Completion Report

Project Number: 27258
Loan Number: 1425/1426(SF)-INO
December 2006

Indonesia: North Java Flood Control Sector Project

Asian Development Bank

CURRENCY EQUIVALENTS

Currency Unit – rupiah (Rp)

		At Appraisal	At Project Completion
		4 August 1995	29 June 2004
Rp1.00	=	$0.00044	$0.00012
$1.00	=	Rp2,272	Rp8,597

ABBREVIATIONS

ADB	–	Asian Development Bank
ADF	–	Asian Development Fund
BSDA	–	Balai Sumber Daya Air (River Basin Organization)
DGWR	–	Directorate General of Water Resources
EA	–	executing agency
EIRR	–	economic internal rate of return
NGO	–	nongovernment organization
O&M	–	operation and maintenance
OCR	–	ordinary capital resources
PIU	–	project implementing unit
PMU	–	project monitoring unit
RBDP	–	river basin development project
RFDR	–	river flood damage rehabilitation
RIWDP	–	Research Institute for Water Resources Development
RRP	–	report and recommendation of the President
RBDP	–	River Basin Development Project
TA	–	technical assistance

NOTE

In this report, "$" refers to US dollars.

Vice President	C. Lawrence Greenwood, Jr., Operations Group 2
Director General	A. Thapan, Southeast Asia Department (SERD)
Director	U. S. Malik, Agriculture, Environment and Natural Resources Division, SERD
Team Leader	C. I. Morris, Senior Water Resources Engineer, Agriculture, Environment and Natural Resources Division, SERD

CONTENTS

BASIC DATA

A. Loan Identification

1.	Country	Indonesia
2.	Loan Number	1425/1426
3.	Project Title	North Java Flood Control Sector Project
4.	Borrower	Government of Indonesia
5.	Executing Agency	Directorate General of Water Resources of the Ministry of Public Works
6.	Amount of Loan	$45,000,000 ordinary capital resources (OCR) SDR30,109,000 Asian Development Fund (ADF)
7.	Project Completion Report Number	976

B. Loan Data

1.	Appraisal	
	– Date Started	20 July 1995
	– Date Completed	4 August 1995
2.	Loan Negotiations	
	– Date Started	5 November 2005
	– Date Completed	7 November 2005
3.	Date of Board Approval	18 January 1996
4.	Date of Loan Agreement	26 January 1996
5.	Date of Loan Effectiveness	
	– In Loan Agreement	25 April 1996
	– Actual	6 March 1996
	– Number of Extensions	0
6.	Closing Date	
	– In Loan Agreement	31 March 2002
	– Actual	29 June 2004 (OCR) 7 May 2004 (ADF)
	– Number of Extensions	1
7.	Terms of Loan	
	-- Commitment Charge	0.75% for OCR
	– Interest Rate	Pool-based variable rates for OCR
	-- Service Charge	1.00% for ADF
	– Maturity (number of years)	26 years for OCR; 35 years for ADF
	– Grace Period (number of years)	6 years for OCR; 10 years for ADF

8. Disbursements

a. Dates (i = 1425-INO; ii = 1426-INO[SF])

Initial Disbursement	Final Disbursement	Time Interval
i – 15 December 1996	29 June 2004	90 months
ii – 28 August 1997	7 May 2004	83 months

Effective Date	Original Closing Date	Time Interval
i and ii – 6 March 1996	31 March 2002	73 months

b. Amount

i. 1425-INO ($'000)

Category	Original Allocation	Last Revised Allocation	Amount Canceled[a]	Amount Disbursed	Undisbursed Balance[b]
Civil Works	21,184	2,022	19,162	2,145	(123)
Equipment and Vehicle	1,536	1,667	131	1,666	1
Consulting Services	10,754	8,506	2,248	8,434	72
Surveys and Investigations	691	524	167	547	(23)
Training	113	271	(158)	275	(4)
Subtotal	**34,278**	**12,990**	**21,288**	**13,067**	**(77)**
Unallocated	2,807	496	2,311	0	496
Interest and Commitment Charges	7,915	5,615	2,300	5,342	273
Total	**45,000**	**19,101[a]**	**25,899**	**18,409**	**692**

[a] A total of $25.899 million was canceled on 16 July 1998 ($16.178 million) and 6 October 2000 ($9.720 million), resulting in a final loan allocation of $19.101 million.
[b] The undisbursed loan balance of $0.692 million was canceled on 29 June 2004.

ii. 1426-INO(SF) (SDR'000)

Category	Original Allocation	Last Revised Allocation	Amount Canceled[a]	Amount Disbursed	Undisbursed Balance[b]
Civil Works	26,797	24,494	2,303	23,743	751
Unallocated	2,710	220	2,490	0	220
Service Charge	602	602	0	581	21
Total	**30,109**	**25,316[a]**	**4,793**	**24,324**	**992**

[a] SDR4.793 was canceled on 6 October 2000, resulting in a final loan allocation of $25.316 million.
[b] The undisbursed loan balance of SDR0.992 million was canceled on 7 May 2004.

($'000)

Category	Original Allocation	Last Revised Allocation	Amount Canceled[a]	Amount Disbursed	Undisbursed Balance[b]
Civil Works	40,050	33,196	2,990	32,106	1,090
Unallocated	4,050	319	3,231	0	319
Service Charge	900	818	0	788	30
Total	**45,000**	**34,333[a]**	**6,221**	**32,894**	**1,439**

[a] $6.221 million equivalent was canceled on 6 October 2000, resulting in a final loan allocation of $34.333 million equivalent.
[b] The undisbursed loan balance of $1.439 million equivalent was canceled on 7 May 2004.

9. Local Costs (Financed)
   - Amount ($'000) 19,769
   - Percent of Local Costs 47
   - Percent of Total Cost 27

C. Project Data

1. Project Cost ($'000)

Cost	Appraisal Estimate	Actual
Foreign Exchange Cost	48,072	31,534
Local Currency Cost	104,928	42,179
Total	**153,000**	**73,713**

2. Financing Plan ($'000)

Cost	Appraisal Estimate	Actual
Implementation Costs		
Borrower Financed	63,000	22,410
ADB Financed	81,146	45,173
Total	**144,146**	**67,583**
IDC Costs		
Borrower Financed		
ADB Financed	8,854	6,130
Total	**8,854**	**6,130**

ADB = Asian Development Bank, IDC = interest during construction.

3. Cost Breakdown by Project Component ($'000)

Component	Appraisal Estimate	Actual
A. Investment Costs		
Land Acquisition	15,319	5,344
Flood Control and Protection	119,511	57,832
Institutional Strengthening of Water Resources Services	582	493
Flood Warning Pilot Project	830	943
Monitoring River Degradation	1,864	1,681
Monitoring Water Quality	1,760	1,290
Subtotal	**139,506**	**67,583**
B. Recurrent Costs		
Incremental Operation and Maintenance	4,640	
C. Interest and Other Charges during Construction	8,854	6,130
Total	**153,000**	**73,713**

4. Project Schedule

Item	Appraisal Estimate	Actual
Date of Contract with Consultants	1Q 1996	31 January 1997
Completion of Engineering Designs	4Q 1998	December 2000
Civil Works Contract		
Date of Award	3Q 1996	9 January 1997
Completion of Work	4Q 2001	30 November 2003
Equipment and Supplies		
Dates		
First Procurement	3Q 1996	3 April 1999
Last Procurement	3Q 1998	16 December 2002
Completion of Equipment Installation	4Q 1998	December 2001
Start of Operations		
Completion of Tests and Commissioning	1Q 1999	14 October 2002
Beginning of Start-Up	1Q 1999	14 October 2002
Other Milestones		
Cancellation of Loan Proceeds		
First Partial Cancellation (OCR)		16 July 1998
Second Partial Cancellation (OCR and ADF)		6 October 2000
Final Partial Cancellation (ADF)		7 May 2004
Final Partial Cancellation (OCR)		29 June 2004

5. Project Performance Report Ratings

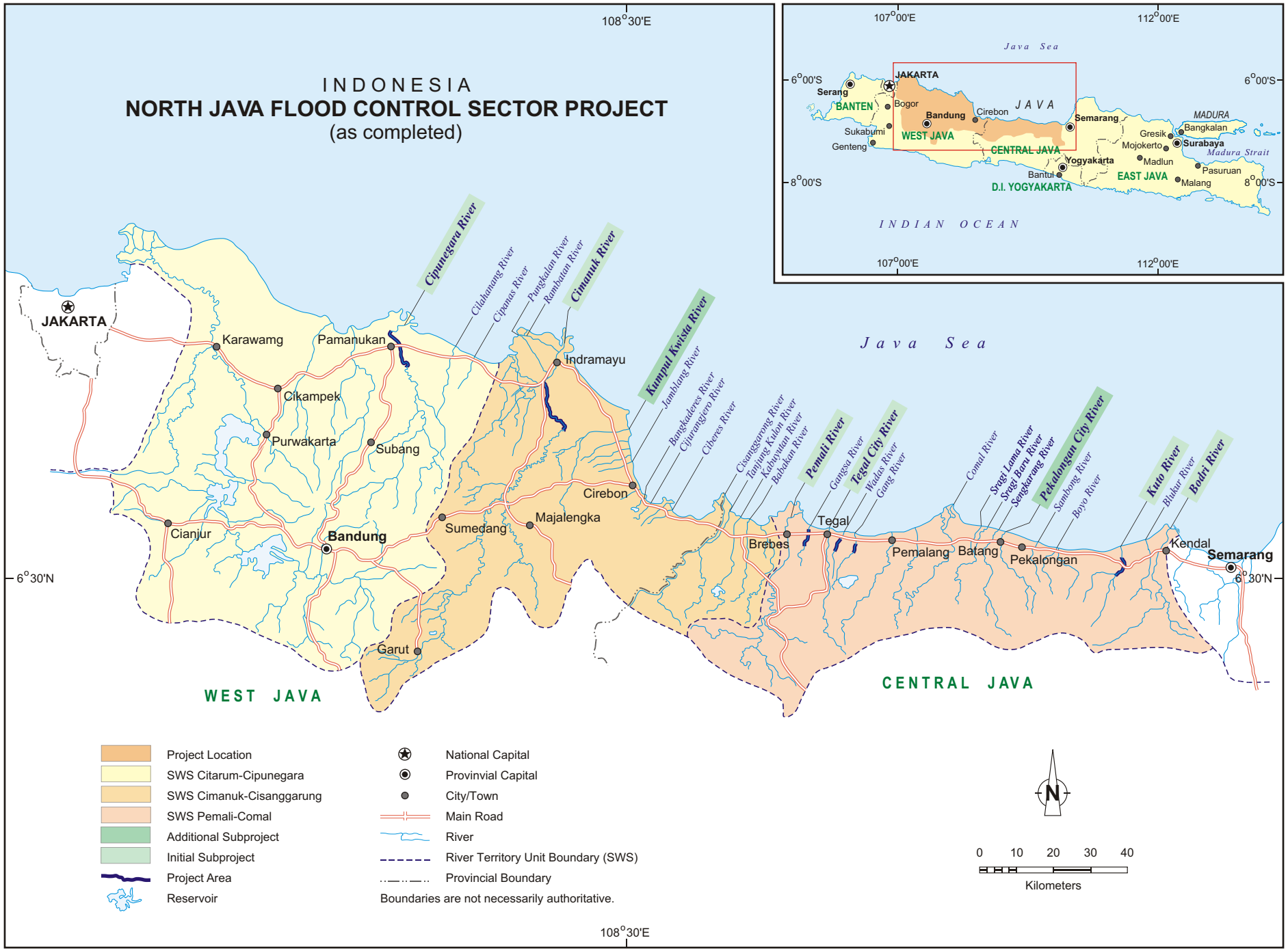
	Ratings	
Implementation Period	Development Objectives	Implementation Progress
From 6 March 1996 to 31 December 1996	Satisfactory	Satisfactory
From 1 January 1997 to 31 December 1997	Satisfactory	Satisfactory
From 1 January 1998 to 31 December 1998	Satisfactory	Satisfactory
From 1 January 1999 to 31 January 1999	Satisfactory	Partly satisfactory
From 1 February 1999 to 31 March 1999	Satisfactory	Unsatisfactory
From 1 April 1999 to 31 December 1999	Satisfactory	Partly satisfactory
From 1 January 2000 to 31 December 2000	Satisfactory	Partly satisfactory
From 1 January 2001 to 31 December 2001	Satisfactory	Partly satisfactory
From 1 January 2002 to 28 February 2002	Satisfactory	Partly satisfactory
From 1 March 2002 to 31 December 2002	Satisfactory	Satisfactory
From 1 January 2003 to 31 December 2003	Satisfactory	Satisfactory

D. Data on Asian Development Bank Missions

Name of Mission	Date	No. of Persons	No. of Person-Days	Specialization of Members[b]
Fact-Finding Mission	24 Apr–18 May 1997	6	144	a, b, c(2), d, e
Appraisal Mission	18 Jul–4 Aug 1995	4	72	a, b, c, e
Project Inception Mission	8–11 Oct 1996	2	8	a, g
Project Review Mission 1	24 Feb–1Mar 1997	1	6	a
Project Review Mission 2	22–25 Nov 1997	2	8	a g
Project Review Mission 3	31 Aug–4Sept 1997	2	10	a, h
Midterm Review	12–24 Apr 1999[a]	3	39	h, g, l, f
Project Review Mission 4	21–26 Nov 1999[a]	2	12	h, g
Special Loan Administration Mission	27–29 Feb 2000	1	3	i
Project Review Mission 5	14–19 May 2000[a]	3	18	i, h, g, f
Project Review Mission 6	27 Mar–3 Apr 2001	2	16	h, g
Project Review Mission 7	12–20 Nov 2001	2	14	j, h
Project Review Mission 8	4–20 Mar 2002[a]	2	34	k, g
Special Loan Administration Mission	27 May–7 Jun 2002[a]	1	12	k
Project Review Mission 9	12–28 May 2003[a]	2	17	k, g
Project Completion Review[c]	21 Nov–8 Dec 2005	4	52	k, l, m, g

[a] The Mission was conducted back-to-back with Loan No. 1479-INO South Java Flood Control Sector project.

[b] a – rural development specialist, b – economist, c – programs officer, d – environment specialist, e – counsel, f – consultant (resettlement specialist), g – project administration assistant or assistant project analyst, h – project engineer, I – social development specialist, j – manager, k – water resources specialist, l – consultant (economist), m – consultant (engineer).


INDONESIA
NORTH JAVA FLOOD CONTROL SECTOR PROJECT
(as completed)
108°30'E
6°30'N
JAKARTA
Karawang
Pamanukan
Cikampek
Purwakarta
Subang
Cianjur
Bandung
Sumedang
Majalengka
Indramayu
Cirebon
Garut
Brebes
Tegal
Pemalang
Batang
Pekalongan
Kendal
Semarang
Java Sea
WEST JAVA
CENTRAL JAVA
Cipunegara River
Cilahanang River
Cipanas River
Pungkalan River
Rambatan River
Cimanuk River
Kumpul Kwista River
Jamblang River
Bangkaderes River
Cijurangkero River
Ciberes River
Cisanggarong River
Tanjung Kulon River
Kabuyutan River
Bahakan River
Pemali River
Gamsa River
Tegal City River
Wadas River
Gung River
Comal River
Sragi Lama River
Sragi Baru River
Sengkarang River
Pekalongan City River
Sambong River
Boyo River
Kuto River
Blukar River
Bodri River
Project Location
SWS Citarum-Cipunegara
SWS Cimanuk-Cisanggarung
SWS Pemali-Comal
Additional Subproject
Initial Subproject
Project Area
Reservoir
National Capital
Provinvial Capital
City/Town
Main Road
River
River Territory Unit Boundary (SWS)
Provincial Boundary
Boundaries are not necessarily authoritative.
N
0 10 20 30 40
Kilometers
107°00'E
112°00'E
6°00'S
8°00'S
Java Sea
JAKARTA
Serang
BANTEN
Bogor
Bandung
Cirebon
JAVA
Semarang
MADURA
Bangkalan
Sukabumi
WEST JAVA
Gresik
Mojokerto
Surabaya
Genteng
CENTRAL JAVA
Madura Strait
Yogyakarta
Madlun
Pasuruan
Bantul
EAST JAVA
Malang
D.I. YOGYAKARTA
INDIAN OCEAN

06-2527 HR

I. PROJECT DESCRIPTION

1. On 18 January 1996, the Asian Development Bank (ADB) approved two loans to the Government of Indonesia: (i) one loan in the amount of $45 million from ADB's ordinary capital resources, and (ii) one loan in various currencies in the amount of SDR30.1 million (equivalent to $45 million) from ADB's Special Funds to finance 59% of the total $153 million cost of the North Java Flood Control Sector Project. The goal of the Project was to improve the quality of life for rural and urban populations in the project area by reducing flood-induced disruption of human activities and the incidence of disease by preventing regular flooding of houses and crops, minimizing disruptions of services and commercial activities, and enhancing the income-earning capacity of the generally poor populations in flood-affected areas. The Project also aimed to promote sound management of natural resources and the environment by encouraging further improvements in land use in the upper river basin catchments, monitoring and controlling sediment imbalances in the river channels, and expanding the monitoring of river water quality. This approach was consistent with the Government's policy and strategy[1] and ADB's country operational strategy in Indonesia.

2. The Project's scope comprised (i) flood control and protection, (ii) institutional strengthening of water resources services, (iii) a flood warning pilot project, (iv) monitoring river degradation, and (v) monitoring river water quality. The project documentation consists of a report and recommendation of the President.[2] The strategic development objectives classification of the Project was social concerns, primary—human development. The project framework is shown in Appendix 1.

3. The Directorate General of Water Resources Development (DGWR)[3] was the executing agency (EA) and the Project was implemented by national project implementation units (PIUs) (Appendix 2). The loans became effective on 6 March 1996 and were closed on 29 June 2004, following one extension of 30 months granted by ADB. The original loan amount was later reduced to $73.7 million after potential savings from loan proceeds were canceled in 1998 ($16.2 million) and 2000 ($15.9 million). The Government completed a comprehensive project completion report, dated December 2003. The Government found the overall implementation of the Project to be satisfactory.

II. EVALUATION OF DESIGN AND IMPLEMENTATION

A. Relevance of Design and Formulation

4. The desired Project impact was consistent with the Government's overall development priorities and ADB's support to the water resources sector in Indonesia. The Project remained highly relevant through the implementation period, as a number of major floods hit the north coast of Java. At appraisal, the Water Resources Law No. 11/1974 had defined the Government's commitment to sustainable water resources management in river basins, and the second 25-year development plan (1994/1995 to 2019/2020) had identified its key concerns in the water resources sector. Under the sixth five-year development plan (1994/1995–1998/1999), the Government made human development one of its highest priorities for

[1] Water Resources Development Strategy and Policy Statement of the Directorate General of Water Resources, dated 16 May 1994.

[2] ADB. 1995. *Report and Recommendation of the President to the Board of Directors on Proposed Loans to the Republic of Indonesia for the North Java Flood Control Sector Project*. Manila.

[3] Previously known as the Directorate General of Water Resources Development (DGWRD), including at the time of appraisal and for part of the Project.

qualitative and quantitative improvement. Key government initiatives under that plan that were supported during appraisal and later incorporated into the project design included to (i) improve the ability of communities to function in the event of natural disasters; (ii) map disaster-prone areas and utilize the information in land use and spatial planning; (iii) improve the quality of human resources and quality of life (as reflected in life expectancy and the welfare of families and communities); (iv) provide a human settlement environment that is clean, healthy and safe; (v) implement a pollution control and cleanup program for Indonesia's most heavily polluted rivers; and (vi) rehabilitate land in critical areas.

5. The purpose of the Project was consistent with ADB's operational strategy for Indonesia,[4] which identified water resources development as a priority for investments and with emphasis on (i) optimal use of existing infrastructure through improved operation and maintenance (O&M); (ii) improving water use management; and (iii) integrated water resources planning, including flood control.

6. The Project's design remains relevant today in light of the ever-increasing urbanization and land use pressure in Java. Significantly, while small in cost terms, the inclusion of nonstructural components in the Project (institutional strengthening, flood warning, river degradation and water quality monitoring) were considered important in leading the process of paradigm change from "flood control" to "flood management" in Indonesia.[5]

7. Seven flood control subprojects were prepared to detailed design level under the project preparatory technical assistance (TA).[6] The sector approach to implementation was appropriate, as the multiple-river development needs along Java's northern coastal strip lead naturally to a staged but integrated approach to flood protection works. Beneficiary surveys were part of the project preparation, but fuller consultations and more in-depth dialogue were required during implementation, particularly regarding resettlement and land compensation issues. Feasibility studies and detailed engineering designs, based on 1993 surveys and investigations, were found in some locations to need updating during construction. A flexible approach to design updates during construction was adopted, taking into account physical river morphological changes, land use changes, and community wishes. Improved TA terms of reference, supervision, and sequencing of tasks could have improved the Project's start-up. Although resettlement was identified as a potential risk to implementation, insufficient resources were provided to ensure continued community dialogue and resettlement preparation between the end of the TA activities and the Project's start.

8. During project design, consultations were held with other multilateral and bilateral donors. ADB (with 14%) and Japan (with 81%) dominate the aid support for flood control and river management, which amounted to $1.191 billion during 1971–1995. Coordination of activities to avoid overlap of programs was effective during project design and implementation.

---

[4] ADB. 1994. *Indonesia: Country Operational Strategy*. Manila (December).

[5] A flood control approach has traditionally been taken in Indonesia and involves using infrastructure works to control rivers in an attempt to alleviate flooding. Flood management, more recently adopted by the Government, takes a holistic approach whereby physical works are combined with nonphysical activities to provide solutions where communities live with a certain degree of flooding in a managed environment and it includes flood prevention, mitigation, and flood warnings.

[6] ADB. 1991. *Report and Recommendation of the President to the Republic of Indonesia for the Central Java Groundwater Irrigation Development Project*. Manila (Loan No. 1126-INO, approved on 25 November).

B. Project Outputs

9. The project documents describe the scope of the five project components. Subproject descriptions are summarized in Appendix 3. A detailed assessment of the target vis-à-vis accomplishments for each individual output is in Appendixes 4 to 8.

1. Component A: Flood Control and Protection

10. At appraisal, the Project was designed to implement flood control works for reducing the adverse social, health, and economic effects of flooding for 800,000 people in flood-prone areas in about 15 subprojects. Flood control and protection works carried out during implementation included (i) six (out of the seven) initial subprojects subjected to feasibility study under the TA, comprising three core subprojects (Kuto, Pemali, and Tegal City) and three noncore subprojects (Bodri, Cimanuk, and Cipunegara); (ii) two additional subprojects (Kumpul Kwista and Pekalongan City) selected and prepared during implementation; and (iii) four packages of river flood damage rehabilitation (RFDR) works on the Citarum, Tanjung Kulon, Babakan and Kabuyulan, and Pemali rivers. Key infrastructure included more than 450 kilometers of riverbank works, improvement of river channel flood capacity, improvement of flood diversion and river mouth discharge capacity, weir protection, and raising and widening of selected roads and bridges.

11. Works were selected to safeguard the well-being of those living in flood-affected areas and underwent a thorough screening and feasibility analysis in accordance with procedures and criteria agreed by ADB and the EA. The Government provided funds for resettlement (some 250 houses in the Cipunegara subproject) and land acquisition and implemented these activities with support (survey, training, consultants, and nongovernment organizations) from the Project. Additional subprojects were prepared but not implemented due to budget constraints on the Government's counterpart funding and, eventually, also time constraints. A full listing of the works is in Appendix 4. There are strong indications that flooding has been reduced in the Project area, with the flood control works protecting about 130,000 households and some 32,000 hectares (ha) that are 60% agricultural and 40% urban.

12. In most subprojects, the works undertaken supplemented existing flood works, implemented in various stages by a range of Government agencies. The Project did not attempt to provide total flood control (i.e., containment of all probable floods) but rather to improve the existing level of flood protection. Such an approach requires consultation and close participation with local communities and strong institutional knowledge. Protecting rural and urban areas along the northern coastal floodplain is complex, and many issues (e.g., urban drainage through flood dikes) appeared only to be fully addressed when construction was ongoing. The project design had allowed for adequate surveys, and wider engagement of the community in early design stages could have reduced implementation overruns.

2. Component B: Institutional Strengthening of Water Resources Services

13. The Project aimed to strengthen those agencies responsible for O&M of rivers through assistance and training in sustainable asset management techniques. Seven key workshops and 27 training programs were undertaken that involved 2,379 participants over 5,000 training days. These covered a range of subjects (see Appendix 5), with a focus on river and catchment management. The Project trained district office water resources services staff throughout the project area in needs-based budgeting for river O&M. These training activities were part of a wider government initiative to improve flood management capacity.

14. This component also had a program of watershed management and soil conservation[7] in the upper catchment areas of project rivers, including (i) reviews of watershed management planning information systems and approaches, (ii) soil erosion and regreening studies, (iii) strategic planning for watershed improvements and related training, and (iv) promotion of community-based activities in five villages to improve the upper catchment of Tanjung River.

3. Component C: Flood Warning Pilot Project

15. One flood warning pilot subproject was included in the Project to test methods for improving the effectiveness of district-led disaster prevention and increasing public awareness of flood avoidance, mitigation, and preparedness. This included expanding a simple telemetry system on the Cimanuk River as a pilot subproject. Ten rainfall stations and seven rainfall (automatic water level recorder) stations were rehabilitated, while four new rainfall-recording stations were installed with telemetry links to a base station in the Cimanuk–Cisanggarung River Basin Development Project (RBDP) office (see appendixes 6 and 7).

16. The system was designed to automatically transfer relevant data to the base station through a dedicated radio frequency. However, interference from illegal use of the frequencies disrupted reception. Training was provided to RBDP operators, but the system was poorly maintained and fell into disuse due to inadequate budget allocation for O&M and transfer of key staff resources. Similar initiatives on other projects using expensive equipment for flood warning have also failed or underperformed.

4. Component D: Monitoring of River Degradation

17. The Project included a program of riverbed degradation monitoring and sediment modeling carried out by the Research Institute for Water Resources Development (RIWRD).[8] The program was designed to promote a rational basis for licensing riverbed sand and gravel extractions and to assess the effects of watershed erosion on riverbed lowering. Key activities included RIWRD capacity building, along with sharing knowledge and experience regarding river degradation with provincial and district water resources agencies (see Appendix 8).

18. The Integrated Riverbed Degradation Work Program, a detailed monitoring program covering 10 rivers, included (i) consultant studies; (ii) procurement of survey and sedimentation measuring equipment, boats, and vehicles; (iii) pilot investigations; and (iv) on-the-job training of water resources agency staff. Training in riverbed degradation monitoring, data analysis, and river morphology was provided and included a 3-month field program of data collection and analysis. Although RIWRD helped establish baseline conditions and design a program of long-term riverbed monitoring, the provincial and district agencies did not continue this after the Project was completed. The level of hydraulic expertise required to properly use data generated by a routine rivers monitoring program would suggest RIWRD should be custodian to the equipment and undertake the monitoring and analysis at least until river basin organization and/or provincial water resources agencies have expertise and are allocated adequate resources.

---

[7] The watershed activities were limited to nonphysical works and included training, community assessments, and community plan development.

[8] RIWRD, based in Bandung, West Java, is part of the Ministry of Public Works. It was contracted under the Project to provide services under components D and E.

5. Component E: Monitoring of River Water Quality

19. The river water quality component included activities to be implemented by the provincial environmental agency to (i) establish water quality monitoring sites in selected project rivers, (ii) provide water sampling and field-testing equipment, and (iii) train agency staff in using equipment and water quality data analysis (Appendix 8).

20. These activities were implemented by RIWRD during a 2 year period (February 1999 to February 2001) while working closely with, and building the capacity of, the four provincial river basin organizations (BSDA)[9] and Public Works laboratories in 12 selected rivers (Citarum, Cilamaya, Cipunegara, Cimanuk, Petrik, Bangkaderes, Cisanggurung, Pemali, Comal, Pekalongan, Sambung, and Kulo). The scope of work included (i) database establishment and mapping, (ii) strengthening technical and management capabilities, (iii) training, (iv) river water quality monitoring, (v) sediment pollution monitoring equipment and facilities procurement, and (vi) water quality modeling. The capacity of the BSDAs to carry out routine water quality monitoring throughout the project area was increased under this component, and these organizations have continued routine water quality monitoring activities. The provincial environmental agency became a recipient and user of water quality data under the Project. Long-term cooperation between BSDAs and environmental agencies needs to continue in order to further develop river water quality management systems.

C. Project Costs

21. Project expenditures from the two loans and Government sources totaled $73.7 million, considerably less than the $153 million anticipated at appraisal. Total utilization of the loans was $51.3 million, compared with the original allocation of $90 million (Table 1 and Appendix 9). Five loan reductions (Basic Data B. 8.) totaling $32.12 million were implemented by ADB. At project completion, a further $2.13 million of undisbursed funds were retained. Loan savings were due to devaluation of the rupiah against the US dollar and cancellation of subproject implementation activities during the latter years of project implementation. Cancellations occurred due to concerns over available counterpart budget and lack of willingness to further extend the loan period.

22. Of total actual expenditure, loan funds accounted for 70% of project costs (appraisal 59%) and totaled $51.3 million (including $6.1 million in interest and other charges). Government funds accounted for 30%, or $22.4 million ($5.3 million compensation, $16.2 million civil works, and $ 0.9 million project administration). Since completion of project activities, the Government has also been providing O&M funds,[10] which are not included in the above figures.

23. Of the total expenditures, $31.5 million were foreign costs and $42.2 million are described as local costs. Such breakdowns are somewhat artificial as, apart from foreign consultants and some specialized equipment, most project inputs were domestically sourced.

24. The Project comprised five components, with Component A, Flood Control and Protection, absorbing approximately 93% of the funds (Table 1). Of $57.8 million spent on this component (excluding compensation and interest charges), $49.3 million went to eight flood protection subprojects, each ranging in cost from $3.9 million to $10.4 million at current prices.

[9] The BSDA are: Citarum, Cimanuk–Cisanggurung, Pemali, and Comal.
[10] A detailed O&M funding study would be required to ascertain the level of funding specifically allocated project infrastructure.

The remaining $8.2 million was spent during 2002–2003 on four RFDR subprojects. A small watershed protection awareness and training initiative was also funded under this component.

25. The remaining four components absorbed the rest of the funds, ($4.4 million), with component expenditure ranging from $0.5 million to $1.7 million, inclusive of a share of administration overheads.

26. Of total expenditure of $67.6 million (excluding interest and charges), 8% was spent on compensation (paid by Government), 75% on civil works (shared Government and loan), 2.5% on equipment (loan), 12.5% on consultancy (loan), 1% on surveys (loan), 0.4% on training (loan), and 1.3% on administration (Government). The consultancy budget included more than $1 million for surveys. The Project studied a larger number of potential subprojects than it was able to implement, and the cost of surveys and studies is considered disproportionately high. The project administration budget is low, and analysis reveals inconsistencies that may indicate the Government spent more on administration than appears in its expenditure statements.

27. All the civil works were undertaken under Component A, where the only other significant costs were surveys, consultants, and administration. Expenditures on the other four components were primarily related to equipment, training, procurement, and consulting services. Consultant cost allocation has also been calculated for each component and for the subprojects contained within that component.

28. It is evident that the slow buildup usually associated with projects of this nature extended well beyond what is normal, and it was not until 2001 that a reasonable level of expenditure was achieved. This was short-lived, however, and in 2002 expenditure levels slipped back. During the last 2 years, there was another surge in construction activity. While the first impact of the 1998 monetary crisis was to dramatically increase the value of the dollar relative to the rupiah, the negative impact on the availability of Government counterpart funds had a serious impact on the Project's progress. The Government's inability to provide adequate funds reduced activities in 1999 and 2000. ADB consequently initiated a process of loan cancellations that resulted in a total reduction of $32.12 million during 1999 and 2000. While the Government failed to provide adequate counterpart funding during the early project years, allocations increased substantially from 2001 onwards. Over the whole project period, the Government complied with the loan agreement and provided 30% of the costs.

D. Disbursements

29. Of the total project costs, $50.42 million ($34.25 million from loans 1425-INO and 1426-INO [SF][11], plus Government funding of $16.17 million) was utilized for civil works. ADB financed 100% of project costs for equipment and materials ($1.67 million), consulting services ($8.43 million), training ($0.28 million), surveys and design ($0.55 million). The Government funded 100% of land compensation ($5.34 million) and project administrative support ($0.90 million). Appendix 9 summarizes project costs by components as funded by ADB and the Government.

[11] ADB. 1995. *Report and Recommendation of the President to the Board of Directors on Proposed Loans to the Republic of Indonesia for the North Java Flood Control Sector Project.* Manila (Loans 1425/1426(SF).

E. Project Schedule

30. Project delays occurred due to counterpart fund shortages, delays in land acquisition and compensation, and the need for additional beneficiary participation during implementation. Components C, D, and E were implemented later than had been intended due to the lower priority accorded to them by the DGWR. Contractor procurement delays were minimal, as extensive use of subcontracts for surveys, equipment, and studies under the main consulting services package reduced potential procurement delays for consulting services. Advanced procurement of consultants was not used, causing initial start-up delays. The designed and actual implementation schedules are compared in Appendix 10.

Table 1. Summary of Component, Subproject, and Cost Category Expenditure.
(Current $ million)

Component	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
Compensation	0.04	0.08	0.68	0.69	0.38	1.76	1.73			5.34
A. Flood control		2.87	3.64	3.19	6.18	8.92	7.92	17.33	7.47	57.51
Cipunegara						1.59	1.10	1.33	2.22	6.23
Cimanuk			3.09	0.11	1.24	3.51	1.78	0.65		10.39
Tegal				1.78	1.84	1.32	0.31	1.08	0.38	6.70
Kuto						0.65	2.04	3.57	1.30	7.56
Bodri				0.44	2.59	1.71	0.49		0.07	5.31
Pekalongan							0.75	1.95	1.60	4.30
Kumpul Kwista							1.44	2.07	0.34	3.85
Pemali (part RFDR)		2.87	0.55	0.86	0.50	0.14		1.99	0.85	7.75
Citarum (RFDR)								2.45	0.51	2.97
Tanjung (RFDR)								0.50	0.08	0.58
Babakan (RFDR)								1.74	0.11	1.85
B. Institutional		0.07	0.02	0.02	0.10	0.03	0.05	0.09	0.12	0.49
C. Flood Warning		0.09	0.03	0.03	0.04	0.24	0.30	0.18	0.04	0.94
D. River Degrade		0.21	0.06	0.28	0.58	0.12	0.12	0.23	0.08	1.68
E. Water Quality		0.21	0.06	0.09	0.56	0.10	0.08	010	0.08	1.29
Total investment	**0.04**	**3.43**	**4.77**	**4.31**	**7.67**	**11.26**	**10.12**	**17.93**	**8.05**	**67.58**
Interest	0.04	0.36	0.69	0.74	0.87	0.98	1.16	1.30		6.13
Total expenditure	**0.08**	**3.79**	**5.46**	**5.04**	**8.55**	**12.24**	**11.28**	**19.23**	**8.05**	**73.71**
Phasing (%)	neg.	5	7	6	11	17	9	27	12	100
Funding sources										
Loan	0.04	3.38	3.79	3.51	6.56	7.19	7.23	13.90	5.71	51.30
Government	0.04	0.41	1.67	1.53	1.99	5.06	4.05	5.33	2.34	22.41
Government contribution (%)	50	11	31	30	30	41	36	28	29	30
Cost categories										
Compensation	0.04	0.08	0.68	0.69	0.38	1.76	1.73			5.34
Civil Works		1.03	3.39	2.62	5.03	7.91	7.08	16.39	6.96	50.42
Equipment				0.22	0.69	0.25	0.26	0.24		1.67
Consultants		2.32	0.68	0.68	1.23	0.57	0.98	1.08	0.90	8.43
Surveys and Design			0.03	0.10	0.27			0.05	0.09	0.55
Training					0.08	0.01	0.02	0.08	0.09	0.28
Administration						0.77	0.05	0.08		0.90
Total										**67.58**

RFDR = River Flood Damage Rehabilitation, neg. = negative.
Sources: Asian Development Bank and Government project files.

F. Implementation Arrangements

31. Implementation arrangements were effective and appropriate. The project organizational chart is in Appendix 2. Implementation was through the River Basin Development Project

Offices of DGWR in close coordination with provincial and district water resources services and, for the river degradation and water quality monitoring components, the RIWDP. DGWR established a project management unit (PMU) at Cirebon in the offices of the RBDP Cimanuk–Cisanggarung. The National Development Planning Agency provided effective coordination among all concerned ministries at national level. The inclusion of provincial-level working teams[12] increased interagency implementation coordination at provincial and district levels.

G. Conditions and Covenants

32. The Government has complied with most of the loan covenants (Appendix 11). The major compliance difficulties were in failure to provide timely and adequate counterpart funds and the delayed establishment of the PMU. Fiscal budget constraints at national level created implementation delays, as resettlement, which required significant funding, was a 100% Government-funded activity.[13]

H. Consultant Recruitment and Procurement

33. Consulting firms (in one main procurement package) provided 235 person-months of international and 1,082 person-months of national consultant services (Appendix 12). These totals exceeded the appraisal estimate of 170 person-months of international and 720 person-months of national services because of (i) extension of the implementation period, (ii) additional hydraulic modeling and design work,[14] and (iii) additional construction services for the RFDR works. Some 37 subcontracts (total value Rp8.521 billion) covering such items as aerial surveys, topographic surveys, environmental and social surveys, resettlement planning, geotechnical investigations, hydraulic modeling, nongovernment organization (NGO) services, river mouth investigations, and construction of a documentation center were implemented as part of the main consulting services contract. This arrangement proved efficient both in terms of reducing procurement burdens and delays, as well as in ensuring close and timely working relations between the consulting teams. Procurement of RIWRD for two separate contracts (monitoring of water quality and riverbed degradation) proved lengthy due to the complexity of directly appointing a government agency. The institutional capacity gained by RIWRD was considered valuable. All consulting services recruitment was carried out in accordance with ADB's guidelines on the use of consultants.

34. Equipment and vehicles were procured through a mix of international shopping, local and international bidding, and direct purchase (appendixes 6 and 7). Local competitive bidding was used for the procurement of all 26 packages of civil works. Procurement was carried out according to ADB's guidelines on procurement.

I. Performance of Consultants, Contractors, and Suppliers

35. All consultants made significant contributions to the achievements of the Project (Appendix 12). The provision of a single consulting firm working closely alongside the RBDP staff throughout the project period provided continuity of services and good coordination while allowing for complex social issues impacting on design to be addressed in an open and frank manner. Equipment purchases were made under the consultant's contract to ensure timely

[12] One each in West and Central Java provinces, headed by senior staff from the Regional Development Planning Board.
[13] ADB's ability to fund resettlement activities provides for a more flexible approach to financial management. The Government has shown an interest in borrowing for resettlement activities.
[14] Design changes occurred due to (i) community demands, and (ii) use of old 1993 mapping used by TA designers.

availability. The quality of project management[15] was high and technical inputs generally of satisfactory standard. Construction quality supervision and design updates were identified by ADB missions as areas requiring improvements. Strengthening was provided to the consultant's team. Provision of specialist work through subcontracting mechanisms allowed for good scheduling and quality control. Consultant services provided additional and specialized staff to complement RBDP internal resources to implement a high volume of work during project implementation. The services also provided direct and indirect capacity building for RBDP and other agency staff. Detailed project completion reports for each subproject and RFDR provide a well-documented chronological history of project activities, and these are in ADB's project files.

36. A total of 26 construction packages, valued at $57.8 million, were let (Appendix 4) to 15 contractors (six Government-owned contractors implemented 15 packages) using local competitive bidding procedures with post-facto ADB award approval. Contracts over $3 million required prior approval of prequalification, selection, and engagement. Contract packages were designed geographically and, because of the nature of works, package size varied from about $500,000 to $3 million. The works and construction method were considered appropriate for local competitive bidding. Variation orders, increasing contract value, occurred on all but three packages. The average contract increase was 7%. Civil works were administered and supervised by five RBDPs (acting as PIUs) with consultant assistance. Initial average contract period was 393 days, and average contract overrun was 42%. Only seven contracts finished within a 10% time overrun. The majority of delays were attributed to weather, social issues, and design changes. Contractor cash flows and resources allocation were also contributing factors. Minor construction delays on some subprojects occurred due to high river flows and to changes in design required to accommodate specific local conditions. Such adjustments are to be expected on this type of project and no unusual difficulties were encountered. Some 212 stage payments were made on the 26 construction packages in seven regional treasury offices. Quality control and assurance systems were implemented by PIUs. Overall construction quality was adequate, although areas of inadequate quality in earthwork dike construction were reported by ADB missions on a number of occasions. With the Government funding 100% of land compensation, its shortage of funds delayed implementation.

J. Performance of the Borrower and the Executing Agency

37. The performance of the Borrower and EA was satisfactory. The PMU established in RBDP Cimanuk–Cisanggurung was staffed in general by capable personnel throughout project implementation. Although establishment of the PMU was delayed, this was considered an administration issue, with the RBDP performing Project-related duties before the PMU's formal establishment. The Project attracted a high level of interest and commitment from local, provincial, and national government agencies. Coordination between the PMU and the PIUs responsible for implementation of subprojects working in close cooperation with provincial and district water resources services was considered satisfactory during design and implementation. Improvements in early project fiscal management and proactively addressing resettlement would have expedited the Project's progress. Post-project O&M activities also were adequate in core subprojects where construction works were completed early on in the Project.

[15] A change in team leader from the main consultant early on in the Project was required to strengthen an initially underperforming team.

K. Performance of the Asian Development Bank

38. The performance of ADB was satisfactory. The summary of missions given in the basic data shows that routine administration missions totaling 170 days and including a timely midterm review were carried out. Three different project officers administered the Project, and they provided good continuity and adequate support to resettlement. ADB generally provided timely and constructive responses to the EA's approval requests and provided flexible, practical support in relation to subproject design changes brought about by land acquisition and budget constraints. Communication and relations between ADB, the EA, and consultants were good. Monitoring focused on the Project's inputs and outputs.

III. EVALUATION OF PERFORMANCE

A. Relevance

39. Project purpose was relevant. The Project was consistent with the Government's development objectives and ADB's country strategies to provide capacity building in the flood management sector. Although the project design provided a reasonably comprehensive set of interlinked activities directed to achieving the Project's purpose, the complex labyrinth of government agencies involved in river management and the BSDAs' relative early stage of development reduced the relevance and effectiveness of some capacity building activities.[16] The design of project interventions was based on a sound evaluation of the problems facing the sector. The introduction of nonphysical components (components B–E) started a shift in the approach to flood preparedness, prevention, and mitigation by expanding on the DGWR's traditional infrastructure-based approach to flood control and introducing (albeit in a modest way) flood management principles. This approach has been adopted by the Government and developed further with ADB assistance. The proposed inputs and activities in Component A were well-conceived and provided the necessary outputs to achieve the desired reduction in adverse social effects from flooding in the project area. The selection of EA was relevant and remained so during implementation despite considerable organizational changes at the central government level. The design took capacity weaknesses into account, and it was flexible enough to allow adjustments when required. The sector approach was appropriate, but improvements in utilizing the outputs of the preparatory TA to ensure early implementation could have been incorporated into the design more efficiently.

B. Effectiveness in Achieving Purpose

40. The Project is assessed as effective. Most of the outputs identified during appraisal were achieved. Flood control works were completed in eight subprojects and flood damage rehabilitation in four rivers. That compares with an estimated 15 subprojects anticipated at appraisal. There were significant achievements in the selection, survey, design, and implementation of appropriate flood defense and river training works.

41. Community consultations and adjustments to design to accommodate local conditions were a common feature. Nongovernment organizations were engaged to facilitate community participation. Particularly in areas where resettlement occurred, earlier engagement of

[16] Prior to new legislation in 2004, development (planning, design, and construction) and management (O&M) functions in government were often handled by different organizations. Thus, the nationally funded RBDP develops flood protection infrastructure while the provincial BSDAs manage the assets. Commencing in fiscal 2007, these river basin development and management functions will be merged under one organization.

nongovernment organizations in the planning and design process would have been beneficial for reducing delays and improving community involvement.

42. Design and construction quality in general was up to specification and of high standard. Design of appropriate physical works along the north coast floodplain, where multiple rivers and their tributaries flow through changing rural and urban environments, presents a complex hydrodynamic design challenge. Adequate incorporation of local knowledge and flexibility in solutions appear to have been achieved. Most subproject infrastructure withstood floods of (estimated) 15-year average recurrence interval in early 2006. For most subprojects, this has been the most severe test during the post-completion period. Human suffering as a result of flooding has been significantly reduced in approximately 85% (32,000 ha) of the Project's targeted flood-prone areas, bringing relief and benefits to about 130,000 households. The annual total benefits over the Project area are estimated to be $12 million[17] (Appendix 13). Although the overall structural integrity of the systems remained intact, these floods damaged two Cipunegara subprojects in West Java. Particularly severe flooding in downstream areas resulted from overflows from adjacent rivers and local rainfall. Some key protective structures (e.g., groundsill works protecting national highway bridges, stabilization downstream of Rentang weir on the Cimanuk River, and flood damage rehabilitation works) provided large benefits compared to the investment made.

43. Capacity building activities of components B, C, D, and E were executed well, but it is considered unlikely that the pilot flood warning and monitoring of degrading rivers outputs will lead to the desired outcomes without fuller long-term support to the relevant BSDA. Nevertheless, these activities provided the DGWR and RIWRD valuable experience in developing programs and policy for more integrated flood management approaches in addition to initial capacity building in local water resources agencies. Water quality sampling and analysis have been operationalized as routine activities in accordance with project objectives. The Project contributed to establishing water quality databases and strengthening the capacity of government agencies to collect and evaluate water quality data. Improved coordination with environmental and planning agencies on enforcing effluent standards requires further attention if the outputs from BSDA water quality modeling are to have a useful purpose. At appraisal, no specific design targets were set for the implementation of regreening activities. The Project provided a modest level of support to watershed management activities, considered to be initial steps acquainting agency staff and stakeholders with watershed improvement processes through community awareness programs in five subproject areas. Such activities are becoming routine as government policy emphasizes a more integrated, community-led approach to watershed management.

C. Efficiency in Achieving Outputs and Purpose

44. The overall Project is assessed as efficient. Cost per protected hectare ranged from $1,300 to $2,800 with an average of around $1,700. Final individual subproject costs often varied considerably (up or down) from both appraisal and feasibility estimates. Appraisal's direct flood damage estimates relied on selected river field surveys carried out after significant floods in 1993. Routine and reliable long-term flood mapping and flood impact records are not kept by any one agency in Indonesia. Indirect losses at appraisal were taken at 30% of total direct damages (report and recommendation of the President, para. 108), excluding intangible benefits. Economic internal rates of return (EIRR) in the core subprojects ranged from 14% to

[17] Including a 20% assumption of indirect and intangible benefits. Fifty-three percent of the benefits occur in the agriculture and fisheries sectors.

43%, with a combined EIRR estimate of 28%. No financial internal rates of return were calculated.

45. The post-project analysis is detailed in Appendix 13 and uses a similar evaluation approach to that used during appraisal. It considers post-implementation impacts from field surveys by government agencies following heavy rainfall and high river flows in late January and early February 2006 (estimated to represent a 15 year flood). The crucial benefits are those related to agriculture, fisheries, and housing damage, and, in specific locations, damage to transport. As direct comparative analysis of with-project benefits with appraisal benefit is not realistic due to the lack of available data, new estimates have been prepared.

46. An overall average loss approach was considered appropriate rather than to estimate loss rates per subproject, as was done for the feasibility studies. Direct agricultural losses were estimated to be $73/ha/year (in 2005 prices). That represents 300 kg of paddy rice, or 5–6% of potential yield, with a standard mean household loss of $28 applied to the proportion of total houses (25% rural and 60% urban in affected areas).

47. On applying the benefit estimates, an overall EIRR of around 19% was obtained, with a range from 6% for Cipunegara (the only scheme under 14%) to 50% for Pekalongan.

48. No attempt was made to include the benefits generated from saving the Rentang weir,[18] which generates income savings on the order of $150 million annually from 90,000 ha of highly productive irrigated rice land. Also, benefits from the RFDR were not evaluated in detail. It was conservatively assumed, however, that if these works generated sufficient benefits to yield a nominal 10% EIRR the inclusion of these additional benefits would only marginally impact on the overall project EIRR.

D. Preliminary Assessment of Sustainability

49. Project outcome sustainability is considered less likely. This assessment is based on the past performance of the sector despite the newly established BSDAs, increasing awareness, and, importantly, higher budget allocations to the sector. Traditionally, the Government has found it extremely difficult to fund O&M adequately. Without such funding, the integrity of the subprojects cannot be guaranteed and the likelihood is that they will break down, possibly resulting in more severe flooding than would have been the case had the river embankments not been raised. Responsibility for the medium- to long-term success of this Project rests heavily on the relatively new BSDAs and those who allocate funds between sectors.

IV. OVERALL ASSESSMENT AND RECOMMENDATIONS

A. Overall Assessment

50. Based on ADB's project performance rating assessment criteria, the Project is rated as successful. The Project achieved a significant number of outputs relative to those conceived during appraisal and provided flood protection to a similar number of people as conceived. The overall project costs were 52% lower than expected, largely because of exchange rate variations and cancellation of flood control and protection works. Project implementation

[18] River stabilization works were implemented immediately downstream of the weir, providing security from potential catastrophic weir failure.

arrangements were appropriate. Training activities met the appraised targets and post-project institutional changes will increase the likelihood of the Project's sustainability.

B. Lessons

51. A number of lessons were learned through this Project:

(i) The sectoral approach is an appropriate implementation modality for flood management. It is recommended, however, that the approach be adjusted to allow for sequential preparation and implementation of subprojects in tranches.

(ii) Although sector institutions have adequate capacity (or can outsource) for project development, there is a general lack of capacity for planning and implementing O&M, consulting with beneficiaries, conducting environmental management and monitoring plans, preparing resettlement plans, and managing spatial planning.

(iii) Communities and developers are not adequately aware of flood risks and how to take precautions to limit flood damage. Flood warning systems may not reach flood-affected communities effectively.

(iv) Engaging NGOs in facilitating beneficiary consultation and stakeholder capacity building proved successful. NGOs support should be provided throughout the project cycle.

(v) Internal land drainage and adequate river flooding must be carefully studied and incorporated into flood prevention planning at a micro level before detailed flood works are designed.

(vi) The use of flood protection funds to safeguard such existing infrastructure as bridges, roads, and weirs appears to be a cost-effective option.

(vii) There is a need to develop (a) river asset management systems, (b) needs-based O&M budgeting, and (c) flood damage mapping and damage assessment reporting systems that quantify direct and indirect flood and drainage damages.

(viii) It takes time to design and construct a system that is physically appropriate, socially acceptable, and cost-effective. Flood projects need long implementation periods to ensure that holistic integrated solutions will be implemented.

C. Recommendations

1. Project Related

52. **Future Monitoring**. The Government should closely monitor O&M programs in the project area and establish flood event information systems.

53. **Covenants.** The covenants in the loan agreement were appropriate and should be maintained.

54. **Further Action or Follow-Up.** It is necessary for (i) RBDP to complete land certificate transfers to local Cipunegara communities; (ii) BSDA to complete asset surveys of river works in the subproject areas and implement needs-based budget O&M programs; (iii) the PMU to complete O&M of the telemetry computer processing equipment; (iv) DGWR to review the water quality monitoring data collection, data analysis, and database systems jointly with RIWRD and environmental agencies to ensure ready access to quality data; (v) DGWR and the National Development Planning Agency to review implementation programs for subprojects that were shown to be feasible under the Project; and (vi) the river degradation equipment purchased under the Project to be returned to RIWRD and a monitoring program initiated.

55. **Additional Assistance.** It is recommended that the proposed Flood Management in Selected River Basins[19] be widened in scope to include activities to include further flood management support to river basins along the north coast of Java under a long-term investment program using ADB's new multi-tranche financing facility[20].

56. **Timing of the Project Performance Evaluation Report**. An evaluation should be prepared to assess the impact of the works on mitigating flood damage. Such a review would best be carried out at least 5 years after project completion, when it would be reasonable to have seen some flood events. The review should incorporate rapid rural appraisal field surveys to update flood mapping to an extent sufficient to enable fair comparisons with appraisal baseline surveys.

2. General

57. To ensure the sustainability of flood management subprojects the following are recommended:

(i) During the transfer of assets from development to management organizations, close attention should be paid to the sharing of asset management and O&M responsibilities among those agencies concerned.
(ii) Human resource diagnostic surveys of water resources services should be completed to ensure sufficient resources are available to meet the specific responsibilities as defined by Water Law No. 7, 2004.
(iii) The Government should collect and analyze flood damage data on a routine basis.
(iv) Complementary watershed management programs are essential to improve impact and sustainability of flood control works.
(v) Simple flood control principles focus on confining water in the river channel between such artificial structures as embankments and concrete walls or on storing peak floodwaters in reservoirs with the aim of separating water and people. Flood management encompasses a broader approach that focuses on reducing flood hazards through a combination of policy, institutional, regulatory, and physical measures. It recognizes that floods can never be fully controlled and that communities in densely populated floodplains must live in harmony with nature. Support is needed for long-term flood management concepts.

[19] ADB Country Strategy and Program for Indonesia 2006-2009.
[20] Approved 1 January 2006 under ADB's Innovation and Efficiency Initiative. The MFF provides greater flexibility in project design by allowing project structuring with (i) discrete, sequential components of large stand-alone projects, and (ii) slices (or tranches) of sector investment programs over a long time frame.

PROJECT FRAMEWORK

Design Summary	Project Targets	Project Monitoring Mechanisms	Risks/Assumptions
1. Sector/Area Goals 1.1 To improve the quality of life by reducing human suffering (disease, increased mortality, loss of income, and damage to houses) caused by floods. 1.2 To promote economic growth by reducing flood damages (loss of land and houses, damage to crops and infrastructure). 1.3 To promote sound management of natural resources and the environment (by monitoring and controlling river degradation, water quality, and watershed land use).	• Quality of life improved by reduction of flooding. • Incidence of water-related diseases and loss of life resulting from floods reduced. • Area flooded and average annual direct flood losses reduced. • Riverbed degradation arrested and riverbanks stabilized. • River water quality improved. • Watershed erosion and soil loss reduced.	• Baseline socioeconomic surveys undertaken as part of TA loan. • Benefit monitoring and evaluation (BME) • District government statistics • Provincial government statistics • Project completion report • Project performance audit report	• Effective coordination between ministries and agencies carried out by National Development Planning Agency and DGWR at national, provincial and district levels. • Sufficient O&M funds provided and flood control works maintained and managed. • Government's ongoing program for upper catchment reforestation and regreening expanded. • No unusually large flood above design limit of flood control works.
2. Purpose/Objective 2.1 To reduce human suffering caused by flooding on the north coast of Java in the provinces of West Java and Central Java.	• Adverse social effects of flooding (disruption of human activities, disease and increased mortality, flooding of houses, and disruption of social services) reduced for 800,000 people, with disproportionate benefits to women and children. • Average annual direct flood losses in project area reduced by 90% from $20 million. • Average area flooded annually in project area reduced by 44,000 ha. • Riverbed degradation and water pollution levels reduced. • Ongoing regreening programs reoriented in project river watersheds.	• Baseline socioeconomic surveys undertaken as part of TA loan. • BME • District government statistics • Provincial government statistics • Ministry of Health statistics • Project completion report. • Project performance audit report.	• Government commits funds for and implements flood control subprojects. • Provincial and district governments resettle and adequately compensate affected families. • National standards for design and implementation of flood control works adopted. • Government commits funds for and implements O&M of rivers. • Government supports monitoring programs.
3. Project Outputs 3.1 Physical infrastructure for subprojects implemented. 3.2 Flood warning pilot project	• Flood control works implemented in about 15 subprojects by end of year 2002.	• Project progress reports • Loan review missions	• No delay in Government approvals for counterpart funding.

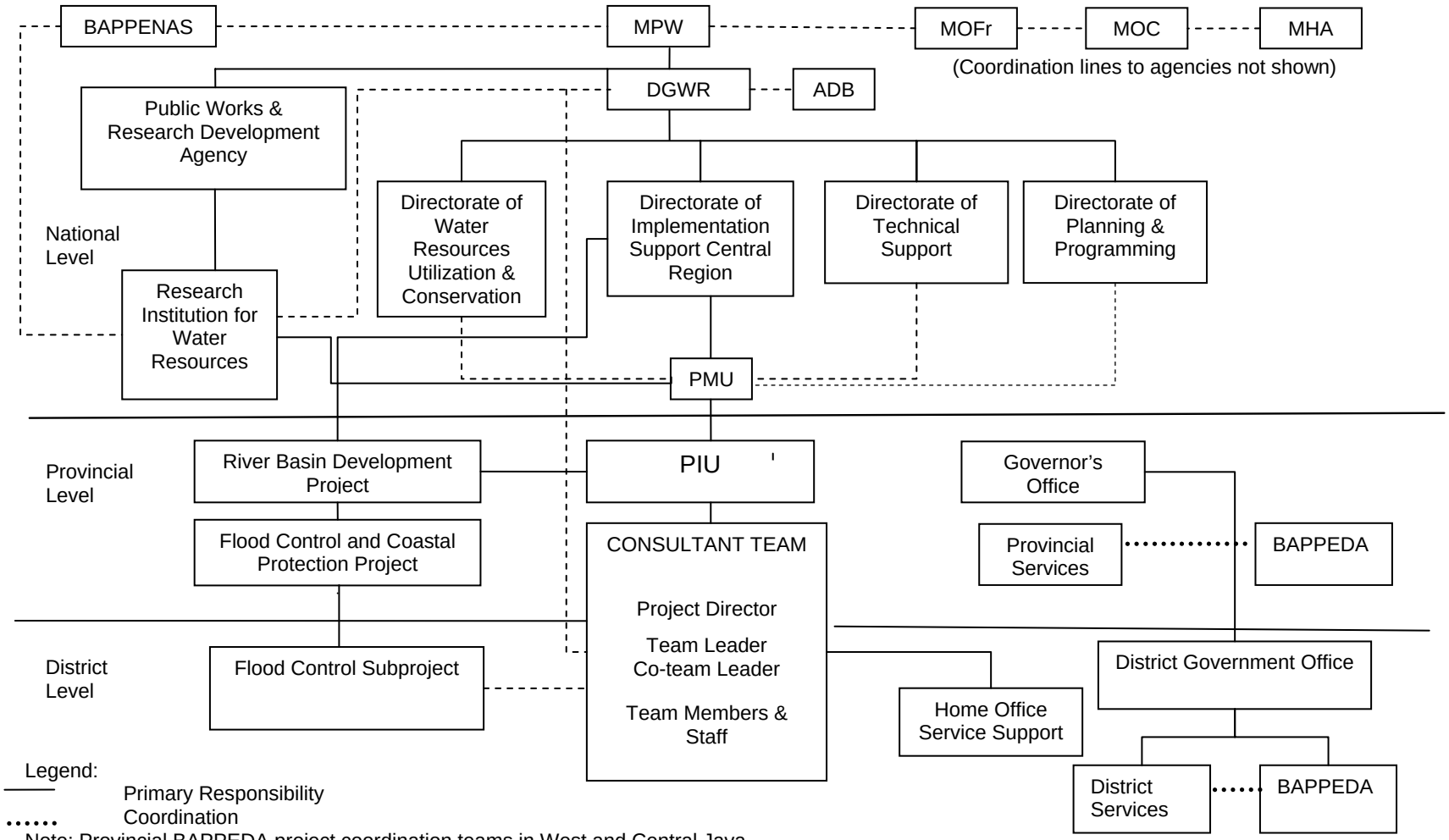
Design Summary	Project Targets	Project Monitoring Mechanisms	Risks/Assumptions
implemented. 3.3 Provincial and district water resources services strengthened in O&M procedures. 3.4 Program for monitoring riverbed degradation operationalized. 3.5 Program for monitoring river water quality operationalized. 3.6 Watershed stabilization and regreening programs reoriented to target critical areas in subproject river basins.	• Flood forecasting and flood warning (including disaster prevention) operationalized in pilot project by end of year 1998. • Staff of provincial and district water resources services trained in: o community consultation o subproject selection o preparation of EIAs and resettlement plans o feasibility study and detailed design o contract award procedures o construction management o determination of O&M budgets o management of O&M o implementation of environmental management and monitoring plans o sediment sampling and measurement o water quality determination. • Rivers selected for monitoring programs. • Equipment for monitoring programs procured by end of 1997. • Monitoring programs (riverbed degradation and water quality) operationalized by end of 1988.	• BME reports • Initial, midterm, and end of project surveys • Annual reports of provincial and district water resources services • Annual reports of the Research Institute for Water Resources Development National Water Quality Database • Annual reports of the Directorate General of Reforestation and Land Rehabilitation of the Ministry of Forestry	• No delay in land and house acquisition and in resettlement of affected persons. • Competent consultants appointed. • Competent contractors engaged. • No delay in payments to contractors. • No delay in procurement of equipment. • No unusually large or untimely floods during construction.
4. Activities 4.1 Project Management • Project manager appointed. • Project monitoring unit and project implementation unit formed. • Working teams formed in Central Java and West Java. • Terms of reference, shortlist, and evaluation criteria for consultants prepared and approved. • Selection of consultants completed and approved.	• DGWR budget project list allocation for project management (Rp6.330 billion over 6 years) • Provincial and regional budgets for project management. • Inception workshop	• DGWR communications with ADB prior to loan effectiveness • Environmental assessments • Resettlement plans • Inception mission • Project progress reports • Loan review missions	• No delay in Government provision of counterpart funding. • No delay in Government approval and appointment of consultants. • No delay in Government appointment of project manager and other project staff. • Sufficient staff of adequate training and experience available in the River Basin Development

Design Summary	Project Targets	Project Monitoring Mechanisms	Risks/Assumptions
• Contract for consulting services negotiated and approved. • Consultant mobilized. • TOR, specifications, and authorizations for aerial photography finalized. • Contract for aerial photography awarded.			Project offices and provincial and district water resources services. • Staff permanently assigned to project monitoring unit and project implementation unit.
4.2 Land and House Acquisition, Resettlement, and Environmental Mitigation Measures • Inventory of houses, land, trees, crops, and other immovable personal property completed. • Community consultation, negotiation and agreement on compensation levels completed by *Tim Sembilan*. • Compensation paid and acquisition of houses and land for subproject works completed. • Resettlement for subprojects completed.	• $15.3 million	• DGWR communications with ADB and subproject summary reports • EIAs/summary EIAs • Resettlement plans • Inception Mission • Project progress reports • Loan review missions	• Swift approval of land acquisition budget. • No delay in Government provision of counterpart funding. • No delay in Government approval and appointment of consulting firm(s). • No delay in Government appointment of project manager and other project staff. • Sufficient staff of adequate training and experience available in the RBDP offices, as well as provincial and district water resources services. • Staff permanently assigned to project implementation and monitoring units. • Swift approval of land acquisition budget.
4.3 Flood Control and Protection • Additional subprojects selected. • Socioeconomic and other surveys completed. • Environmental impact assessment and resettlement plans prepared. • Feasibility studies and detailed designs completed. • House and land acquisition and resettlement of affected persons monitored. • Soil conservation programs reviewed and reoriented. • Contractors selected and mobilized.	• $119.2 million • 98 person-months international consulting services • 615 person-months domestic consulting services		

Design Summary	Project Targets	Project Monitoring Mechanisms	Risks/Assumptions
• Environmental monitoring and management operationalized. 4.4 Institutional Strengthening of Water Resources Services • O&M procedures reviewed, work plans prepared, and O&M implemented. 4.5 Flood Warning Pilot Project • River basin selected, equipment procured and installed, and flood warning system and emergency procedures implemented. 4.6 Monitoring River Degradation • Rivers selected, equipment procured, training initiated, and program implemented. 4.7 Monitoring Water Quality • Rivers selected, equipment procured, training initiated, and program implemented.	• $5.2 million • 33 person-months domestic consulting services • $0.8 million • 12 person-months international consulting services • 12 person-months domestic consulting services • $1.9 million • 30 person-months international consulting services • 30 person-months domestic consulting services • $1.8 million • 30 person-months international consulting services • 30 person-months domestic consulting services		

ADB = Asian Development Bank, BME = benefit, monitoring, and evaluation, DGWR = Directorate General Water Resources, EIA = environmental impact assessment, O&M = operation and maintenance, RBDP = River Basin Development Project, TA = technical assistance, TOR = terms of reference.
Source: ADB. 1995. *Report and Recommendation of the President to the Board of Directors on Proposed Loans to the Republic of Indonesia for North Java Flood Control Sector Project*. Manila (L1425/1426[SF]–INO).

PROJECT ORGANIZATION CHART



Note: Provincial BAPPEDA project coordination teams in West and Central Java.
ADB = Asian Development Bank, BAPEDAL = National Environmental Agency, BAPPENAS/BAPPEDA = National/Provincial Development Planning Agency, DGWR = Directorate General of Water Resources, MHA = Ministry of Home Affairs, MOFr = Ministry of Forestry, MOC = Ministry of Communications, MPW = Ministry of Public Works, PIU = project implementation unit, PMU = project management unit
Source: ADB. 1995. *Report and Recommendation of the President to the Board of Directors on Proposed Loans to the Republic of Indonesia for North Java Flood Control Sector Project.* Manila (Loans 1425/1426[SF]-INO).

SUBPROJECT DESCRIPTIONS

A. Cipunegara River Subproject

1. The Cipunegara River passes through the urban area of Pamanukan (Kabupaten Subang, West Java), a busy coastal town on the Jakarta–Semarang national highway, about 110 kilometers (km) east of Jakarta. The subproject area stretches from about 5 km upstream of the main highway bridge to 2 km downstream, totaling some 17.7 km of riverbanks. Areas on both sides of the river are productive farmlands, which are replaced by extensive fish ponds as the river approaches the sea. The area had suffered from regular inundation due to breaching or overtopping of the riverbanks almost every rainy season, causing significant losses to the local population. Relocation of 170 houses from within the new flood levees was a major feature of the subproject. Two new settlements of 123 (Tanjung Jaya Village—new) and 47 (Galiang Village) extension houses on land selected by the affected people outside the new levees were constructed. Public facilities such as roads, drains, electricity and water supply have been provided in the new settlements. In Tanjung Jaya Village, one elementary school, one mosque, and one village meeting hall also were constructed.

2. The civil works were constructed under three packages. Two upstream packages, covering respectively the left and right banks for about 13.5 km, and the downstream package of 3.6 km on the right bank and 4.2 km on the left bank were held up due to resettlement delays. Major works consisted of constructing earth levees, upgrading existing levees, constructing concrete pile groins and stone masonry retaining walls, plus 584,000 cubic meters of dredging works.

B. Cimanuk River Core Subproject

3. The Cimanuk River is located in West Java, approximately 160 km east of Jakarta. With a catchment area of 3,600 square kilometers (km^2), this is the largest river in the Project. Extensive concrete and gabion groins flood control works river training works below Rentang weir (1987) and a major weir groundsill were constructed under this subproject. In addition, in the lower reaches of the Rambatan River, some 35 km of river training works were constructed in four packages and included upgrading levees, stone masonry retaining walls, concrete and gabion groins, gabion revetment, and counterweight for bank stabilization.

C. Pemali River Subproject

4. The Pemali River is located approximately 14 km west of district capital Tegal, a sizable city on the north coast of Central Java. The river originates from a mountainous catchment area, with Gunung Slamet the highest point, at 3,432 meters (m), and a total catchment of 1,276 km^2. Brebes, a major town on the Pemali River, suffered frequent flooding together with many surrounding villages and agriculture lands. A large flood in 1995 covered 8,645 hectares (ha) and affected 123,000 people. The district of Brebes is famous for intensive cultivation of high value red onions.

5. River training works in this subproject were provided only to critical locations on both banks in order to stabilize the riverbank and prevent it from collapsing and sliding. As this was a core subproject, works started in the initial stage of the Project, with two packages covering 14 km of river works on Nippon River downstream of the Jakarta–Semarang railway crossing and followed by an upstream package of 6 km. Floods in 2002, which were estimated to have produced the design discharge through the river of a 25-year flood, exposed fuller weakness in

the defenses and, under the Flood Damage Rehabilitation Program, fuller works were undertaken to extend the flood protection further upstream and downstream of the original coverage.

D. Tegal City Rivers Core Subproject

6. Tegal City is located immediately to the east of Brebes and some 60 km east of Cirebon. It is one of the largest cities on the north coast of Central Java. The subproject includes three major rivers (the Gangsa, Wadas, and Gung) passing through the city from the west, with catchment areas of 94, 64, and 156 km^2 and river lengths of 30, 25, and 54 km, respectively. Some rudimentary and incomplete flood protection levees and stone masonry walls existed but the rivers flowing through densely populated and commercial areas routinely flooded due to insufficient river capacities. During flooding in 1995, some 6,365 ha was inundated and more than 120,000 people were affected.

7. Three packages of protection works—one for each of the rivers—involved mostly constructing earth levees, stone masonry retaining walls, gabion revetment, and groins, as well as related drainage works. In addition, a new Muarareja bridge in the lowest reaches of the Wadas River and rehabilitation of two irrigation headworks (the Pesayangan and Danawarih weirs) in the middle reaches of the Gung River were also completed under the subproject.

E. Kuto River Core Subproject

8. The Kuto River is located approximately 40 km west of Semarang City, on the north coast of Central Java. With a total catchment area of 341 km^2, it was estimated that in 1995 some 1,700 ha of the coastal area was flooded. This affected some 15,200 people and inundated large areas of paddy fields. Isolated local levees, bank protection, and river training works had been constructed in the past to protect the Kedung Asem Weir.

9. The subproject, delayed by 2 years due to land acquisition problems and the need for design changes, was divided into three packages. The works covered 6 km of riverbank improvements close to Yosorejo Village and construction of two sea jetties, 300 m and 365 m long on the left and right banks, respectively. Major flood protection works consisted of constructing earth levees, stone masonry retaining walls, gabion groins, and revetment, along with related drainage works.

F. Bodri River Subproject

10. The Bodri River is the most eastern river of the Project and is located just 31 km west of Semarang City on the north coast of Central Java. With a total catchment area of 600 km^2, the river originates from a mountainous headwater area where the highest elevation is 3,136 m, at Gunung Sindoro. About 4,100 ha of the downstream area was frequently flooded, affecting about 87,000 residents.

11. The subproject was constructed under three packages totaling 12.5 km. Major works consisted of upgrading existing levees, constructing stone masonry retaining walls, concrete piles, gabion groins, concrete sheet pile bank protection, gabion bank revetment, and related drainage works. To abate riverbed degradation, three units of groundsills were also constructed.

G. Pekalongan City Rivers Subproject

12. The Pekalongan River flows through Pekalongan City, about 98 km west of Semarang City on the north coast of Central Java. With a catchment area of 199 km^2 and river length of 53 km, it is not a large river. Nevertheless, rapid urbanization of the city has resulted in settlements and roads encroaching on the river channel, limiting its capacity, and resulting in regular flooding that disrupts transportation and commercial activities in the city.

13. A bypass channel built in 1988 to divert part of floodwaters from Pekalongan River to the nearby Banger River was not functioning as expected and Pekalongan City continued to suffer routine flooding. Also affected was the largest fishing port in Indonesia, which is near the city.

14. The subproject was one of two additional subprojects for which feasibility studies were carried out under the Project. Several alternative schemes were studied, and widening of the Banger channel was opposed by residents, who both protested and rejected land acquisition terms. Construction was undertaken in two separate packages, one for improving Banger channel and excavating a new outlet and the other for an unregulated control structure on Pekalongan River. Major works in the former consisted of levees, gabion and stone masonry bank protection, excavation of a new channel 90 m wide and 2 km long, a new Slamaran bridge over the new channel, as well as two 300 m long jetties and 100 m of offshore breakwater.

H. Kumpul Kwista River Subproject

15. The Kumpul Kwista River is one of several rivers flowing to the Java Sea on the north coast of West Java between Cirebon City and Indramayu. The river forms the boundary of two irrigation systems: the Sindopraja irrigation area of 30,255 ha to the left and Gegesik irrigation area of 25,625 ha on the right. The river has an important function in draining the irrigation areas. With a catchment area of 126 km^2 and river length of 56 km, the river also serves as a source of water during dry seasons when irrigation water is in shortage and farmers resort to pumping water from the river.

16. Feasibility studies were undertaken during the Project, and flood control works were found viable for the river reaches from Kali Wedi Lor Village to the river mouth, with a total length of some 15 km. Major works included rehabilitation of earth levees, river excavation and improvement of the left bank drain, river dredging for the lower reaches, and construction of a new footbridge.

SUMMARY OF CIVIL WORKS

Major Work Item	Measurement Unit	Per Appraisal	Actual
Initial Subprojects			
(1) Cipunegara Subproject			
Construction of earth levee	meters	8,600	
Excavation of existing channel	meters	4,200	
Construction of new drainage control structures	set	2	
- box culvert	meters	14,700	12
Upgrading of existing levee			
Construction of river training works	set	63	44
- concrete pile groins	meters	250	28,883
- masonry retaining wall	meters		3,807
Slope protection			
Groin	meters		1,797
Concrete wall	meters		51
Bridge	meters		8
Embankment work for resettlement area	cubic meters		42,255
Village	item		175
Mosque	item		1
School building	item		1
Steel gate structure	item		9
Dredging work	cubic meters		584,500
(2) Cimanuk Subproject			
Upgrading of existing levees	meters	2,257	
Construction of new levees			
- earth levee	meters	882	3,647
- masonry flood wall	meters	943	1,180
- concrete flood wall	meters	295	182
Construction of river training works			
- concrete pile groins	set	18	49
- gabion type groins	set	31	34
- revetment	meters	1,306	2,549
- slip protection works	meters	813	
Construction of drainage control structures			
- pipe culvert	set	3	
- box culverts	set	4	9
Masonry retaining wall	cubic meters		357
Counterweight	meters		699
(3) Pemali Subproject			
Upgrading of new earth levees	meters	11,500	
Construction of new levees			
- earth levee	meters	4,200	
- masonry flood wall	meters	476	
Construction of river training works			
- concrete pile groins	set	15	
- revetment	meters	286	
Construction of new masonry flood wall	meters	1,816	3,887

Major Work Item	Measurement Unit	Per Appraisal	Actual
Construction of river training works			
- concrete pile groins	set	26	15
- revetment	meters	936	823
Counterweight	meters		156
Gabion groin	item		20
Concrete frame	meters		213
(4) Tegal City Subproject			
(i) Gangsa River			
Upgrading of existing levees	meters	2,258	
Upgrading of existing flood wall	meters	625	10,688
Construction of existing flood wall			
- earth levee	meters	18,626	
- masonry flood wall	meters	6,000	5,175
Construction of river training works			
- masonry revetment	meters	330	
- gabion revetment	meters	610	1,166
Excavation of existing channel	meters	12,980	
Construction of new drainage control structures			
- pipe culvert	set	19	8
- box culverts	set	10	31
Rehabilitation of drainage structure	set	13	
Reconstruction of Jakarta–Semarang highway bridge	set	1	1
Concrete frame	meters		85
Gabion groin	item		6
(ii) Wadas River			
Upgrading of existing levees	meters	3,800	
Construction of new levees			
- earth levee	meters	9,800	12,100
- masonry flood wall	meters	1,800	1,664
Construction of river training works			
- concrete grid revetment	meters	78	47
- gabion revetment	meters	510	442
Excavation of existing channel	meters	5,300	
Construction of drainage control structures			
- pipe culvert	set	10	17
- box culverts	set	8	6
Construction of rural road bridge	set	2	
Raising of existing Jakarta–Semarang (upstream) highway bridge	set	1	
Construction of new Jakarta–Semarang (downstream) highway bridge	set	1	
(iii) Gung River			
Upgrading of existing levees	meters	12,456	12,405
Construction of new levees			
- masonry flood wall	meters	1,610	1,009
Construction of river training works revetment	meters	918	
Rehabilitation of drainage control structures	set	4	5
Channel excavation	kilometer		1

Major Work Item		Measurement Unit	Per Appraisal	Actual
	Gabion revetment	meters		2,784
	Gabion groin	item		44
(5)	**Kuto Subproject**			
	Excavation of proposed diversion channel			
	- length	meters	2,028	
	- width	meters	100	
	Channel excavation	cubic meters		1,269,228
	Construction of diversion weir with crest length	meters	140	
	Construction of new single lane bridge over diversion channel	meters	124	
	Construction of new earth levees	meters	11,900	
	Earth levee	cubic meters		1,030,682
	Construction of river training works			
	- gabion type groins	set	61	72
	Excavation of existing channel for embankment material			
	Construction of drainage control structures			
	- box culvert	set	5	40
	Gabion	meters		2,029
	Stone masonry	meters		5.519
	Jetty Construction	meters		665
	Improvement of access road	square meters		19,986
(6)	**Bodri Subproject**			
	Upgrading of existing levees	meters	22,087	
	Construction of masonry retaining wall for earth levees	meters	8,138	
	Embankment work for resettlement area	cubic meters		1,062,593
	Construction of river training works			
	- concrete sheet pile bank protection	meters	325	3,300
	- gabion type bank protection	meters	1,596	
	- bank protection	meters	1,144	
	- ground sill	set	3	3
	Demolition of old capering bridge	set	1	
	Construction of drainage control structures			
	- pipe culverts	set	5	
	- box culvert	set	2	
	Gabion revetment	item		2,029
	Masonry wall	cubic meters		19,282
	Additional Subproject			
(7)	**Pekalongan City Subproject**			
	River works			
	- river channel excavation	cubic meters		423,923
	- compacted embankment	cubic meters		74,709
	- masonry wall	meters		1,957
	- gravel metaling	square meters		42,851
	Shortcut	kilometers		3
	Drain inlet structure			
	- box culvert	set		12
	- pipe culvert			

Major Work Item		Measurement Unit	Per Appraisal	Actual
	Road bridge structure			
	- span of road bridge	meters		105
	Jetties structure			
	- Excavation by machine	cubic meters		21,578
	- sand gravel	cubic meters		15,758
	- rubble stone	cubic meters		25,063
	Control structure	number		1
	Concrete revetment	meters		575
	Irrigation aqueduct			
	- Span of irrigation aqueduct	meters		30
	Gabion groin	number		3
(8)	**Kumpul Kuista Subproject**			
	Channel normalization for Kumpul Kuista River	km		19,290
	Channel normalization for Situnggak River	km		12,630
	Channel normalization for drainage	km		14,079
	Stone masonry wall	meters		930
	Construction and rehabilitation of drain inlet			
	Kumpul Kuista River			
	1. New construction	number		2
	2. Rehabilitation	number		6
	Situnggak River			
	1. New construction	number		1
	2. Rehabilitation	number		12
	Road raising in Block kaliwedi	meters		1,075
	1. Raising of degraded road	meters		755
	2. Raising of road using concrete structure supported by driven concrete piles	meters		320
	Gabion revetment	meters		172
	Block Jagapura	meters		75
	Block Kaliwedi	meters		97
	Driven log piles for strengthening of levee foundation, Block Goa Kidul	meters		150
	Construction of wooden bridge, Block Jagapura	item		1
	Construction of wooden bridge, Block Buungko	item		1
	Rehabilitation of control structure Bungko	item		1
(9)	**Flood Damage Rehabilitation (Package F-1)**			
	Construction of levee	cubic meters		8,032
	Construction of masonry retaining wall	meters		680
	Dredging works	cubic meters		1,135,820
	Reinforced concrete sheet pile	item		170
	Concrete pile length	meters		85
	Construction of slope protection and groins by gabion	item		4,570
	Construction of spoil bank	km		8
(10)	**Flood Damage Rehabilitation (Package F-2)**			
	Excavation by machines	cubic meters	401,095	466,318
	Compacted embankment	cubic meters		12,760
(11)	**Flood Damage Rehabilitation (Package F-3)**			

Major Work Item		Measurement Unit	Per Appraisal	Actual
	Earth works			
	Excavation	cubic meters	1,177,515	1,370,883
	Excavation for foundation	cubic meters		787
	Back fill	cubic meters		176
	Concrete BO Class	cubic meters		16
	Reinforce concrete K-225 Class	cubic meters		75
	Furnishing and installing wooden pile diameter 10 cm, 4.0 meters long	meters		1,040
	Stone masonry	cubic meters		3001
	Rendering	square meters		98
	Pointing	square meters		345
(12)	**Flood Damage Rehabilitation (Package F-4)**			
	Construction of			
	Gabion groins	number		10
	Masonry flood wall	meters		632
	Gabion revetment	meters		1.837
	New drainage structure	number		2
	Levee	meters		7.995
	Prestressed concrete pile groins	number		34
	Retaining wall	meters		120
	Slide gate	item		3
	Reinforced concrete wall	meters		150
	Gabion protection	meters		74
	Gravel metaling	meters		8,261
	Gabion counterweight	meters		75

Source: North Java Flood Control Completion Report, Sinotech Engineering Consultants Ltd et. al. December 2005.

SUMMARY OF TRAINING PROGRAMS IMPLEMENTED
(1997–2003)

Description	Implemented Date	Duration (Days)	Number of Participants
Component A: Flood Control and Protection			
1 Annual Work Plan Workshop	08–1997	2	58
2 Prepreparation for O&M Training on River	12–1998	2	27
3 Prepreparation for O&M water quality, flooding	05–1999	2	50
4 Construction Supervision (2 Batches)	1998–999	10	60
5 Operation and Maintenance of River	03–999	5	29
6 Workshop on Land Acquisition and Resettlement	06–2000	3	27
7 Workshop on Land Acquisition and Resettlement	09–2002	2	86
8 Workshop on Handover Plan for Completed Projects	04–2003	2	50
Component B: Institutional Strengthening of Water Resources Services			
1 Law and Regulation Dissemination	1999–2001	20	113
2 Computer Application: Internet Information System	1999–2001	15	38
3 Workshop on Watershed Management Improvement	07–2001	2	40
4 Upper Catchment Area of Tanjung River—Farmers	11– 2001	5	116
5 Upper Catchment Area of Tanjung River—Community	11– 2001	4	58
6 Computer Application on Web and Database System	09/10–2003	14	12
7 Promotion for Improved Watershed Management	2002	2	101
8 Improved Watershed Management	2002	20	240
9 Workshop on Cimanuk Arboretum Conservation	04–2003	1	57
10 Improved Watershed Management for Bodri, Kuto, Pekalongan, Tegal, and Cimanuk rivers	2003	36	
Component C: Flood Warning Pilot Project			
1 Telemetry System for North Java Flood Forecasting System	2003	6	20
Component D: Riverbed Degradation Monitoring			
1 Riverbed Degradation Monitoring	1999	9	55
2 River Morphology Changes and River Modeling:	2001	6	39
Component E: Water Quality Monitoring			
1 Water Quality / Database and Computer Mapping	1999–2000	15	50
Subtotal (Category 03)			**1,326**
Category 05 (Outside Consultant Contract)			
Component A:			
1 O&M of River for Water Services Staff	2003	15	94
Component B:			
1 Water Resources Management and Flood Control	08/10–1999	104	159
2 Foreign Aid and Audit Financial Statement	11/12– 2001	21	23
3 Project Administration for Goods and Services Procurement	04–2002	5	30
4 Project Administration for Quality Assurance	04/05–2002	5	30
Subtotal (Category 05)			**336**
Component D:			
1 Measuring Flow Parameters and Sediment Transport Characteristic	02–2002	12	23
2 Measuring Riverbed Level Changes	05/06–2002	6	80
3 Intensive Course Numerical Modeling	03/05–2003	5	34
Subtotal (Category 03)			**137**
Total			**1,799**

O&M = operation and maintenance.
Source: North Java Flood Control Completion Report, Sinotech Engineering Consultants Ltd et.al. December 2005.

On-the-Job Training Programs for Resettlement Units

No	Locations	Intensive Class Training	Number of Participants	Duration (Day)
1	Cipunegara Flood Control Subproject: Resettlement Unit in Subang District	10/11–2002	165	**5**
		01/02–2003	165	**5**
		04/05–2003, 08–2003	99	**3**
		06–2003	99	**3**
2	Kuto Flood Control Subproject Resettlement Unit in Kendal District	01/02–2003	76	**4**
		03/04/05–2003	76	**4**
		06/07/08/09/10/11–2003	190	**10**
3	Kuto Flood Control Subproject Resettlement Unit in Batang District	09/10/11– 2003	95	**5**
		01/02–2003	57	**3**
4	Pekalongan City Flood Control Subproject Resettlement Unit in Pekalongan Municipal	11–2002	45	**3**
		12–2002, 01/02–2003	60	**4**
		03/04/05–2003	45	**3**
		06/07/08–2003	45	**3**
5	Kumpul Kuista Flood Control Subproject Resettlement Unit in Cirebon District	01/02–2003	45	**3**
		03/04/05–2003	60	**4**
	Total		**1,322**	

Source: North Java Flood Control Completion Report, Sinotech Engineering Consultants Ltd et.al. December 2005.

SUMMARY OF TELEMETRY SYSTEM

1. A telemetry system for flood forecasting and warning comprising 11 rainfall stations, 10 rainfall cumulative water level stations, 3 repeater stations, 1 master station, and 2 monitoring stations installed in the Cimanuk River basin, with the master station located in the Cimanuk–Cisanggarung River Basin Development Project in Cirebon.

2. Flood forecasting models were established in the telemetry system.

3. Flood warning dissemination procedures were devised and incorporated in the telemetry system.

4. Three workshops on the Cimanuk telemetry system were held for provincial and district water resources staff and project staff (18–19 September, 23–25 September, and 1–3 December 2002), followed by on-the-job training for the telemetry system's operating staff in the master station.

LIST OF EQUIPMENT PROCURED

Table A7.1: Telemetry System Equipment for Flood Forecasting and Warning

No.	Item	Quantity
1.	Automatic Rainfall Station	11
2.	Automatic River Height and Rainfall Station	9
3.	Automatic River Station (Rentang)	1
4.	Repeater Station	3
5.	Master Station / Monitoring Station	2
6.	Spare Part / Module	3 sets
7.	Application Software	1

Supplier - PT. New Module (Imported), Total Cost – $218,940.
Source: North Java Flood Control Completion Report, Sinotech Engineering Consultants Ltd et.al. December 2005.

Table A7.2: Telemetry System Equipment for Flood Forecasting and Warning

No.	Item	Quantity
1.	Automatic Rainfall Station	11
2.	Automatic River Height and Rainfall Station	9
3.	Automatic River Station (Rentang)	1
4.	Repeater Station	2
5.	Master Station / Monitoring Station	2
6.	Maintenance Instruments (Miscellaneous)	1 set
7.	Spare Part / Module	1 set
8.	System Engineering	1 set
9.	Training Program	1 lot
10.	Rating Curve	9 sets
11.	Key Telephone System	1 lot
12.	Networking	2 lots

Supplier - PT. New Module (Local), Total Cost – Rp3,741,313,493.
Source: North Java Flood Control Completion Report, Sinotech Engineering Consultants Ltd et.al. December 2005.

Table A7.3: Survey and Sediment Measuring Equipment for Riverbed Degradation Monitoring

No	Item	Package 1 Quantity	Package 2 Quantity
1.	Theodolite	2 units	6 units
2.	Automatic Level	4 units	3 units
3.	Range Finder	1 unit	3 units
4.	Echo Sounder	1 unit	10 units
5.	Current Meter	1 unit	3 units
6.	Radio Communication	2 units	6 units
7.	Heeley Smith Sampler	1 unit	3 units
8.	Sample Bottles / Container for US D-49 Sampler	25 bottles	200 bottles
9.	US D-49 Depth Integrating Sampler	1 unit	3 units
10.	Sieve Instruments	1 unit	3 units
11.	US BM-54 Sampler	1 unit	3 units
12.	Laptop Computer	1 unit	3 units
13.	Multimedia Projector	1 unit	
14.	Mike 11 Numerical Model	3 units	
15.	Mechanical Core Sampler		3 units
16.	Desktop computer		2 units
17.	Plotter for A1 Drawing		1 unit
18.	Laser Printer		1 unit

Package 1 = Supplier - PT. Geo Lawu Lestari, Total Cost – $100,846 and Rp70,874,000; Package 2 = Supplier - PT. New Module Int, Total Cost – $291,200 and Rp467,020,500.
Source: North Java Flood Control Completion Report, Sinotech Engineering Consultants Ltd et.al. December 2005.

Table A7.4: Vehicles, Motorcycles and Transportation Facilities

No.	Item	Quantity
	Investigation vehicles	
1.	Vehicles 1	13 units
2.	Motorcycle 1	20 units
3.	Boat Motor	3 units

Supplier - PT. Kuperin Indokusion, Total Cost – Rp2,339,675,000.
Source: North Java Flood Control Completion Report, Sinotech Engineering Consultants Ltd et.al. December 2005.

Table A7.5: Water Quality Monitoring Equipment

No.	Item	Quantity
1.	Field Equipment	5 units
2.	Laboratory Equipment	5 units
3.	Database System Equipment	5 units
4,5	Spare Parts and Replacement (Miscellaneous)	6 units

Supplier - PT. Maslando Jaya Borna, Total Cost – $210,144 and Rp769,910,000.
Source: North Java Flood Control Completion Report, Sinotech Engineering Consultants Ltd et.al. December 2005.

Table A7.6: Equipment Procured by Consultant[a]

	Item	Quantity	Amount (Rp)
A.	**Automobiles**		
1.	Isuzu Panther / Daihatsu Rocky	9 / 2	515,700,000
B.	**Motorcycle**		
2.	Honda GL	14	69,900,000
C.	**Office Equipment and Computer**		
3.	Computer	18	155,750,000
4.	Notebook Satellite Pro 6100	1	11,780,000
D	**Office Furniture**		
5.	Filing Cabinet, Cupboard, Chairs, etc.	various	24,850,000
6.	Drafting Sets, Lettering Sets, Electric Typewriter	various	67,550,000
7.	Air Conditioner Unit	18	57,000,000
8.	Facsimile Machine	4	14,000,000
9.	Binding Machine	1	1,100,000
10.	Video Camera	2	2,370,000
11.	Additional Furniture	10	11,477,600
E.	**Office Furniture and Equipment and/or Documentation Room**		350,000,000
	Total		**1,281,477,600**

[a]Included under consulting services category.

Source: North Java Flood Control Completion Report, Sinotech Engineering Consultants Ltd et.al. December 2005.

SUMMARY OF WATER QUALITY AND RIVER DEGRADATION MONITORING

A. Water Quality Monitoring

1. The water quality monitoring activities included:

   (i) Under contract with the Project, the Water Environment Center of the Research Institute for Water Resource Development provided services under the Water Quality Monitoring Component.
   (ii) Ten river reaches in the Citarum, Cipunegrara, Cisanggarung, Bangkaderes, Pemali, Comal, Kuto, Pekalongan and Sambong, Bodri, and Pekik rivers were selected for river water quality monitoring.
   (iii) Through five formal training programs and on-the-job activities, capacity building was provided for provincial and district water resources services staff (and, in particular, the river basin organizations concerned) in water sampling and analyses, as well as field and laboratory activities.
   (iv) A set of sampling and field and laboratory testing equipment for river water quality, including sediment sampling, was procured for each of the four river basin organizations in the project area.

B. River Degradation Monitoring

2. The river degradation monitoring activities included:

   (i) The Research Institute for Water Resource Development provided services under the River Degradation Monitoring Component.
   (ii) Ten river reaches in the Cimanuk, Cipamingkis (tributary of the Cimanuk), Pemali, Kuto, Comal, Bodri, Cipunegara, Pekik, Cilamaya, and Bangkaderes rivers were selected for monitoring of medium-term and long-term riverbed degradation.
   (iii) Hydraulic computer models were utilized to simulate and predict the riverbed degradation conditions.
   (iv) Two training workshops for provincial and district water resources services staff as well as river basin organization staff were held in Cirebon (25–29 October 1999) and Bandung (10–11 January 2001). Each workshop was followed with 3 months of on-the-job field training in sediment monitoring procedures for selected staff. Five additional practical field trainings were also provided.

SUMMARY OF PROJECT COSTS

Table A.9.1: Summary of Project Costs
($'000)

Component	Appraisal			Actual		
	Foreign	Local	Total	Foreign	Local	Total
A. Investment Costs						
1. Land Acquisition, Resettlement, and Environmental Mitigation	0	15,319	15,319		5,344	5,344
2. Flood Control and Protection	36,670	82,481	119,151	22,447	35,385	57,832
3. Institutional Strengthening of Water Resources Services	66	516	582	229	264	493
4. Flood Warning Pilot Project	471	359	830	811	132	943
5. Monitoring River Degradation	1,043	821	1,864	1,184	497	1,681
6. Monitoring Water Quality	968	792	1,760	733	557	1,290
Subtotal	**39,218**	**100,288**	**139,506**	**25,404**	**42,179**	**67,583**
B. Recurrent Costs						
1. Incremental Operation and Maintenance	0	4,640	4,640			0
Subtotal	**39,218**	**104,928**	**144,146**	**25,404**	**42,179**	**67,583**
C. Interest and Other Charges during Construction	**8,854**	**0**	**8,854**	**6,130**	**0**	**6,130**
Total	**48,072**	**104,928**	**153,000**	**31,534**	**42,179**	**73,713**

Source: Asian Development Bank.

Table A.9.2: Breakdown of Category Costs by Funding Source

Cost Category	Appraisal			Actual		
	ADB %	Government %	Total ($'000)	ADB %	Government %	Total ($'000)
1. Land Compensation	0	100	15,300	0	100	5,340
2. Civil Works	70	30	58,296	68	32	50,470
3. Equipment	100	0	1,312	100	0	1,670
4. Consultants	100	0	10,754	100	0	8,430
5. Surveys and Design	100	0	691	100	0	550
6. Training	100	0	113	100	0	280
7. Unallocated Loans	100	0	2,807	100	0	
8. Operation and Maintenance, Project Administration	0	100	6,560	0	100	900
Total	**59**	**41**		**70**	**30**	

ADB = Asian Development Bank
Note: Excludes taxes and duties, as well as interest and other charges during construction.
Source: Asian Development Bank.

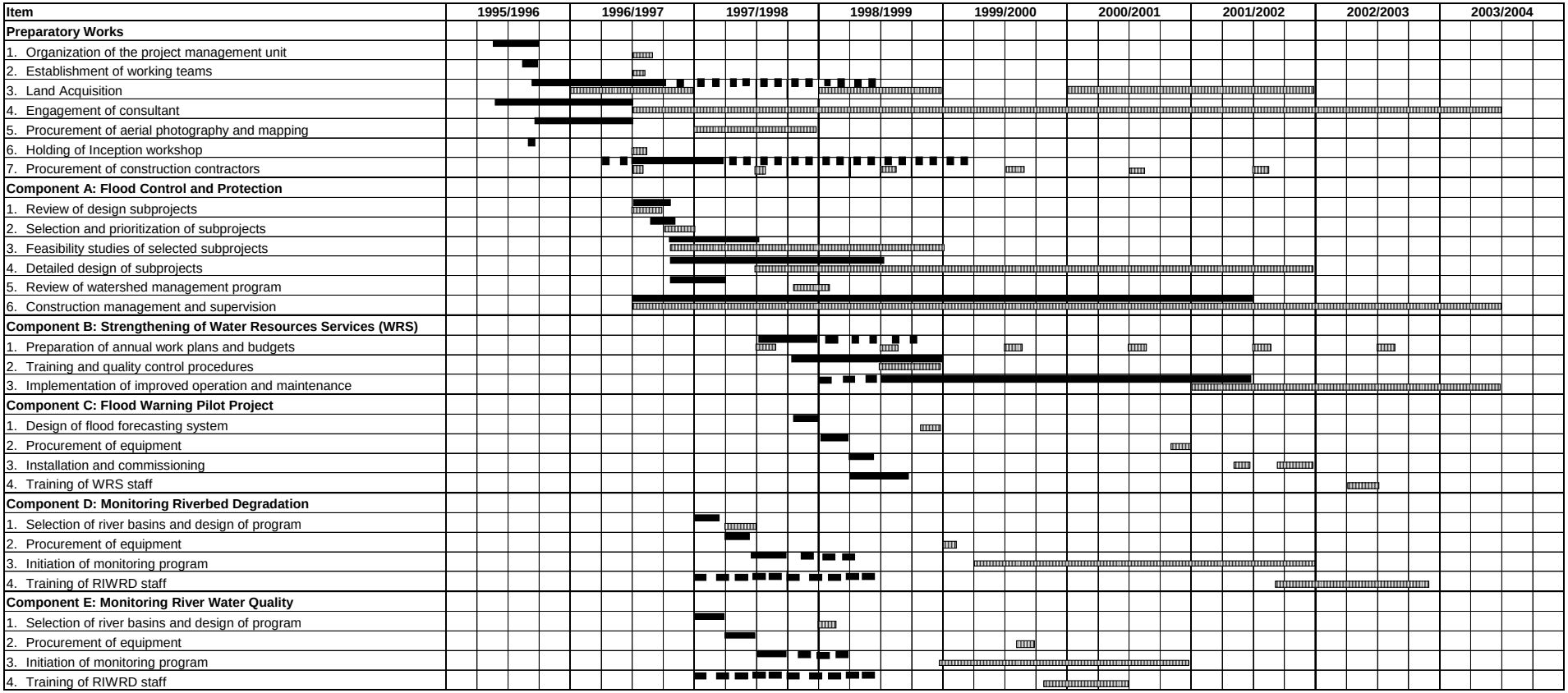
Table A.9.3: Total Capital Cost by Subproject

(current economic $ million)

Subproject	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
Cipunegara	0.00	0.00	0.00	0.00	0.00	1.27	0.88	1.06	1.77	4.97
Cimanuk	0.00	0.00	2.42	0.09	0.99	2.80	1.42	0.52	0.00	8.25
Kumpul Kwista	0.00	0.00	0.00	0.00	0.00	0.00	1.15	1.65	0.27	3.07
Pemali	0.00	2.26	0.43	0.68	0.40	0.11	0.00	1.58	0.68	6.15
Tegal	0.00	0.00	0.00	1.42	1.47	1.05	0.25	0.86	0.31	5.36
Pekalongan	0.00	0.00	0.00	0.00	0.00	0.00	0.60	1.55	1.28	3.43
Kuti	0.00	0.00	0.00	0.00	0.00	0.52	1.63	2.84	1.04	6.03
Bodri	0.00	0.00	0.00	0.35	2.07	1.37	0.39	0.00	0.06	4.24
Total	**0.00**	**2.26**	**2.85**	**2.55**	**4.93**	**7.12**	**6.33**	**10.06**	**5.41**	**41.51**

Source: ADB PCR Mission, November 2005.

PROJECT IMPLEMENTATION SCHEDULE



RIWRD = Research Institute for Water Resources Development; WRS = Water Resources Services.

Planned

Actual

Source: Consultant's final report.

COMPLIANCE WITH LOAN COVENANTS

Covenant	Reference	Status/Remarks
The Borrower will carry out the Project with due diligence and efficiency and in conformity with sound administrative, financial, engineering, environmental, and natural resource management principles and practices.	Article IV, Section 4.01	Complied with. .
The Borrower will make available the funds, facilities, services, land, and other resources required, in addition to the proceeds of the Loan, for carrying out the Project and for the operation of the Project facilities.	Article IV, Section 4.02	Partially complied with. (Significant delays were encountered.)
The Borrower will engage competent Project consultants and contractors, acceptable to the Borrower and the Bank.	Article IV, Section 4.03(a)	Complied with. (Consultant staff changes were required. Close construction supervision was necessary.)
The Borrower will carry out the Project in accordance with plans, design standards, specifications, work schedules, and construction methods acceptable to the Bank and the Borrower and will furnish the plans, design, standards, specification, and work schedules and any modifications thereto as may reasonably be requested by the Bank.	Article IV, Section 4.03(b)	Complied with.
The Borrower will maintain separate records and accounts, have such accounts audited annually, and furnish the Bank a copy of the audited reports in the English language.	Article IV, Section 4.06(a) and (b) (not later than 9 months after end of fiscal year)	Complied with.
The Borrower will enable the Bank to discuss the financial statements for the Project and financial affairs with the auditors.	Article IV, Section 4.06(c)	Complied with.
The Borrower will prepare consolidated semiannual progress reports for submission to the Bank.	Article IV, Section 4.07(a) and (b)	Complied with.
The Borrower will prepare a Project Completion Report for submission to the Bank at the latest 3 months after physical completion of the Project.	Article IV, Section 4.07 (c)	Complied with.

Covenant	Reference	Status/Remarks
The Borrower will enable the Bank's representatives to inspect the Project, subprojects, the goods financed out of the proceeds of the Loan, and any relevant records and documents.	Article IV, Section 4.08	Complied with.
The Borrower will ensure that the Project facilities are operated, maintained, and repaired.	Article IV, Section 4.09	Being complied with. The Executing Agency is in the process of turning over the completed facilities to the Balai, the responsible agency
The Borrower will open a Special Account at Bank Indonesia immediately after the effective date.	Schedule 2, paragraph 15 (ordinary capital resources) Schedule 3, paragraph 15 (ADF)	Complied with.
DGWR will establish a Project Management Unit (PMU) within 1 month of the effective date.	Schedule 5, paragraph 3	Delayed compliance. Due in April 1996 – established in January 1997.
The Borrower will establish a Working Team chaired by a representative of BAPPEDA I and comprised of representatives of RBDP, Provincial Water Resources Services and the concerned heads of district for each of the provinces of West and Central Java.	Schedule 5, paragraph 5	Delayed compliance. Due by 31 March 1996. Established in Central Java on 26 September 1996 and in West Java on 3 January 1997.
The Borrower will make sufficient funds available in the national budget for costs of annual incremental and ongoing operation and maintenance in Project area rivers, at levels determined by the PMU and ADB.	Schedule 5, paragraph 9	Complied with.
The Borrower will ensure that all land and rights required to allow construction of Project works are carried out in time and that all affected persons are resettled and/or compensated in accordance with principles agreed between the Borrower and ADB.	Schedule 5, paragraph 10	Complied with. (Delays occurred on some subprojects.) .
The Borrower will conduct community awareness programs for people affected by land and house acquisition, resettlement, compensation levels, and assist with displacement prior to the implementation of any subproject.	Schedule 5, paragraph 11	Complied with. (Process improved after nongovernment organization hire)
The Borrower will ensure that DGWR will prepare an environmental management and monitoring plan for each subproject prior to construction, and will report to the Bank the implementation of such plan at 6 month	Schedule 5, paragraph 13	Complied with.

Covenant	Reference	Status/Remarks
intervals thereafter.		
The Borrower will submit to ADB, for its review and approval, an annual work plan covering proposed Project activities by the end of each calendar year.	Schedule 5, paragraph 15	Complied with.
The Borrower will realign, as necessary in accordance with findings of the Working Teams, its ongoing programs for upper catchment regreening to ensure that urgently needed works in subproject watershed are undertaken concurrently with subproject implementation.	Schedule 5, paragraph 14	Complied with. (Increased funding to watershed improvements was provided.)
The Borrower will prepare and submit to ADB for review and approval within 6 months of effective date, a detailed program for the training required under the Project.	Schedule 5, paragraph 16	Complied with.
ADB and DGWR will conduct an intensive review of the Project at least once each year during Project implementation.	Schedule 5, paragraph 17	Complied with.
A comprehensive midterm review of the Project will be undertaken in the third year of the Project implementation.	Schedule 5, paragraph 17	Complied with.

ADB = Asian Development Bank, ADF = Asian Development Fund, BAPPEDA = Regional Development Planning Agency, DGWR = Directorate General of Water Resources, PMU = project management unit, RBDP = River Basin Development Project.

[a] New works required little operation and maintenance. Budgets were available, but the operation and maintenance budget for nonproject asset management was limited.

Source: ADB. 1995. *Report and Recommendation of the President to the Board of Directors on Proposed Loans to the Republic of Indonesia for the North Java Flood Control Sector Project*. Manila. (L1425/1426[SF]–INO).

SUMMARY OF CONSULTING SERVICES

Expertise	International		Domestic		Schedule of Completion	
	Appraisal[a]	Actual	Appraisal	Actual	Original	Actual
	Person-Months		Person-Months			
A. Flood Control and Protection	140	196	619	885	May 2002	Dec 2003
B. Institutional Strengthening of Water Resources Services			55	94	Oct 2000	Dec 2003
C. Flood Warning Pilot Project	5	12	11	31	Jan 2001	Nov 2003
D. Monitoring Riverbed Degradation	11	13	18	18	Jan 2002	Oct 2003
E. Monitoring Water Quality	12	13	20	55	Dec 2000	Feb 2001
Total	**169**	**234**	**723**	**1,083**		

[a] The figures quoted in the report and recommendation of the President do not anticipate the additional person-months required for resettlement planning and additional civil works due to site condition changes and generally underestimated the overall consulting services required.

Sources: ADB Records.

ECONOMIC ANALYSIS

A. Component Breakdown and Approach

1. The Project comprised five components:
   (i) Component A: Flood Control and Protection,
   (ii) Component B: Institutional Strengthening of Water Resources Services,
   (iii) Component C: Flood Warning Pilot Project,
   (iv) Component D: Monitoring of River Degradation, and
   (v) Component E: Monitoring of River Water Quality.

2. In expenditure terms, Component A was by far the most significant, utilizing approximately 93% of the total budget, (not accounting for interest charges). It comprised 13 subproject activities, 12 of which related to constructing flood protection works and one to watershed management. The latter cost approximately 0.4% of the Component A budget. Of the 12 flood protection subprojects, eight were subjected to river feasibility study. The other four were river flood damage rehabilitation (RFDR) subprojects, where expenditure was authorized towards the end of the Project without the requirement for economic justification. One of the RFDR subprojects was implemented on the same river (Pemali) that had already been included within the eight subprojects subject to feasibility study. There are thus 11 subproject locations. The total cost of the three distinct RFDR subprojects, excluding Pemali, was approximately 8% of total Component A spending.

3. The economic effectiveness of the Project was evaluated based on the eight subprojects for which feasibility studies had been prepared (including Pemali and the RFDR subprojects associated with that river), the three stand-alone RFDR subprojects, the watershed management subproject, and the remaining Components B through E. The capital cost of the eight appraised subprojects was approximately $57 million, or 92% of Component A expenditure and 85% of overall spending (excluding interest payments).

B. Project Costs

4. As shown in Table A.13.1, average cost per protected hectare (ha) ranged from $1,300 to $2,800, with an overall average of about $1,700.

Table A.13.1: Average Costs per Protected Hectare

Subproject	ha	$/ha
Cipunegara	2,440	2,550
Cimanuk	6,210	1,670
Kumpul Kwista	2,330	1,650
Pemali	5,545	1,390
Tegal	5,065	1,330
Pekalongan	2,080	2,070
Kuto	2,630	2,870
Bodri	4,055	1,310
Total	**30,355**	**1,710**

Sources: Feasibility Study, and Appraisal Reports and ADB PCR field surveys.

5. The differences between estimates and actuals for individual subprojects ranged widely (which also was apparent in the comparison of appraised versus implemented works shown in Appendix 4), with some proving to be less costly than estimated and some more expensive. The differences were substantial, generally between 30% and 60%. Appendix 9 shows a breakdown of project costs.

C. Project Benefits

6. During the Project Completion Review Mission, attempts were made to assess the level of benefits that had actually been generated or which were likely to occur in the future. During late January and early February 2006, just a few days before the Mission visited the Project Area, much of the north coast of West and Central Java had severe rains. At many of the subprojects, river flows were at the highest levels seen since completion of the Project, and initial indications were that, overall, the flows were around those of a 15-year flood. This flood event provided the opportunity for the Mission to

(i) assess whether the flood protection works were capable of containing the flows which they were almost all designed to accommodate;
(ii) determine to what extent the systems were damaged;
(iii) attempt to check on the levels of flooding and flood damage that had been experienced prior to the Project, and to determine whether the areas intended to benefit from the Project had in fact seen improvements since the construction had been completed, disregarding the immediate impact of the recent wet conditions;
(iv) obtain estimates of the areas within the Project's zones of influence that were still considered vulnerable to flood risk from any source;
(v) place some unit values on flood losses, including crop damage, fish pond losses, and house damage, and to see how these compared with values used in the feasibility study; and
(vi) assess whether the inclusion of other benefits in the feasibility studies had been justified and to consider if there were still other benefits that should have been included.

7. Table A.13.2 indicates that approximately 85% of the initially identified flood-affected area has now been provided with improved flood protection. (This estimate does not include the large area in Cipunegara that was flooded in February 2006).

Table A.13.2 Subproject Flooded Areas and Households

Scheme	Flood-prone areas (ha) Before Project	After Project	Net Protected	Households in Flood-Prone Areas
Cipunegara	2,440	0	2,440	2,400
Cimanuk	7,510	1,300	6,210	25,700
Kumpul Kwista	2,930	600	2,330	1,880
Pemali	8,645	3,100	5,545	27,300
Tegal	6,365	1,300	5,065	27,150
Pekalongan	2,330	250	2,080	24,300
Kuto	2,690	60	2,630	3,400
Bodri	4,100	45	4,055	19,300
Total	**37,010**	**6,655**	**30,355**	**131,430**

Sources: Feasibility Study, and Appraisal Reports and ADB PCR field surveys.

8. Apart from the problems of obtaining comprehensive data on the incidence of flooding for the areas and properties affected and the extent of damage, it is also difficult to obtain satisfactory information on unit losses. In the case of severely damaged crops, such as rice and red onions, farmers are able to provide a reasonable indication of the losses, as they are, too, with fish losses. Per-hectare losses can range widely, depending on the crop. The loss of a high-yielding, mature red onion crop is valued at about Rp40 million ($4,300/ha), while that from a mature rice crop would be about Rp8 million ($870). The value of a hectare of mature prawns is approximately Rp15 million to Rp25 million ($1,630–$2,700). Fish losses are generally either insignificant or total. With rice, losses can range from insignificant all the way to total, while for onions, again, the impact is either insignificant or total.

9. In the case of house damage and disruption, it is also difficult to obtain estimates, as the range is wide. To obtain such information requires detailed questioning and considerable time.

10. Data is not available to compare with-project benefits to an independent base, and so the team was obliged to prepare its own estimate. At the same time, then, it was possible to check whether the original feasibility studies and the bases for making the original investment decisions had been realistic.

11. Potential benefits estimates for each of the eight schemes have been prepared.

12. The net area flood-protected has been calculated, including estimates of the approximate land area utilized for housing. In rural areas, housing density is approximately 12 households per hectare and in urban areas a density of twice this was assumed. Of the remaining area, most of this is agricultural and it has been assumed that around 75% of this would be irrigated rice land, as this is the normal and rational agriculture practice in the low-lying, flat lands that are naturally prone to flooding. In the villages closer to the sea, the rice land gives way to fishponds.

13. Most of the direct benefits accrue to agriculture, fisheries, and housing, while less significant benefits would result from reduced damage to public infrastructure. Where applicable, benefits from reduced transport disruption were included in the analysis.

While the pre-project feasibility studies included varying proportional estimates for both indirect and intangible benefits, a view by subproject suggests that, at the level of accuracy to which benefits have been calculated, it is more appropriate to apply a standard rate.

14. A mean annual loss saving of Rp2 million/ha ($217) for agricultural land was assessed, which represents a 20% loss of yield from a rice crop. While conditions are subproject specific, in general, with schemes offering protection against a 25-year flood event, it is expected that annual losses would equate approximately to 33% of the mean annual losses. With the above assumed mean annual loss, on average, agricultural land within the flood-affected area would suffer losses of around Rp650,000/ha ($73) in normal years, and considerably more in those years were the flooding is more severe. Losses of this magnitude represent around 300 kg of paddy rice, equivalent to around 5% or 6% of potential yield. This is considered to be quite conservative, as it is easy for flooding, or, what is perhaps just as damaging, the threat of flooding, to create losses of this scale. The unit loss is quite close to the average value used in the feasibility study, but it is suggested that, without better records, it is more appropriate to use a standard value rather than to apply rates ranging from almost zero to over $2,200/ha. In overall terms, and as a proportion of total benefits, the Mission estimate of agricultural benefit is quite close to that of the feasibility study, but the individual allocations between subprojects reveal some wide differences.

15. Regarding household losses, a standard mean annual loss of Rp250,000 was applied to an estimated proportion of total houses within each subproject (ranging from 25% in rural areas to 60% in densely populated urban areas). Average overall unit losses per household and a overall loss calculated were similar to those in the feasibility study. Again, individual allocations between subprojects reveal some wide differences.

16. Standard allowances for indirect and intangible benefits (at 20% of direct benefits each) have been applied, and the total proportionate benefit roughly equates to that of the overall feasibility study package. Some minor reductions were made for intangible losses in rural areas, where it is considered that these are generally somewhat less severe.

D. Subproject and Overall Feasibility

17. **Pre-implementation Estimates**. Table A13.9 presents the latest available estimates of economic internal rates of return (EIRRs) for individual subprojects during feasibility study analyses. No overall EIRR was calculated, as appraisal and implementation of individual subprojects took place over an extended period.

18. Post-implementation Indications. For each of the eight subprojects, a series of EIRRs have been calculated, utilizing the actual rupiah costs incurred, converted to dollars at the current exchange rate, then converted to economic as shown in Table A.9.3 prices using a standard conversion factor of 0.8 and adjusted to 2005 constant prices, using the factors presented in Table A.13.3. Land compensation costs were not included. An annual operation and maintenance allowance of 4% of the cost of capital works was included, bearing in mind that works under the Project are just part of the overall capital expenditure that has been incurred while providing improved flood protection infrastructure to these subproject river systems. Two different sources of

benefit data were used: (i) benefits estimated during the feasibility studies (tables A13.4 and A13.5), and (ii) new post-project estimates, as presented in tables A13.6 and A13.7.

Table A.13.3 $ Deflator Indexes

Item	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
$ Deflator Index (2000 base)	93.7	95.2	96.2	97.7	99.7	102.3	103.9	106.0	108.9	111.6
Annual increase % factor (1997 base)	0.984	1.000	1.011	1.026	1.047	1.075	1.091	1.113	1.144	1.172
Based on 2005	1.19	1.17	1.16	1.14	1.12	1.09	1.07	1.05	1.02	1.00

Source: ADB Project Completion Review Mission.

19. EIRRs. The overall analyses for the eight subprojects combined are presented in Tables A13.8 and the resulting EIRRs are in Table A13.9.

20. In comparing original estimates against the results obtained using feasibility study benefit assumptions, as one would expect, the differences simply reflected the extent to which actual costs differed from estimated cost. Overall EIRR was 22% and only two subprojects, Cimanuk and Kuto, had EIRRs below 10%. Pekalongan showed a somewhat remarkable 123% result.

21. In most cases, the estimated overall benefits were somewhat lower than had been previously assumed (particularly Pekalongan). Exceptions were the cases of Cimanuk and Kumpul Kwista, where it was considered that the original estimates had been overly pessimistic.

22. The estimates of direct benefits are quite conservative. One must be mindful of the fact that there is little clear evidence regarding the extent of flooding and that relatively minor adjustments to such factors as unit values or assumed weights for indirect and intangible benefits can quite significantly impact on the calculated EIRR.

23. On applying the post-project benefits estimates, a lower overall EIRR of around 19% was obtained. This was negatively impacted by the apparent poor performance of Cipunegara (which indicated high costs per protected ha). Despite the lower EIRR, the overall result is reasonable, as it is for all of the subprojects, except Cipunegara.

24. **Overall Economic Feasibility**. While it is likely that benefits were created, there is little prospect of being able to quantify benefits generated through implementing the RFDR schemes. It is also considered somewhat unrealistic to attempt to quantify benefits accruing to the watershed management subproject or to the activities undertaken under Components B to E. If, as in Table A13.10, the costs of these subprojects and components for which no benefits have been quantified are added to the costs of the eight subprojects, and set against the benefits accruing to the eight subprojects alone, a crude overall EIRR for the Project's total investment of around 16% is indicated. If it were assumed that the RFDR subprojects generated sufficient benefits to yield a nominal 10% EIRR, the inclusion of these additional benefits has only a marginal impact on the overall EIRR.

Table A13.4: Benefit Summary, as Prepared during Feasibility

(In current 1997 Rp million)

Subproject	Net Protected Area (ha)	Households (number)	Agriculture (Rp m)	Fisheries (Rp m)	Subtotal Agri. + Fish. (Rp m)	Buildings (Rp m)	Infrastructure (Rp m)	Transport (Rp m)	Other (Rp m)	Total Direct (Rp m)	Indirect (Rp m)	Intangibles (Rp m)	Total (Rp m)
Cipunegara	2,440	2,400	550	620	1,170	17	620	0	2	1,809	543	77	2,429
Cimanuk	6,210	25,700	326	0	326	620	215	0	4	1,165	349	825	2,339
Kumpul Kwista	2,330	1,880	458	115	573	66	31	0	0	670	75	0	745
Pemali	5,545	27,300	660	541	1,201	24	670	0	1	1,896	569	948	3,413
Tegal	5,065	27,150	174	7	181	54	670	868	48	1,821	546	942	3,309
Pekalongan	2,080	24,300	1,967	1,967	3,933	1,933	69	0	0	5,935	701	0	6,636
Kuto	2,630	3,400	272	585	857	36	200	569	1	1,663	499	77	2,239
Bodri	4,055	19,300	26	0	26	1	620	804	17	1,468	440	620	2,528
Total	**30,355**	**131,430**	**4,433**	**3,835**	**8,267**	**2,751**	**3,095**	**2,241**	**73**	**16,427**	**3,722**	**3,489**	**23,638**
% allocation			18.8	16.2	35.0	11.6	13.1	9.5	0.3	69.5	15.7	14.8	100.0

ha = hectare, Rp m = rupiah millions.
Note: Mean annual benefits, by sector (Initial Year 1).
Source: Project Completion Review Mission.

Table A13.5: Benefit Summary, as Prepared during Feasibility

(In constant 2005 $)

Subproject	Net Protected Area	Households	Agriculture	Fisheries	Subtotal Agri. & Fish.	Buildings	Infrastructure	Transport	Other	Total Direct	Indirect	Intangibles	Total
	ha	number	$M	$M	$M	$M	$M	$M	$M	$M	$M	$M	$M
Cipunegara	2,440	2,400	0.256	0.289	0.545	0.008	0.289	0.000	0.001	0.843	0.253	0.036	1.132
Cimanuk	6,210	25,700	0.152	0.000	0.152	0.289	0.100	0.000	0.002	0.543	0.163	0.385	1.090
Kumpul Kwista	2,330	1,880	0.213	0.054	0.267	0.031	0.014	0.000	0.000	0.312	0.035	0.000	0.347
Pemali	5,545	27,300	0.308	0.252	0.560	0.011	0.312	0.000	0.000	0.884	0.265	0.442	1.591
Tegal	5,065	27,150	0.081	0.003	0.084	0.025	0.312	0.405	0.022	0.849	0.255	0.439	1.542
Pekalongan	2,080	24,300	0.917	0.917	1.833	0.901	0.032	0.000	0.000	2.767	0.327	0.000	3.093
Kuto	2,630	3,400	0.127	0.273	0.399	0.017	0.093	0.265	0.000	0.775	0.233	0.036	1.044
Bodri	4,055	19,300	0.012	0.000	0.012	0.000	0.289	0.375	0.008	0.684	0.205	0.289	1.178
Total	**30,355**	**131,430**	**2.066**	**1.787**	**3.854**	**1.282**	**1.443**	**1.045**	**0.034**	**7.657**	**1.735**	**1.626**	**11.019**
% allocation			18.8	16.2	35.0	11.6	13.1	9.5	0.3	69.5	15.7	14.8	100.0

Table A13.5—Continuation

Subproject	Unit rates: Agriculture + Fisheries	Unit rates: Per household
	$/ha	$
Cipunegara	325	3
Cimanuk	50	11
Kumpul Kwista	164	16
Pemali	189	0
Tegal	32	1
Pekalongan	2,206	37
Kuto	227	5
Bodri	6	0
Average	**231**	**10**

ha = hectare, M = millions.

Note: Mean annual benefits, by sector (Initial Year 1).

Source: Project Completion Review Mission.

Table A13.6: Updated Benefit Estimate Summary
(In constant 2005 Rp million)

Subproject	Estimated Urban Area ha	Estimated Irrigated Area ha	Benefits/ Protected ha $/ha	Cost/ Protected ha $/ha	Agri. and Fish. Rp m	Buildings Rp m	Infra-structure Rp m	Transport Rp m	Other Rp m	Total Direct Rp m	Indirect Rp m	Intangibles Rp m	Total Rp m
Cipunegara	200	1,680	228	2,547	3,360	150	105	0	181	3,796	759	569	5,124
Cimanuk	2,142	3,051	219	1,661	6,103	1,606	1,124	0	442	9,275	1,855	1,391	12,521
Kumpul Kwista	157	1,630	229	1,648	3,260	118	82	0	173	3,633	727	545	4,904
Pemali	1,606	2,954	287	1,386	5,909	2,389	1,672	0	498	10,468	2,094	2,094	14,655
Tegal	1,597	2,601	401	1,323	5,202	2,376	1,663	3,472	636	13,348	2,670	2,670	18,687
Pekalongan	972	831	565	2,064	1,163	3,645	2,552	0	368	7,728	1,546	1,546	10,819
Kuto	283	1,760	345	2,866	3,520	213	149	2,000	294	6,175	1,235	926	8,337
Bodri	1,135	2,190	264	1,308	4,380	1,448	1,013	0	342	7,182	1,436	1,221	9,840
Total	**10,953**	**16,697**	**304**	**1,709**	**32,896**	**11,943**	**8,360**	**5,472**	**2,934**	**61,605**	**12,321**	**10,962**	**84,887**
% allocation					39	14	10	6	3	73	15	13	100

Table A13.6—Continuation

Subproject	After 10 Years Rp m	After 10 Years $M	Initial Rp m	Initial $M
Cipunegara	6,863	0.75	5,124	0.557
Cimanuk	16,770	1.82	12,521	1.361
Kumpul Kwista	6,569	0.71	4,904	0.533
Pemali	19,629	2.13	14,655	1.593
Tegal	25,029	2.72	18,687	2.031
Pekalongan	14,491	1.58	10,819	1.176
Kuto	11,166	1.21	8,337	0.906
Bodri	13,179	1.43	9,840	1.070
Total	**113,696**	**12.36**	**84,887**	**9.227**

ha = hectare. M = millions, Rp m = rupiah millions.
Note: Mean annual benefits, by sector.
Source: Project Completion Review Mission.

Table A13.7: Benefit Estimate Summary

(In constant 2005 $ million)

Subproject	Estimated Urban Area ha	Estimated Irrigated Area ha	Benefits/ Protected ha $/ha	Cost/ Protected ha $/ha	Agri. and Fish. $M	Buildings $M	Infra-structure $M	Transport $M	Other $M	Total Direct $M	Indirect $M	Intangibles $M	Total $M
Cipunegara	200	1,680	228	2,547	0.365	0.016	0.011	0.000	0.020	0.413	0.083	0.062	0.557
Cimanuk	2,142	3,051	219	1,661	0.663	0.175	0.122	0.000	0.048	1.008	0.202	0.151	1.361
Kumpul Kwista	157	1,630	229	1,648	0.354	0.013	0.009	0.000	0.019	0.395	0.079	0.059	0.533
Pemali	1,606	2,954	287	1,386	0.642	0.260	0.182	0.000	0.054	1.138	0.228	0.228	1.593
Tegal	1,597	2,601	401	1,323	0.565	0.258	0.181	0.377	0.069	1.451	0.290	0.290	2.031
Pekalongan	972	831	565	2,064	0.126	0.396	0.277	0.000	0.040	0.840	0.168	0.168	1.176
Kuto	283	1,760	345	2,866	0.383	0.023	0.016	0.217	0.032	0.671	0.134	0.101	0.906
Bodri	1,135	2,190	264	1,308	0.476	0.157	0.110	0.000	0.037	0.781	0.156	0.133	1.070
Total	**10,953**	**16,697**	**304**	**1,709**	**3.576**	**1.298**	**0.909**	**0.595**	**0.319**	**6.696**	**1.339**	**1.191**	**9.227**
% allocation					39	14	10	6	3	73	15	13	100

Table A13.5—Continuation

Subproject	Unit rates: Agriculture + Fisheries $/ha	Unit rates: Per household $
Cipunegara	217	7
Cimanuk	217	7
Kumpul Kwista	217	7
Pemali	217	10
Tegal	217	10
Pekalongan	152	16
Kuto	217	7
Bodri	217	8
Average	**214**	**10**

ha = hectare, M = millions.
Note: Mean annual benefits, by sector.
Source: Project Completion Review Mission.

Table A13.8: Economic Analysis Comparison for Combined Eight Subprojects, Feasibility Study and Updated (Project Completion Report) Data
(Costs $ million)

	Feasibility Study Data				Updated (Project Completion Report) Data			
		Costs		Net Cash		Costs		Net Cash
Year	Benefits	Capital	Recurrent	Flow	Benefits	Capital	Recurrent	Flow
1996	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1997	0.00	2.65	0.00	-2.65	0.00	2.65	0.00	(2.65)
1998	0.00	3.31	0.11	-3.41	0.00	3.31	0.11	(3.41)
1999	0.00	2.92	0.24	-3.16	0.00	2.92	0.24	(3.16)
2000	3.03	5.52	0.36	-2.85	2.95	5.52	0.36	(2.92)
2001	3.13	7.77	0.58	-5.22	3.05	7.77	0.58	(5.29)
2002	3.23	6.80	0.89	-4.46	3.15	6.80	0.89	(4.53)
2003	11.14	10.59	1.16	-0.61	9.53	10.59	1.16	(2.22)
2004	11.51	5.54	1.58	4.39	9.84	5.54	1.58	2.72
2005	11.89	0.00	1.80	10.09	10.17	0.00	1.80	8.36
2006	12.28	0.00	1.80	10.48	10.50	0.00	1.80	8.70
2007	12.69	0.00	1.80	10.88	10.85	0.00	1.80	9.05
2008	13.11	0.00	1.80	11.30	11.21	0.00	1.80	9.40
2009	13.54	0.00	1.80	11.74	11.58	0.00	1.80	9.77
2010	13.85	0.00	1.80	12.05	11.83	0.00	1.80	10.03
2011	14.18	0.00	1.80	12.37	12.09	0.00	1.80	10.29
2012	14.51	0.00	1.80	12.71	12.36	0.00	1.80	10.55
2013	14.51	0.00	1.80	12.71	12.36	0.00	1.80	10.55
2014	14.51	0.00	1.80	12.71	12.36	0.00	1.80	10.55
EIRR %	**22**				**19**			

( ) = negative
EIRR = economic internal rate of return.
Source: ADB Project Completion Review Mission.

Table A13.9: EIRR Summary of Eight Subprojects

Costs / Benefits	Feasibility Study (latest) (%)	Actual Feasibility Study (%)	Actual Post-Project Estimate (%)	Differences (actual versus feasibility study) Costs	Percentage Difference	Benefits	Percentage Difference
Subproject							
Cipunegara	8	14	6	lower	45.3	lower	33.2
Cimanuk	11	4	15	higher	28.2	higher	71.9
Kumpul Kwista	19	8	16	higher	60.2	higher	44.7
Pemali	41	31	22	higher	48.1	lower	28.7
Tegal	24	28	23	lower	36.6	lower	19.0
Pekalongan	28	123	50	lower	26.9	lower	42.0
Kuto	12	6	14	higher	46.0	higher	49.2
Bodri	18	21	16	lower	48.8	lower	26.9
Overall		**22**	**19**	**lower**	**11.9**	**lower**	**14.8**

EIRR = economic internal rate of return.
Notes:

(i) High cost/hectare feasibility study overestimated benefits and costs.

(ii) Feasibility study did not include benefits from protection of Rentang weir and underestimated other benefits.

(iii) Feasibility study underestimated agricultural, indirect, and tangible benefits and costs.

(iv) Feasibility study underestimated costs and overestimated indirect and intangible benefits.

(v) Feasibility study underestimated agricultural benefits and overestimated indirect and intangible benefits and costs.

(vi) Feasibility study overestimated fisheries benefits and costs.

(vii) High cost/hectare relies on transport benefit. Last estimate over-reduced benefits.

(viii) Feasibility study underestimated agricultural and fisheries benefits and overestimated other benefits and costs.

Source: ADB Project Completion Review Mission.

Table 13.10: Cash Flow, Overall Project 2005

(In constant $ economic prices)

		Costs									
Year	Benefits	Eight Subprojects	RFDR Subprojects	Watershed Management	Component B	Component C	Component D	Component E	Total Costs	Net Cash Flow	EIRR%
1996	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16%
1997	0.00	2.65	0.00	0.05	0.08	0.11	0.25	0.25	3.39	-3.39	
1998	0.00	3.41	0.11	0.09	0.02	0.03	0.07	0.07	3.70	-3.70	
1999	0.00	3.16	0.24	0.00	0.02	0.03	0.31	0.11	3.64	-3.64	
2000	2.95	5.87	0.36	0.02	0.12	0.05	0.67	0.66	7.38	-4.43	
2001	3.05	8.34	0.58	0.02	0.03	0.31	0.14	0.11	8.95	-5.90	
2002	3.15	7.69	0.89	0.00	0.05	0.33	0.14	0.10	8.31	-5.15	
2003	9.53	11.75	1.16	0.11	0.09	0.20	1.22	0.11	16.40	-6.87	
2004	9.84	7.12	1.58	0.00	0.10	0.04	0.08	0.08	8.01	1.83	
2005	10.17	1.80	1.80	0.00	0.00	0.00	0.00	0.00	1.80	8.36	
2006	10.50	1.80	1.80	0.00	0.00	0.00	0.00	0.00	1.80	8.70	
2007	10.85	1.80	1.80	0.00	0.00	0.00	0.00	0.00	1.80	9.05	
2008	11.21	1.80	1.80	0.00	0.00	0.00	0.00	0.00	1.80	9.40	
2009	11.58	1.80	1.80	0.00	0.00	0.00	0.00	0.00	1.80	9.77	
2010	11.83	1.80	1.80	0.00	0.00	0.00	0.00	0.00	1.80	10.03	
2011	12.09	1.80	1.80	0.00	0.00	0.00	0.00	0.00	1.80	10.29	
2012	12.36	1.80	1.80	0.00	0.00	0.00	0.00	0.00	1.80	10.55	
2013	12.36	1.80	1.80	0.00	0.00	0.00	0.00	0.00	1.80	10.55	
2014	12.36	1.80	1.80	0.00	0.00	0.00	0.00	0.00	1.80	10.55	

RFDR = river flood damage rehabilitation.
Source: Project Completion Review Mission.