

Indonesia

Lower Jeneberang River Urgent Flood Control Project

Report Date: March 2001

Field Survey: September 2000

1. Project Profile and Japan's ODA Loan



Location Map of Project Area



Jongaya Drainage Canal

(1) Background

The Jeneberang River runs for 75km through the southern tip of South Sulawesi Province, and the region surrounding the provincial capital of Makassar (known as Ujungpandang at the time of the appraisal in 1984) has from time to time suffered from heavy flooding by this river. This region also has poor drainage capabilities, which has resulted in landside water damage every year.

Since being designated as a main focal point for Eastern Indonesian development in the second 5-Year Plan (1974~1978), Makassar has propelled the industrialization and its urban development plan. The flood control has been a pressing issue in regards to establishing the foundation for sound living environment and economic activities. Against this background, the implementation of this project was requested by the Indonesian government on the results of the engineering services provided by the fiscal 1980 ODA loan.

(2) Objectives

This project was to conduct river improvements for the Jeneberang River to provide 10-year flood protection specifications in order to protect an area of 60.5km² including Makassar, the capital of South Sulawesi Province, and also aimed to improve the Makassar drainage facilities to a 5-year flood protection level.

(3) Project Scope

The scope of this project covered the following four areas.

1) River Improvements

Dredging, excavation, embankment and revetment constructions for a 9.6km section between the mouth of the Jeneberang River and the Sungguminasa Bridge, and the raising of a 2.5km section of the Marino Road.

2) Improve City Drainage System

- (1) Improve the Panampu Drainage Channel (4.9km section)
- (2) New excavation of the Jongaya Drainage Channel (7.8km section)
- (3) Improve the Sinrijala Drainage Channel (2.4km section)

3) Flood Warning Equipment

- (1) Water-level Monitoring Station at three locations
- (2) One Central Monitoring Center
- (3) Three warning vehicles

4) Consulting Service

356.5M/M for assistance for procurement procedures and construction supervision

Figure 1 Project Region



(4) Borrower/Executing Agency

The Republic of Indonesia / Directorate General of Water Resources Development, Ministry of Housing and Infrastructure Development (former Directorate General of Water Resources Development, Ministry of Public Works)

(5) Outline of Loan Agreement

Loan Amount/Loan Disbursed Amount	¥5,381million / ¥5,033 million
Exchange of Notes/Loan Agreement	July 1984 / February 1985
Terms and Conditions	Interest rate: 3.5%, Repayment period: 30 years (10 years for grace period), General Untied (Partially untied for consulting services)
Final Disbursement Date	December 1993

2. Results and Evaluation

(1) Relevance

This project was urgently needed and deemed to be relevant as it aimed to protect Makassar, the economic center for Eastern Indonesia, from flooding, while strengthening a base for promoting industry and urban development in the region.

(2) Efficiency

This project was executed by the Jeneberang River Basin Development Office, which is under the jurisdiction of the Directorate General of Water Resources Development, Ministry of Housing and Infrastructure Development. Total project costs were set at ¥11,313 million during the planning stage, but the actual amount came to only ¥5,033 million due to the sharp drop in the value of the rupee against the yen at the time of project implementation.

The start of the project was delayed by two years due to some design changes and the need to obtain land, and the overall project was completed three and a half years behind schedule.

(3) Effectiveness

1) Effects of Flood Reduction

Quantitative data of secular change on the effects of flood control projects, such as maximum floodwater drainage and maximum flood levels, could not be possibly obtained to assess the mitigation of flood damage. Since there were no direct data to measure the effects achieved by the project, the questionnaire survey of local residents were complementally used to gain the effects.

This project was prepared to meet with 5-year probability level for city drainage facilities and 10-year probable flood control for the Jeneberang River improvements. This project was aimed to mitigate the flood damage, and not necessarily anticipated to protect areas in the target region in the event of a flood. The target region did in fact suffer some flood damage in 1994, the year after completion of the project, and again in 2000. Records for the 1994 flood could not be confirmed, but records show that the 2000 flood

came close to the scale of 25-year probable flood¹. The 2000 flood inundated an area of 2,535ha, or roughly 40% of the whole region, and resulted in the deaths of two children.

The Jeneberang River itself was improved to the level of specifications for 50-year probable flood by the succeeding project² which was completed in 1988. However, it is believed that the flood damaged occurred because the main drainage channels in the city improved by this project and the Pampang River that receives the inflows from these channels, were not equipped with drainage of inner basin function equivalent to the 25-year probable flood.

2) Assessment by Local Residents

A questionnaire survey was conducted for 100 households living in the region of Makassar where the river improvement project was conducted and the area surrounding the drainage channel that had been hit with floods in the past. This survey was conducted with help from the Jeneberang River Basin Development Office³. (N in the figure below represents the number of valid answers⁴.) The questions asked about “damage conditions of both before and after completion of the project, the sense of security felt while living in the region”, “participatory status in operating and maintaining the facilities”, and “overall evaluation and additional requests”. It should be noted that the respondents to the questionnaire themselves do not have a full understanding of the project scope and effects. There was also a flood exceeding the flood-protection capabilities of this project, and thus some of the disappointment brought about by the resulting flood damage may be reflected in their answers.

The following is an overview of the survey results.

<Damage Situation and Sense of Security in the Region>

Almost 100% of the respondents said that they have experienced some form of flood damage regardless of both before and after completion of the project. This is in line with the fact that there were two major floods, in 1994 and 2000, following the completion of this project. When asked about the degree of damage, many said that they suffered serious damage before completion of the project such as “lost livestock” and “house damaged or destroyed” (see Fig. 2). However, after completion of the project there was still damage such as “inundation above floors” and “damaged crops”, but there was a big drop in the amount of serious damage such as “lost livestock” and “house damaged or destroyed”. When asked about the level of the floodwaters, respondents said between 90cm and 130cm before the completion of the project, but this fell to between 40cm and 50cm after the project was finished, according to the questionnaire survey results. The fact that these 100 households saw a sharp reduction in serious damage such as the loss of life and essential assets can be evaluated how this project mitigated the impact from floods.

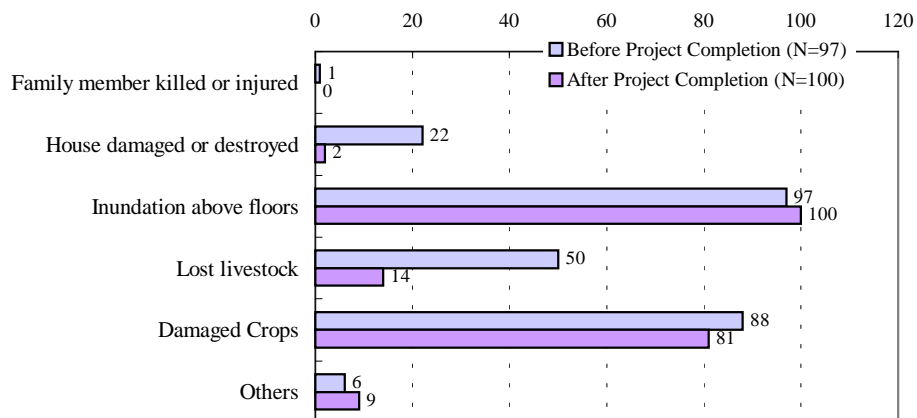
¹ The 5-year probable flood refers to 760m³/second, the 10-year probable flood refers to 1,090m³/second and the 25-year probable flood refers to 1,630m³/second. The 2000 flood recorded a maximum flood discharge amount of 1,530m³/second between February 3 and 5 of that year.

² The ODA loan project refers to the “Bili Bili Dam Project”. This project involved the construction of a multi-purpose dam upstream on the Jeneberang River that is used to control flooding, help with irrigation and provide electrical power. This dam was completed in 1998, five years after the completion of this project, and joint use was started from that year. The combination of the flood control functions of this dam and the river improvement works was to raise capacity to the 50-year probable flood exceeding 10-year probable flood.

³ According to the executing agency, the 100 households were selected at random from among those living in Makassar and surrounding areas that were hit by flooding before the start of this project. The survey was conducted through interviews using question sheets.

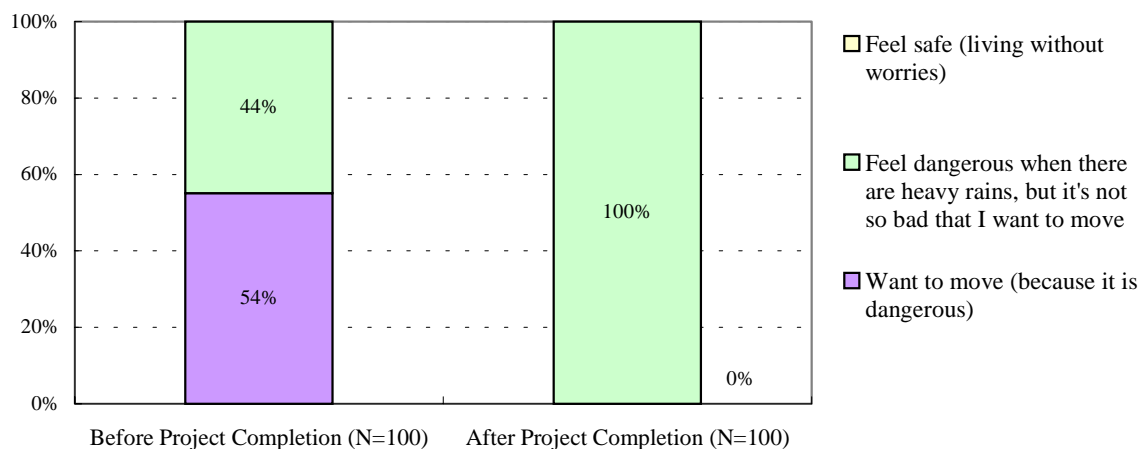
⁴ N represents the number of valid answers for each question.

Figure 2 Degree of Flood Damage (multiple answers allowed)



Most respondents said that before the completion of the project they felt that the region was unsafe and so they wanted to move to another location, but this concern all but vanished once the project was finished. However, all of the respondents said that they still felt that the area was dangerous during heavy rains, even after completion of the project.

Figure 3 Safety Awareness in Flood Threatened Region (3-rank evaluation)



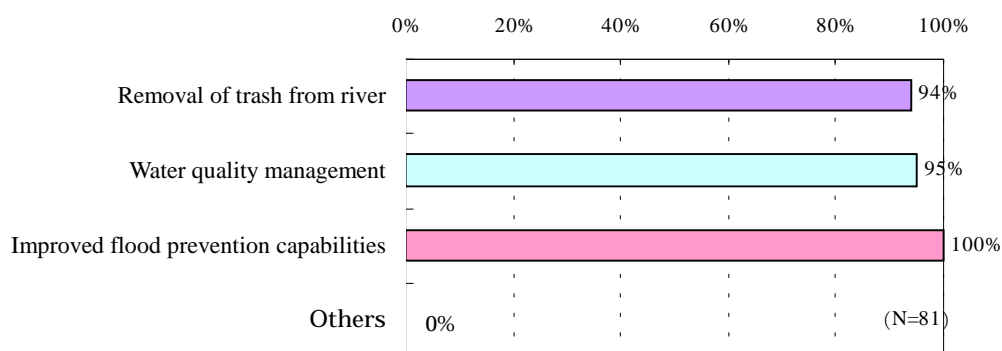
<Safety Awareness in Flood Threatened Region>

80 of the 100 surveyed households said that they participate in activities to operate and maintain the facilities. Specifically, all respondents said that they voluntarily cooperated in activities to remove trash and sludge from the drainage channels with their own will (a type of volunteer activity called Gotong-Royong).

<Additional Requests for this Project>

When asked if there were any additional requests for this project, all respondents said that they would like to see a further improvement in flood prevention capabilities (see Fig. 4).

Figure 4 Additional Requests for this Project (multiple answers allowed)



3) Effects of Flood Warning Activities

A flood warning system was completed in accordance with the previously mentioned succeeding project, with this project introducing a portion of the system. When the dams upstream release water, the Jeneberang River Basin Development Office directly informs the residents in the downstream area (verbally and with sirens). However, the questionnaire survey showed that most residents are not very aware of this warning system. It is hoped that this system will be put to further use and that efforts will be taken to make local residents more aware of the system.

4) Recalculation of Economic Internal Rate of Return

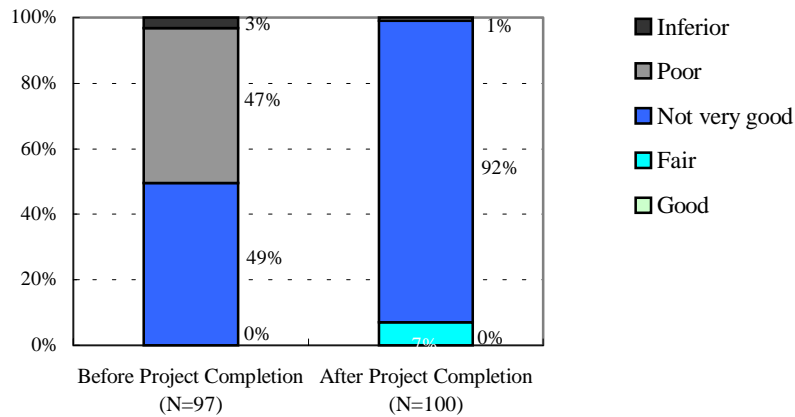
EIRR was not calculated, as the quantitative data on flood damage costs were not available.

(4) Impact

1) Impact on Environment

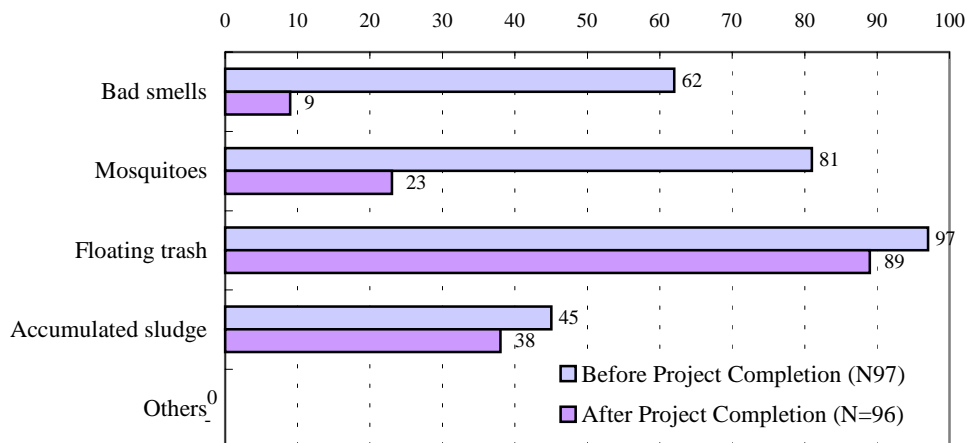
The aforementioned questionnaire asked the project beneficiaries to evaluate the quality of the water in the river and drainage channels in order to understand what impact the project had on the water environment in the target region. Figure 5 shows that before the completion of the project all respondents rated the water quality as being “not very good”. However, there was a complete change after the project was finished with almost none of the respondents describing the water quality as “poor” or “inferior”. This shows that the river improvement projects had a positive impact in this area.

Figure 5 Evaluation of Water Quality (5-scale evaluation)



Specifically, the residents said that there were big improvements in terms of the problems with “mosquitoes” and “bad smells” that were quite pronounced before completion of the project. However, “floating trash” (93%) and “accumulated sludge” (40%) are still recognized as problems (see Fig. 6).

Figure 6 Causes for Poor Water Conditions (multiple answers allowed)



There are concerns that trash and sludge will hurt the performance of the drainage channels in draining floodwaters. The survey also asked the respondents where they dispose of their trash. 75% of the respondents said that they would throw trash into the rivers and drainage channels before the completion of this project, but this number dropped to 45% after completion of the project, which suggests that the project led to some improvement in the situation. 100% of the respondents said that the reason they threw trash into the river and drainage channels was because there is “no collection service and no other place to dispose of the trash”. The respondents indicated that they would stop throwing trash if a better trash collection system was in place.

The trash problem is both a living environment problem and a cause of flood damage. For the betterment of the entire region, the problem of trash being thrown into the rivers and drainage channels should be addressed under the leadership of the Makassar municipal authorities.

2) Impact on Society

All respondents answered in the affirmative when asked if they believed that the project had a positive impact on economic activities in the region. The problems of “inundation above floors” and “damage crops” still existed, but the overall level of security for the region was raised by the project. The acquisition of land for this project involved the relocation of a little more than 100 households. However, the Jeneberang River Basin Development Office, the executing agency, said that this did not result in any particular problems as these residents were given financial compensation or provided with land at a different location.

3) Others

In addition to the above, the following cultural impacts were also reported.

- Conservation of historical and cultural assets in the flood-stricken region (ancient ruins of Sonba Opu)
- Improved use of recreational facilities through the control of flooding (boating, others)

(5) Sustainability

1) Operation and Maintenance

After completion of this project the management of the flood control facilities remained under the jurisdiction of the central government’s Jeneberang River Basin Development Office. This office is currently made up of three departments: (1) Water Resources Conservation and Development Project, (2) South Sulawesi Raw Water Supply Project, and (3) Bili Bili Dam Project. (1) and (2) are involved in the maintenance of these facilities.

The budget for operating and maintaining these facilities is provided each year by the central government in accordance with the project action plan (DIP: Daftar Isian Proyek) drafted by the Jeneberang River Basin Development Office. Actually around 60% of the allotted budget goes to the operation and maintenance of the Bili Bili Dam and the remaining 40% goes to the maintenance of this project⁵. This office said that the allotted budget is only enough to conduct small-scale repairs. For larger rehabilitation works a special request needs to be submitted to the central government to get the needed funding.

The Makassar municipal government is also responsible for some of the maintenance. The City Sanitation Bureau is responsible for regularly removing trash and accumulated sludge from the reservoirs (part of a former river section) and main drainage channels such as the Jongaya channel, the Panampu channel and the Sinrijala channel, using the bureau’s own budget.

2) Operation and Maintenance Status

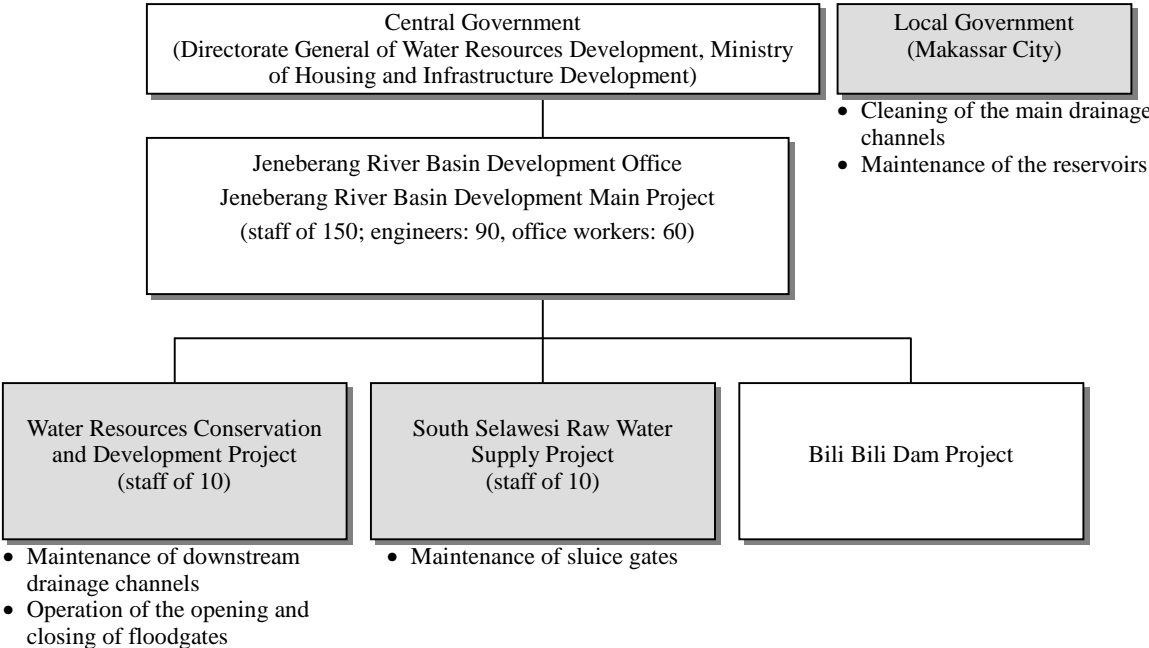
According to the field survey in September 2000, trash and sludge were seen in many places along the main channels, but in most cases the accumulation was only between 1.0~1.5m. The Makassar municipal government is responsible for the cleaning of these facilities, but it is hard to say that this maintenance has

⁵ According to the Jeneberang River Basin Development Office, the budget from the central government in fiscal 1999 came to 200 million rupees, of which 40%, or 85 million rupees was allotted to the maintenance of the facilities provided by this project.

been sufficiently performed. The accumulation of trash and sludge in the main drainage channels deteriorates the living environment and lowers drainage capacity. Therefore, the regular removal is needed. The Jeneberang River Basin Development Office is responsible for daily maintenance such as lubricating the manual sections of the floodgates, but such maintenance is not being adequately performed and there are many locations in need of proper lubrication. Rusted equipment can affect performance when opening and shutting the floodgates. This could result in problems such as the gates not opening when floodwaters need to be released. However, there were no problems with the river embankments, which seemed to be no notable problems.

Figure 7 System for Operating and Maintaining the Flood Control Equipment for the Jeneberang River

(gray areas are the organizations actually operating and maintaining the facilities)



3) Sustainability

This project has contributed to mitigating the amount of flood damage to some degree, but the target region is still threatened by flood damage (damage caused by the February 2000 flood was brought about equivalent to the flooding scale of 25-year probability). With the provision of succeeding project, the improvements of the Jeneberang River are now being made adequately to meet even the relevant scale of flooding and there should be no particular problems in this area. However, substantive efforts have not been made to clean the sludge and trash out of the main drainage channels (Jongaya, Panampu, Sinrijala) that comes from the discharge of city water. When flooding occurs, this trash and sludge can block the floodgates, and it is pointed out that this impedes the manifestation of downstreaming capabilities of drainage channels. The Makassar municipal authorities, responsible for cleaning activities of the relevant facilities of drainage channels, said that it is difficult to conduct adequate cleaning of the drainage facilities due to local financial difficulties.

In order to maintain the sustainability of this project, the Makassar municipal authorities will need to strengthen their activities to remove trash and sludge from the drainage channels, the public sanitation

system will need to be expanded to prevent residents from disposing of garbage in the river and a campaign to urge residents not to throw trash into the river will need to be implemented. It is expected that the Makassar municipal authorities will take the necessary steps in these areas.

At the same time improvements will need to be made from the midstream region of the Pampang River, which receives the water discharged from the main drainage channels, to areas further downstream, with the aim of controlling floodwaters and reducing flood damage for the Makassar city region. However, this falls outside of the scope for this project.

Accordingly, it will be necessary to examine systematic and multifaceted plans for bolstering its public sanitation system, improving river sections downstream from the drainage channels provided by this project, and enacting various campaigns (trash throwing, others) calling for participation among the local residents under the leadership of Makassar municipal authorities, in order to maintain the sustainability of the effects by this project.

Comparison of Original and Actual Scope

Item	Plan	Actual
Project Scope		
1. Construction works		
<u>Package 1</u>		
(1) Dredging		<u>Package 1:</u> Same as left
- Mouth of the Jeneberang River	598,000 m ³	
- Panampu and Jongaya Drainage Channels	45,000 m ³	
(2) Excavation	412,000 m ³	
<u>Package 2</u>		
(1) Excavation	338,000 m ³	<u>Package 2:</u> Same as left
(2) Embankment/river improvement	272,000 m ³	
(3) Revetment	29,000 m ³	
(4) Raising of Marino Road	20,000 m ³	
(5) Paving of Marino Road	14,000 m ³	
<u>Package 3</u>		
(1) Excavation	422,000 m ³	<u>Package 3:</u> Same as left
(2) Embankment	96,000 m ³	
(3) Revetment	120,000 m ²	
(4) Bridging	23	
		<u>Package4:</u> Addition
		(1) Excavation: 333,200 m ³
		(2) Embankment: 333,000 m ³
		(3) Revetment: 60,700 m ²
		(4) Bridging: 1
		<u>Package 5:</u> Addition
		(1) Fence: 15,000 m
		(2) Gravel paving: 4,280 m ²
		(3) Concrete paving: 1,600 m ²
		(4) Asphalt paving: 19,160 m ²
2. Flood Warning System	Water-level Monitoring Station: 3 Central Monitoring Station: 1 Vehicles: 3	Same as left
3. Consulting service		
(1) Prior coordination	Total: 356.5 M/M	Total: 869.5 M/M
(2) Construction supervision	Foreign: 228.5 M/M	Foreign: 354.2 M/M
(3) Technology transfer	Local: 128.0 M/M	Local: 515.3 M/M
Implementation Schedule		
1. Exchange of Notes	Nov. 1984	Jul. 1984
2. Selection of consultant	Nov. 1984 ~ Nov. 1985	-
3. Land compensation	Apr. 1985 ~ Nov. 1987	-
4. Selection of contractor	Nov. 1985 ~ Nov. 1986	Jul. 1987 ~ Jun. 1988
5. Civil Works	May 1987 ~ Sep. 1990	Mar. 1989 ~ Dec. 1993
6. Consulting service	Nov. 1985 ~ Nov. 1990	Nov. 1985 ~ Jun. 1994
7. Project completion	Nov. 1990	Mar. 1994
Project Cost		
Foreign currency	¥4,600 million	N.A.
Local currency	¥6,713 million	N.A.
Total	¥11,313 million	N.A.
ODA loan portion	¥5,381 million	¥5,033 million
Exchange rate	¥1 = 4.2194 Rp. (Apr. 84)	¥1 = 14.81 Rp. (Average between '88 and '93)