the training of sabo engineers and the development of adequate sabo technology.

Complying with this request, Japan, based on the Colombo plan, has been continuously despatching long-term experts since 1970. In 1976, as one of the development and research schemes of the Japan International Cooperation Agency (JICA), research on "The Basic Plan for Sabo for Mt. Merapi" was commenced, and in 1980 "The Sabo Master Plan for Mt. Merapi", advocating the importance of establishing a "Volcanic Sabo Technical Centre" was submitted to the Indonesian government. Based on this master plan, the Indonesian government drafted a plan to establish a "Volcanic Sabo Technical Centre" and requested the cooperation of the Japanese government for its establishment.

In response to this request, the Japanese government, following the October 1981 preliminary study, despatched a JICA mission to Indonesia in August 1982, signed the Records of Discussion on August 26 and commenced a 5-year technical cooperation plan for the project.

Over the approximately 3 years and 6 months since 1982, the Japanese government has made numerous contributions to the Republic of Indonesia through the despatch of long-term and short-term experts and the furnishing of necessary equipment for the "training of sabo engineers," "improvement of sabo technology," "development of adequate sabo technology", and "preparation of sabo technical standards".

As a result, volcanic sabo has now been recognized as one of the most important policies for maintaining the domain and protecting the environment, to such an extent that, by expanding and strengthening the existing facilities of the Volcanic Sabo Centre, effective and economical sabo activities should be promoted at home along with an attempt to expand and strengthen the services rendered by the existing facilities. Based on this perception, the Indonesian government has made a request to the Japanese government for a grant aid relating to the furnishing of the necessary facilities and equipment.

Accepting this request, the Japanese government planned the implementation of basic design research for "the Improvement Project for Volcanic Sabo Technical Centre", and in March 1986 JICA despatched a basic design study team to the Republic of Indonesia.

Concerning this scheme, the team discussed and conducted studies with the relevant Indonesian government personnel regarding the background of the Project, the confirmation of the substance of the request, and the planned construction site, etc.

After their return to Japan, the team studied analysis work relating to the materials locally collected, while at the same time repeated discussions were held with the relevant persons to perform sufficient studies as to the adequacy of the Project, adequate scale and grade, operation management

system, and the effect of the assistance, after which followed the drafting of a basic design centering on the necessary facilities and equipment.

The facilities and main equipment for which Japan's Grant Aid is considered reasonable are given below.

(1) Facilities

(a) Sabo Information Centre 1,218 m^2
(One 2-storied reinforced concrete building)
including a training auditorium (80 persons capacity) and a computer room.

(b) Lahar Laboratory 986 m^2
(One single-storied reinforced concrete building)

(c) Dormitory 1,560 m^2
(One 3-storied reinforced concrete building)

Total 3,764 m^2

(2) Equipment

(a) Experimental equipment for sabo technology training.
(b) Laboratory equipment for forecasting and alarm system.
(c) Equipment for data processing and text preparation.
(d) Audio/visual education equipment.
(e) Automobiles for training.
(f) Equipment for restoration of the Mt. Galunggung forecasting and alarm system.

The planned construction site for these facilities is located in the Depok district, in the suburbs of Yogyakarta, Sleman, approximately 2 km northwards from Solo avenue, leading to Solo city from Yogyakarta. The site totals an area of about 5,600 m^2 consisting of the plot of the

existing facility, a newly acquired plot contiguous westwards to the site plus another plot scheduled to be required.

On the newly acquired plot will be built the Sabo Information Centre and the Lahar Laboratory. The Dormitory will be built where the workshop currently stands on the existing plot. The workshop is to be removed.

The existing plot has been provided with power supply lines and water supply and drainage system for the existing facility. The new plot can easily be provided with power service lines with the possibility for water supply and drainage. However, as the supply of water from the existing facility would be difficult, the provision of a well is necessary.

The period required for the implementation of the Project will be 19 months, after conclusion of the Exchange of Notes between the two countries.

By implementing the Project, the experimentation and training function of the Centre will be expanded and strengthened to contribute to the completion of the target of the preceding technical cooperation so that Japan can assist Indonesia in the training of sabo engineers, improvement of sabo technology or development of a sago technology befitting Indonesia. This will doubtlessly result in the sabo operations of the country being proficiently developed to decreae the damages caused by lahar and debris flows; to contribute to the welfare of the residents living in the affected regions; and to produce a satisfactory result in the protection of the environment and the security of the domain, thus contributing to the development of the welfare and economy of the Republic of Indonesia.

Thus it is concluded that this project is appropriate for execution under Japan's Grant Aid.

As previously mentioned, Japan's technical cooperation has already been implemented and the operation and management of the existing facility

has been carried out by Indonesia's excellent staff. In implementing this Project, the positive and continuous effort of the Indonesian government toward the expansion of the existing facility will be necessary, along with the securing of competent staff, particularly electronics engineers, both qualitatively and quantitatively.

Action should be taken to establish a budget to maintain these engineers and to operate the facilities to be newly built under the Project.

CHAPTER 1. INTRODUCTION

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In the Republic of Indonesia, after the eruption of Mt. Agung, the eruptions of Mt. Kerut and Mt. Merapi followed consecutively, resulting in the frequent occurrence of damage by lahar.

The Indonesian government, fully realizing the necessity for disaster countermeasures, established a volcanic sabo technical centre to start up sabo undertakings and requested that the Japanese government provide Indonesia with technical cooperation relating to sabo technology.

Responding to this request, Japan has to date been despatching long- and short-term experts to Indonesia to continue the technical cooperation, while the Indonesian government, as part of its sabo countermeasures, established a "Volcanic Sabo Technical Centre" in 1982 along with placing a request to Japan for technical assistance. Japan commenced technical cooperation for the Centre in August 1982, a period of 3 years and 6 months having elapsed to date.

Consequently, the Indonesian government has become perceptive of the importance of volcanic sabo, and, by expanding and strengthening the existing Centre, has attempted to provide increased and improved functions at the Centre so that effective and economical sabo activities can be domestically promoted. Thus, the Indonesian government has made a request to the Japanese government to provide the country with an economic grant relating to the facilities and equipment required to implement "the Improvement Project for Volcanic Sabo Technical Centre".

Responding to this request, the Japanese government planned the execution of a basic design research relating to the Project, and, through the Japan International Cooperation Agency (JICA), despatched a Basic Design Study Team for "the Improvement Project for Volcanic Sabo Technical Centre", headed by Mr. Tadahiro Matsushita, the chief engineer for debris flow control, Department of Erosion and Sediment Control, River Bureau, Ministry of Construction, to the Republic of Indonesia for a period of 24 days from March

6, 1986. The organization of the team and its research itinerary are detailed in the Appendix.

Discussions relating to the basic design were held between the team and the relevant Indonesian Government personnel, listed in the appendix, and on March 18, 1986, the minutes involving the basic matters agreed between Mr. Matushita, the leader of the team and Ir. Putra Duarsa, an assistant to the Minister for River Development were signed. The contents of the minutes are shown in the appendix.

After their return to Japan, the team had a series of discussions with the relevant persons to evaluate the viability of the Project, established an adequate scale and grade, and, via studies made as to the operation and management system and the effect of technical assistance, determined necessary facilities and equipment and finally drafted a basic design.

Based on the results of the discussions held with the relevant Indonesian Government personnel and on the materials locally collected along with the analyses thereafter, the basic design optimal to the implementation of the Project has been prepared. This report deals with the results thereof.

CHAPTER 2. PROJECT BACKGROUND

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2-1 GEOGRAPHICAL CONDITIONS

2-1-1 Location, Area and Population

The Republic of Indonesia is located between the continents of Asia and Australia and between the Indian Ocean and the Pacific Ocean, with a spread of 2,035 km from 6 deg. north latitutde to 11 deg. south latitude and 5,510 km from 94 deg. to 142 deg. east longitude, totalling an area of approximately 1,920,000 km^2 (approximately 5.5 times the total area of Japan). The country consists of about 13,000 large and small islands, of which about 3,500 are inhabited. The total population of the country is approximately 150,000,000 (1980). About 91,000,000 persons (1980), which is equivalent to 62% of the total population, are concentrated in the islands of Java and Madura of which the total area is only about 7% of the country's domain, indicating a high population density of 650 persons per km^2 (about twice Japan's population density). Consequently, Java's land is highly utilized while other areas have been relatively depopulated.

2-1-2 Volcanic Situation

The Republic of Indonesia is located east of the circum-pan Pacific orogenic zone and south of the Himalayan orogenic zone. As the volcanic zone of the country lies along these orogenic zones, its topography is young and consists of a number of active volcanoes.

Of the approximately 750 active volcanoes considered to be existing in the world, the Republic of Indonesia has 127. According to "A Collection of Basic Data on Volcanoes in Indonesia" published in 1979 by the Volcanic Bureau, the Ministry of Mines and Energies, 75 of the 127 active volcanoes registered