

Indonesia

## Krueng Aceh Urgent Flood Control Project Stage 2 Phase 1

Report Date: March 2001

Field Survey: September 2000

### 1. Project Profile and Japan's ODA Loan



Location Map of Project Area



A Part of Estuary for the Project

#### (1) Background

The Aceh River stretches for 145 kilometers and has a drainage area of 1,800km<sup>2</sup>. For many years the Aceh Plain, which has served as the basin for this river, has been plagued by flooding. Flood damage has been especially severe in Banda Aceh, the capital of the Aceh Special Province and the province's political and economic center. However, before the implementation of this project, no full-scale constructions of flood prevention were ever undertaken, and there have been strong requests for emergency actions to be taken.

Against this background, the Indonesian government has requested an urgent flood control project to be executed for this river. So far engineering services (E/S; FY'79 project) and Stage 1 (FY'82 project) have been adopted as ODA loan projects.

#### (2) Objectives

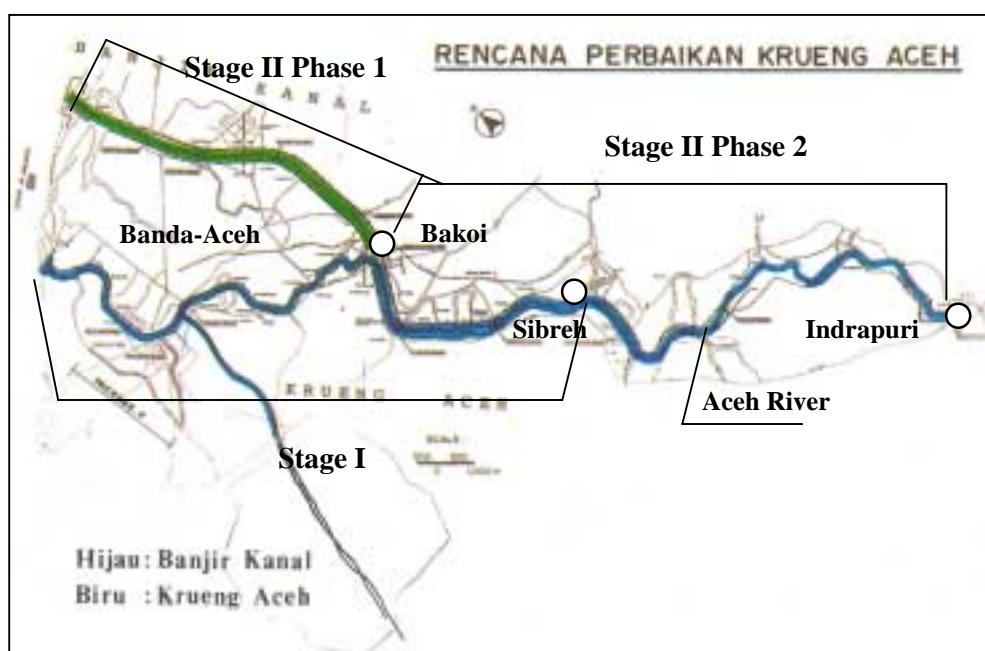
The project was aimed to protect from flood damage for five years the area of 45km along the Aceh River from the river mouth up to Indrapuri through the construction of new flood control channels and other river-improvement projects.

#### (3) Project Scope

The overall project was divided into three stages, and this project was to construct 12km of flood control channels as Stage II, Phase I (FY'83 project) of the overall project. (It is surrounded by thick line as shown in the table below.)

**Table 1 Positioning of this Project in the Aceh River Urgent Flood Control Project**

Stage	Details	Remarks
Stage I	River improvement and embankment construction between the river mouth and Bakoi Embankment construction along the left side of the river between Bakoi and Sibreh, small river improvements within the city	FY '82 project
Stage II phase 1	Construction of flood control channels (River channel of 12km, 900m <sup>3</sup> /sec)	This project FY'83 project
Stage II phase 2	Channel improvement between Bakoi and Indrapuri Construction of embankment on right side of the river between Bakoi and Sibreh	Not covered by ODA loan project



**Figure 1 Location Map of this Project and Overall Project**

**(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	¥8,953 million / ¥8,814 million
Exchange of Notes/Loan Agreement	September 1983 / June 1984
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	May 1993

## **2. Results and Evaluation**

### **(1) Relevance**

The Aceh River Urgent Flood Control Project is a series of flood prevention projects combining the previous Stage I project and the current Stage II project. The objective of this project is to mitigate damage caused by flooding in Bahnda Aceh City, the capital of the Aceh Special Province. This project is desperately needed with high urgency by the region, which is plagued by floods every year, and therefore the project continues to be seen as being relevant even at the time of evaluation. There were no major changes in the scope of the project during its implementation.

### **(2) Efficiency**

This project was executed by the Aceh River Flood Control Office, which is under the jurisdiction of the Directorate General of Water Resources Development, Ministry of Housing and Infrastructure Development (former Directorate General of Water Resources Development, Ministry of Public Works). Implementation schedule was delayed by three years mainly due to delays in obtaining the required land. This project required land acquisition of around 1,000ha with relocation of some 5,500 residents. However, as the lengthy process involved in negotiating with these residents, the project could not be completed in 2.5 years as planned, but instead took 5.5 years to finish.

### **(3) Effectiveness**

#### **1) Quantitative Effects**

Floods struck this region in 1991 and 1992 before the project was completed, but there has been no flooding after completion of the project. However, Directorate General of Water Resources Development, Ministry of Housing and Infrastructure Development has not kept any quantitative data that measures the effects of this project. Therefore, the effects of the project will be substituted for “Evaluation by Local Residents” (as reported below).

When asked what is the maximum amount of flood water that can be discharged ( $\text{m}^3/\text{sec.}$ ), as an indication of the operating conditions of the facilities, the Directorate General of Water Resources Development replied roughly between  $1,000\sim 1,200\text{m}^3/\text{second}$ . The design of these facilities called for a capacity of  $1,300\text{m}^3/\text{second}$  (river:  $400\text{m}^3/\text{second}$ , flood control channels:  $900\text{m}^3/\text{second}$ ). Therefore, it can be assumed that the flood control functions are operating correctly.

#### **2) Evaluation by Local Residents**

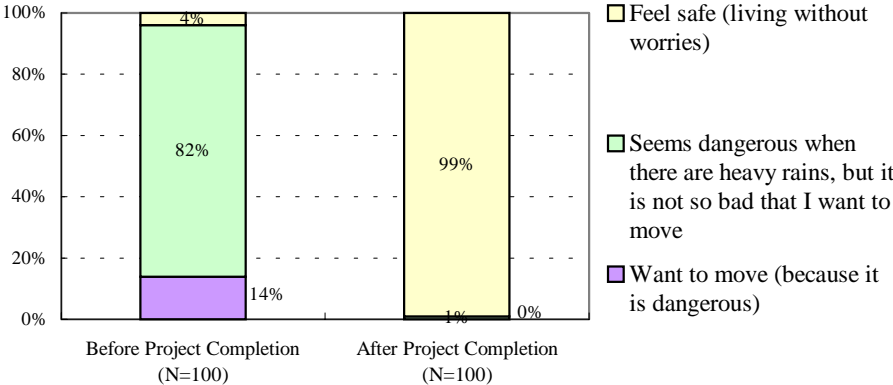
In September of 2000 this project conducted a questionnaire survey of 100 households living in the target area (those households living in this area before completion of the project) under the cooperation of Directorate General of Water Resources Development, Ministry of Housing and Infrastructure Development. Summary of the questionnaire survey results is explained as below.

#### **<Damage and Degree of Safety Before and After Project Completion>**

100% of the respondents said that they suffered some damage from flooding before implementation of the project. Such damage included houses being inundated with water, lost livestock and damaged crops.

However, none of the families met with any flood damage after the project was completed. This brought about a tremendous change in the sense of safety among the residents in this region (see Fig. 2). More than 95% of the respondents said that before completion of this project they felt that the area was unsafe and wanted to move, or felt that the area was dangerous whenever there were heavy rains. However, after completion of the project 99% said that they no longer felt such unease. These findings suggest that this project had a dramatic impact in terms of improving the safety of this region.

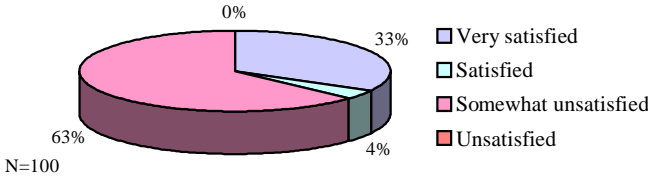
**Figure 2 Overall Project and Positioning of this Project (select one of the three alternatives)**



**<Overall Evaluation and Additional Requests>**

Respondents to the survey were asked to give an overall evaluation (degree of satisfaction) of the project using a 4-rank scale. As shown in Figure 3, more than 60% said “somewhat unsatisfied”, which was more than the total of those that said “very satisfied” and “satisfied”. When asked about additional request, the most common response (54%) was that they would like to see the flood handling capabilities raised even further.

**Figure 3 Overall Evaluation (4 ranks)**



Despite the fact that there has been no flood damage since the completion of the project, many still expressed dissatisfaction and there were calls to further improve the capabilities of the installed facilities. This is due in part to the large amount of soil that has accumulated in the river and drainage channels, and is also due to the fact that many of the respondents are unable to forget some of the flood disasters of the past.

**3) Recalculation of Economic Internal Rate of Return (EIRR)**

The EIRR (Economic Internal Rate of Return) recalculated for this project came to 11.83%, which was a little higher than the 9.3% calculated at the time of the appraisal. The expenditure of project costs

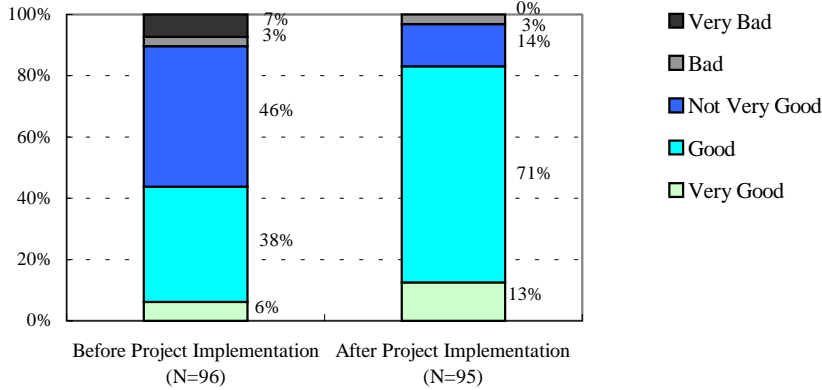
(projected amount) and maintenance costs gained from the executing agency were used when recalculating the EIRR. There were no measured data for actual amounts of the benefits (results from preventing flood damage), and thus the initial expected values were converted to the standard annual values. Further, target asset prices at the time of the appraisal and for standard years were used as corrected theoretical values that took into consideration the population increase.

**(4) Impact**

**1) Environmental Impact**

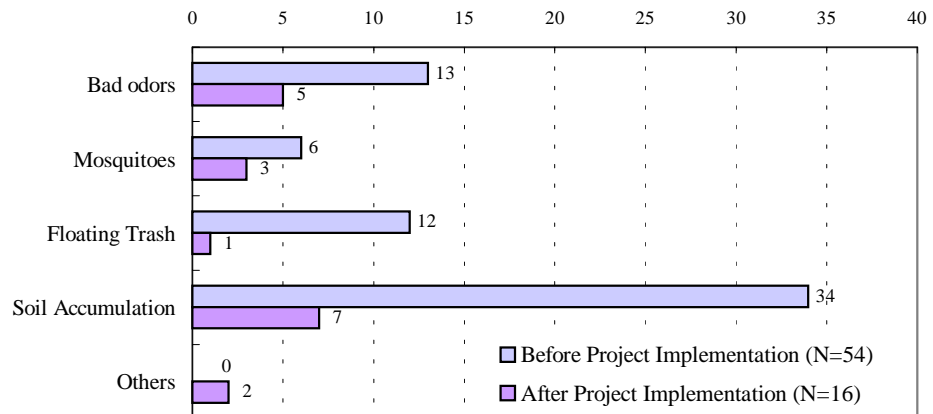
The aforementioned questionnaire survey also asked about water quality in the rivers and drainage channels before and after completion of the project to understand what impact the project had in the surrounding area of waters. Figure 4 shows their assessment of the water quality using a 5-rank scale. More than half of the respondents gave low marks, describing the water quality as “not very good”. However, after completion of the project assessment of the water quality was much improved with more than 80% of the respondents describing the water as “good” or better. This suggests that the improvements to the river brought about a positive effect for the surrounding environment.

**Figure 4 Evaluation of Water Quality for River and Drainage Channels (5 ranks)**



Specifically, the amount of accumulated soil was reduced, which helped to reduce floating trash and bad odors to some degree (see Fig. 5).

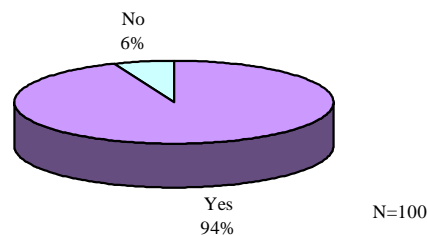
**Figure 5 Concrete Examples of Improved Water Quality (multiple answers allowed)**



## 2) Social Impact

Respondents to the questionnaire survey were also asked what contributions the project made to economic activities, in order to gauge what impact the project had on the regional economy and society (see Fig. 6). The result was that more than 90% of the respondents said that the project has supported economic activities. Specifically, stable agriculture activities resulting from the project led to higher incomes and more (stable) employment opportunities.

**Figure 6 Do you Think This Project Has Helped Support Economic Activities?**



The implementation of this project involved the land acquisition of around 1,000ha and the relocation of some 5,500 residents. This all required more time than was initially planned, but there were no particular social problems such as protests from the residents.

## (5) Sustainability

### 1) Operation and Maintenance

The facilities (drainage channels) have been managed by the Aceh River Flood Control Office under the jurisdiction of the central government (Ministry of Housing and Infrastructure Development) even after completion of the project. The original plan was to transfer maintenance of the facilities to local governments (Aceh Special Province Public Works Division), but this was not executed (as of September 2000), as the local authorities did not have the adequate system in place for taking over these operations. The Aceh River Flood Control Office has 35 employees (including 5 engineers) responsible for the maintenance of drainage facilities, roads used for maintenance and various floodgates.

## **2) Operation and Maintenance Status**

The maintenance budget for this project is provided by the central government every year. As for budgetary amounts, the central government makes a review based on the project list (DIP: Daftar Isian Proyek) submitted each year by the Aceh River Flood Control Office. However, this office has not been able to get its requested amount of funding due to the nation's financial difficulties. In fact, the budget has only been enough to cover daily maintenance operations such as gate maintenance and cleaning of the embankments.

Dredging of the drainage channels has not been conducted even once since the completion of the project and the accumulated soil has been left untouched. Soil accumulation has been seen not only at the mouth of the river, but also at various sections along the river. It is feared that this will lower the flowing capacity of the drainage channels. The Aceh River Flood Control Office has proposed to the central government the extension of breakwaters at the mouth of the river and dredging operations as steps to address this problem.

There have also been reports that during the rainy season seawater can flow all the way up to near 37 km in the middle reaches of the river, damaging the quality of the water obtained by the nearby public water authorities (PDAM). Therefore, the Aceh River Flood Control Office has also proposed the government to construct a rubber dam to prevent this inflow of seawater.

The aforementioned questionnaire survey also asked the local residents about their participation in operating and maintaining river facilities. 95 of the 100 surveyed households said that they did participate in these activities at the time of the evaluation. Specifically, they helped to remove trash from the river several times a year. Most of the respondents said that their participation was not due to any orders from the local governments, but was purely on a voluntary basis.

## **3) Sustainability**

This project achieved its objective of preventing flood damage in the Aceh River surrounding region. This is clearly demonstrated from the evaluations by the local residents. However, currently soil is accumulating in the down the river and decline of riverbed in the middle and up the river is progressing. If this situation is left untouched, it gives rise to impairing the sustainability of the project effects. To rectify this problem when the Indonesian government asks Japan for ODA loans involving rehabilitation of previous ODA loan projects, it was decided that an additional survey (Special Assistance for the Project Sustainability) would be conducted to study the technical feasibility of the rehabilitation plan and whether or not sustainability will be secured after completion of the rehabilitation. The issue of the insufficient maintenance budget is also being raised with the central government.

## Comparison of Original and Actual Scope

Item	Plan	Actual
Project Scope		
1. Construction of flood control channels		
<Package C>	Estuary to No.7+100 (4.85km)	
-Dredging	2,040,000 m <sup>3</sup>	907,487 m <sup>3</sup>
-Embankment	208,000 m <sup>3</sup>	54,559 m <sup>3</sup>
-Spoiling	2,040,000 m <sup>3</sup>	2,040,000 m <sup>3</sup>
-Revetment	82,700 m <sup>3</sup>	60,227 m <sup>3</sup>
-Sodding	24,000 m <sup>3</sup>	63,161 m <sup>3</sup>
-Bridges	2 units	3 units
-Tide Gate	1 unit	1 unit
-Inspection Road	6 km	6 km
-Confluence Works	1 site	1 site
-Jetty	200 m	192 m
<Package D>	No.7+100 to Bakoi (5.18km)	
-Excavation	3,327,000 m <sup>3</sup>	2,824,724 m <sup>3</sup>
-Embankment	68,000 m <sup>3</sup>	344,383 m <sup>3</sup>
-Spoiling	3,259,000 m <sup>3</sup>	4,382,306 m <sup>3</sup>
-Revetment	41,000 m <sup>2</sup>	48,235 m <sup>2</sup>
-Sodding	40,000 m <sup>2</sup>	71,142 m <sup>2</sup>
-Diversion Structure	1 unit	1 unit
-Bridges	1 unit	1 unit
-Sluice	1 unit	1 unit
-Inspection Road	10 km	10 km
-Irrigation Pump & Station	1 unit	1 unit
-Confluence Works	2 sites	2 sites
2. Consulting service		
-Foreign Consultant	179 M/M	179 M/M
-Local Consultant	84 M/M	84 M/M
Implementation Schedule		
1.Loan Agreement Signing	Dec. 1983	Jul. 1984
2.Employment of Consultant	Dec. 1983 ~ Dec. 1984	Dec. 1983 ~ Dec. 1984
3.Procurement of Contractor for Civil Works	Jan. 1985 ~ Dec. 1985	Jan. 1985 ~ Dec. 1985
4.Land Acquisition	Oct. 1984 ~ Mar. 1987	Oct. 1984 ~ Mar. 1990
5.Construction	Jan. 1986 ~ Jun. 1989	Jan. 1986 ~ Jun. 1991
6.Engineering Services	Apr. 1985 ~ Oct. 1989	Apr. 1985 ~ Oct. 1993
<Completion>	Oct. 1989	Oct. 1993
Project Cost		
Foreign currency	¥7,648 million	¥7,515.8 million
Local currency	¥8,128 million	N.A.
Total	¥15,776 million	N.A.
ODA loan portion	¥ 8,953 million	¥8,814 million
Exchange rate	700 Rp. = ¥230 (1983)	