



Completion Report

Project Number: 26009
Loan Number: 1500
December 2007

Malaysia: Klang River Basin Environmental Improvement and Flood Mitigation Project

CURRENCY EQUIVALENTS

Currency Unit – ringgit (RM)

		At Appraisal	At Project Completion
		6 November 1996	31 August 2007
RM1.00	=	\$0.3962	\$0.2899
\$1.00	=	RM2.5239	RM3.4494

ABBREVIATIONS

ADB	–	Asian Development Bank
AFS	–	audited financial statement
ARI	–	average recurrence interval
DID	–	Department of Irrigation and Drainage
DOE	–	Department of Environment
EA	–	executing agency
EIRR	–	economic internal rate of return
ha	–	hectare
IRBM	–	integrated river basin management
KBMC	–	Klang Basin Management Council
km	–	kilometer
MASMA	–	Urban Stormwater Management Manual for Malaysia (or <i>Manual Saliran Mesra Alam Malaysia</i>)
MOA	–	Ministry of Agriculture
MNRE	–	Ministry of Natural Resources and Environment
MTR	–	midterm review
MWSS	–	Malaysia Wetland Sanctuary, Selangor
OPP3	–	Malaysia Third Outline Perspective Plan
O&M	–	operation and maintenance
PAM	–	project administration memorandum
PCR	–	project completion review
PELAWI II	–	Strategic Plan for Klang River Basin
PPTA	–	project preparatory technical assistance
SMART	–	storm water management and road tunnel
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
Director	U. Malik, Agriculture, Environment and Natural Resources Division, Southeast Asia Department
Team leader	M. Nasimul Islam, Environmental Engineer, Southeast Asia Department
Team members	N. Calma, Associate Project Analyst, Southeast Asia Department H. Refareal-Nacario, Senior Operations Assistant, Southeast Asia Department

CONTENTS

	Page
BASIC DATA	i
MAP	
I. PROJECT DESCRIPTION	1
II. EVALUATION OF DESIGN AND IMPLEMENTATION	1
A. Relevance of Design and Formulation	1
B. Project Outputs	2
C. Project Costs	4
D. Disbursements	5
E. Project Schedule	5
F. Implementation Arrangements	5
G. Conditions and Covenants	6
H. Related Technical Assistance	6
I. Consultant Recruitment and Procurement	6
J. Performance of Consultants, Contractors, and Suppliers	7
K. Performance of the Borrower and the Executing Agency	7
L. Performance of the Asian Development Bank	8
III. EVALUATION OF PERFORMANCE	8
A. Relevance	8
B. Effectiveness in Achieving Outcome	8
C. Efficiency in Achieving Outcome and Outputs	9
D. Preliminary Assessment of Sustainability	10
E. Impact	11
IV. OVERALL ASSESSMENT AND RECOMMENDATIONS	11
A. Overall Assessment	11
B. Lessons	13
C. Recommendations	14
APPENDIXES	
1. Project Framework	17
2. Total Project Cost	23
3. Expenditure Account by Financier	24
4. ADB Yearly Expenditures	25
5. Project Implementation Schedule	26
6. Organization Charts	29
7. Status of Compliance with Loan Covenants	31
8. Summary of Consulting Services	34
9. Summary of Training Programs	35
10. List of Equipment Procured	36
11. Summary of Main Findings at Midterm and Project Completion Review	37
12. Economic Analysis	39
13. Project Performance Rating	45

BASIC DATA

A. Loan Identification

1.	Country	Malaysia
2.	Loan Number	1500
3.	Project Title	Klang River Basin Environmental Improvement and Flood Mitigation Project
4.	Borrower	Government of Malaysia
5.	Executing Agency	Ministry of Agriculture through the Department of Irrigation and Drainage
6.	Amount of Loan	\$26.3 million
7.	Project Completion Report Number	PCR: MAL 1003

B. Loan Data

1.	Appraisal	
	– Date Started	11 September 1996
	– Date Completed	23 September 1996
2.	Loan Negotiations	
	– Date Started	7 November 1996
	– Date Completed	7 November 1996
3.	Date of Board Approval	5 December 1996
4.	Date of Loan Agreement	5 November 1997
5.	Date of Loan Effectiveness	
	– In Loan Agreement	3 February 1998
	– Actual	3 February 1998
	– Number of Extensions	0
6.	Closing Date	
	– In Loan Agreement	30 September 2003
	– Actual	07 February 2006
	– Number of Extensions	1
7.	Terms of Loan	
	-- Commitment Charge	0.75%
	– Interest Rate	Pool-based variable rate and Libor-based (floating)
	– Maturity (number of years)	15 years
	– Grace Period (number of years)	6 years

8. Disbursements

a. Dates

Initial Disbursement	Final Disbursement	Time Interval
15 September 1998	07 February 2006	89 months
Effective Date	Original Closing Date	Time Interval
3 February 1998	30 September 2003	68 months

b. Amount (\$'000)

Category	Original Allocation	Last Revised Allocation	Amount Canceled	Amount Disbursed	Undisbursed Balance
Civil Works	21,620	10,620	11,000	7,409	3,211
Vehicles	198	198		100	98
Equipment	3,282	2,262	1,000	9	2,253
Consulting Services	1,220	1,220		857	363
Total	26,300	14,300	12,000	8,375	5,925

9. Local Costs (Financed)

- Amount (\$)
- Percent of Local Costs
- Percent of Total Cost

C. Project Data

1. Project Cost (\$ '000)

Cost	Appraisal Estimate	Actual
Foreign Exchange Cost	40,200	10,352
Local Currency Cost	61,600	33,836
Total	101,800	44,188

2. Financing Plan (\$'000)

Cost	Appraisal Estimate	Actual
Implementation Costs		
Borrower Financed	68,600	33,836
ADB Financed	26,300	8,375
Other External Financing		
Total	94,900	42,211
IDC Costs		
Borrower Financed	6,900	1,977
ADB Financed		
Other External Financing		
Total	6,900	1,977

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

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

Component	Appraisal Estimate	Actual
A. Environmental Improvement		
1. Integrated River Basin Management	13,500	
2. Solid Waste Management	8,300	
3. Sediment Trapping	3,200	
Subtotal Environmental Improvement	25,000	
B. Flood Mitigation		
4. Tributary River Corridor Improvement	54,100	38,031
5. Flood Forecasting and Warning System	1,600	
Subtotal Flood Mitigation	55,700	
Total Costs		42,211
Physical Contingencies	8,300	
Price Contingencies	5,900	
Total Project Costs before Interest during Construction	94,900	
Interest during Construction	6,900	1,977
Total	101,800	44,188

4. Project Schedule

Item	Appraisal Estimate	Actual
Date of Contract with Consultants	1Q 1997	February 2001
Completion of Engineering Designs	2Q 1999	June 2005
Civil Works Contract		
Date of Award	1Q 1998	May 1998
Completion of Work	4Q 2005	Ongoing
Equipment and Supplies		
Dates		
First Procurement	1Q 1997	February 2000
Last Procurement	3Q 1999	September 2000
Completion of Equipment Installation	3Q 1999	December 2000
Start of Operations		
Completion of Tests and Commissioning	4Q 1999	Not implemented
Beginning of Start-Up	4Q 1999	Not implemented
Other Milestones		
Cancellation of Loan Proceeds		24 May 2004
First Partial Cancellation		7 February 2006
Final Partial Cancellation		

5. Project Performance Report Ratings

Implementation Period	Ratings	
	Development Objectives	Implementation Progress
From 3 February 1998 to 30 November 1998	Satisfactory	Satisfactory
From 30 November 1998 to 31 December 1998	Satisfactory	Partly Satisfactory
From 1 January 1999 to 31 October 1999	Satisfactory	Partly Satisfactory
From 1 November 1999 to 31 December 1999	Satisfactory	Satisfactory
From 1 January 2000 to 29 February 2000	Satisfactory	Satisfactory
From 1 March 2000 to 31 December 2000	Satisfactory	Partly Satisfactory
From 1 January 2001 to 31 December 2001	Satisfactory	Partly Satisfactory
From 1 January 2002 to 31 December 2002	Satisfactory	Partly Satisfactory

From 1 January 2003 to 30 April 2003	Satisfactory	Partly Satisfactory
From 1 May 2003 to 31 December 2003	Satisfactory	Satisfactory
From 1 January 2004 to 31 December 2004	Satisfactory	Satisfactory
From 1 January 2005 to 31 December 2005	Satisfactory	Satisfactory
From 1 January 2006 to 07 February 2006	Satisfactory	Satisfactory

D. Data on Asian Development Bank Missions

Name of Mission	Date	No. of Persons	No. of Person-Days	Specialization of Members ^a
Project Consultation Mission	4–8 Nov 1994	2	10	a,b
Fact-Finding Mission	27 Nov–16 Dec 1994	5	100	c,d,e,f,g
Loan Consultation	17–21 Jun 1996	3	15	c,d,h
Appraisal Mission	11–23 Sep 1996	5	65	b,c,d,h,i
Inception Mission	9–15 Dec 1997	2	14	i,j
Review Mission 1	30 Nov–4 Dec 1998	2	10	i,j
Review Mission 2	4–8 Oct 1999	1	5	i
Review Mission 3	10–14 Jul 2000	2	10	i,j
Midterm Review	17–27 Sep 2001	3	33	i,j,k
Review Mission 4	9–15 Aug 2002	1	5	l
Review Mission 5	6–10 Oct 2003	2	10	j,l
Review Mission 5	13–17 Dec 2004	1	5	j
Project Completion Review ^b	31 Jul–11 Aug 2007	4	43	j,k,m,n

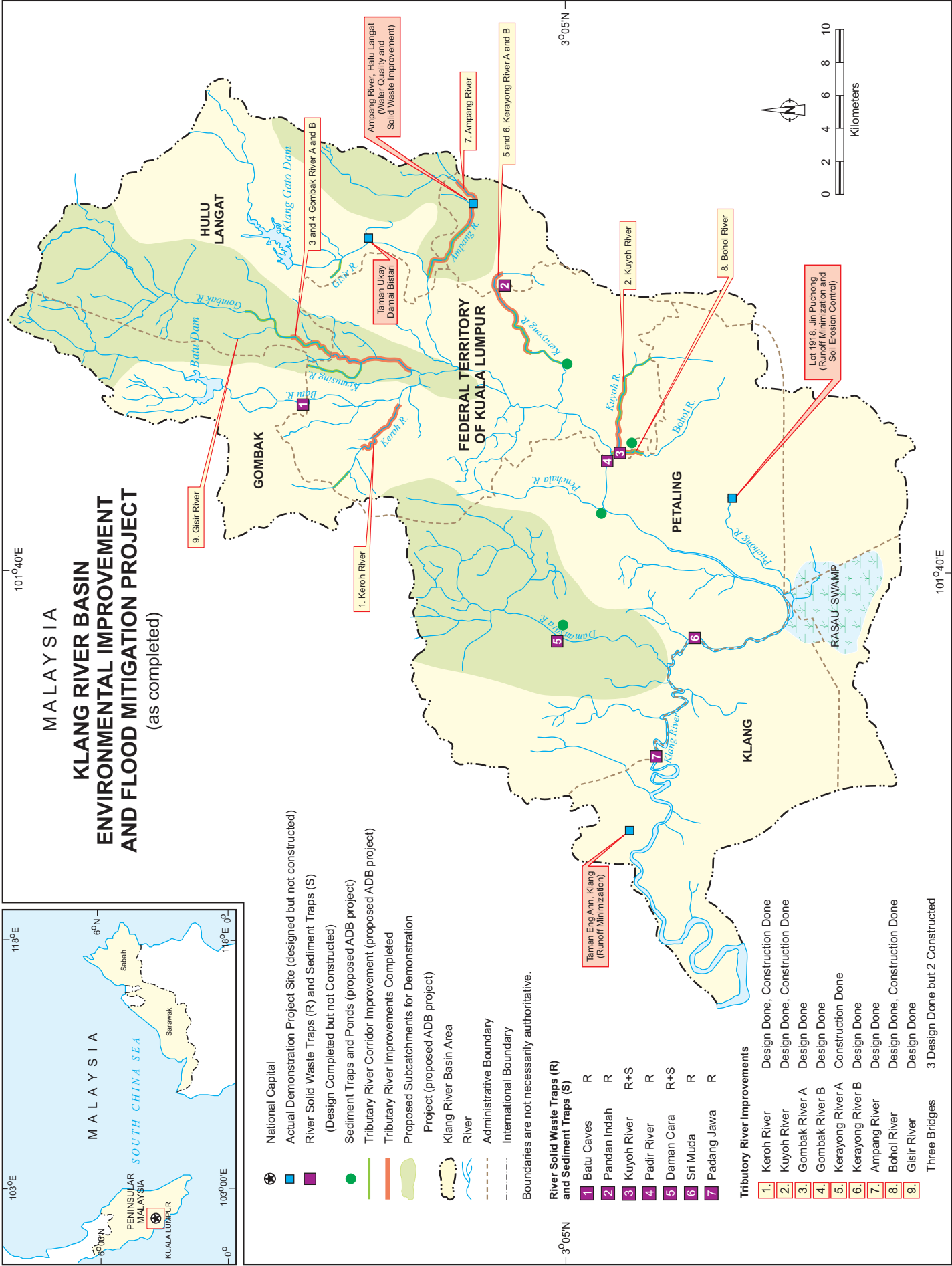
^a a – manager, b – environment specialist, c – programs officer, d – project economist, e – project specialist, f – consultant (hydrologist), g – consultant (resettlement specialist), h – social development specialist, i – project engineer, j – project analyst, k – consultant (project economist), l – water resources specialist, m – environmental engineer, n – operations assistant.

^b The project completion report was prepared by M. Nasimul Islam, Environmental Engineer; Nida Calma, Associate Project Analyst; Hazel Refareal-Nacario, Sr. Operations Assistant; and Tan Bock Thiam, Consultant (Economist).



MALAYSIA

KLANG RIVER BASIN ENVIRONMENTAL IMPROVEMENT AND FLOOD MITIGATION PROJECT (as completed)



- National Capital
 - Actual Demonstration Project Site (designed but not constructed)
 - River Solid Waste Traps (R) and Sediment Traps (S) (Design Completed but not Constructed)
 - Sediment Traps and Ponds (proposed ADB project)
 - Tributary River Corridor Improvement (proposed ADB project)
 - Tributary River Improvements Completed
 - Proposed Subcatchments for Demonstration Project (proposed ADB project)
 - Klang River Basin Area
 - River
 - Administrative Boundary
 - International Boundary
- Boundaries are not necessarily authoritative.

- River Solid Waste Traps (R) and Sediment Traps (S)**
- 1** Batu Caves R
 - 2** Pandan Indah R
 - 3** Kuyoh River R+S
 - 4** Padir River R
 - 5** Daman Cara R+S
 - 6** Sri Muda R
 - 7** Padang Jawa R

- Tributary River Improvements**
- 1** Keroh River Design Done, Construction Done
 - 2** Kuyoh River Design Done, Construction Done
 - 3** Gombak River A Design Done
 - 4** Gombak River B Design Done
 - 5** Kerayong River A Construction Done
 - 6** Kerayong River B Design Done
 - 7** Ampang River Design Done, Construction Done
 - 8** Bohol River Design Done, Construction Done
 - 9** Gisir River Design Done
- Three Bridges 3 Design Done but 2 Constructed

I. PROJECT DESCRIPTION

1. The catchment area of the Klang River basin is 1,288 square kilometers (km²), and it is the most urbanized region in Malaysia, encompassing the Federal Territory of Kuala Lumpur and includes part of the state of Selangor. It has an estimated population of 4.4 million (16% of the national population) that is growing at a rate of 5% annually. The basin spreads over nine local government authorities and faces serious environmental degradation and flooding problems from urbanization, industrialization, and population growth. More than half of the basin has been urbanized, and much of this continuing urban development has taken place on land that is prone to flooding. Construction has caused soil erosion and huge discharges of sediments into waterways. The increase in impervious surface area in the watershed causes flooding. The water quality in the basin has declined due to high sediment loads from construction and deforestation, large quantities of litter and rubbish, and untreated sewage and industrial and commercial effluents. The ecology of the river has suffered from the removal of vegetation from the riparian corridor and removal of snags from the watercourses, diminishing habitats for a variety of riparian and aquatic fauna. This has also reduced pollutant filtration capacity and increased the nutrients and other pollutants going into the rivers. The combined effect of poor water quality, high sediment load, and the removal of vegetation from the river corridor has caused a decline in the number and diversity of native flora and fauna.

2. A loan amounting to \$26.3 million from the ordinary capital resources of the Asian Development Bank (ADB) was approved on 5 December 1996, and the loan agreement was signed on 5 November 1997. The loan became effective on 3 February 1998. The overall goals of the Klang River Basin Environmental Improvement and Flood Mitigation Project (the Project) are to (i) improve environmental conditions, including those that worsen flooding, through integrated river basin management (IRBM) that addresses environmental and economic development needs and (ii) minimize the adverse economic, social, and environmental impacts of flooding in the Klang River basin. Specifically, the Project objectives are to (i) implement IRBM, including solid waste management and sediment trapping, to improve water quality and enhance the Klang River basin environment and (ii) provide a high degree of flood protection along tributaries and to downstream communities through structural flood mitigation measures and an improved flood forecasting and warning system. Project interventions were expected to result in reduced soil erosion, cleaner rivers for recreation, and reduced damage and disruption from flooding in the Klang River basin.

3. The Project was implemented by the Department of Irrigation and Drainage (DID). The project framework is shown in Appendix 1.

II. EVALUATION OF DESIGN AND IMPLEMENTATION

A. Relevance of Design and Formulation

4. The Project is relevant to ADB's country strategy and program, which emphasizes that development should take into consideration environmental impacts and needs to be managed holistically to ensure sustainable development. It is also in line with the policies and strategies as outlined in the Malaysia Third Outline Perspective Plan (OPP3). One key strategy of OPP3 is to adopt an integrated and holistic approach to environmental and resource management for sustainable development.

5. ADB actively supports the efforts of the Government of Malaysia (the Government) to strengthen environmental improvement and conservation and to promote the sustainable use of

natural resources. Prior to this project, ADB provided loans to the Government for five flood-related projects¹ totaling \$122 million that supported Government efforts to reduce flood damage and improve the environment in both rural and urban areas. This project was a continuation of ADB's support to the Government in the areas of flood protection and environmental improvement.

6. The Government incorporated environmental and conservation considerations into development planning in its Seventh 5-Year Development Plan (1996–2000) and in the eighth (2001–2005) and ninth (2006–2010) such plans. It has enacted new legislation and regulations to encourage the private sector to adopt environmentally sound technologies. Environmental awareness programs were implemented on the importance of maintaining a sustainable environment to build a sense of social responsibility in the general population. The Government has an active program for heightening the awareness of district and city governments of their need to strictly enforce compliance with environmental laws and regulations. The *Urban Storm Water Management Manual for Malaysia* (or *Manual Saliran Mesra Alam Malaysia [MASMA]*), which provides guidance to all stakeholders on controlling urban storm water discharges, from the perspectives of both quality and quantity, was approved by Malaysian Cabinet in 2001. These programs and activities of the Government show that the Project is relevant in both design and implementation, and continues to be relevant to the Government's current policies and programs.

7. However, project design and formulation did not anticipate the rapid population growth and urbanization in the watershed, such that the flood control infrastructure formulated during the feasibility study was found to be inadequate during implementation. With funding under this Project, the Government completed in 2003 the Klang River Basin Environmental Improvement and Flood Mitigation Project Master Plan, which revised the original design and project interventions to account for changing conditions in the watershed.

B. Project Outputs

8. The Project had five main components, three for environmental improvement and two for flood mitigation: (i) integrated river basin management, (ii) solid waste management, (iii) sediment trapping, (iv) tributary river corridor improvement, and (v) developing a flood forecasting and warning system. The IRBM component aimed to control soil erosion and water runoff by adopting an appropriate program to (i) strengthen the coordination of land use and land-use planning, (ii) enact legislative and regulatory measures, (iii) implement monitoring and enforcement, and (iv) adopt specific strategies to control soil erosion and water runoff. Its long-term aim was the creation of a permanent IRBM institutional arrangement to assume responsibility for project river basin management. Four sites were to be developed as

¹ ADB. 1991. *Report and Recommendation of the President to the Board of Directors on Proposed Loan to the Government of Malaysia for the National Coastal Erosion Control Sector Project*. Manila. (Loan 1120–MAL) Approved on 19 November 1991 for \$29.3 million; ADB. 1990. *Report and Recommendation of the President to the Board of Directors on Proposed Loan to the Government of Malaysia for Besut Agricultural Development Project*. Manila (Loan 36/37–MAL) Approved on 22 September 1970 for \$4.2 million; ADB. 1990. *Report and Recommendation of the President to the Board of Directors on Proposed Loan to the Government of Malaysia for the Kemasin Rural Development Project*. Manila. (Loan 497–MAL) Approved on 15 December 1980 for \$40 million.; ADB. 1989. *Report and Recommendation of the President to the Board of Directors on Proposed Loan to the Government of Malaysia for the Semerak Rural Development Project*. Manila. (Loan 992–MAL) Approved on 23 November 1989 for \$33.2; ADB. 1990. *Report and Recommendation of the President to the Board of Directors on Proposed Loan to the Government of Malaysia for the MAL Northern Trengganu Rural Development Project*. Manila (Loan 1068–MAL.) Approved on 13 December 1990 for \$15 million.

demonstration areas for IRBM measures. Assistance was to be provided for a wetland site of 1,800 hectares (ha) to serve as a water retention pond and enhance the local flora and fauna.

9. The component for solid waste management aimed to reduce solid waste in the river system to enhance environmental quality. Seven automated trash booms were to be installed to improve rubbish collection in the rivers. It was envisaged that the Project would result in a 30% reduction in uncollected solid waste. The sediment-trapping component aimed to construct four sediment traps to reduce the sediment load in the rivers by 35%. The component for tributary river corridor improvement was the largest, absorbing over 70% of the total investment cost. This component aimed to improve nine tributaries, construct three bridges, and widen selected river reaches to provide areas needed for river corridor beautification and recreation. The improved flood forecasting and warning system was to provide residents with at least 3 hours' warning before flood events.

10. The feasibility study,² costing \$2.20 million, was designed to supplement DID's ongoing programs to reduce flooding in the Klang River basin. The study included proposals for flood-control infrastructure improvements for the entire length of the Klang River. The appraisal proposed tertiary river corridor improvements for 28.6 km of nine tributaries, or less than half of the figure recommended in the feasibility study. It was expected that the Government would finance the improvements not included in the appraisal estimate. The Project was designed to cover only a small portion of the overall Government flood mitigation and environmental improvement project for this basin. By project completion, the Government had completed river corridor improvement on 94 km in 26 tributaries, including work carried out by the Government both inside and outside the Project's scope.

11. Project achievements varied considerably for the five components. The Project achieved most of its targeted output for tertiary river corridor improvements but only part of its target for the components on solid waste management, the flood forecasting and warning system, sediment trapping, and IRBM. Because of project delays due to difficulties in conforming with ADB administrative procedures and changes in Government priorities, the Government decided to fund from its own budget 35% of tertiary river corridor improvements and 100% of the costs of solid waste management, sediment trapping, and the flood forecasting and warning system. This substantially reduced the size of the loan required from ADB. Activities under the IRBM component were scaled back to only half of its original cost. The major project achievements for each component are compared to targets set at appraisal in Appendix 1 and Appendix 11 .

12. The Strategic Plan for Klang River Basin (PELAWI II)³ has been formulated and circulated to relevant agencies and authorities for implementation and adoption. Flood mitigation projects are now adopting such environmental approaches as pollution control at source and water quality consideration. The Klang Valley Planning Council working committee currently coordinates and oversees land-use planning in the basin. Flooding and environmental issues are being addressed for all new development projects. However, demonstration projects, the development of enforcement checklists, and public consultation campaigns were not accorded a high priority in this plan. In addition, work was not completed on the river beautification subcomponent, which included landscaping, identifying pollution sources, enforcing regulations, public communication, and introducing fish and prawn fry in river channels.

² ADB. 1994. Kinhill Engineers Pty Ltd., *Klang River Basin Integrated Flood Mitigation Project*. Manila.

³ The overall 2020 strategic plan drawn up by the Federal Territory Development and Klang Valley Planning Division in 2002.

13. The Klang River Flood Mitigation Program was revised, and additional flood mitigation projects such as the Storm Water Management and Road Tunnel (SMART⁴) and the Kuala Lumpur Flood Mitigation Project Package 2 have been implemented and will be fully operational by the end of 2007. The state government of Selangor has decided not to reserve the Rasau Swamp as a flood detention pond. Instead, the government has focused on developing the nearby 3,000 ha site at Paya Indah as the National Wetland Park. Several local councils have adopted in principle recommendations from the MASMA⁵ and expanded coverage of solid waste management to more areas and improved services to hot spot areas like night markets. This has reduced the need for solid waste collection from rivers.

14. Detailed design for two sediment traps on the rivers Sungai Damansara and Sungai Kuyoh was carried out, but technical analysis indicated that two other proposed sites were unsuitable. The implementation of this component was found not to be viable as the bulk of sediments are either retained at construction sites or carried out to the estuaries. None of the four sediment traps was built.

15. By project completion, the Project had improved 26 km of tertiary river corridor, or 90% of target set at appraisal. This represents 27% of the total improvements made by the Government during the last 10 years. The flood warning system within 3 hours' notification was provided for most of the Kuala Lumpur city center but warning more than 3 hours prior to storm events cannot be provided due to short lag-time of these storms. The flood forecasting and warning system, now operated as part of the SMART project, was not procured with the project loan as envisioned during appraisal.

C. Project Costs

16. Project expenditure from the loan and Government counterpart funding totaled \$44.19 million (RM167.86 million), representing 43% of the total project cost of \$101.68 million (RM278.20 million) estimated at appraisal. The loan of \$8.38 million accounted for 19% of total project expenditure. Government funds accounted for 81%, or \$35.81 million (74% of appraisal). The depreciation of the ringgit from RM2.5 per dollar at appraisal to a fixed rate of RM3.8 in 1999, or by 34%, reduced the project cost by 21% in dollar terms. The Government's major expenditures comprised civil works (58%), consulting services (8%), land acquisition and resettlement (27%), and interest during construction (6%). This does not include Government expenditures on activities to clean up rivers, which were included in the appraisal estimate but not implemented under the Project. During project appraisal, the bulk of the ADB loan, which formed 25.9% of the total project cost, was for civil works (82.1%), followed by equipment (12.4%), consulting services (4.7%), and vehicles (0.8%).

17. The amount of \$12.0 million was canceled on 24 May 2004 due to (i) savings of \$9.0 million from the depreciation of the ringgit and (ii) reduction in the scope of activities for ADB financing estimated at \$3.0 million. These savings were from four civil works contracts originally under the ADB loan that were fully financed by the Government. Of the four, three packages were completed with Government funds because of their urgency, and one package was completed with Government funds for reasons associated with noncompliance with ADB procurement procedures. At project completion, a further \$5.93 million in unallocated funds were canceled.

⁴ The Storm Water Management and Road Tunnel, the only flood tunnel in the world that can be utilized for road transportation when there is no risk of flooding, was successfully tested on 19 August 2007.

⁵ Developed by DID and approved by the Government in June 2000.

18. The project costs at appraisal and completion are shown in Appendices 2, 3, and 4.

D. Disbursements

19. Disbursement under the loan was \$8.38 million, which was only 32% of the original loan amount. The amount comprised payment of civil works (\$7.41 million), vehicles and equipment (\$0.11 million), and consulting services (\$0.86 million). Disbursement was slow, particularly during the early years of implementation, as the recruitment of consultants for project implementation was delayed. International consultants were engaged to prepare the design of the civil works package but were fielded only in early 2001, 4 years after project effectiveness. In the first 3 years, local consultants were tasked with some of the design work. Further delays in implementing civil works were caused by delays in land acquisition and resettlement issues associated with squatter removal. Inconsistencies and differences between ADB and Government procurement guidelines further slowed disbursement. As a result, four of the civil works packages originally planned for partial financing by ADB were eventually financed solely by the Government, and some of the project contracts were awarded and implemented after the loan closing date. To accelerate the implementation of priority project activities, the Government preferred to be reimbursed, as it had adequate funds to pre-finance activities under the Project.

E. Project Schedule

20. The Project was envisioned to be implemented over 6 years. The loan agreement was signed 11 months after loan approval, becoming effective 3 months thereafter. The loan was closed on 7 February 2006, following one extension of 2 years in the loan closing date. Implementation slippages were attributed to (i) delayed consultant recruitment, which delayed detailed feasibility studies and engineering designs for project interventions; (ii) problems associated with squatter relocation; and (iii) changes in project sites associated with pilot demonstration schemes. Although approved by ADB, advanced procurement of the consultant, civil works, and equipment was not done, which caused start-up delays. The project implementation schedule is shown in Appendix 5.

F. Implementation Arrangements

21. The Government established a special implementation division comprising senior engineers, high-quantity surveyors, and technical and clerical support groups. DID permanent officers were seconded to implement the Project in line with the proposal at appraisal. However, implementation arrangements were not effective because of the lack of active involvement of other related agencies—e.g., the Department of Environment (DOE)—and local governments in project planning and implementation. (The project organization structure and the organization chart of the DID are shown in Appendix 6.) In 2005, DID was transferred from the Ministry of Agriculture (MOA) to the newly created Ministry of Natural Resources and Environment (MNRE). Over the last decade, DID's priorities shifted from maintaining irrigation schemes for rice cultivation to flood control in urban centers. With its shift to the new ministry, DID's role will be restricted to river maintenance and flood control, while the irrigation unit remains at MOA. Being now under the MNRE umbrella, DID should be better able to coordinate with DOE to control both quality and quantity aspects of urban storm water runoff, which did not happen under the institutional arrangement during the Project.

G. Conditions and Covenants

22. The major loan covenants were partly complied with. Noncompliance with loan covenants included failure to submit the final 2005 audited financial statement or collect benefit monitoring information on environmental, economic, and socioeconomic impacts. Some of the covenants were only partly complied with because some important activities—such as the implementation of soil erosion and rainfall runoff control, demonstration schemes, and solid waste management activities—were not completed. The status of loan covenants is shown in Appendix 7.

H. Related Technical Assistance

23. Project preparatory technical assistance (PPTA) costing \$2.2 million was used to develop the feasibility study for the Project. Appraisal proposed 28.6 km of river corridor improvement works, or half of what was recommended in the feasibility study, out of which 26 km was completed, utilizing 65% of project funds. The feasibility study considered 6 hours of average rainfall intensity over the Klang Basin as the design parameter for river corridor improvement works. Rapid development in the catchment area, particularly in and around Kuala Lumpur, which was unanticipated in the feasibility study, made a shorter duration of 2 hours of intense rainfall a more appropriate design parameter for flood mitigation.

I. Consultant Recruitment and Procurement

24. The appraisal mentioned that consulting services would be provided under the Project to help DID design and implement project components. As competent domestic expertise was available, the Government's normal practice was to use a domestic consulting firm as the lead consultant with assistance from international consulting firms. Based on this practice, DID shortlisted six local consulting firms as lead firms. ADB subsequently requested the Government to revise the proposed shortlist to include two Malaysian firms and four non-Malaysian firms as lead consultants. This changing of the shortlist significantly delayed project consultant recruitment, and hence project implementation, by about 3 years. Among the civil works, goods, and services categories, equipment was the least utilized loan category (at less than 1% utilization of the original allocation), followed by civil works (about 15% utilization). Refer to Section B.8.b of Basic Data. Equipment for flood forecasting and the early warning system, solid waste management, sediment trapping and demonstration units was not procured under the Project. Some of the river corridor improvement works under the scope of the loan project were carried out using Government funds.

25. ADB guidelines stipulated that the work contract be awarded to the lowest evaluated bid, and that bids could not be disqualified purely because of tender price. Some of the awarded contract costs were very much lower than DID's estimate. During the early years of the Project (1998 to 2001), with the Malaysian economy in recession following the economic crisis, contractors were eager to obtain contracts, and many bids were submitted at less than 70% of DID's estimated cost. At these low prices, the contractors often encountered severe cash-flow problems, causing substantial delays in project completion. DID's normal practice was to disqualify all bids that differed by 10–15% from their estimated contract cost. The summary of consulting services is shown in Appendix 8.

J. Performance of Consultants, Contractors, and Suppliers

26. Three independent local consulting firms were appointed to undertake the detailed design for tributary river improvement works to speed implementation. The detailed design for two river improvements, on the Bohol and Gisir, was carried out in-house by DID staff. Technical inputs provided by the consultants were generally of satisfactory quality. Construction quality supervision and design updates were satisfactory.

27. The Project provided for 61 person-months of international consultancy and 1,159 person-months of local, for a total of 1,220 person-months. More than 60% of the international consultant inputs were for the IRBM component, while 63% of the local consultant inputs were for tertiary river corridor improvements. The project completion report (PCR) found that the Project had utilized 69 person-months of international consultancy and 346 person-months of local, or only 40.6% of the budgeted cost.

28. The study and formulation of the Kuala Lumpur Flood Mitigation Master Plan (2003) utilized 49 person-months of international consultant inputs and 156 person-months of local. This study was not planned at appraisal, but arose from the Government priority set in 2001 to focus on solving frequent and severe flooding of the city center. Consultant inputs planned to assist in project implementation were diverted to this study. This study proposed additional flood mitigation components such as (i) constructing the Klang River bypass (SMART tunnel), (ii) constructing the flood detention storage system in the Bonus catchment area, (iii) upgrading the Gombak diversion system (or Batu detention pond storage), (iv) constructing the Keroh diversion and enlarging the Jinjang ponds for flood detention, and (v) upgrading the mechanical gate system of the Klang Gate Dam. This study's main recommendation was accepted by the Government; some of the proposed recommendations have been implemented and some are awaiting implementation. The low utilization of consultant input was due to the reduced scope of some project activities and some river corridor design work being performed with Government resources. The change of scope was not specifically reflected in the project performance report but was mentioned in ADB review mission reports. Overall, the consultants performed satisfactorily during project implementation. The performance of contractors and suppliers was also satisfactory.

K. Performance of the Borrower and the Executing Agency

29. The performance of the Borrower was generally satisfactory. The Government established the necessary imprest account and generally met counterpart fund requirements. The performance of the EA was also generally satisfactory. DID successfully undertook its role as the EA and fulfilled its responsibility for project implementation, coordination and supervision. DID assigned competent staff for project administration.

30. The project scope was very broad and complex, requiring for implementation the roles of many agencies and local councils. DID set up a project implementation unit with staff drawn from only itself and was able to implement the project interventions under its jurisdiction such as flood mitigation, but was less effective in implementing measures that were not under its direct control, such as water quality improvement, institutional and legislative measures, and improving solid waste management. For effective implementation, DID should have drawn fulltime officers from local governments and partner agencies.

31. The Project's effectiveness in managing the river basin in an integrated way was not adequate. As a result, DID implemented the Project with its focus predominantly on flood control

and drainage, without close interaction with, or the involvement of, DOE, Fisheries Department, or local councils, all of whom were responsible for issues related to water quality and environmental improvement. A holistic river basin planning and implementation arrangement was not adopted. Overall, DID's performance was partly satisfactory during project implementation.

L. Performance of the Asian Development Bank

32. Through nine review missions from 1997 to 2005, ADB monitored the physical and financial progress of the Project and identified implementation problems. ADB approved an extension of the loan closing date from 30 September 2003 to 30 September 2005. Overall, ADB's performance is rated only partly satisfactory during the project implementation, as the project review missions failed to adequately alert the Government to the lack of attention given to the environmental activities under the Project and because environmental specialists were not included in ADB review missions even though it was an environmental project.

III. EVALUATION OF PERFORMANCE

A. Relevance

33. The Project is consistent with ADB's country strategy and the Government's development objectives. The Project's integrated approach to river basin management is relevant to the Government's and ADB's objectives of improving the environment, protecting natural resources, reducing flooding in urban centers, and developing self-sustaining and self-reliant community groups that can enhance their quality of life.

34. The Project provided impetus and increased awareness among all stakeholders of the IRBM approach in managing land, water, and other natural resources, including optimizing the use of those resources in a sustainable and productive manner. The Project provided impetus to DID in its efforts to promote the adoption of the MASMA model for all river basins in Malaysia, to ensure that future land-use planning and river basin management incorporate ecological and social requirements. The Government has set an objective of achieving Class IIB water quality (water quality that is suitable for recreational use and protecting sensitive aquatic species) in the Klang River basin by the year 2020. To achieve this, pollutant loads from construction will need to be dramatically reduced, as will watershed degradation; deforestation; and domestic, municipal, and industrial waste discharges. In 2007, the Government enacted the Solid Waste and Public Cleansing Management Act, which mandates sorting solid waste at source.⁶ The newly formed National Solid Waste Management Department and the Solid Waste and Public Cleansing Management Corporation will now be responsible for ensuring the proper disposal of solid wastes, aspiring to eliminate discharges of waste into the river. The Government's plans and programs have been in line with and relevant to the goals and objectives set in the project framework. Overall, the project is rated as relevant.

B. Effectiveness in Achieving Outcome

35. The Project achieved part of its objective of improving environmental conditions and fully achieved its objective of minimizing the adverse economic, social, and environmental impacts of flooding. The main shortcoming in the project was the failure to improve water quality in the Klang River or implement the sediment-trapping program. The target set at appraisal was to

⁶ Government of Malaysia budget for 2008, presented to parliament on 8 September 2007.

reduce water pollution in the river system by half and to increase the fish population by 20% by 2003. About 130,000 cubic meters of river sediment was to be trapped annually.

36. At PCR, the water quality of the Klang River remained substantially degraded (Class IV) in over 90% of its length. Class IV designation characterizes the water as adequate for most agricultural uses but unsuitable for aquatic life, drinking, or swimming. High water quality is available only in headwaters, where little urban development takes place.

37. The Government departments responsible for managing various aspects of river water are DOE and DID, along with local government authorities. DOE plays the major role in water quality management with respect to emission control, licensing, and monitoring. Other authorities such as the Town and Country Planning Department administer regulations that influence water quality. Coordinating the activities of all these organizations is essential to ensure effective control of waste discharges. While DID promotes control of pollution at the source, enforcement power lies with DOE, which is responsible for enforcing regulations on all aspects of the environment including haze and other air pollution problems, illegal logging, soil erosion, biodiversity conservation, and improving water quality. The Project failed to establish a special unit comprising DID and DOE staff to monitor and control pollution discharges into the Klang River system.

38. The project objective to control sediments was not considered a priority by DID. Responsibility for controlling soil erosion was transferred to land developers with DOE and DID monitoring their land-clearing activities. The approach has been successful in less hilly areas downstream from the city center but less successful in upstream hilly areas. DID is of the opinion that sediment traps are too ineffective to deploy, as they can trap only 30% of sediments at best.

39. The project plan for developing a wetland sanctuary to serve both as a water retention pond and as a wildlife habitat was discontinued because the state government preferred to earmark this area for commercial development. The national wetland at Paya Indah was developed instead to serve the new townships of Putrajaya and Cyberjaya, which does not benefit the Klang River basin. Overall, the Project is rated as less effective.

C. Efficiency in Achieving Outcome and Outputs

40. The Project achievement of its output targets was variable. The main project benefits for the different components estimated at PCR and appraisal are as follows:

- (i) **Integrated River Basin Management.** This component has reduced flooding for some 12,000 ha of flood-prone land in the project area, or only about 30% of the estimated target area of 38,700 ha at appraisal, based on the feasibility study report covering the entire Klang River basin.
- (ii) **Solid Waste Management.** The target at appraisal of a 30% reduction in solid waste disposal in waterways was apparently optimistic. The master plan study⁷ indicates that the total volume of solid waste entering the Klang River system annually ranges from 170,000 to 280,000 tons, and only about 10% of this amount is collected at the trapping boom sites. The economic analysis used 10% reduction as the benefit from solid waste removal component.

⁷ Dr Nik & Associates Sdn Bhd, DHI and SMEC. 2003. *Klang River Basin Environmental Improvement and Flood Mitigation Project*. {CITY}

- (iii) **Sediment Removal.** At appraisal, it was estimated that 130,000 cubic meters of sediment was to be trapped annually by the Project, but this component was not implemented.
- (iv) **Tributary River Corridor Improvement.** The main direct benefits of this component were reductions in annual flood damage, vehicle operating costs, and time savings in flood-prone areas. These benefits were calculated based on estimated flood damage for three average recurrence intervals (ARIs) of 100, 10, and 2 years. At appraisal, this benefit was estimated at RM14.02 million. The PCR estimate of RM13.0 million is marginally lower. This component also reduced flooding in areas adjacent to tributaries that underwent improvement. Some 1,200 ha of such land benefited from these improvements, or less than half of the appraisal estimate of 2,500 ha.
- (v) **Flood Forecasting and Warning System.** The direct benefit has been assessed at 35% of the annual flood damage reduction attributable to the river tributary corridor improvements. This includes savings in vehicle operating costs and shorter waiting times with the reduction in flood incidents

41. At midterm review in 2001, the Project's economic internal rate of return (EIRR) was estimated at 13.6%, as compared with the appraisal estimate of 14.9%. The midterm reevaluation took into consideration the 2-year delay in project implementation, but it essentially used the project benefits identified at appraisal. The midterm report indicated that the benefits identified were about 50% lower than the estimates expected at appraisal, and that, despite using conservative estimates of project benefits, the Project remains economically viable when measured against ADB's criteria of 12%.

42. At PCR, it was found that there were substantial changes in project benefits. The main project benefits were derived from reductions in both direct and indirect flood damage costs and increases in property value. The benefits from sediment removal, solid waste disposal, tourism, and carbon sequestration became insignificant because related project activities were not implemented. Total project benefits remained high due to substantial reduction in flood damage and increases in property value as a result of rapid urban development in the river basin, which was not forecasted during appraisal. The project EIRR at PCR was estimated at 15.1%. Despite the 5-year delay in project implementation, it remained economically viable when measured against the opportunity cost of capital at 12%. With project viability set at an EIRR of 12%, sensitivity analysis indicated that the Project remained viable with as much as a 15% reduction in benefits but becomes unviable at 20%. Overall, the project efficiency is rated as less efficient. Switching value analysis indicates the project remains viable with a 16.1% decrease in benefits.

D. Preliminary Assessment of Sustainability

43. The sustainability of the Project appears to be promising as the Government has placed a high priority on flood control and environmental mitigation. Additional funds estimated at \$700 million have been provided from 2003 to 2007 to implement a comprehensive flood-mitigation project for Kuala Lumpur and its surroundings. After the severe floods of 10 June 2007, an additional RM100 million has been allocated for developing a retention pond to reduce flooding in the Klang River basin. The implementation of the PELAWI II and the Storm Water Management Plan by the newly formed Government Committee on Integrated River Basin Management are promising developments. In addition, local government commitment to the future implementation of MASMA provides hope for a holistic reduction of water peak flows and improvement in water quality in the river basin.

44. There is some uncertainty regarding funding of operation and maintenance (O&M), which remains primarily the responsibility of city councils and district governments. Local governments depend on taxes that they collect annually from commercial and residential properties. Large cities such as Kuala Lumpur and Klang, with highly developed commercial buildings, have adequate funds for O&M of rivers and tributaries flowing through their areas, but some less developed districts have to rely on Government funding for O&M. Overall, project sustainability is rated as likely.

E. Impact

45. The Project's impact on the environment has been marginally positive. Some environmental improvements were associated with the relocation of squatters and the reduction in solid waste and sewage flowing directly into the waterways. The main benefit was the reduction in environmental damage in conjunction with reduced flooding in areas where river corridor improvements took place under the Project.

46. **Water Quality Impacts.** At appraisal, the target was a 50% reduction in water pollution and 20% increase in fish population by 2003. These improvements were to be achieved through reduced soil erosion, the removal of sediments and solid waste, and better control of municipal and industrial effluent discharges into the river system. Water quality was expected to improve from Class III and IV (poor to very poor) to Class II and III. Project documents did not set out water quality parameters that should be monitored to achieve desired targets, and DID did not monitor water quality throughout the period of project implementation. The water quality data from between 1995 and 2001 in the Ampang River, a tributary of the Klang, indicated little change in water quality over this period, with relatively elevated levels of suspended solids and chemical oxygen demand. The rising levels of chemical oxygen demand indicate the increasing contribution of industrial discharges in the river basin. Although some progress has been made in reducing discharges into the river basin in recent years, water quality in large areas of the Klang River basin is still Class III and IV.

47. **Social Impacts.** The Project resettled 620 squatter families (out of the appraisal target of 640 families) at a cost of RM14.95 million, or RM24,000 per family. At appraisal, the monthly household income of squatter families that were interviewed ranged from RM655 to RM1,965, with an average of RM1,441 in 2007 constant values. The average squatter family income in 2007 was estimated (with no actual data available) at RM2,900 per month, showing an increase in income of about 100%. The Project did not focus on raising the income of poor households in the project area, as the feasibility study did not identify any poor families in the squatter areas. However, the Project's squatter relocation program was successful and provided good new homes and amenities, and this resulted in socioeconomic improvement to the lives of relocated people, better aesthetics in the river corridor areas, and general improvement in the quality of life for residents of the river corridor area.

IV. OVERALL ASSESSMENT AND RECOMMENDATIONS

A. Overall Assessment

48. The Project forms only a small component of the overall Government flood-mitigation and environmental-improvement program for the Klang River basin. At the time of project inception, the Government was already implementing its own program, which had all the subcomponents included in the Project. Many of the environmental-improvement activities like

solid waste management, sediment trapping, river beautification, and demonstration projects were not completed. Some of these activities were considered redundant, infeasible, or low priority by DID and hence were not implemented. Based on the level of achievement of project outputs in terms of relevance, efficiency, effectiveness, and sustainability, the Project was rated partly successful (Appendix 13).

49. The Project provided consulting services to help DID design and implement all five main project components. The recruitment of consultants was delayed for 3 years, and the scope of consulting services was expanded to prepare a master plan for the Klang River Basin. This master plan proposed additional project components estimated at \$700 million, including the (i) SMART Project, to divert flood water at the confluence of the Klang and Ampang river prior to its flow into the city center; (ii) upgrading of Gombak diversion and Batu pond flood mitigation system; and (iii) development of the Keroh diversion and Jinjang ponds flood mitigation system.

50. Since 2001, DID has promoted the adoption of MASMA by state and district governments, and many of them have adopted its recommendations. The Government has recently allocated funds for developing 28 former mining ponds into storm water retention ponds to reduce the severity of flooding.

51. Project deficiencies include lack of attention given during project implementation to achieve the environmental goals set at appraisal. Implementation delays reduced the efficiency of the Project, as many of the anticipated benefits were either delayed or reduced.

52. There was a year's delay between loan approval and loan signing. Subsequently, the belated appointment of consultants further delayed implementation by another 3 years. In view of this delay, ADB agreed to a DID proposal that some packages, especially the detailed design of some civil works that did not require foreign specialists' input, be removed from the Project. Local consultants were engaged to carry out the detailed design, and these components were fully funded by the Government.

53. The delays in implementation affected four project components: (i) solid waste management, (ii) sediment trapping, (iii) demonstration projects, and (iv) the flood forecasting and warning system. In many cases, detailed design and tender documents were completed but the components were not implemented for the following reasons: (i) identified subprojects under the components listed above were no longer deemed as priorities by the Government, in view of the completion of similar activities funded by the Government; (ii) the implementation of other measures such as control of discharges at the source to reduce silt runoff and wastewater discharges into the river system; (iii) the emergence of new problems such as riverbank erosion; and (iv) the urgency of implementing commercial development, which could not afford to wait for the demonstration projects to allow the integration of those findings and concepts into site design.

54. The initial year of the Project coincided with the onset of the Asian financial crisis. In the first 3 years of project implementation (1998 to 2000), less than 3% of the loan was disbursed.

55. The Project was classified as environmental improvement, but it did not fund any component for environmental improvements and there was no provision for recruiting environmental specialists as consultants. DID was not advised by ADB review missions to collect crucial data on water quality and fish population. Environmental issues were not raised during ADB's annual and midterm review missions. Although the project was classified as a

water-quality and environmental-improvement project, the priority focus of DID was on flood control and drainage in urban areas.

56. There was little coordination with DOE in the implementation of Project's environmental components such as solid waste management, sediment traps, water quality improvements, etc. The Project initially was focused predominantly on flood mitigation and considered only end-of-pipe pollution-control measures such as sediment ponds and solid waste log booms, rather than focus on construction site runoff, solid waste source controls, and vigorous public awareness campaigns.

B. Lessons

57. During implementation, there was a need for rigorous review of project activities proposed at appraisal to evaluate their feasibility. With rapid urbanization in the Klang River catchment, the project scope should have been modified to quickly respond to changing conditions. ADB review missions could have been strengthened with more technical specialists, including environment specialists, to analyze the changing civil works and environmental requirements and to advise ADB management and the Government on the best use of the project funds to achieve desired outputs and outcomes.

58. Project consultants could have been recruited using advance procurement procedures, as their timely engagement was essential to ensuring that project components were implemented on schedule for maximum benefit.

59. The project administration memorandum should have provided explicit provisions for budget and implementation arrangements for improving water quality, river corridor development, watershed management, municipal and industrial pollution control, and environmental monitoring. Although water quality and environmental improvement was to be a major outcome of the Project, the involvement of DOE in project implementation was minimal. The provision of specific funding for environmental improvement and the involvement of DOE and city councils as project implementing agencies was a crucial missing link in project implementation. This was particularly important because the primary mandate and focus of DID was drainage improvement and flood control, and not environmental improvement. The review missions could have included environmental specialists to advise DID on incorporating measures into the project design to mitigate adverse impacts on the environment and meet environment targets set at appraisal.

60. Basin-level flood control and environmental improvement is a dynamic and holistic activity. Although the Project funded a study to assess IRBM issues, the commencement of the study took 3 years, or almost half of total duration of the Project. The study recommended drastic revisions to many proposals made during the feasibility study and appraisal. Time was inadequate to implement these revised findings during the remaining implementation period. For an IRBM project, watershed-level strategic assessment, including strategic environmental assessment, could have been conducted early in the process. It is also important to have clear understanding of government procedures, mandates, priorities, institutional capacities, and development trends in the feasibility study stage, to design the project without duplicated effort. Related government activities outside the project scope could have been closely monitored to ensure a more realistic project design.

61. EAs tend to focus their efforts on resolving politically sensitive and important pressing issues (e.g., the flooding problem in Kuala Lumpur) without having time to give adequate

thought to interventions' downstream impacts (e.g., downstream water volume and quality and the potential for erosion and sedimentation), including the need to consider the views of the downstream communities. It is important to recognize and address these views and issues before embarking upon solving pressing issues.

62. The Project did not provide any funds for monitoring project benefits, and this activity was not undertaken by the Project. DID conducted its own monitoring of all activities, but no specific data was collected or submitted to ADB on the impact of this Project, as was required by project appraisal and the project implementation memorandum.

C. Recommendations

63. Cooperation should continue between ADB and the Government in river basin management, flood mitigation, and environmental improvement through river basin management training, workshops, forums, and regional technical assistance. Regional cooperation would result in the cross-fertilization of ideas, benchmarking efforts, and the mainstreaming of lessons learned. The possibility of pursuing regional cooperation in urban storm water management exists, especially from an environmental standpoint, as Government is currently focusing attention on stormwater quality issues and is also interested to share and exchange information on a regional level.

64. The Government should consider a suitable institutional arrangement to implement recommendations of the ADB-funded 2003 final report on the Klang River Basin Environmental Improvement and Flood Mitigation Project (Basin Master Plan), with particular emphasis on water quality and environmental aspects through the active participation of federal, state, local, community, and private sector partners. Upstream and downstream issues should both be considered in project planning and design, with the active participation of all stakeholders, including civil society and private sector partners.

1. Project Related

65. **Future Monitoring.** DID may consider establishing realistic performance indicators for future projects and closely monitor implementation activities against those indicators. DID needs to regularly evaluate the compliance of city councils and local government authorities with applicable Government regulations. A reliable and adequate computer database is essential for effective managing the river system. As DID moves towards obtaining ISO 9001 certification, priority should be given to setting up an effective unit for monitoring and enforcement. The range of monitoring activities may include the following: (i) land-use plans, (ii) development-control standards, (iii) building standards, (iv) runoff controls, (v) solid waste collection, (vi) wastewater-disposal regulations, and (vii) compliance with MASMA guidelines.

66. **Further Action or Follow Up.** The following may need follow-up action from DID: (i) continued development of effective institutional arrangements for IRBM; (ii) implementation of a water quality-management plan developed under the IRBM master plan (2003), (iii) implementation of a program to control soil erosion and sedimentation following MASMA guidelines, (iv) regular upstream and downstream community participation and training in IRBM programs and (v) submission of audited financial statement for FY 2005 to ADB.

67. There is a need for a single organization to be responsible for planning, implementing, monitoring, and enforcing the IRBM master plan (2003). This organization could be set-up by reconstituting and strengthening the existing Klang River Planning Council into the Klang Basin

Management Council (KBMC). The existing council is a senior committee formed in 1981 and chaired by the Prime Minister. The proposed KBMC could take steps to ensure strict enforcement of current Government regulations prohibiting the development of land under forest cover in sloping upper-catchment areas. Emphasis could be given to controlling the quality and quantity of runoff on site. KBMC and local development plans should integrate environmental-enhancement measures. A comprehensive policy on floodplain management could be formulated to incorporate the consideration of social, economic, and environmental issues. DID could be made the lead agency to develop a program of best practices for controlling erosion and sediments at construction sites. A comprehensive program of public education and awareness could be drawn up to introduce the broader concept of IRBM and specific issues such as water quality, solid wastes, and erosion- and runoff-control measures. This will require regular public education through newspaper articles, videos, pamphlets, and meetings. Special focus should be directed at school children.

68. **Additional Assistance.** Assistance should be provided for building capacity at all levels of government, especially for the district authorities that will be at the forefront of IRBM implementation. District governments should be provided with adequate funds to upgrade sewage treatment plants to treat all effluent discharged into waterways. Support should be provided to DID to develop a comprehensive database of relevant natural resources and human activities in the basin and to monitor important indicators of river water quality and fish population. DID could work closely with DOE to ensure that regulations to protect the environment are strictly enforced. Adequate funds should be provided to undertake comprehensive public awareness and education programs on environmental and solid waste-management issues in the river basin.

69. **Timing of the Project Performance Evaluation Report.** An evaluation of the impact of the Project toward mitigating flood damage and improving the environment should be carried out 3 years after project completion.

2. General

70. For future projects in Malaysia, the following actions are recommended.

- (i) The project lessons learned showed that there were considerable delays in project implementation due to differences in procurement procedures between ADB and the Government of Malaysia. In addition, lack of attention was given by ADB to flexibly adjust to the scope of the project based on the changing project conditions and Government priorities. It is recommended that future ADB projects consider approaches that are consistent with country procedures and also take necessary prompt actions on-time to revise project scope as needed, so as to efficiently and effectively implement ADB projects in the context of a middle income country like Malaysia.
- (ii) The environmental aspects of the project were not given adequate attention during project implementation. For projects with environmental orientation, it is recommended that ADB's review missions should include environmental specialist/engineer and the project design should provide necessary incentives and institutional arrangements so that country's environmental agencies can effectively participate in the environmental aspects of project implementation. It is recommended that ADB review missions ensure that the project monitoring and evaluation data are collected on-time and the findings are used as a feedback for continuous improvement of the project during implementation.

PROJECT FRAMEWORK

Design Summary	Performance Indicators/Targets	Assumptions and Risks	Achievements
<p>Goals</p> <p>1. Improve environmental conditions, including those that worsen flooding, through an integrated river basin management approach that addresses environmental and economic development needs.</p> <p>2. Minimize the adverse economic, social, and environmental impacts of flooding in the Klang River basin.</p>	<ul style="list-style-type: none"> • Total soil erosion in the catchment area will be reduced from 2.3 million tons (t) per year to 1.5 million t per year by 2003. • Watershed conditions generally improved, including preservation of the 1,800 hectare (ha) Malaysia Wetland Sanctuary, Selangor (MWSS), which has significant ecological value. • Uncollected solid waste reduced by 30% from 150,000 t per year by 2003. • River water quality and fish life in the rivers is improved, and recreational and aesthetic value of river corridors is increased. • \$17 million in losses from floods in the Klang River basin will be avoided annually from 2003 onward as a result of the overall Klang River basin environmental improvement and flood mitigation program. 	<p>Assumptions</p> <ul style="list-style-type: none"> • The Project is accorded high priority, and the Government budgets adequate funds. • An effective institutional structure for integrated river basin management is established. • Demonstration subcatchment management projects are successfully replicated, and other environmental improvement programs are adopted and sustainably operated. • Adequate operation and maintenance (O&M) funding is provided, and flood control works are sustainably maintained and managed. • Coordination among the various agencies involved in the Project is effective. 	
<p>Objectives</p> <p>1. Implement integrated river basin and solid waste management to improve quality of the Klang River basin environment.</p>	<ul style="list-style-type: none"> • 630,000 cubic meters (m³) of sediment will be trapped annually, including 130,000 m³ by project sediment traps, and the sediment load in tributary rivers will be reduced by 35% from about 560,000 m³ to 364,000 m³ per year by 2003, to achieve a Class III standard in 	<p>Assumptions</p> <ul style="list-style-type: none"> • Integrated catchment management and other environmental and flood mitigation measures are undertaken in a timely manner. • Public cooperates in solid waste management program. 	

Design Summary	Performance Indicators/Targets	Assumptions and Risks	Achievements
<p>2. Provide a high level of flood protection to tributary rivers and downstream communities through structural flood-mitigation measures.</p>	<p>the Klang River.</p> <ul style="list-style-type: none"> • Soil erosion loss will be reduced by 35% from the existing level of 30 t to 19.5 t per ha per year by 2003. • Reduction in uncollected solid waste by 30% from 11,000 t per year to 7,700 t per year by 2003. • 19,800 t of carbon sequestered annually by the MWSS, and biodiversity preserved. • Fish life in tributary rivers increased by 20% and water pollution reduced by 50% by 2003. • River corridors will be made suitable for recreational activities, and aesthetic value improved. • \$6.2 million in losses from property damage and disruption of transport and business activities will be saved annually by the Project from 2003. 	<ul style="list-style-type: none"> • River corridor improvement measures are implemented on time. • Land is acquired and squatters are compensated and resettled without delays. <p>Risk</p> <ul style="list-style-type: none"> • Once-in-100-year flood may occur before project completion, causing significant damage. <p>Assumption</p> <ul style="list-style-type: none"> • Adequate O&M of sediment traps occurs and ponds are available for use as traps. 	
<p>Project Components</p> <p>1. Integrated river basin management (IRBM)</p>	<ul style="list-style-type: none"> • Planning and coordination of Klang River basin improved through integration of three ongoing environmental improvement and flood mitigation programs, revised institutional arrangements, training in IRBM techniques, and monitoring and enforcement. 	<p>Assumptions</p> <ul style="list-style-type: none"> • Community support for IRBM groups is strong, and recommendations of groups are implemented. • Conservation laws in the catchment area are effectively enforced. 	<p>Study final report circulated to relevant agencies and authorities for adoption and guidance. Some of the study recommendations had been adopted by relevant agencies and planning authorities, including local councils.</p> <p>Flood mitigation projects now adopting environmental approach (control at source, water quality consideration, etc.). The Klang Valley Planning Council working committee (supported by the Federal Territory Development and</p>

Design Summary	Performance Indicators/Targets	Assumptions and Risks	Achievements
<p>2. Solid waste management</p>	<ul style="list-style-type: none"> • Prepare strategic IRBM plan for the basin and implement it. • Implement three demonstration IRBM projects. • Implement river corridor beautification, fish life rehabilitation, public education, and water pollution control programs. • Implement special solid waste collection services for currently under serviced areas. 	<ul style="list-style-type: none"> • Privatization program works effectively and concerned consortium is adequately monitored. 	<p>Klang Valley Planning Division, under the Ministry of Federal Territory) currently coordinates and oversees land-use planning in the area. Flooding and environmental issues are included as among those to be addressed.</p> <p>IRBM strategic plan for Klang River basin has been formulated. The plan, as included in the study final report, has been circulated to relevant agencies and authorities for implementation and adoption.</p> <p>IRBM demonstration projects in Taman Eng Ann, Klang, were to focus on flood mitigation by creating flood detention ponds. Detailed design for the proposed works was completed, but implementation was held back by lack of funds. The land development demonstration project was to focus on soil erosion control measures at the construction site. Lot 1918, Jalan Puchong, was to focus on soil erosion control during housing development and runoff minimization. The Ampang River water quality improvement project only collected data and carried out a preliminary assessment. All three of these demonstration projects could not be implemented because they were overtaken by events.</p> <p>Only river beautification through river-cleaning activities was done, but not using project funds. Government has developed guidelines to ensure that all flood mitigation projects incorporate environmental measures (construction site runoff pollution control at source) to improve aquatic and recreational uses.</p> <p>Not implemented under the project, but Government supporting it separately from the project.</p>

Design Summary	Performance Indicators/Targets	Assumptions and Risks	Achievements
3. Sediment trapping	<ul style="list-style-type: none"> • Install seven mechanical trash booms. • Designate the MWSS as a Ramsar site and gazette protection of the MWSS. • Improve and clear rubbish booms and trash screens. • Four sediment traps constructed or improved by 2000. 	<ul style="list-style-type: none"> • Land acquired, and consultants recruited without delays. 	<p>Detailed design for the seven proposed trash booms was completed but not implemented.</p> <p>Government decided not to use Rasau Swamp as a flood detention pond for the Klang River. The Klang River Flood Mitigation Project was revised with other options including the Storm Water Management and Road Tunnel and Kuala Lumpur Flood Mitigation Project Package 2. Both these projects are ongoing and expected to be completed by 2007.</p> <p>Several local councils have adopted recommendations from the Klang River basin master plan study, including, for example, providing services to more areas, in particular improved services to hot spot areas, such as cleaning up night markets immediately after closing.</p> <p>2 packages designed but none constructed.</p> <p>Detailed design for two sediment traps on the Damansara and Kuyoh rivers were carried out. Technical analysis indicated that two other proposed sites were not suitable or economic.</p>
4. Tributary river corridor improvement	<ul style="list-style-type: none"> • Eight tributary corridors improved by 2002. • Three bridges constructed by 1999. • About 640 squatter families relocated by 2001. • Improve flood warning system to provide warning not less than 3 hours before flood occurs by 1999. 	<ul style="list-style-type: none"> • Government has adequate experience in land acquisition and relocating squatters to minimize delays. • Competent consultants and contractors are appointed. • No delays in payments or procurement • Reliability of predictions is sufficient to gain public support. 	<p>International consultants under the project completed detailed design for two rivers out of eight. Five tributary river improvements were completed with project funds.</p> <p>Completed.</p>
5. Flood Forecasting and Warning System	<ul style="list-style-type: none"> • Improve flood warning system to provide warning not less than 3 hours before flood occurs by 1999. 	<ul style="list-style-type: none"> • Reliability of predictions is sufficient to gain public support. 	<p>620 squatter families relocated. The flood forecasting system (Flood Watch) has been installed and is used. Flood warning cannot be provided</p>

Design Summary	Performance Indicators/Targets	Assumptions and Risks	Achievements
			more than 3 hours before flooding occurs in most parts of Kuala Lumpur city center because of the short lag time.
<p>Activities</p> <ol style="list-style-type: none"> 1. Integrated river basin management <ul style="list-style-type: none"> • Institutional structure for IRBM: <ul style="list-style-type: none"> - Establish IRBM working committee - Recruit consultants - Establish three subcatchment IRBM groups - Propose and establish more permanent IRBM institutional arrangements • Demonstration projects: <ul style="list-style-type: none"> - Select three demonstration IRBM schemes - Prepare management plans for three sub-catchments - Demonstrate erosion control and rainfall runoff measures - Prepare detailed erosion and rainfall runoff control guidelines - Prepare conservation plans for former mining ponds. • IRBM strategic plan: <ul style="list-style-type: none"> - Integrate existing legislation and prepare new legislation - Prepare strategic IRBM plan for the entire basin • Training and public participation: <ul style="list-style-type: none"> - Conduct 16 workshops and/or seminars and site visits to 	<ul style="list-style-type: none"> • \$15.3 million • 84 person-months of consultant services 	<p>Assumptions</p> <ul style="list-style-type: none"> • Effective coordination of numerous federal and local agencies occurs. • A program steering committee chaired by the Ministry of Agriculture exists for managing the Klang River basin program. 	<p>These achievements are same and corresponds to related activities described for project components above.</p>

Design Summary	Performance Indicators/Targets	Assumptions and Risks	Achievements
<p>demonstration schemes</p> <ul style="list-style-type: none"> - Prepare checklist for local enforcement staff - Undertake public consultation campaign <ul style="list-style-type: none"> • MWSS: <ul style="list-style-type: none"> - Carry out detailed studies of the MWSS - Gazette the MWSS as a protected area • River beautification: <ul style="list-style-type: none"> - Undertake landscaping - Undertake seminars, lectures, dialogue meetings, and radio and/or television broadcasts - Identify pollution sources and enforce regulations - Introduce about 1 million fish and prawn fry <p>2. Solid waste management</p> <ul style="list-style-type: none"> - Prepare and improve collection sites - Procure equipment and improve trash booms - Recruit consultants <p>3. Sediment trapping</p> <ul style="list-style-type: none"> - Design and construct sediment traps - Acquire land - Construct works - Operate traps. <p>4. Tributary river corridor Improvement</p> <ul style="list-style-type: none"> - Survey and design works, - Acquire land and resettle squatters - Construct works. <p>5. Flood forecasting and</p>	<ul style="list-style-type: none"> • \$9.6 million • 17 person-months of consulting services <ul style="list-style-type: none"> • \$3.8 million • 46 person-months of consulting services <ul style="list-style-type: none"> • \$64.5 million • 1,043 person-months of consulting services 	<ul style="list-style-type: none"> • No delay in appointment of program manager and other project staff. <ul style="list-style-type: none"> • No delays in provision of local funding 	

Design Summary	Performance Indicators/Targets	Assumptions and Risks	Achievements
warning system - Procure equipment - Recruit consultants and implement improved systems.	<ul style="list-style-type: none">• \$1.8 million• 30 person-months of consulting services	<ul style="list-style-type: none">• Adequately trained staff available.	

TOTAL PROJECT COST

Table A2.1: Summary by Component (\$'000)

Item	Appraisal			Actual		
	Foreign	Local	Total	Foreign	Local	Total
A. Environmental Improvement						
1 Integrated River Basin Management	2,957	10,501	13,457	966	3,213	4,179
2 Solid Waste Management	3,775	4,560	8,335	0	0	0
3 Sediment Trapping	832	2,403	3,235	0	0	0
Subtotal Environmental Improvement	7,563	17,464	25,027	966	3,213	4,179
B. Flood Mitigation						
1 Tributary River Corridor Improvement Flood Forecasting and Warning	19,043	35,018	54,061	7,409	30,622	38,031
2 System	1,131	517	1,647	0	0	0
Subtotal Flood Mitigation	20,174	35,535	55,708	7,409	30,622	38,031
Total Costs	27,736	52,999	80,735	8,375	33,836	42,211
Physical Contingencies	3,575	4,719	8,293	0	0	0
Price Contingencies	2,015	3,894	5,909	0	0	0
Total Project Cost before Interest						
Construction	33,326	61,611	94,937	8,375	33,836	42,211
Interest during Construction	6,942		6,942	1,977	0	1,977
Total Project Cost	40,268	61,611	101,879	10,352	33,836	44,188

Source: Asian Development Bank.

Table A2.2: Summary by Component (RM'000)

Item	Appraisal			Actual		
	Foreign	Local	Total	Foreign	Local	Total
A. Environmental Improvement						
1 Integrated River Basin Management	7,400	26,200	33,600	3,669	12,210	15,879
2 Solid Waste Management	9,400	11,400	20,800	0	0	0
3 Sediment Trapping	2,100	6,000	8,100	0	0	0
Subtotal Environmental Improvement	18,900	43,600	62,500	3,669	12,210	15,879
B. Flood Mitigation						
1 Tributary River Corridor Improvement Flood Forecasting and Warning	47,600	87,500	135,100	28,099	116,365	144,464
2 System	2,800	1,300	4,100	0	0	0
Subtotal Flood Mitigation	50,400	88,800	139,200	28,099	116,365	144,464
Total Costs	69,300	132,400	201,700	31,768	128,575	160,343
Physical Contingencies	8,900	11,800	20,700	0	0	0
Price Contingencies	13,100	25,400	38,500	0	0	0
Total Project Cost before Interest						
Construction	91,300	169,600	260,900	31,768	128,575	160,343
Interest during Construction	17,300		17,300	7,513	0	7,513
Total Project Cost	108,600	169,600	278,200	39,281	128,575	167,856

Sources: Asian Development Bank and Government of Malaysia.

EXPENDITURE ACCOUNTS BY FINANCIER
(\$'000)

Categories	Appraisal			Actual		
	ADB	Government	Total	ADB	Government	Total
A. Investment Cost						
Civil Works	21,625	27,615	49,240	7,409	20,919	28,328
Vehicles	198	39	237	100	19	119
Equipment	3,261	703	3,963	9	4	13
Consulting Services	1,253	8,039	9,292	857	2,918	3,775
Training		128	128	0	0	0
Land Acquisition and Resettlement		14,954	14,954	0	9,704	9,704
River Cleanup Activities		10,110	10,110	0	0	0
Project Management		1,116	1,116	0	9	9
Total Investment Cost	26,337	62,704	89,041	8,375	33,573	41,948
B. Recurrent Costs						
Operating Costs		5,896	5,896	0	262	262
Total Disbursement Before IDC	26,337	68,600	94,937	8,375	33,836	42,211
Interest during Construction		6,942	6,942	0	1,977	1,977
Total Disbursement	26,337	75,543	101,879	8,375	35,813	44,188

Sources: Asian Development Bank and Government of Malaysia.

ADB YEARLY EXPENDITURES
(\$'000)

Categories	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
A. Investment Cost										
Civil Works	393	359	288	797	1,388	1,213	721	1,567	683	7,409
Vehicles			100							100
Equipment			9							9
Consulting Services				13	576	216	32		20	857
Training										0
Land Acquisition and Resettlement										0
River Cleanup Activities										0
Project Management										0
Total Investment Cost	393	359	397	810	1,964	1,429	753	1,567	703	8,375
B. Recurrent Costs										
Operating Costs										0
Total Disbursement Before IDC	393	359	397	810	1,964	1,429	753	1,567	703	8,375
Interest during Construction										0
Total Disbursement	393	359	397	810	1,964	1,429	753	1,567	703	8,375

IDC = Interest During Construction.
Sources: Asian Development Bank.

PROJECT IMPLEMENTATION SCHEDULE

Activity	1996				1997				1998				1999				2000				2001				2002				2003				2004				2005			REMARKS
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3					
1. Integrated River Basin Management																																				Study completed but recommendations not fully implemented.				
2. Solid Waste Management																																								Detail design completed but not Constructed.
3. Sediment Trapping																																								Detail design completed but not Constructed.
4. Tributary River Corridor Improvement																																				Detail design completed & construction in phases. Gisir still ongoing.				
5. Flood Forecasting and Warning System																																				Detail design completed but not procured.				

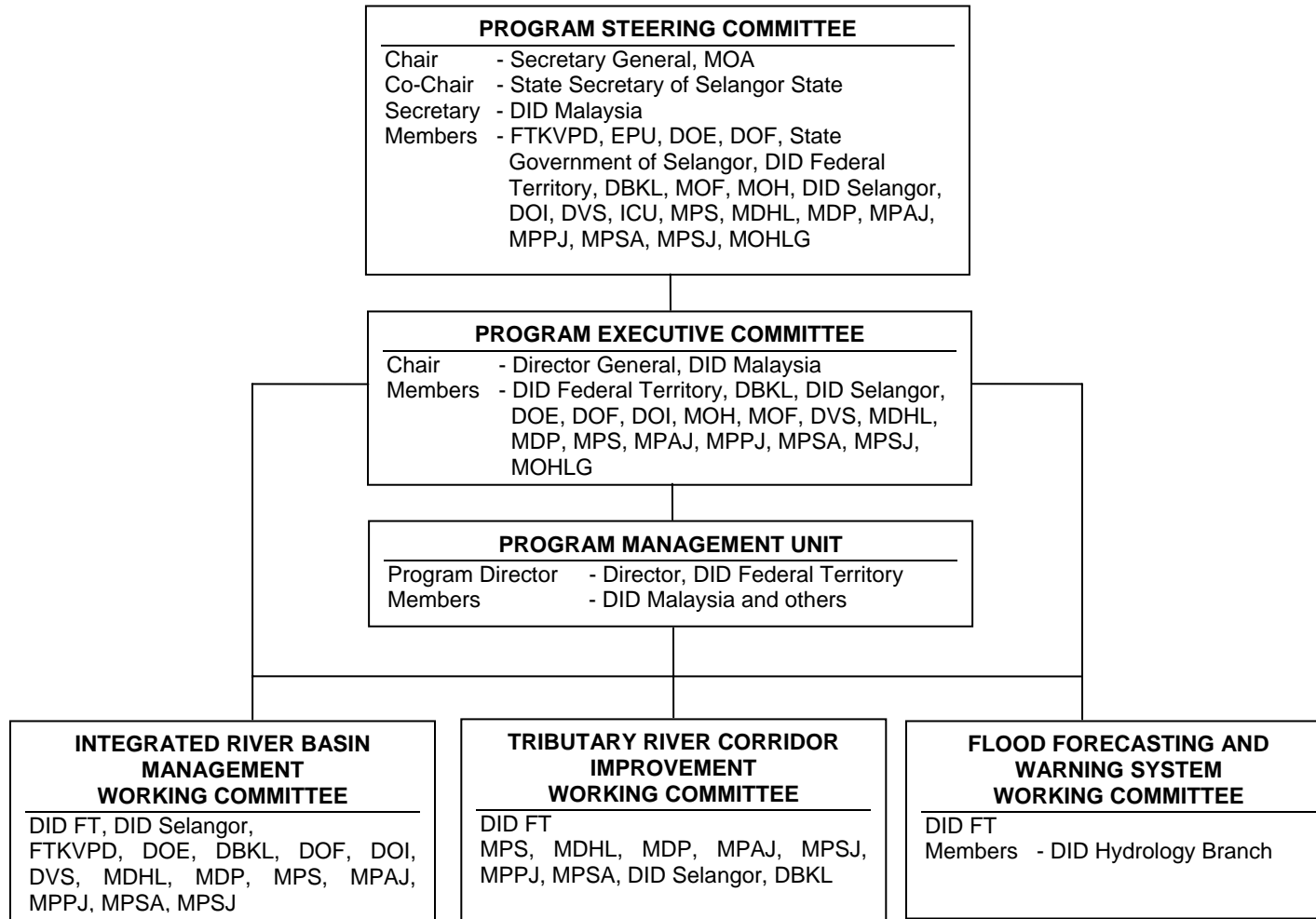
- Target Detailed Design and Preparation
- Target Implementation
- Actual Detailed Design and Preparation
- Actual Implementation

PROJECT PACKAGES AND IMPLEMENTATION SCHEDULE

Package No.	Works	Length (km)	Cost (RM million)	Actual Cost (RM million)	1997				1998				1999				2000				2001				2002				2003				2004				2005			
					1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Consulting Services		16.6																																					
	a) Survey and Investigation (River Improvement)																																							
	b) Detailed Design (River Improvement)																																							
	c) Supervision (River Improvement)																																							
	d) Sediment Trapping																																							
	e) Flood Forecasting and Warning																																							
	f) Integrated Catchment Management																																							
	g) Solid Waste Management																																							
2	Gombak River Improvement	9.0 + 1B	37.5																																					
	a) Land Acquisition		9.0																																					
	b) Resettlement		4.3																																					
	c) Construction		24.2																																					
3	Keroh River Improvement	3.0 + 1B	22.2																																					
	a) Land Acquisition		5.0																																					
	b) Resettlement		2.2																																					
	c) Construction		15.0																																					
4	Bohol River Improvement	0.8	1.9																																					
	a) Land Acquisition		0.3																																					
	b) Construction		1.6																																					
5	Kerayong River Improvement (Package A)	3.2	10.6																																					
	a) Construction		10.6																																					
6	Kuyoh River Improvement	5.5	20.6																																					
	a) Land Acquisition		1.0																																					
	b) Resettlement		1.6																																					
	c) Construction		18.0																																					
7	Ampang River	4.6	15.5																																					
	a) Land Acquisition		2.9																																					
	b) Construction		12.6																																					

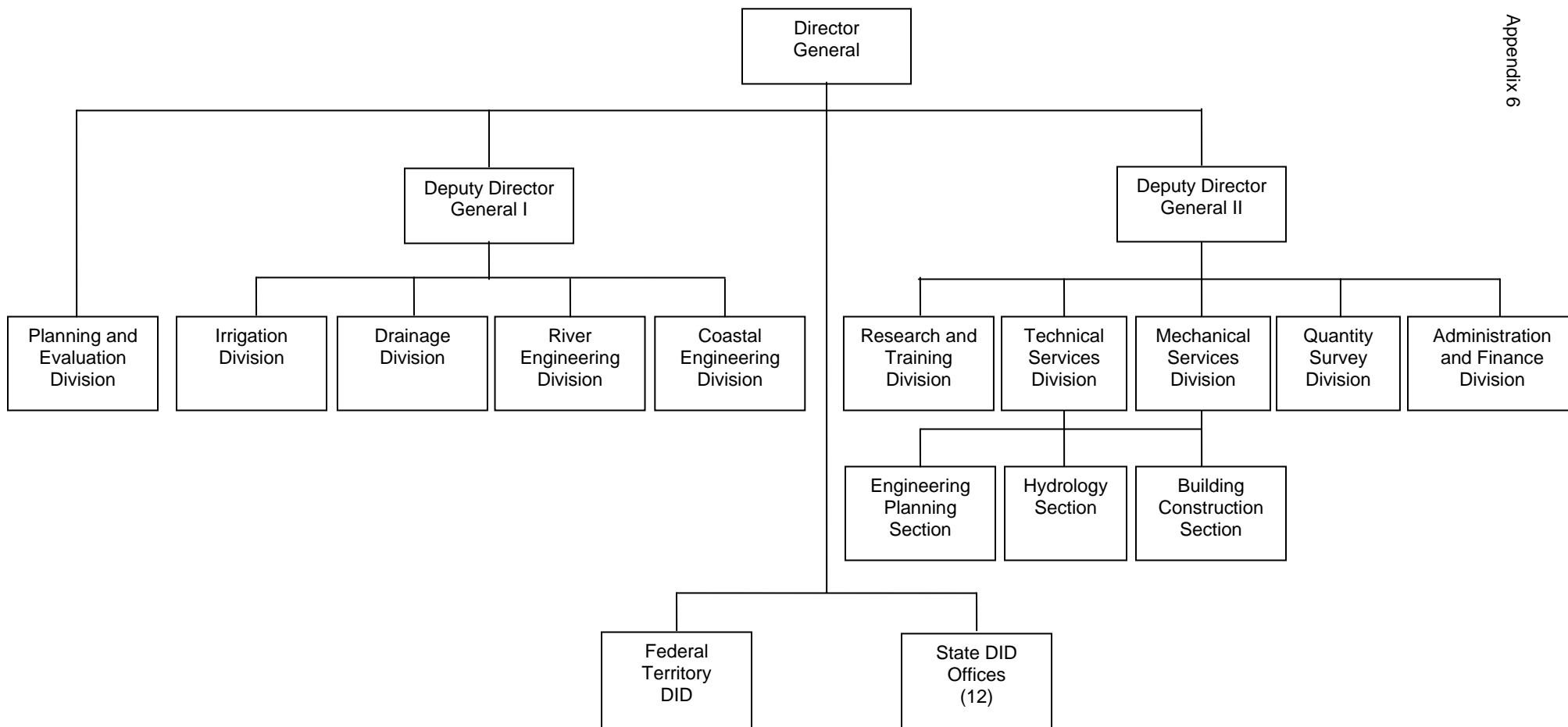
Target
 Actual

Figure A6.1: Project Organizational Structure



DBKL = Kuala Lumpur City Hall, DID = Department of Irrigation and Drainage, DOE = Department of Environment, DOF = Department of Fisheries, DOI = Department of Information, DVS = Department of Veterinary Services, EPU = Economic Planning Unit, Prime Minister's Department, FT = Federal Territory, FTKVPD = Federal Territory and Klang Valley Planning Division, Prime Minister's Department, ICU = Implementation Coordination Unit, Prime Minister's Department, MDHL = Hulu Langat District Council, MDP = Klang Municipal Council, MPAJ = Ampang Jaya Municipal Council, MPPS = Petaling Jaya Municipal Council, MPS = Selayang District Council, MPSA = Shah Alam Municipal Council, MPSJ = Subang Jaya Municipal Council, MOA = Ministry of Agriculture, MOF = Ministry of Finance, MOH = Ministry of Health, MOHLG = Ministry of Housing and Local Government.
 Source: Report and Recommendation of the President, Asian Development Bank.

Figure A6.2: Organization Chart of the Department of Irrigation and Drainage (DID)



Source: Report and Recommendation of the President, Asian Development Bank.

STATUS OF COMPLIANCE WITH LOAN COVENANTS

Covenant	Reference in Loan Agreement	Status of Compliance
1. The Government shall make available, promptly as needed, the funds, facilities, services, land and other resources which are required, in addition to the proceeds of the Loan, for the carrying out of the Project.	LA, Art. IV, Sec. 4.02	Complied with.
2. The Borrower shall cause competent and qualified consultants and contractors, acceptable to the Borrower and Bank, to be employed to an extent and upon terms and conditions satisfactory to the Borrower and the Bank.	LA, Art. IV, Sec. 4.03(a)	Complied with late. The Main consultant only commenced their services in February 2001 and have completed in February 2003.
3. The Borrower shall maintain records and accounts adequate to identify the goods and services financed out of the proceeds of the loan.	LA, Art. IV, Sec. 4.06(a)	Complied with.
4. The Borrower shall maintain separate accounts for the Project, have such accounts audited annually and furnish the Bank with a copy of the audited reports 9 months after the end of each related fiscal year.	LA, Art. IV, Sec. 4.06(b)	Not complied with. The audited financial statement for FY 2005 was not received by ADB.
5. The Borrower shall furnish the Bank quarterly reports on the carrying out of the Project and on the operation and management of the Project facilities.	LA, Art. IV, Sec. 4.07(b)	Complied with.
6. The Borrower will prepare a Project Completion Report for submission to the Bank 3 months after the loan closing date.	LA, Art. IV, Sec. 4.07(c)	Partly complied with.
7. The Borrower shall establish a Program Steering Committee (PSC) 3 months after the effective date to provide guidance and direction for Project implementation and coordination of the Project. The PSC shall meet at least once every six months during the Project implementation period.	LA, Sch. 6, para. 3	Complied with.

8. The Program Management Unit (PMU) shall carry out the day-to-day Project implementation activities. The Director of the ongoing Klang River Basin Flood Mitigation Project of the Borrower shall assume the role of Program Director of the PMU.	LA, Sch. 6, para. 4	Complied with.
9. The Borrower shall (i) establish an Integrated River Basin Management Working Committee and a Flood Mitigation Working Committee to assist in implementing Part I.A of the Project; (ii) take necessary measures to implement the recommendations of the study to be conducted under Part I.A.1 of the Project; (iii) ensure that the existing working committees supervising the implementation of the three ongoing environmental management and flood mitigation programs in the Klang River Basin will be responsible for implementing the other activities of the Project.	LA, Sch. 6, para. 5	(i) Complied with. (ii) Being implemented. (iii) Complied with.
10. The Borrower shall review and take necessary action to recover part of the initial investment and total operation and maintenance (O&M) cost of the Project upon completion of the works.	LA, Sch. 6, para. 6	Being complied with.
11. DID shall carry out BME of the environmental, economic and socioeconomic impacts of the Project.	LA, Sch. 6, para. 7	Not complied with.
12. DID shall be responsible for the O&M of the Project facilities until transfer of such responsibility to other relevant local authorities in accordance with arrangements satisfactory to the Bank.	LA, Sch. 6, para. 8	Being complied with.
13. The Borrower shall make sufficient budgetary provisions to finance, in a timely manner, (i) the annual incremental O&M requirements for all Project facilities calculated at two percent of the cost of the civil works completed under the Project; (ii) ongoing O&M requirements in the Klang River Basin.	LA, Sch 6, para 9	Being complied with.

14. The Borrower shall closely supervise the implementation of the resettlement plan for relocation of families in the Project area.	LA, Sch. 6, para. 10	Being complied with. Around 20 squatters in the Gombak Package A and B areas need to be relocated.
15. The Borrower shall ensure that the ecological integrity and flood retention capacity of the Malaysia Wetland Sanctuary, Selangor (MWSS) will be preserved.	LA, Sch. 6, para. 11	Being complied with.
16. The Borrower shall ensure that development schemes on the embankments of the Klang River and its tributaries within the Federal Territory will continue to be subject to the review and approval of DID; (ii) provide environmental and river management guidelines; (iii) monitor private companies authorized to carry out works for river channel improvement, sediment trapping, sewage treatment and solid waste management programs for the Klang River system during Project implementation to ensure their effectiveness; (iv) ensure that water quality and river corridors shall be sufficiently improved for recreational use of the river corridors within three years after completion of the Project.	LA, Sch. 6, para. 12	(i) Being complied with. (ii) Complied with. (iii) Partly complied with. (iv) Being complied with.
17. The Borrower shall cause DID to implement soil erosion and rainfall runoff control demonstration schemes at selected subcatchment sites and establish local IRBM groups at each of the demonstration sites.	LA, Sch. 6, para. 13	Partly complied with. Demonstration projects were identified and design completed but not implemented.
18. The Borrower shall effectively regulate the solid waste management privatization program and ensure that adequate measures will be undertaken for collection and disposal of solid waste along the river corridors in the Klang River basin.	LA, Sch. 6, para. 14	Partly complied with. Study and design were done by the consultant but implementation not yet commenced.
19. The Borrower shall take all necessary action to enforce penalties on illegal deforestation and encroachment onto forest reserves and swamps in the Klang River basin, and illegal disposal of solid and liquid waste into the rivers of the Klang River Basin.	LA, Sch. 6, para. 15	Partly complied with.

SUMMARY OF CONSULTING SERVICES
(person-months)

Expertise	Appraisal			Actual			Schedule of Completion	
	International	Domestic	Total	International	Domestic	Total	Appraisal	Actual
Integrated River Basin Management	43.0	104.0	147.0	42.0	234.2	276.2	Dec 2000	April 2003
Flood Mitigation	9.0	1,034.0	1,043.0	15.5	71.9	87.4	Dec 2002	April 2003
Flood Forecasting and Warning	9.0	21.0	30.0	11.5	39.9	51.4	Dec 1999	April 2003
Total	61.0	1,159.0	1,220.0	69.0	346.0	415.0		

Source: Government of Malaysia.

SUMMARY OF TRAINING PROGRAMS

Name of Seminar	Participants	Period
On-the-Job Training	8	4 days up to 3 weeks
Mike 11 Introductory Training Course	17	14–18 May 2001
Mike 11 Advanced Course	5 (DID engineers)	June 2001
Study Tour in Australia on Integrated River Basin Management (IRBM) and Urban Storm Water Management	21 (DID, consultant engineers, housing developers, construction industry, contractors, researchers, mass media)	1–10 August 2001
GIS Basic Training Course	2 officers from DID	1 to 15 September 2001
Interim Report Seminar	120 (federal and state departments, agencies, local councils, consultants, NGOs)	6 to 7 November 2001
Technical Seminar on Study Findings on Paya Indah Wetlands Water Resources Management Plan and Flood Forecasting and Warning System	25 participants from DID and relevant agencies	14 May 2002
Flood Forecasting and Warning System	22 participants from DID and relevant agencies	23 May 2002
Workshops on IRBM and Demonstration Projects	55 (DID, agencies, local councils)	20 and 29 April 2002
Flood Forecasting System	20 participants from DID and relevant agencies	October 2002
GIS Seminar	5 participants from DID and relevant agencies	July 2002
Workshop on Best Management Practices on Soil Erosion Control, Runoff Minimization, River Quality Improvement, and River Solid Waste Management Along with Demonstration Projects	100 participants from DID and relevant agencies	July –August 2002
Project Final Report Seminar	130 participants from DID and relevant agencies	August 2002

DID = Department of Irrigation and Drainage, GIS = geographic information system, NGO = non-government organization.

Sources: Asian Development Bank and Government of Malaysia.

LIST OF EQUIPMENT PROCURED

Item	Quantity	Condition
1 Four-wheel-drive vehicles	5	Good
2 Photocopier	1	Good
3 Projector	1	Good
4 Desktop computer	2	Good
5 Notebook computer	1	Good
6 Plotter	1	Good

Note: All currently used by the Department of Irrigation and Drainage (DID).
Sources: Asian Development Bank and Government of Malaysia.

SUMMARY OF MAIN FINDINGS AT MIDTERM AND PROJECT COMPLETION REPORT

Component	RRP 1996	Mid-term 2001	Project Completion 2007	Targets/Comments
1. Integrated River Basin Management (IRBM)	<ul style="list-style-type: none"> • set up IRBM program and plan 		<ul style="list-style-type: none"> • proposal submitted to cabinet 	<ul style="list-style-type: none"> • proposal is for permanent IRBM institution
	<ul style="list-style-type: none"> • training • clean up program and landscaping 	<ul style="list-style-type: none"> • Mike 11 training • additional scope proposed 	<ul style="list-style-type: none"> • completed • proposal not implemented 	<ul style="list-style-type: none"> • target to reduce uncollected waste by 45,000 t/yr not achieved
	<ul style="list-style-type: none"> • 4 demonstration sites 	<ul style="list-style-type: none"> • 1 site designed at Klang 	<ul style="list-style-type: none"> • none constructed 	
	<ul style="list-style-type: none"> • MWSS, 1,800 ha at Ramsar 			
2. Solid Waste Management	<ul style="list-style-type: none"> • 7 automated trash booms • 1,200 trash bins • improve access roads 	<ul style="list-style-type: none"> • proposed water quality demonstration project • 7 sites identified 	<ul style="list-style-type: none"> • none constructed 	<ul style="list-style-type: none"> • target to trap 630,000 m³ of waste not achieved • program not implemented
3. Sediment Trapping	<ul style="list-style-type: none"> • 4 sediment traps or ponds at Kerating, Kuyoh, Penchala, and Damansara • Government to build 12 traps 	<ul style="list-style-type: none"> • 2 packages designed 	<ul style="list-style-type: none"> • none constructed 	<ul style="list-style-type: none"> • target to reduce sediment by 196,000 m³/year and soil erosion by 0.7 million t/year not achieved
4. Tertiary River Corridor Improvement	<ul style="list-style-type: none"> • 28.6 km in 8 tributaries 	<ul style="list-style-type: none"> • 7 ADB packages 	<ul style="list-style-type: none"> • 7 ADB packages completed 	<ul style="list-style-type: none"> • 2.5 km of Gombak not completed due to resettlement problem
	<ul style="list-style-type: none"> • Gombak (9.0 km) • Keroh (3.0 km) • Kemusiing (2.5 km) 	<ul style="list-style-type: none"> • tendered 		
		<ul style="list-style-type: none"> • funded by the Government 	<ul style="list-style-type: none"> • 4 Government package completed 	<ul style="list-style-type: none"> • the Government program to improve all tributaries near completion
	<ul style="list-style-type: none"> • Kuyoh (5.5 km) • Ampang (3.2 km) 	<ul style="list-style-type: none"> • funded by the Government 		<ul style="list-style-type: none"> • the Government's SMART completed
	<ul style="list-style-type: none"> • Gisir (1.4 km) 			<ul style="list-style-type: none"> • the Government retention

				<ul style="list-style-type: none"> pond program will be completed next year
	<ul style="list-style-type: none"> Bohol (0.8 km) Kerayong (3.2 km) (Government, 94 km in 26 tributaries) 3 bridges fish life increase by 20% 	<ul style="list-style-type: none"> exclude bridge at Keroh 	<ul style="list-style-type: none"> only 2 funded by ADB 	<ul style="list-style-type: none"> RRP target to reduce annual flood damage by \$17 million/year bridge part of tributary river improvement package no monitoring information on fish life collected
5. Flood Forecasting and Warning System	<ul style="list-style-type: none"> 1 master station 3 submaster stations 3 river-gauging stations 35 rainfall-recording stations 		<ul style="list-style-type: none"> no equipment purchased with project funds 	<ul style="list-style-type: none"> system in place for operation of SMART
6. Resettlement	<ul style="list-style-type: none"> resettle 640 squatter families 	<ul style="list-style-type: none"> only 20 families not resettled 	<ul style="list-style-type: none"> only 20 families not resettled 	

ADB = Asian Development Bank, ha = hectare, IRBM = Integrated River Basin Management, km = kilometer, m³ = cubic meter, MWSS = Malaysia Wetland Sanctuary, Selangor, RRP = Report and Recommendation to the President, SMART = Storm Water Management and Road Tunnel, t/yr = tons per year.
Sources: Asian Development Bank and Government of Malaysia.

ECONOMIC ANALYSIS

A. Introduction

1. The economic analysis was undertaken on the basis of the methodology used at appraisal to allow for comparison between the targets set and those achieved. The analysis was based on data obtained from the Executing Agency (Department of Irrigation and Drainage) and local consultants, and from data collected from field visits undertaken by the Project Completion Report (PCR) Mission.

B. Major Assumptions

2. The economic life of the Project is assumed to be 30 years, with the full economic benefits realized in 2007. Investment costs including all consultancy, civil works, and equipment costs are adjusted to constant 2007 prices. The Malaysian consumer price index is used to adjust past costs to constant 2007 prices.¹ The standard conversion factor used in this analysis is 0.96, which is the rate used in a recent project completion report (PCR) for Malaysia.² The appraisal used a standard conversion factor of 0.90. The operation and maintenance (O&M) cost is assumed as 2.5% of the investment cost, starting in 1998.

C. Project Cost

3. The project cost at PCR is RM226.0 million at 2007 constant value (Table A12.1). This cost figure takes into account the cost of some components such as (i) four packages of tertiary river corridor improvements, (ii) solid waste management, and (iii) the flood forecasting and warning system that are entirely financed by the Government. The cost at PCR is only 54% of the amount estimated at appraisal. The main sources of this saving are (i) devaluation of the local currency (20%), (ii) overestimation of project cost (40%), and (iv) subcomponents either not implemented or implemented on a reduced scale (40%). In 1999, the ringgit depreciated from RM2.5 at appraisal to RM3.8 per dollar (fixed rate), or by 34%. After the Asian economic crisis, there was strong deflationary pressure, which resulted in considerable cost savings for the period from 1998 to 2002. Many of the components budgeted for at appraisal were not carried out or were carried out on a reduced scale, because either local funds were unavailable or Government priorities changed. Civil works on sediment trapping and improvement to the wetland sanctuary were not implemented. There were considerable savings in the use of local consultants because DID relied on its own staff to design and implement some components. The Project utilized only 30% of the allocated local consultant person-months and less than 40% of the total amount allocated for consultancy. Similarly, less than half of the amount allocated for land acquisition and resettlement was spent.

4. The Midterm Review (MTR) Mission recognized the considerable savings in the project budget and lowered the estimated project cost by 30% from appraisal figures. However, the MTR budget included the cost of some additional components proposed by DID; these new proposals were subsequently dropped by the Government. At project completion, the project budget proposed at MTR was found to be 23% higher than actual expenditure. The MTR allocated only a sum of RM650,000 for annual O&M, starting from 2005, which is not realistic.

¹ Source: Monetary and Financial Policy, Bank Negara, Malaysia (2007 = 100).

² ADB. 2001. *Project Completion Report on the Rehabilitation and Upgrading of Water Supply Systems Sector Project*. Manila.

Table A12.1: Project Cost in Constant 2007
(RM million)

Project Benefits	Appraisal	Mid-term	Project Completion
Environmental Improvement			
Integrated River Basin Management	66.27	45.12	17.93
Solid Waste Management	41.02	25.93	21.95
Sediment Trapping	15.98	10.46	0.00
Subtotal	123.27	81.51	39.88
Flood Mitigation			
Tributary River Corridor Improvement	266.45	205.21	160.24
Flood Forecasting and Warning System	8.09	5.21	4.47
Subtotal	274.54	210.42	164.70
Annual O&M 1997 – 2007	22.40	1.31	21.42
Total	420.21	293.24	226.00

O&M = operation and maintenance.

Note: All cost valued at 2007 ringgit.

Source: Asian Development Bank.

D. Project Benefits

5. The quantified incremental benefits identified at appraisal are summarized below and shown in Table A12.2. At PCR, it was found that there were substantial changes in project benefits. The anticipated benefits from solid waste removal and sediment trapping have been reduced substantially from the appraisal estimate. This is in line with the lower priority accorded to these activities by DID. However, there is a substantial increase in property values in line with the high demand for land in the city and its suburbs. A study commissioned by DID³ found that the 2001 flood inundated 413 hectares (ha) of the city center, causing RM59.45 million (\$15.65 million) in damage. The 2001 flood was classified as having an average recurrence interval of 20 years. Property values in the river basin increased by 600% from 1996 to 2004.⁴ The benefits from sediment removal, solid waste disposal, soil runoff control, tourism, and carbon sequestration have become insignificant, as these activities have been either scaled down or not implemented. The total project benefits remained high in view of the huge reduction in flood damage and increases in property value due to the rapid pace of urban development.

6. **Integrated River Basin Management.** Direct benefits are from the increase in land value, at RM1,000/ha, for an estimated 12,000 ha of flood-prone land in the river basin. This is equivalent to RM12.00 million per year. This compares with the appraisal estimate for a larger land area (38,700 ha) valued at a lower price (RM170/ha), or RM6.78 million per year.

7. **Solid Waste Management.** The tonnage of solid waste extracted from river trash booms is reduced by 10% from 11,000 tons to 9,900 tons per year, and the amount of uncollected solid waste is reduced by 10% from 150,000 tons to 135,000 tons per year. The direct cost saving is

³ Tenaga KTA. 2003. *Flood Damage Assessment of 26 April 2001 Flooding Affecting the Klang Valley*. {CITY}

⁴ William CH, Taher, and Wong. 2004. *WTW Industrial Property Market*. {CITY}

estimated at RM1.20 million by year 2006 and increasing by 4% annually thereafter. Indirect benefits resulting from improved health, civic pride, and aesthetic value are estimated as being equal to the direct cost savings. This compares with the appraisal estimate of a 30% reduction both for solid waste extraction and uncollected waste valued at RM4.45 million each for direct and indirect benefits.

8. **River Tributary Corridor Improvement.** Direct benefits of annual flood damage reduction, vehicle operating cost savings, and time savings in flood-prone areas is based on average annual financial values derived from calculations of the damage for three average recurrence intervals (ARIs) of 100, 10, and 2 years. Annual flood damage savings is estimated at RM67.17 million for ARI 100, RM17.88 million for ARI 10, and RM11.00 million for ARI 2 for an average annual damage of RM13.00 million by 2007 and increasing by 4% per year thereafter. At appraisal, these savings were estimated at a slightly higher value of RM14.02 million. Direct benefits resulting from land value increases is estimated at RM1,000 per hectare in the 1,200 ha of flood-prone area, or RM1.20 million per year, as compared with the appraisal estimate of RM0.43 million for 2,500 ha valued at RM170/ha.

9. **Flood Forecasting and Warning System.** Direct benefit is assessed at 35% of the annual flood damage reduction attributable to the river tributary corridor improvements. This includes savings in vehicle operating costs and reduced waiting time with the reduction in flood incidents. The combined annual flood damage savings is RM4.60 million by 2007 and increasing by 4% per year thereafter, as compared with the appraisal estimate of RM4.95 million.

Table A12.2: Summary of Project Benefits at Appraisal, Mid-term and Project Completion
(at constant 2007 value)

Project Benefits	Appraisal	Mid Term	Project Completion
	1996 Benefits in 2007 (RM million)	2001 Benefits in 2007 (RM million)	2005 Benefits in 2007 (RM million)
Direct Benefits			
1. Solid waste disposal	4.45	3.93	1.20
2. Sediment removal	1.97	1.60	0.00
3. Sale of sand	0.66	0.60	0.60
4. Flood protection	14.02	9.50	13.00
5. Incremental property value	7.21	2.50	13.30
6. Flood forecasting	4.95	6.70	4.60
Subtotal	33.24	24.83	32.70
Indirect Benefits			
1. Solid waste removal	4.45	3.00	1.20
2. Tourism and recreation	0.66	1.30	0.00
3. Carbon sequestration	0.79	0.80	0.00
Subtotal	5.90	5.10	1.20
Total	39.14	29.93	33.90

Source: Asian Development Bank.

C. Main Findings

10. At PCR, the economic internal rate of return (EIRR) is estimated at 15.1%, as compared with 14.9% at appraisal and 13.6% at MTR. Despite the 5-year delay in project implementation, it remains economically viable when measured against the opportunity cost of capital at 12%. Sensitivity analysis indicates that the Project remains viable if the benefits are reduced by 15%. However, a 20% reduction in project benefits results in an EIRR of 11.3%, leaving the project unviable. The switching value analysis indicates that the Project is still viable with a 16% reduction in project benefit. This is the maximum reduction in expected benefits that will still leave the Project economically viable. (Table A12.3).

Table A12.3: Sensitivity Analysis of EIRR
(%)

Variation	EIRR
A. Base Case	15.1
B. Sensitivity Tests	
Benefits decrease by 10%	13.2
Benefits decrease by 15%	12.3
Benefits decrease by 20%	11.3
C. Switching Value^a	
Project benefits decrease	16.1

EIRR = economic internal rate of return.

^a Percentage by which variable tested can increase or fall to maintain an EIRR of 12% (opportunity cost of capital).

Source: Asian Development Bank.

1. Poverty Impact Ratio

11. The poverty impact ratio compares net economic benefits to the poor with the net economic benefits. The project net economic benefits (the difference between the net present value of economic and financial benefits) are estimated at RM38.05 million. The poverty-reducing impact is traced by evaluating the expected distribution of net economic benefits to different groups. The distribution of project benefits was analyzed to determine the overall project impacts spread across different stakeholders and the share of benefits to the poor. The four main stakeholders are (i) consumers of services provided, (ii) labor, (iii) government, and (iv) the rest of the economy. In Table A12.4, the differences between economic and financial returns are distributed among different stakeholders.

12. Apportioning the gains between the poor and those above the poverty line within each subgroup and labor, and assuming that government tax revenues are evenly expended among the population, the project poverty impact ration is 3.6%. The ratio is low, as the proportion of poor beneficiaries affected by the Project is low at 7.5%.

Table A12.4: Poverty Impact of Project
(RM million)

Infrastructure	Financial	Economic	Difference	Consumers	Government Economy
Incremental benefit	190.25	152.20	38.05	38.05	
Incremental cost	108.94	104.58	4.36		5.66
Labor	32.68	31.37	1.31		
O&M cost	23.78	22.83	0.95		
Taxes	0.00		0.00		
Total	355.65	310.99	44.67	38.05	5.66

Table A12.5: Poverty Impact Ratio
(RM million)

Beneficiaries	Consumers	Government Economy	Labor
NEB-NFB	38.05	0.00	1.31
Financial returns		5.66	
Benefits	38.05	(5.66)	1.31
Proportion of poor	0.075	0.350	0.575
Benefits to poor	2.854	(1.983)	0.752
Poverty impact ratio	0.036		

() = negative , O&M = operation and maintenance, NEB = net economic benefit, NFB = net financial benefit, RM = ringgit.

Note: NEB and NFB at discount of 12%.

Source: Asian Development Bank.

Table A12.6: Economic Cost and Benefit of Project (million RM at constant 2007 value)

Project Components	1 1998	2 1999	3 2000	4 2001	5 2002	6 2003	7 2004	8 2005	9 2006	10 2007	11 2008	12 2009
A. Project Benefits												
Integrated River Basin Management:												
Indirect Benefit - Land Value Increase	-	-	-	-	-	-	-	12.0	12.0	12.0	12.0	12.0
Solid Waste Management:												
Direct Benefit - Cost Savings	-	-	-	0.7	1.0	1.0	1.1	1.1	1.2	1.2	1.3	1.3
Indirect benefit	-	-	-	0.7	1.0	1.0	1.1	1.1	1.2	1.2	1.3	1.3
Sediment Trapping:												
Direct Benefit – Cost savings	-	-	-	-	-	-	-	-	-	-	-	-
Direct Benefit – Sand sales	-	-	-	-	0.2	0.4	0.6	0.6	0.6	0.6	0.6	0.5
Tributary River Basin Management:												
Direct Benefit - Flood Damage Avoided	-	-	-	-	5.8	8.1	11.6	12.0	12.5	13.0	13.5	14.1
Indirect Benefit - Land Value Increase	-	-	-	-	-	-	1.3	1.3	1.3	1.3	1.3	1.3
Flood Forecasting & Warning System:												
Direct Benefit - Flood Damage Avoided	-	-	-	-	2.9	4.0	4.1	4.3	4.4	4.6	4.8	5.0
Total Benefits	-	-	-	1.4	10.8	14.5	19.7	32.4	33.1	33.9	34.7	35.5
B. Project Costs												
Integrated River Basin Management	-	1.7	1.5	3.9	6.3	1.8	1.1	0.7	0.1	-	-	-
Solid Waste Management	-	-	-	0.6	6.2	9.9	2.7	1.6	-	-	-	-
Sediment Trapping	-	-	-	-	-	-	-	-	-	-	-	-
Tributary River Channel Improvement	4.7	3.1	3.7	18.1	31.5	33.8	32.8	23.6	2.5	-	-	-
Flood Forecasting & Warning System	-	-	-	0.4	3.4	0.3	0.0	0.0	-	-	-	-
Operation and Maintenance – 2.5%/yr	-	0.1	0.1	0.2	0.8	1.7	2.4	3.9	6.1	6.1	6.1	6.1
Total Cost	4.7	4.9	5.3	23.4	48.3	47.5	39.2	29.9	8.7	6.1	6.1	6.1
Economic Cash Flow	(4.7)	(4.9)	(5.3)	(22.0)	(37.5)	(33.0)	(19.5)	2.5	24.5	27.8	28.6	29.4
Economic Internal Rate of Return:		15.1%										
Net Present Value at 12% discount rate:		RM24.8	Million									

Project analyzed for 30 years but only the data for the first 12 years shown in this table.

Source: Asian Development Bank.

Table A13: Project Overall Assessment

Criterion	Weight	Remarks	Assessment	Score	Weighted
					Rating
1. Relevance	20%	The consistency of the project goal, purpose, and output with the Government's development strategy, ADB's lending strategy for the country, and ADB's strategic objectives at the time of approval and evaluation	Highly relevant Relevant Partly Relevant Irrelevant	3 2 1 0	0.4
2. Effectiveness	30%	The achievement of purpose as specifies in the policy goals and the physical, financial and institutional objectives adopted at project approval, or as formally modified during implementation.	Highly effective Effective Less Effective Ineffective	3 2 1 0	0.3
3. Efficiency	30%	Comparison of the achievement of project purpose with use of inputs, based on implementation performance with consideration of the economic internal rate of return or cost-effectiveness of the investment.	Highly efficient Efficient Less Efficient Inefficient	3 2 1 0	0.3
B. Sustainability	20%	Likelihood that human, institutional, and financial resources are sufficient to support achievement of results and benefits over the economic life of the project.	Most Likely Likely Less Likely Unlikely	3 2 1 0	0.4
Overall Assessment (weighted average of above criteria)	100%	The overall weighted average of the four criteria. If one of the criteria has a score of 0, the rating will be Partly Successful	Highly Successful Successful Partly successful Unsuccessful	≥ 2.7 1.6 to < 2.7 0.8 to < 1.6 < 0.8	1.4