ASIAN DEVELOPMENT BANK
Operations Evaluation Department

PROJECT PERFORMANCE EVALUATION REPORT

IN

BANGLADESH

In this electronic file, the report is followed by Management's response.

Performance Evaluation Report

Project Number: PPE: BAN 21087
Loan Number: 1289-BAN(SF)
November 2007

Bangladesh: Khulna-Jessore Drainage Rehabilitation Project

Operations Evaluation Department

Asian Development Bank

CURRENCY EQUIVALENTS
(as of 25 October 2007)

Currency Unit	=	taka (Tk)
Tk1.00	=	$0.0146
$1.00	=	Tk68.6950

ABBREVIATIONS

ADB	–	Asian Development Bank
BWDB	–	Bangladesh Water Development Board
CEGIS	–	Centre for Environmental and Geographical Information Services
CEP	–	Coastal Embankment Project
CERP-II	–	Second Coastal Embankment Rehabilitation Project
DAE	–	Department of Agricultural Extension
EA	–	executing agency
EIRR	–	economic internal rate of return
HBB	–	Herringbone Bond
KCERP	–	Khulna Coastal Embankment Rehabilitation Project
KJDRP	–	Khulna Jessore Drainage Rehabilitation Project
MOWR	–	Ministry of Water Resources
NGO	–	nongovernment organization
O&M	–	operation and maintenance
OED	–	Operations Evaluation Department
OEM	–	operations evaluation mission
PCR	–	project completion report
PPER	–	project performance evaluation report
RRP	–	report and recommendation of the President
SIEE	–	summary initial environmental examination
TA	–	technical assistance
TRM	–	tidal river management
WMA	–	water management association
WMO	–	water management organization

NOTE

In this report, “$” refers to US dollars.

Overall Assessment Methodology

Criterion	Weight (%)	Definition	Rating Description	Rating Value
1. Relevance	20	Relevance is the consistency of a project's impact and outcome with the government's development strategy, the Asian Development Bank's lending strategy for the country, and the Asian Development Bank's strategic objectives at the time of approval and evaluation and the adequacy of the design.	Highly relevant Relevant Partly relevant Irrelevant	3 2 1 0
2. Effectiveness	30	Effectiveness describes the extent to which the outcome, as specified in the design and monitoring framework, either as agreed at approval or as subsequently modified, has been achieved.	Highly effective Effective Less effective Ineffective	3 2 1 0
3. Efficiency	30	Efficiency describes, ex post, how economically resources have been converted to results, using the economic internal rate of return, or cost-effectiveness, of the investment or other indicators as a measure and the resilience to risk of the net benefit flows over time.	Highly efficient Efficient Less efficient Inefficient	3 2 1 0
4. Sustainability	20	Sustainability considers the likelihood that human, institutional, financial, and other resources are sufficient to maintain the outcome over its economic life.	Most likely Likely Less likely Unlikely	3 2 1 0
Overall Assessment (weighted average of above criteria)	Highly Successful: Overall weighted average is greater than or equal to 2.7. Successful: Overall weighted average is greater than or equal to 1.6 and less than 2.7. Partly Successful: Overall weighted average is greater than or equal to 0.8 and less than 1.6. Unsuccessful: Overall weighted average is less than 0.8.			

Source: ADB. 2006. *Guidelines for Preparing Performance Evaluation Reports for Public Sector Operations.* Manila. Available: http://www.adb.org/Documents/Guidelines/Evaluation/PPER-PSO/chapter3.pdf

Key Words

asian development bank, beels, evaluation, khulna, jessore, nongovernment organization, operations and maintenance, operations evaluation department, polders, technical assistance, tidal river management, upazila, water management, water management organization

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The guidelines formally adopted by the Operations Evaluation Department (OED) on avoiding conflict of interest in its independent evaluations were observed in the preparation of this report. A. Somesan (Drainage Rehabilitation and Water Management Specialist) and Md. N. Islam (Institutional Development Specialist) were, respectively, the international and national consultants. To the knowledge of the management of OED, there were no conflicts of interest of the persons preparing, reviewing, or approving this report.

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Attachment: Management Response

BASIC DATA

TA Number	TA Title	Type	Amount ($'000)	Approval Date
TA 2012	Technical Assistance to Khulna-Jessore Drainage Rehabilitation	AD	920	14 Dec 1993

Key Project Data ($ million)	As per ADB Loan Documents	Actual
Total Project Cost	62.7	44.9
Foreign Exchange Cost	19.8	14.2
Local Currency Cost	42.9	30.7
ADB Loan Amount/Utilization	38.9	32.6
ADB Loan Amount/Cancellation		16.1

Key Dates	Expected	Actual
Fact-Finding		4–26 May 1993
Appraisal		20 Jul 1993
Board Approval		14 Dec 1993
Loan Agreement		17 Dec 1993
Loan Effectiveness	17 Mar 1994	4 Apr 1994
Loan Closing	31 Dec 1999	18 Mar 2003

Borrower	Government of Bangladesh
Executing Agencies	Bangladesh Water Development Board Department of Agricultural Extension Department of Fisheries

Mission Data	No. of Missions	No. of Person-Days
Type of Mission		
Fact-Finding	1	110
Appraisal	1	96
Inception	1	8
Project Administration		
Review	9	150
Project-Specific Consultation	1	5
Special Project Administration	6	55
Project Completion Review	1	75
Operations Evaluation	2	98

Project Performance Report Ratings

Implementation Period	Development Objective	Implementation Progress
4 April 1994–30 August 1999	N/A	N/A
31 August 1999–31 December 2000	S	U
1 January–30 June 2001	S	PS
1 July–31 December 2001	S	S
1 January–31 December 2002	S	PS

AD = advisory, DMC = developing member country, N/A = ratings not available, PS = partly satisfactory, S = satisfactory, TA = technical assistance, U = unsatisfactory.

EXECUTIVE SUMMARY

The shortcomings of the Coastal Embankment Project in Southwest Bangladesh worsened drainage congestion and caused prolonged inundation of farmlands, household lots, and the internal communication networks. The results were declining agricultural production, fewer employment opportunities, and deteriorating salinity conditions, which collectively led to lower living standards, reflected by 75% of the population living below the poverty line at the time of project formulation. The principal objective of the Khulna-Jessore Drainage Rehabilitation Project was to reduce poverty to below 60% by increasing agricultural production and creating on-farm employment in the project area. The objective was to be achieved by (i) mobilizing beneficiary participation in the design, implementation, and subsequent operation and maintenance (O&M) of the project facilities; (ii) rehabilitating the existing drainage infrastructure to reduce congestion and protecting the project area from tidal and seasonal flooding; (iii) providing support for the expansion of agricultural extension services that was necessary as flooded lands were returned to productivity; and (iv) improving the management of fisheries in polder areas to ensure a continuing supply of noncommercial fishes caught and consumed primarily by the poor. The Project was expected to cover one fourth of the Coastal Embankment Project area (approximately 100,000 hectares [ha]) of flat, low-lying alluvial lands with seasonally inundated depressions called “beels,” supporting a population of 800,000 in Southwest Bangladesh.

It was envisaged that the Project would benefit the landless (who comprised nearly half of the project households) and landowners. Cropping intensity was expected to increase from 137% to 157% as a result of increased production on 30,900 ha of arable land, which would lead to 63,000 tons incremental food production per year. The Project also was to lease Government land to 20 legally registered water management associations (WMAs), assist farmers to adopt integrated pest management practices (5,000 households), operate facilities to maximize agriculture and fisheries potential, and support homestead gardening (5,000 households). The Project also had provision for constructing 8 new and rehabilitating 25 drainage structures, rehabilitating 30 kilometers of embankments and 70 tidal irrigation inverts (locations for silt excavations to enable free flow of tidal water in irrigation canals), river dredging (1.6 million cubic meters), and a need-based O&M budget. Opposition from local people required changes to the technical design three times during project implementation.

Technical assistance (TA) provided for the Project was to help social preparation and beneficiary participation in Bangladesh Water Development Board (BWDB) projects by assisting BWDB in developing and implementing appropriate procedures. The TA scope included (i) developing a WMA plan; (ii) preparing and implementing an information campaign; (iii) formulating indicators for monitoring and evaluating benefits, together with periodic impact assessment studies; (iv) formulating a land acquisition, compensation, and resettlement plan; (v) creating a legal framework for the registration of WMAs; and (vi) recommending modifications of existing legislation or proposing new legislation to allow the registration of WMAs as legal entities.

At appraisal, the Project was estimated to cost $62.7 million, but the actual cost was $44.97 million, including $1.03 million for servicing the loan. Component-wise the Project used 86% of the projected base costs for participatory development (social mobilization), 97% of that projected for rehabilitation of civil works, 27% of that projected for agricultural development, and 25% of that projected for fisheries management. On the other hand, the project administration

cost increased by 206% of the base cost estimates. Project cost savings were largely attributable to savings in duties and taxes, physical contingencies, price escalations, and loan cancellations and service charges.

The findings of the Operations Evaluation Mission revealed continued tension between local stakeholders and the lead Executing Agency, BWDB, from the start of the Project due to diametrically opposed perspectives on the solutions to drainage congestion problems. The tension caused a more than 3-year delay in project implementation. Lack of appreciation for indigenous knowledge systems and BWDB's resistance to adopting nonstructural solutions in favor of structural solutions were the main factors contributing to the rift between the local people and BWDB. The Project made progress only after the local people demonstrated an indigenous-knowledge-based "tidal river management" (TRM) approach, which was later found as technically feasible, economically viable, and socially acceptable. The water management groups at the village level were formed at a much later stage and had little contribution to project design and implementation.

Membership in the water management groups was assessed to be 35% at project completion in 2004, which dropped to 15% at the time of evaluation in 2007 as a result of lack of an active common agenda and program to keep the groups together. The two key livelihood supporting components, agricultural development and fisheries management in polder areas, were poorly resourced, weakly coordinated, and ineffectively implemented, leading to the decision to drop both components from the Project as the local people did not see that they would benefit from it. This further weakened group cohesiveness and members lost interest in the Project. The evaluation did not find any verifiable evidence that water management groups, the landless, and fisherfolk groups were active and showed strong public participation in establishing ownership and responsibility for operating and maintaining the project facilities.

The evaluation concluded that the O&M of drainage infrastructure and river channels was less than satisfactory. Heavy silt deposition in drainage canals and riverbeds caused active rivers to dry up and clogged the regulators with silt deposits. The assumption of annually leasing privately contested government land to WMAs to generate funds for O&M was unrealistic. Uncertainty in budgetary allocations for O&M led to poor O&M. The Project developed an O&M plan, a fisheries management plan, and an environmental management plan, but BWDB did not adopt them. The TA for institutional strengthening of BWDB was less effective as it did not create any added capacity for engaging with local communities. There was a substantial departure from the original project design with the construction of 111 km of roads where none were envisaged in the original design. Forty of the 43 loan covenants were fully or partially complied with.

Overall, the Project is assessed as *unsuccessful* but borderline partly successful in contrast to the successful rating assigned in the project completion report. The Operations Evaluation Department, which conducted an in-depth review of the project completion report, did not support the rating in the report because evidence to support it was insufficient. The evaluation found the Project to be partly relevant, less effective, inefficient, and less likely to be sustainable. The Project had limited impact on institutions as the Executing Agency eventually conceded to the public demand for nonstructural solutions. A sense of ownership of the Project by local communities failed to develop even after their solution was partially adopted. The project activities were implemented without consulting or engaging local government institutions. While some benefits accrued from the Project but these were insufficient for a rating to be effective.

The socioeconomic survey undertaken during the evaluation found that the Project and non-project (control) areas were impacted by several development activities, including an increase in cropping intensity. However, these benefits are not attributable to the Project because, as mentioned earlier, two key components—agricultural development and fisheries management in polder areas, were dropped from the scope of the Project. The project area households had access to nearly twice as much land as the control area households which was same as at the time of project formulation. Fewer landless individuals were observed in the control area than in the project area. Presumably, the landless people were relatively more mobile and sought income opportunities outside their villages. The household members in the project area and in the control area were broadly similar when the $2 per day poverty line norm was applied. Poverty was widespread. More than half of the project area landless households and more than 80% of the fisherfolk and farming households earned less than $2 per day.

The evaluation identified a number of issues: (i) the need for a holistic approach because of the complexity, interconnectivity, and interdependence of river systems throughout the southwestern coastal region of Bangladesh; (ii) the institutional culture within BWDB, which is focused on structural engineering solutions despite the merits associated with nonstructural solutions; (iii) lack of local ownership of public goods such as drainage infrastructure; (iv) heavy silt deposition on riverbeds and drainage canals; (v) lack of commitment to and trust in collaboration between BWDB and nongovernment organizations (NGOs) and/or civil society groups; (vi) limited awareness of preconditions for a successful TRM operation; (vii) conflict in resource use between fishpond operators and farmers; (viii) skepticism about the viability of the Bhabodah regulator in light of the appropriateness of rotational TRM; (ix) slow decision-making process in recruiting consultants, NGOs, contractors, and suppliers; and (x) lack of a sustainable O&M mechanism to alleviate drainage congestion.

ADB has expressed continued interest in supporting water resource management in Bangladesh. The evaluation recommends ADB take up findings of the study in conjunction with other issues during the policy dialogue with the Ministry of Water Resources (MOWR). The evaluation, for example, provides three specific suggestions. First, that MOWR form an advisory group on water resource management, comprising BWDB, NGOs, civil society organizations, research institutions, knowledge experts, and people's organizations to ensure active partnership with relevant stakeholders in the areas of drainage congestion, silt management, and salinity intrusion. Second, that MOWR prepare a comprehensive approach to solve the flooding, waterlogging, and silt management problems in the drainage congested southwestern Bangladesh (approximately 400,000 ha), originally covered by the coastal embankment systems and/or areas facing similar drainage congestion problems. The study among other things should focus on (i) documenting indigenous knowledge on silt and water management in major river systems throughout Bangladesh; (ii) identifying best practices in silt management, and other water management problems including salinity intrusion, flooding, and irrigation applicable to Bangladesh; (iii) assessing operational compatibility between the fixed structures (e.g., regulators) and nonstructural options like TRM options, including the viability of continuing with the Bhabodah regulator to ease drainage congestion; (iv) identifying preconditions for successful operation of rotational TRM systems for each viable beel; (v) assessing impacts of drainage systems on fisheries' natural habitat and environment; and (vi) preparing a holistic approach to silt management. Third, that MOWR undertake a comprehensive institutional analysis of BWDB, local government institutions, and community-based organizations for (i) developing a self-sustaining mechanism for O&M of drainage systems including a TRM system involving local government institutions and beneficiaries, and

(ii) managing water resources effectively in full partnership with local communities and relevant stakeholders.

Ramesh B. Adhikari
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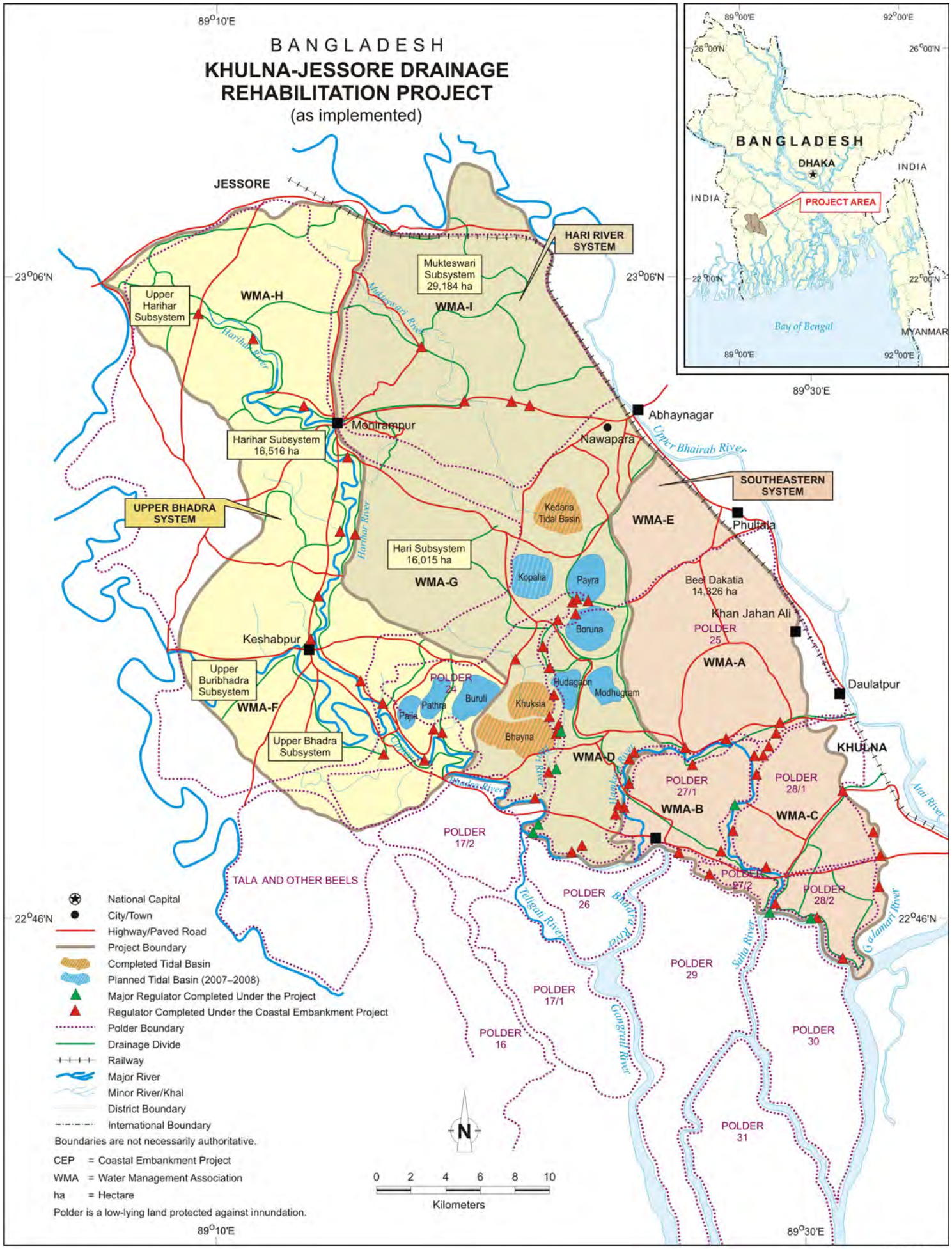
BANGLADESH
KHULNA-JESSORE DRAINAGE REHABILITATION PROJECT
(as implemented)
89°10'E
89°30'E
23°06'N
22°46'N
JESSORE
HARI RIVER SYSTEM
Mukteswari Subsystem 29,184 ha
WMA-I
Mukteswari River
Upper Harihar Subsystem
WMA-H
Harihar River
Harihar Subsystem 16,516 ha
Monirampur
Abhaynagar
Nawapara
Upper Bhairab River
SOUTHEASTERN SYSTEM
UPPER BHADRA SYSTEM
Kedaria Tidal Basin
WMA-E
Phultala
Hari Subsystem 16,015 ha
WMA-G
Kopalia
Payra
Beel Dakatia 14,826 ha
Khan Jahan Ali
POLDER 25
WMA-A
Boruna
Keshabpur
Upper Buribhadra Subsystem
WMA-F
POLDER 24
Pathra
Buruli
Pajia
Hudagaon
Modhugram
Khuksia
Bhayna
Daulatpur
Upper Bhadra Subsystem
Bhadra River
Dhaka River
WMA-D
KHULNA
POLDER 27/1
WMA-B
POLDER 28/1
WMA-C
Atai River
POLDER 17/2
TALA AND OTHER BEELS
POLDER 26
Teligati River
Bhadra River
POLDER 27/2
POLDER 28/2
Gadamari River
Sella River
POLDER 29
POLDER 17/1
Gangrail River
POLDER 16
POLDER 30
POLDER 31
INDIA
DHAKA
PROJECT AREA
Bay of Bengal
MYANMAR
89°00'E
92°00'E
26°00'N
22°00'N
National Capital
City/Town
Highway/Paved Road
Project Boundary
Completed Tidal Basin
Planned Tidal Basin (2007–2008)
Major Regulator Completed Under the Project
Regulator Completed Under the Coastal Embankment Project
Polder Boundary
Drainage Divide
Railway
Major River
Minor River/Khal
District Boundary
International Boundary
Boundaries are not necessarily authoritative.
CEP = Coastal Embankment Project
WMA = Water Management Association
ha = Hectare
Polder is a low-lying land protected against innundation.
N
0 2 4 6 8 10
Kilometers

07-2411 RM

I. INTRODUCTION

A. Evaluation Purpose and Process

1. The Operations Evaluation Department (OED) of the Asian Development Bank (ADB) included the Khulna-Jessore Drainage Rehabilitation Project (KJDRP) in its annual work program for 2007. The main reason for selecting this Project for evaluation was that an in-depth review of the project completion report (PCR)[1] did not validate the "successful" rating assigned to the Project because the review raised specific concerns about the ratings associated with relevance and sustainability assigned in the PCR. In addition, there had been wide media coverage of the Project in Bangladesh over the past 5 years, and civil society groups had raised their voices in different national and international forums to highlight the negative impact of the Project on people and their communities. OED considered that 5 years after project completion was an appropriate time for performance evaluation and fielded an Operations Evaluation Mission (OEM) on 6 March–2 April 2007 to collect field data, and a follow-up Mission on 23 May–1 June 2007 to consult with stakeholders. The OEM followed OED's *Guidelines for Preparation of Project Performance Evaluation Report for Public Sector Operations.*[2]

2. The evaluation is based on a review of project documents and other relevant studies. It also draws on discussions with: ADB staff, senior officials of the Bangladesh Water Development Board (BWDB), Water Resources Planning Organization, Institute of Water Modeling, Centre for Environmental and Geographical Information Services (CEGIS), departments of agricultural extension (DAE), fisheries (DOF), and forestry; representatives of water management organizations (WMOs); nongovernment organizations (NGOs) and civil society organizations; and former staff, consultants, and specialists engaged by the Project. The evaluation also incorporates the findings of the OEM field visits, household surveys,[3] and focus group discussions with beneficiaries. Relevant views expressed during a wrap-up meeting with BWDB and by participants of the consultation meetings in Khulna and Dhaka have been incorporated in the report.

3. The PCR rated the Project "successful" based on achievements of physical targets pertaining to the formation of WMOs, social mobilization and beneficiary participation, and mitigation of drainage congestion. It also stated that the Project substantially brought 48,518 ha of additional land under year-round cultivation. Furthermore, the report noted, "The Project substantially dented poverty and provided numerous benefits to the people of the project area, including (i) higher incomes through increased agricultural and fish production, and additional employment; (ii) higher land values; (iii) improved communication; (iv) better access to markets; (v) improved health conditions; (vi) increased vegetation; (vii) access to safe drinking water; and (viii) reduced intrusion of saline water." The OEM, however, found no evidence for the reported achievements and rated the Project "unsuccessful" but borderline partly successful (para. 41). The OEM findings indicate that agricultural and fish production increased in both project and control areas, but statistically there was little difference in productivity between the two areas. The productivity increases were largely attributable to the regular ongoing programs of DAE and DOF, and production increases were associated with limited increase in cultivable area.

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[1] ADB. 2004. *Project Completion Report on the Khulna-Jessore Drainage Rehabilitation Project.* Manila; and ADB. 1993. *Technical Assistance Grant to the People's Republic of Bangladesh for the Khulna-Jessore Drainage Rehabilitation Project*, Manila (TA 2012-BAN, for $920,000, approved on 14 December).

[2] Available: http://www.adb.org/Documents/Guidelines/Evaluation/PPER-PSO/default.asp.

[3] Operations Evaluation Mission conducted household surveys of 320 respondents representing both within the project and outside the project area and 24 focus group discussions with local project stakeholders, including water management organizations and key informants.

The OEM believes that most of the above reported benefits in the PCR were to a large extent due to an outcome of market forces and people's own indigenous solution to ease drainage congestion and, thus, were not directly attributable to the project activities. Since the two critical livelihood supporting components, agricultural development and fisheries management in polder areas, were dropped at the redesign stage, the reported production benefits could not be attributable to the project activities. The PCR recommended that BWDB should (i) resolve the disputes associated with leased land, (ii) ensure proper operation of tidal river management (TRM) including timely closing and opening of the closures and cross-dams, and (iii) regularly monitor the hydromorphological conditions of the project area. The OEM noted that none of the three recommendations had been pursued after project completion.

B. Expected Results and Program Objectives

4. The principal objective of the Project was to reduce poverty through increased agricultural production and creation of on-farm employment in the project area. This was to be achieved by (i) mobilizing beneficiary participation in the design, implementation, and subsequent operation and maintenance (O&M) of the project facilities; (ii) rehabilitating the existing drainage infrastructure to reduce congestion and protecting the project area from tidal and seasonal flooding; (iii) providing support for the expansion of agricultural extension services that was necessary as flooded lands were returned to productivity; and (iv) improving management of fisheries in polder areas to ensure a continuing supply of noncommercial fishes caught and consumed primarily by the poor. The Project was expected to cover approximately 100,000 ha of flat, low-lying alluvial lands with seasonally inundated depressions called "beels,"[4] supporting a population of 800,000 in southwest Bangladesh.[5]

5. The report and recommendation of the President (RRP) envisaged that the Project was to benefit the landless, comprising nearly half of the project households, and landowners. The Project was to reduce the poverty level from 75% to 60%. Cropping intensity was expected to increase from 137% to 157% as a result of increased production on 30,900 ha of arable land, leading to 63,000 tons food production per year. The Project also was to lease Government land to 20 legally registered water management associations (WMAs),[6] assist farmers to adopt integrated pest management practices (5,000 households), operate facilities to maximize agriculture and fisheries potential, and support homestead gardening (5,000 households). The Project also had provision for constructing 8 new and rehabilitating 25 drainage structures, rehabilitating 30 km of embankments, rehabilitating 70 tidal irrigation inverts, river dredging (1.6 million cubic meters), and a need-based O&M budget.

6. Technical assistance (TA) provided for the Project[7] was to assist BWDB in developing and implementing appropriate procedures to ensure social preparation and beneficiary participation in BWDB projects. The TA scope included (i) developing a WMA plan; (ii) preparing and implementing an information campaign; (iii) formulating benefit monitoring and evaluation (M&E) indicators, together with periodic impact assessment studies; (iv) formulating a land

[4] Polders are referred to as "beels" in Bangladesh.

[5] ADB. 1993. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan and Technical Assistance Grant to the People's Republic of Bangladesh for the Khulna-Jessore Drainage Rehabilitation Project*, Manila.

[6] Water management organization is used as a generic term to represent water management groups, landless group, fisherfolk group, WMAs, and the water management federation.

[7] ADB. 1993. *Technical Assistance to the People's Republic of Bangladesh for the Khulna-Jessore Drainage Rehabilitation Project.* Manila (TA 2012-BAN, for $920,000, approved on 14 December).

acquisition, compensation, and resettlement plan; (v) creating a legal framework for the registration of WMAs; and (vi) recommending modifications of existing legislation or new legislation to allow the registration of WMAs as legal entities. The delay in engaging a TA team at an early stage of the Project led to (i) the start of civil works without due involvement of the affected beneficiaries, (ii) formation of a large number of water management groups within a short time span, and (iii) inadequate representation of the intended beneficiaries in the WMOs at all levels. Community opposition to the project approach made the information campaign less effective. The benefit M&E guidelines had not been adhered to. CEGIS was contracted to undertake monitoring activities. Upon project completion, this activity was discontinued due to lack of funds. Because a relatively small area was still affected under the TRM[8] approach, a plan for land compensation and/or resettlement was not prepared.[9] The Project assisted in preparing a legal framework for registering WMOs at all levels. It also provided input to the preparation of the Guidelines for Participatory Water Management (2000); however, the guidelines were not implemented in the Project.

7. The Project's economic internal rate of return was estimated to be 19.6% in the RRP and the PCR reported 21.6% in 2004. However, project reevaluation by the OEM reduced it to 4.08%.[10]

II. DESIGN AND IMPLEMENTATION

A. Formulation

8. The Project was formulated under the Second Coastal Embankment Rehabilitation Project (CERP-II).[11] The terms of reference of CERP–II were modified in April 1990 to reexamine the proposed works for the Khulna Coastal Embankment Rehabilitation Project (KCERP),[12] taking into consideration the emerging land and water conflicts that had stopped implementation of KCERP[13] and the change in the terms of reference of the combined KCERP and CERP-II project areas. In addition, the Government of Bangladesh commissioned a social design study to assess the needs and desires of the beneficiaries and develop an action plan to mobilize their participation in the Project.[14] The Government requested ADB to include the Project in the country program for 1993. ADB fielded a Fact-Finding Mission in May 1993. The field visit by the Fact-Finding Mission to Beel Dakatia included discussions with the villagers

[8] Under TRM river channels remain open and all beel (polder) lands must be available for silt deposition and until the silt accumulation is complete. These lands cannot be put to any income-producing activities or other use during the years of TRM operations. The general consensus is that TRM in the project area will function effectively if the beels are sequentially rotated.

[9] While this was envisaged to have been developed at an early stage of the Project, it was deemed not required due to the change in the project concept. In response to the persistent demand from affected landowners, in 2007 BWDB commissioned the CEGIS to prepare a report outlining a compensation mechanism. The report is reportedly under preparation.

[10] The reasons for a lower economic internal rate of return estimate and reevaluation results are outlined in Appendix 10.

[11] ADB. 1989. *Technical Assistance to the People's Republic of Bangladesh for the Second Coastal Embankment Rehabilitation Project*. Manila (TA No. 1205-BAN, for $408,000, approved on 14 September). The amount later increased to $600,000.

[12] ADB. 1986. *Report and Recommendation of the President to the Board of Directors on the Proposed Loan and Technical Assistance Grant to Bangladesh for the Khulna Coastal Embankment Rehabilitation Project.* Manila (Loan No. 819-BAN(SF), for $16.9 million, approved on 11 December 1986).

[13] Consequently the Government requested and ADB approved in August 1991 the diversion of $11 million from Loan No. 819-BAN (SF): KCERP to supplement cyclone damage rehabilitation under Loan No. 941-BAN(SF): Flood Rehabilitation (Rural Infrastructure).

[14] Bangladesh Institute of Development Studies. 1993. *Social Survey Cum Action Plan on Coastal Embankment Rehabilitation Project –II*. Dhaka.

and a meeting with NGOs. Villagers highlighted 10 specific concerns.[15] Similar concerns were echoed by the NGOs. The concerns raised by the villagers and NGOs in May 1993 were very much similar to what the OEM noted during the field visits in March and May 2007. Lack of ownership of the process and outcome of the project design by local people and their representatives emerged to be a significant gap in project formulation.[16] An updated project design and monitoring framework with achievements reported in the PCR and assessment at the project performance evaluation (Appendix 1) show some major differences, largely associated with variations in assumptions and modification of design solutions.

9. Project formulation underestimated the influence of local people's organizations, civil society groups, and NGOs in project implementation and overestimated the implementation capability of BWDB, particularly in mobilizing beneficiaries, and forming sustainable WMOs and labor contracting societies. An unrealistic assumption was that adequate government-owned land would be available for leasing to WMAs so that these organizations would generate adequate resources for O&M of the drainage systems. Furthermore, a local indigenous knowledge system in alleviating drainage congestion was not initially accepted. The project design did not address most of the concerns raised by NGOs and villagers (footnote 15) and focused on providing fixed-structure-based engineering solutions. These solutions encountered strong opposition from local people, which delayed project implementation by more than 3 years.

10. The original project design rightly identified agricultural development and fisheries management in polder areas as livelihood-based components, particularly for the poor, but did not provide adequate resources for them. Only $770,000 was allocated for agricultural development and $200,000 for fisheries management. There was no assessment to examine the impact of structures on floodplains. Furthermore, delays in project implementation and lack of coordination between BWDB and the departments of agricultural extension and fisheries led to the dropping of both components from the scope of the Project. At project completion, only 27% of the agricultural development and 25% of fisheries management funds had been utilized (footnote 1).

11. The summary initial environmental examination (SIEE) of the Project was based on document reviews and field visit during the Fact-Finding Mission. It concluded that no significant adverse environmental impact was anticipated, but recommended two additional studies related to fisheries and peat deposits in Beel Dakatia (and elsewhere). These studies were not commissioned prior to or during project implementation. A number of assumptions to address environmental issues did not hold.[17] Previous implementation difficulties, geomorphological complexities, lack of a sediment survey, social implications particularly for the poor, viability of

[15] The specific concerns included (i) feasibility of technical solutions, (ii) long-term impact and sustainability of the technical solutions, (iii) siltation/long-term impact on lower Sholmari River after 20 years, (iv) problem of increased siltation in Hamkura River as a direct consequence of closing embankment breaches and eventual closure of the river, (v) land acquisition proposal for TRM in Beel Kedaria, (vi) possible expansion of brackish water shrimp culture in agricultural land in the areas of polder 25, (vii) the perception that the loop cut in Bhadra River at Chuknagar is unnecessary, (viii) land demarcation problem once water is drained from Beel Dakatia, (ix) loss of income opportunities from fishing and time between draining and rehabilitation of agricultural land, and (x) general dissatisfaction with the failure of BWDB to inform and consult the communities and respond to their needs.

[16] The lack of ownership may have been partly due to several factors, including inadequate attention paid to social issues during the project preparatory technical assistance and rushed project design exercise in response to the call for finding quick solutions to flooding problems.

[17] For example, negligible silt deposits, minimum disruption to indigenous fish species, community management of the natural resources, communities accepting responsibility for O&M, a detailed O&M plan for each polder prior to completion of civil work, etc.

structural solutions vs. nonstructural solutions, and local people's lack of confidence in BWDB would have required a detailed assessment of environmental conditions by an external agency for the proposed Project. At reformulation, the Environmental and Geographical Information Service (later renamed Center for Environmental and Geographical Information Services (CEGIS) conducted environmental and social impact assessment for the Project which concluded that the rotational TRM was technically feasible, socially acceptable, environmentally sustainable compared to regulator approach promoted by the original project design. The study also noted three adverse effects which would require mitigation and compensation measures—loss of open-water fish habitat, the disposal of dredged material and the loss of brackish water shrimp ponds under the regulator options.[18] However, no risk mitigation and compensation measures were adopted during the project implementation. On 4 June 2006, a local NGO filed a complaint to ADB on the damage caused by the discontinuation of TRM. The Office of Special Project Facilitator responded that the Project was not eligible for consideration by ADB's Accountability Mechanism and referred the matter to the Bangladesh Resident Mission for appropriate action. The Resident Mission has tried to facilitate dialogue between the BWDB and the local NGOs but no concrete steps have been taken so far.

12. In formulating the Project, ADB followed standard approaches to project implementation arrangements, consulting services, and procurement for a typical public sector project.[19]

B. Rationale

13. The rationale for the Project, classified as a poverty reduction project at the time of its formulation, was valid because the prevalence of poverty was estimated to be 75% in the project area.[20] Worsening drainage congestion, which caused prolonged inundation of farmlands household lots, and the internal communication networks due to the shortcomings of the Coastal Embankment Project (CEP)[21] were highlighted in the RRP (footnote 5). Negative impacts such as lost agricultural production, decreased employment opportunities, and deteriorating salinity conditions collectively led to lower living standards. The Project was to reverse these negative impacts and benefit local people and reduce the incidence of poverty down to 60%.

14. The OEM assessment suggested that the Project's rationale was consistent with the Government's Fourth and Fifth Five-Year Plans (1990–1995, 1997–2002), and hence valid at appraisal and implementation. It was also valid at the time of evaluation and was in line with the national poverty reduction strategy, and the country strategy and program for 2006–2010.

C. Cost, Financing, and Executing Arrangements

15. At appraisal, the Project was estimated to cost $62.7 million comprising 31.6% in foreign exchange and 68.4% in local currency (Appendix 2). The actual project cost was $44.97 million, including $1.03 million for servicing the loan during implementation. The Project utilized 94.5% of the base cost estimates. Component-wise the Project used 86% of the base costs for social mobilization, 97% for rehabilitating civil works, 27% for agricultural development, and 25% for

[18] Environmental and Geographic Information Service. 1998. Environmental and Social Impact Assessment of Khulna-Jessore Drainage Rehabilitation Project. Ministry of Water Resources, Dhaka, Bangladesh

[19] The loan Fact-Finding Mission (4–26 May 1993), Appraisal Mission (4–20 July 1993), Staff Review Committee Meeting (21 October 1993), and loan approval (14 December 1993).

[20] The project area was approximately one fourth of the area covered by the CEP, constructed in mid-1960s, which provided for the construction of a network of embankments forming polders.

[21] Continuous siltation process in rivers and channels, accelerated by the polders that restrict tidal flows.

fisheries management. On the other hand, the project administration cost increased by 206% of the base cost estimates. Project cost savings were largely attributable to savings in duties and taxes, physical contingencies, price escalations, and loan service charges.

16. Initially, ADB allocated $50 million, but at project completion the revised allocation was $38.9 million, of which $6.25 million was not disbursed and $16.1 million of the loan amount was cancelled. ADB financed 41% of the total project costs in local currency. The OEM noted that the resources allocated to the agricultural development and fisheries components were inadequate and did not reflect their relative importance.

17. The Project had three executing agencies (EAs): BWDB for social mobilization and drainage rehabilitation, DAE for agricultural development, and DOF for fisheries management in polder areas. BWDB appointed one project director for social mobilization (Directorate of Land and Water Use) and another for drainage rehabilitation (Operations and Maintenance Wing), while the two other departments appointed directors for their respective components. The roles of DAE and DOF remained very much limited and they had no voice in how the Project was implemented.[22] While the first two components were implemented by BWDB, there was very little cooperation between the project directors for social mobilization and drainage rehabilitation.[23]

18. The project design assumed the active participation of beneficiaries at all levels and through the formation of 20 WMAs along each of the 20 major drainage units. During implementation, the formation of these associations was delayed because the project staff and the local people disagreed on the proposed drainage design solutions. Furthermore, the project redesign divided the project area into nine zones, with one WMA being formed along each zone. In addition, each village formed a water management group. This was a substantial departure from what was originally envisaged.[24] The OEM analysis suggests that the original concept of WMAs along the drainage units, rather than zones, would have been more effective.

19. The Project envisaged the critical role of NGOs in the formation of WMAs, but it did not clearly foresee their roles in drainage rehabilitation. The nine NGOs contracted by BWDB for social mobilization and formation of water management groups had no experience in drainage congestion and water management issues. The lack of coordination between the two project directors of BWDB further adversely impacted project implementation.

20. A $920,000 advisory and operational TA for the Project (footnote 7) was attached to the loan to help implement social preparation and beneficiary participation in BWDB projects by assisting BWDB in developing and implementing procedures for beneficiary involvement and participation. Ninety-four percent of the TA fund was disbursed.[25] However, the TA resulted in very little influence on BWDB operations in water resource management.

[22] At Operations Evaluation Mission (OEM) discussion, no one could remember if any project steering committee meeting was held and no records of such meetings or minutes were made available to the Mission.
[23] Based on discussions with the Project's former staff and consultants.
[24] The OEM analysis of the events and local situation suggests that the formation of the WMAs along the drainage structures would have been better as it would have encouraged affected households to collaborate more effectively. The water management group formed at the village level did not provide a common binding factor or reason for all to work collectively.
[25] The nature of TA activities is discussed earlier in para. 6.

D. Procurement, Construction, and Scheduling

21. **Procurement**. Goods and services were procured following ADB's *Guidelines on Procurement of Goods* and *Guidelines on the Use of Consultants*. However, recruitment of consultants was delayed, which partly contributed to implementation delays. Protracted delays in procuring vehicles and equipment were caused by BWDB staff's inadequate procurement experience and skills, particularly their lack of familiarity with ADB's procurement system. The Project also encountered difficulties in selecting many contractors, and in engaging participating NGOs.

22. At appraisal, four small dismountable cutter suction dredgers of size 300 mm were identified as necessary. Due to the protracted evaluation process, the procurement of the first small dredger (250–300 mm) took 17 months, that of the second one took 26 months and another 3 months for installation. The Project also procured an amphibious soft terrain excavator and a long-range excavator. The time between procurement and installation was about 18 months.[26] At the time of project completion, dredging was done manually and both dredgers were underutilized and lay idle downstream of the Sholmari regulator (footnote 26, Section 9.6). The Project also procured 12 pieces of survey equipment, which were not specified at appraisal. The full list of equipment and vehicles procured (Appendix 3, shows a significant departure from what was planned, reflecting design weaknesses. While procurement of dredgers and the excavator was justified for project needs, the extended delays in the procurement process led to their less effective utilization during project implementation.

23. **Construction.** Tendering and contracting for all civil works complied with BWDB procedures and ADB's requirements as stated in the loan agreement. BWDB administered all civil works through its executive engineers in the Khulna and Jessore O&M division offices, with the exception of a few large civil contracts administered by the Superintendent Engineer, Jessore Operation and Maintenance Circle in Khulna and the Chief Engineer, Southwestern Zone in Faridpur. The Project engaged more than 100 labor contracting societies for excavating drainage channels and reexcavating river channels. Nearly 82% of civil works were carried out by BWDB under small local contracts, not exceeding $14,000.[27] The OEM views this practice to be less efficient than having large contracts.

24. **Scheduling**. The project appraisal envisaged project completion in 6 years (December 1993–December 1999). The key factors associated with the more than 3 years delay in project completion were (i) lack of public support, demonstrated by strong protests and opposition from civil society groups and local intended beneficiaries, to the proposed engineering design solutions; (ii) lack of synergy between social mobilization and drainage rehabilitation components; (iii) delay in recruiting and fielding consultants; (iv) resistance to adopting non-structural solutions; (v) delays in recruiting capable NGOs for social mobilization; and (vi) additional time devoted to studies to justify the appropriateness of the TRM approach. Loan appraisal, negotiations, and approval were completed in less than 6 months and the loan became effective 3 months after loan approval.

[26] SMEC International Pty Ltd. 2002. *Project Completion Report on the Khulna-Jessore Drainage Rehabilitation Project.* Manila: Section 9.

[27] Larger contracts were split into several small contracts.

E. Design Changes

25. The original project design had provision for constructing eight new and rehabilitating 25 existing drainage structures. The Project also had provision for rehabilitating 30 km of embankments and 70 tidal irrigation inverts, river dredging (1.6 million cubic meters), and a need-based O&M budget. In response to public demand, the project design was revisited and alternative options were developed. However, none of the options was acceptable to the local people. The TA and the Land and Water Use Division of BWDB carried out a rapid consultation (footnote 26, Section 2.2.3) exercise from September to December 1996 on incorporating the opinions of the beneficiaries for overall design options. Many of the meetings expressed doubts and raised questions about the sustainability of the four options presented and stressed the need for further environmental studies to assess the impact of the plan. The outcome of the consultation was not conclusive, although one of the four options which involved the Sholmari, Ramdia, and Tebunia regulators and a major regulator on the Ghengrail River at Madhukali, as well as a tidal basin in Kedaria and Upper Bhadra Loop cut, received cautious support. On the other hand, strong public opposition to the proposed engineering solutions and protests against BWDB project work compelled BWDB to recognize the merits associated with the people-initiated rotational TRM to alleviate drainage congestion in the project area.

26. The Project, under the instruction of the Ministry of Water Resources, commissioned CEGIS to examine the technical and social validity of the rotational TRM approach. CEGIS, using technical data produced by the Institute of Water Modeling, conducted rapid assessment and prepared an environmental and social impact assessment report. The report confirmed that the rotational TRM approach was a technically suitable, economically viable, and socially acceptable option. This recommendation, while keeping geographical coverage to the same level, called for rethinking within BWDB, which in turn led to the next revision[28] in the planning and redesign of the Project in 1999. This activity required training and institutional strengthening of WMAs with a focus on long-term O&M of the drainage infrastructure. The smaller channels were to be maintained by the water management groups, and major works, such as heavy dredging of channels outside polders and construction of embankments for subdividing future tidal river basins, were to be handled by BWDB. The consultants prepared a costed pilot plan for annual maintenance of Beel Dakatia. However, this cost was to be met by revenue generated by leasing lands, water bodies, and embankments, which were owned by BWDB, but transferred to WMAs for this purpose. This requirement proved to be unworkable.

27. During the project period, two of the proposed eight new regulators (Ramdia and Sholmari) were constructed and a planned rotational TRM basin was also initiated in Beel Kedaria, which became fully operational at the time of project completion in 2002. The rotational TRM would have required the selection of a beel next to a locally demonstrated successful one (Beel Bhaina), but OEM found no sound technical and/or social basis for selecting Beel Kedaria, which is far from Beel Bhaina, and hence the sequencing of beel selection was less justifiable.

F. Outputs

28. The Project aimed to increase income and on-farm employment opportunities for local residents in the project area by easing drainage congestion, developing agriculture, and managing fisheries in polder areas. BWDB was to reduce the incidence of flooding in agricultural land through beneficiary mobilization and participation in rehabilitation work; and

[28] SMEC International Pty Ltd. 2002. *Project Completion Report on the Khulna-Jessore Drainage Rehabilitation Project: Turnover.* Manila: Section 2.2.4: page 2.6.

DAE and DOF were to provide technical assistance to the poor. Farmers were expected to adopt the integrated pest management method of pest control and home gardening and fisherfolk were supposed to follow a project-developed fisheries management plan for polder areas.

1. Social Mobilization

29. The TA team (footnote 7) assisted the Project with the preparation of a WMA plan and formation of water management groups in Zone A (Beel Dakatia). The Project contracted six NGOs in mid-1997 to assist BWDB with social mobilization and formation of water management groups, but only four performed satisfactorily.[29] The registration of WMAs was completed only in 2001.[30] The WMAs took steps to form a water management federation in 2002. At the end of the Project, 507 water management groups, nine WMAs, a water management federation, 58 landless groups, and 48 fisherfolk groups were formed (Table A4.1, Appendix 4). The majority of the WMOs were registered as cooperative societies. However, only one fourth of the fisherfolk groups were actually registered by the end of the Project (Table A4.2, Appendix 4). The OEM reviewed the group formation record maintained by the Project and noted that most of the groups were formed within a short span of 10 months. At the time of the PCR, only 34.5% of beneficiaries had reportedly joined management groups. During the OEM the membership had dropped to 15%.[31] There was no clear incentive to join such organizations as opposed to other community-based organizations. Furthermore, the NGOs engaged by the Project lacked experience in water management and drainage issues.[32]

30. The OEM did not find verifiable evidence to support the idea that water management, landless, and fisherfolk groups were active and that these organizations created strong public participation in establishing owning, operating, and managing the project facilities, as reported in the PCR. The O&M of project infrastructure at the OEM was found to be less than satisfactory.

31. BWDB annually leased government land, water bodies, and embankments to the nine WMAs so that they could generate funds for repair and maintenance of the drainage structures.[33] The OEM considers that the area made available was too little to make any difference in funds available for O&M. Furthermore, annual leasing had faced complications as private citizens had reoccupied part of the BWDB-allocated land on the pretext that they had not received full compensation for their land at the time of acquisition.

32. The TA assisted the Project in developing a water management plan and bylaws for WMAs and the water management federation. It also provided (i) funds to engage NGOs for social mobilization and formation of WMOs and (ii) training to BWDB staff involved in water management (under Land and Water Use Division, now renamed Water Management Directorate). The training subjects included formation and development of water management groups, beneficiary participation, organization and management, including cooperative rules, economic management, women in development, water management, TRM, etc. However, the OEM found that such training covered basic group formation concepts and did not reflect the specific needs required for implementing the Project.

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[29] Two NGOs were dropped because of reportedly poor performance/mismanagement of project funds.
[30] Due to technical reasons associated with the Cooperative Department.
[31] Findings based on household survey conducted for the OEM.
[32] The criteria for NGO selection specified that the NGO must (i) be registered with the Government, (ii) have been in existence for 3 years, (iii) have a complement of at least two full-time staff, (iv) be currently operating in the project area, and (v) have the institutional capacity to undertake the assignment.
[33] WMAs had been authorized to lease land to others on an annual basis as well.

2. Drainage Rehabilitation

33. Appendix 5 summarizes civil works completed under the Project. One of the significant differences noted was the construction of 111 km of roads by BWDB, which was not envisaged in the Project. Road construction was not fully justified in the context of project design and redesign. Moreover, in the OEM's view, road construction should have necessitated the involvement of the Department of Roads. Road work was completed by BWDB, an agency with no specialization in this area.

34. The Project dredged upper Sholmari to drain Beel Dakatia in April 1996, and repaired marginal dikes along the Teka River in late 1996. The Hari River was reexcavated by manual labor in May 1997 and the construction of the Sholmari regulator was completed in March 2000. In the second quarter of 2000, the Project raised and resectioned a 10 km long existing marginal dike from Bhabodah to Beel Kedaria. Public cut on the embankment at Beel Bhaina tidal basin remained open from 29 October 1997 to 8 December 2001. The tidal basin in Beel Kedaria became operational at the end of January 2002. Construction of the Ramdia regulator (9 vents) was completed in June 1999.

35. The consultants' PCR noted shortcomings in the supervision of construction and civil works by BWDB staff, and contractors did not fully cooperate with the consultants. Consultants also pointed out the poor quality of construction to BWDB executive engineers (footnote 26, Section 10.4.3). Furthermore, compaction of earthworks was not always to the required standards. The workers employed by the contractors were unskilled and had no prior knowledge about concreting methods. Contractors engaged by the Project took a longer time than was required to mobilize, a fact that also led to delay in work completion and required additional costs (footnote 26: Section 10.5). Most of the time, consultants' advice was not entertained. The consultants prepared the O&M manual for the Project, but it was not used. Furthermore, funds allocated for O&M were unrelated to needs, were insufficient, and were not available on time (footnote 26).[34]

3. Agricultural Development

36. The Project envisaged that the agricultural development component would support the extension activities of DAE, focusing on integrated pest and crop management, women in development programs, integrated home garden programs, multiple uses of embankments, and rice and fish farming. The Project provided for training DAE staff and rehabilitating training centers (footnote 5). Engagement of NGOs for extension work in specialized areas was planned, and consultants were to develop training modules and institutional strengthening measures (footnote 5). Activities under this component were to be coordinated with other development projects, including ADB's Rural Poor Cooperatives Project, Canadian International Development Agency's Crop Diversification Project, and the World Bank's Agricultural Support Services Project. The consultants developed a 5-year work program and organized one workshop. Although the allocated consultancy was used up, no tangible output was delivered. Key problems included lack of funds for training of trainers, transfer of the component's project director, and inadequate time to implement the 5-year program (footnote 26, Section 3.1). These factors also contributed to the dropping of the agricultural development component at a later stage of the Project.

[34] Section 10.6 notes that the timely availability of funds for O&M did not improve from 1992 to 2002.

4. Fisheries Management

37. The Project RRP also had provision for technical support for developing fishery management options for the polder areas. The WMAs were to be given needed advice on how best to operate control structures, set aside protected areas, develop fish habitats, and limit fishing at control points. Technical guidance was also to be given to the engineering design consultants on structure designs and irrigation inlet placements. DOF recruited a domestic consultant for 18 months. A fisheries management plan was produced. However, due to a review of the project drainage concept, adequate time and resources were not available to implement the plan. The component was eventually dropped from the Project.[35]

G. Consultants

38. The Project engaged seven groups of consultants under the project loan and TA.[36] The overall design and redesign responsibility throughout the Project rested with SMEC and Associates, and work was carried out under three amendments to their contract. ADB also engaged an independent river morphology specialist. The project consultants lacked adequate social and geomorphological knowledge of southwest Bangladesh. They seem to have been fixated on providing structural engineering solutions to the drainage congestion problem.[37] Furthermore, lack of synergy among the consultants resulted in a communication breakdown and led to confusion among the EAs and adversely affected project implementation. A TA (footnote 7) attached to the project loan was expected to strengthen BWDB in promoting social mobilization and public participation in BWDB projects.[38] While the spirit of the TA was useful for the Project, the delayed input did not contribute to the envisaged objective.

H. Loan Covenants

39. The PCR stated that most of the loan covenants were generally met by the Borrower. The OEM review of the special loan covenants indicated that three of those covenants were not complied with. First, Schedule 6 (para. 8) of the RRP stated that the Borrower shall coordinate the project activities at the divisional and district levels through meetings chaired by the commissioner (Khulna Division) and deputy commissioner (Khulna and Jessore districts), respectively. However, during project implementation these meetings were not held.[39] Second, Schedule 6 (para. 20) mentioned that if a polder area under the Project is to be used for brackish water shrimp culture, the Borrower shall ensure, or cause to be ensured, that at least 90% of the farmers in such polder area agree. The OEM agreed with the PCR finding that no agreement was made and the landowners continue to practice shrimp culture; hence the Covenant was not complied with. Third, Schedule 6 (para. 22) noted that the Borrower shall

[35] The OEM requested a copy of the fisheries management plan, but it could not be found.

[36] Arcadis Euroconsult and SMEC and Associates were responsible for social mobilization (component A) and drainage rehabilitation (component B). National consultants were engaged for agricultural development (component C) and fisheries management (component D). Implementation of the technical assistance was assigned to Eurocounsult/BETS. In addition, the Project also engaged CEGIS and Institute of Water Modeling. The Haskoning and Associates conducted the feasibility study of the Project.

[37] This resulted in overlooking the merits of the TRM approach, which was originally identified by Addams Williams in 1919.

[38] The TA provided for 25 person-months of international and 51 person-months of national consulting services between May 1995 and October 1997. However, owing to project implementation delays, 23 person-months of international and 77 person-months of national consulting services were utilized, and the consultancy was completed on 31 August 2000.

[39] The OEM followed up on these covenants and confirmed that no such meetings took place, although the commissioner and deputy commissioner were briefed from time to time.

cause BWDB and DAE and DOF to implement, operate, and maintain the Project in a manner consistent with the Borrower's environmental standards. The Borrower shall especially ensure that such problems as impacts on fish migration routes and spawning areas, misuse of pesticides and other agricultural inputs, disposal of dredged material, and potential increases in the incidence of diseases receive due consideration in the design, construction, and operation of the project facilities. While the PCR stated that this covenant was complied with, the OEM differed in its opinion because the environmental management plan prepared by the Project was not implemented.

I. Policy Framework

40. Water resource management in Bangladesh is guided by the National Water Policy.[40] Section 4.14.a of the policy does not envisage cost recovery for flood control and drainage projects. However, the same policy (Section C) states that leasing of land is one financial option for raising O&M revenues. Hence, the burden of such projects lies primarily with the Government. In general, government policy did not change substantially during the project implementation period.

III. PERFORMANCE ASSESSMENT

A. Overall Assessment

41. Overall, the Project is assessed *unsuccessful* but borderline partly successful (Table 1). The overall assessment is based on four evaluation criteria—relevance, effectiveness, efficiency, and sustainability with corresponding weights of 20%, 30%, 30%, and 20%, respectively (Appendix 6).

Table 1: Overall Performance Assessment

Evaluation Criteria	Weight (%)	Assessment	Rating Value	Weighted Rating
Relevance	20	Partly Relevant	1	0.2
Effectiveness	30	Less Effective	1	0.3
Efficiency	30	Inefficient	0	0.0
Sustainability	20	Less Likely to be Sustainable	1	0.2
Overall Rating[a]		**Unsuccessful**		**0.7**

[a] Highly successful > 2.7, successful 1.6 to 2.7, partly successful 0.8 to 1.5, and unsuccessful <0.8.

Note: All four parameters are rated on a four-point scale. Relevance is rated highly relevant (3), relevant (2), partly relevant (1) and irrelevant (0). Effectiveness is rated highly effective (3), effective (2), less effective (1) and ineffective. Efficiency is rated highly efficient (3), efficient (2), less efficient (1) and inefficient (1). Sustainability is rated most likely (3), likely (2), less likely (1) and unlikely (0).

42. The original rationale and project objective were relevant with the Government priorities and consistent with ADB's country strategy for Bangladesh all along, but the OEM concluded that the project lacked active engagement with the beneficiaries and the proposed design did not reflect their need and preferences. The TRM approach was well-received by both the beneficiaries and the scientific community, but major challenges lie ahead with the implementation mechanism. Due to lack of a meaningful partnership between the EA, implementing agencies, and local stakeholders, the project suffered considerably; hence, the intended project benefits would be difficult to attain over the life of the Project. The marginal

[40] Government of Bangladesh. 2000. *National Water Policy 2000.* Dhaka: Ministry of Water Resources.

differences between the project and control areas[41] (treated as counterfactuals) demonstrate that the Project's contribution in agricultural and economic growth has been limited. Throughout the years, people themselves adapted to challenges posed by nature and learned to cope. The TRM approach, if implemented properly, is likely to have some positive impact, but the conflict in resource use between farmers and fishpond operators will continue to be a major challenge. Hence, the overall assessment in this report differs from the rating given in the PCR.

B. Relevance

43. The Project is assessed *partly relevant* based on three key criteria: (i) consistency with the Government's priorities and ADB's country and sector strategies at the time of appraisal, during implementation, and during performance evaluation; (ii) clear justification for the rationale and planned interventions by the Project; and (iii) appropriateness and adequacy of the project design to achieve the intended outcomes and impacts.

44. The Project's core objective of poverty reduction was consistent with the Government's development priorities in the third, fourth, and fifth five-year plans as well as the country's national poverty reduction strategy (at appraisal, implementation, and performance evaluation).[42] Similarly, at appraisal, the Project was also aligned with ADB's Medium-Term Strategic Framework (1993–1996), which emphasized economic growth, poverty reduction, improvement in the status of women, human resource development, and efficient management of natural resources. At evaluation, in line with the national poverty reduction strategy, the country strategy and program (2006–2010) noted that ADB will assist the rural poor to boost productivity, diversify production, and stimulate off-farm activities. In general, given the pervasive nature of rural poverty in Bangladesh, the rationale for the Project as a poverty reduction intervention remained valid throughout project implementation and at the time of evaluation.

45. However, the project interventions are rated *partly relevant*. The Project comprised only one fourth of the CEP; hence its scope was limited. The interconnectivity of river systems in southwestern Bangladesh and tidal flow mechanisms required a holistic approach. The Project targeted women, the landless, small and marginal farmers, and fisherfolk as the core beneficiaries. Moreover, faced with the strong influence of the local elite the Project did not address the conflict of interest in water resource use between fishing and farming interest groups.

46. The project design is rated *partly relevant* as well. The Project recognized and envisaged active participation of beneficiaries in the initial project design, but the institutional arrangement for attaining active participation was weak. The Project assumed that water management groups, which did not exist at the time of project appraisal, would be formed without much difficulty by local NGOs. However, the Project did not take into account that the NGOs, community-based organizations, and civil society groups had little potential to be

[41] Control areas are areas outside the project coverage but have had similar drainage congestion problems at the time of the start of the Project. However, landowners in the control area managed the problem in their own indigenous way. The improvement of the control area represents improvement of an area covered by the Project without ADB assistance.

[42] The Fourth Five-Year Plan had poverty reduction as a prime objective of development policy and aimed to accelerate food production, in particular food grain production, and off-farm activity through labor-intensive techniques. The Plan also emphasized generation of rural employment and the rapid development of fisheries and livestock subsectors. The Fifth Five-Year Plan adopted a pro-poor growth strategy and aimed to reduce poverty through accelerated economic growth.

development partners. The lead EA, BWDB, had very little experience in engaging NGOs and beneficiaries in development projects. Furthermore, the project design heavily relied on the strengths of BWDB, namely, construction of civil works and provision of structural solutions. The relevance of nonstructural solutions preferred by the beneficiaries received less attention until the local people took steps to cut embankments and demonstrated the merits of rotational TRM (footnote 26).[43] Also, while the project design recognized the importance of agricultural development and fisheries management in polder areas, the required scope of work of the concerned service providers was grossly underestimated. For the project management part, the project design provided for one project director for each of the four components. The OEM noted that the project coordination mechanisms envisaged at central, circle, and district levels necessitated commitments from busy officials and thus were a nonoperational proposition.

C. Effectiveness

47. The Project is assessed *less effective*. The analysis is based on four specific considerations: (i) the extent to which the intended outcomes were achieved or the likelihood that they could still be achieved; (ii) influence of implementation processes on outcomes; (iii) major reasons including processes associated with achievement or effective outcomes; and (iv) the roles and activities of other organizations.

48. The PCR rated the Project efficacious (effective) and cited (i) reduction of the incidence of poverty[44] from 75% at appraisal to 53% at project completion based on an increase in cropping intensity from 137% at appraisal to 164% at project completion and annual incremental crop production of 97,994 tons; and (ii) incremental employment of 3.5 million person-days. The report also noted a number of other achievements (footnote 26, paras. 40–42). The Project also took ownership of the TRM approach, which was generated by local people based on their indigenous knowledge.[45] The OEM, however, learned that the increase in cropping intensity reported in the PCR was based on the assumption of a 2% increase per year and not actual data (footnote 26).[46] In addition, the recorded reduction in the incidence of poverty was based on self-assessment recall responses in the “before- and after-project" survey, and the analysis did not take into account counterfactuals.[47] The OEM sought but could not access the survey data collected by the project completion survey team.[48]

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[43] The river basin management concept for Bangladesh, although not necessarily in terms of rotational system, dates back to Adams William’s work in 1919.

[44] The PCR team estimated poverty income at Tk4,816 per household per month, on the basis of a household income and expenditure survey conducted by Bangladesh Bureau of Statistics.

[45] During the stakeholder consultation meetings in Khulna and Dhaka, nongovernment representatives also argued that (i) the waterlogging problem in the project area was partially resolved, but the reason was the people’s initiative and not the Project; (ii) the benefit in the project area was attributed to (a) TRM as a result of the public cut of the Beel Bhaina embankment, and (b) pumping out of water from the waterlogged area thereby facilitating the cultivation of high-yielding varieties of rice (there has been a significant increase in fish cultivation during project implementation and after its completion, but the increase is not due to the project activities because the fisheries management component had been dropped); (iii) the Project did not achieve what it intended to achieve (e.g., the navigability of rivers, land reclamation through silt deposition in beels, and preservation of the environment; and (iv) the changes in the project design were driven by public demand, but because of vested interests, the changes were not implemented as per public expectations.

[46] Assumption cited in the economic analysis of the Project in the PCR.

[47] Counterfactuals are the conditions associated with or without project intervention but that would have occurred anyway due to other nonproject activities or interventions. This is critical as the Project did not have any other agricultural development and/or fisheries interventions because both components were dropped at the redesign stage.

[48] Reportedly the consultant’s partner who handled the survey data had died and data files could not be recovered from his computer.

49. The OEM findings based on a project and control area household survey showed that cropping intensity had increased from 137% in 1993 (at appraisal) to 153% in 2006–2007 (performance evaluation), which is slightly more than 1% per year, instead of a 2% per year assumed in the PCR. However, the difference in cropping intensity and poverty incidence between the appraisal and performance evaluation is not directly attributable to the Project alone because a similar cropping intensity was observed in the control areas. Hence, the Project was less effective in achieving the intended goal of poverty reduction.

50. The area that is reportedly waterlogged year-round differed substantially between the RRP and the PCR (10,233 ha against 48,518 ha) (footnote 5).[49] During the OEM, BWDB data suggested that only 6,008 ha was still under water year-round in Jessore district alone in 2007.[50] In addition, other factors such as heavy silt deposition on beds and in drainage channels, lack of project ownership by local communities, and drying up of active rivers due to silt deposition during the course of the Project constrained the achievement of anticipated outcomes. The OEM estimation shows that a relatively smaller area was free from waterlogging in March 2007.

51. The formation of WMOs by NGOs was expected to take place at the beginning of the Project so that those organizations could provide valuable input in the design process to mitigate the drainage congestion problem. The delayed recruitment of consultants for the social mobilization component and NGOs led to nearly 3 years delay in the preparation of the water management plan. The OEM considers the water management plan as not well-conceived because it assumed that not only those affected by drainage congestion but all beneficiaries would join water management groups and generate revenues for O&M of drainage structures. At the project completion stage, only 34.5% of the beneficiaries had joined water management groups, but at project performance evaluation, only 15% demonstrated some form of affiliation with the water management groups.[51] Even those 15% may not necessarily have been active participants in project-related activities. The water management groups at the village level were not formed until late 1996 to mid-1997 when the design proposals had reached an advanced stage. Thus, the organizations could not meaningfully contribute in the project design process. In addition, the formation of water management groups was driven by the physical target rather than quality and as a result, nearly 500 water management groups were formed within 10 months (Appendix 4). The Project paid little attention to the quality of the NGOs work. Furthermore, the representation of the landless, women, fisherfolk, and small/marginal farmers in the water management groups was found to be grossly inadequate.

52. The OEM confirmed local people's belief and experience and concluded that rotational TRM[52] (Appendixes 8 and 9) was a realistic solution to address drainage congestion and waterlogging in the northwestern part of the project area. Permanent tidal river basin

[49] The OEM did not find reference to 48,518 ha.
[50] Field data provided by Jessore Circle, BWDB to the OEM, March 2007.
[51] Household survey conducted by the OEM.
[52] While the concept of TRM is sound, its implementation has to be carried out sensitively and with care for maximum benefit. The first planned TRM in Beel Kedaria reportedly operated successfully for 3 years, but the gains were reversed when landowners did not allow use of their land for the fourth year. Intensive consultation and a clear agreement from concerned communities and affected landowners are preconditions for selecting a beel for a next rotation. Adequate advance planning for silt deposit monitoring and silt management is required on the part of BWDB and communities to ensure that the scheduled activities take place within the planned time frame. Lack of adequate understanding of silt deposit monitoring and management partially contributed to the limited success of TRM in Beel Kedaria. For a historical account, refer to Appendix 7. Preconditions for TRM are discussed in Appendix 8.

management, a low-cost solution, was one of the five options considered in the original design in a somewhat different form,[53] but it was dropped on social grounds. The original project design of structural solutions with gated regulators accompanied by large volumes of earthworks using mechanical and manual labor was clearly not appropriate to address the problem. However, the geomorphological conditions in the southeastern part of the project area showed a drainage congestion problem that is less in extent compared with the northwestern part. The OEM found that the Ramdia and Sholmari regulators constructed by the Project functioned satisfactorily at the time of the OEM without much sedimentation problem and with a sufficient carrying capacity for the main river downstream. In addition, the O&M of older regulators was found to be less than satisfactory and the river channels were heavily silted up. Hence, the design solutions used to mitigate drainage congestion and flooding were less effective.

53. While the Project ultimately adopted a mixed approach, using a combination of rotational TRM and construction of regulators, the Project also encountered significant challenges in O&M of the basin and regulators as well as removal and management of silt deposits in the project area. Limited budget support, delayed fund release, public protests against the structural solutions, BWDB's resistance to the public-initiated TRM approach, the sheer volume of silt brought by the tidal flows in rivers and channels, lack of ownership of O&M of the structures and basin by the beneficiaries, an ineffective mechanism to fund O&M by leasing government land to WMAs,[54] unavailability of land for silt deposition at the required time,[55] and delayed actions collectively contributed to ineffective O&M of the Project (Appendix 9).

54. Agricultural development and fisheries management in polder areas were critical components of the Project, but they were poorly resourced and received very little institutional support. The exclusion of the two components at redesign further contributed to loss of interest among beneficiaries in project-related activities. The Project did not initiate any other tangible income or livelihood supporting activities. The OEM finds that the project activities became further ineffective due to the exclusion of the two components after the Project was redesigned in 1999. While some benefits were accrued due to the Project, these were insufficiently attributable to the Project for a rating of 'effective.'

D. Efficiency

55. The Project is assessed *inefficient*. The economic internal rate of return, estimated at 19.4% at project appraisal and 20.6% at project completion, was reduced to 4.08% (base scenario) during the OEM (Appendix 10). The economic reevaluation adopted with- and without-project conditions using counterfactuals (based on control areas) while the appraisal and PCR adopted before- and after-project scenarios.[56] The actual project costs accounted for 72% of the total appraisal costs, and the actual base cost was approximately 94% of the project appraisal

[53] The option examined at in the initial stage was permanent TRM, which required acquiring a larger area.

[54] Much of government land leased to WMAs for generating O&M funds is contested in the court with 650 to 1,000 pending legal cases.

[55] Even though the affected landowners gave their land for 3 years for TRM, their counterparts in Beel East Khuksia have demanded compensation for crop loss. Such a demand is likely to be made in other beels too. The OEM learned from BWDB that provision for income loss compensation has been approved for Beel Kapalia in the new Development Project Proforma. This is a good initiative and BWDB together with the Government needs to carefully develop a mechanism as demand for compensation from landowners from Beel East Khuksia, Beel Kedaria, and Beel Bhaina is very much anticipated. Similar provisions would also be expected for all future TRM basins. The mechanism of providing compensation is being studied by CEGIS, but there is already skepticism in local communities who feel that any compensation to be provided will be too little and too late.

[56] Use of the counterfactual methodology (with and without project) is more appropriate than the before- and after-project scenarios because it attempts to take into account the effect of external variables on the project.

estimates. Higher project costs, despite fewer structural civil works and construction directly associated with the drainage system, are attributable to activities not envisaged at appraisal such as the construction of 111 km of roads and 33.4 km of embankments, provision of vertical lift gates, repair of flood embankments at various sections, and acquisition of 136 ha of land.[57]

56. The OEM reevaluation found substantially lower incremental benefits. Two significant differences between the PCR and OEM estimates were the difference in land area under year-round flooding and increase in cropping intensity. The OEM used actual crop yield data from published and unpublished sources at the national and district levels, a socioeconomic survey, and focus group discussions. The OEM, however, did not account for benefits due to increase in fishery activities as these were neither directly nor indirectly supported by the Project. Increase in employment under the Project was largely attributable to labor employed in seasonal manual dredging of rivers and drainage channels and, to a limited extent, on increase in the cropped area. This had fluctuated widely over the years, but records were not available to the OEM. Only limited employment was generated through the crop and fisheries livelihood options.

57. Lack of ownership of the Project by beneficiaries, slow decision-making process, inadequate institutional setup in the field to garner public support for the Project, resistance to adoption of nonstructural solutions by the project management, lack of understanding of an indigenous knowledge base both by the project management and the TA team, inadequate technical supervision, underestimation of the influence of local community-based organizations, ineffective project coordination at all levels, lack of a workable O&M plan during project implementation,[58] delay in the preparation of another beel for TRM rotation collectively contributed to project inefficiency.[59]

58. The OEM requested a record of project steering committee meetings, but it was not made available. The NGO selection process encountered long delays. The NGOs were on short-term contracts and thus lacked full commitment. The Project did not assess the capacity of the NGOs prior to their engagement. Five of the nine NGOs were later dropped, and their work and staff were handed over to the remaining four NGOs. The Project also encountered substantial delays in procuring consultants, vehicles, dredgers, and excavators, which also contributed to delays in project implementation.[60] Furthermore, $16.1 million cancellation of loan reflected inefficiency of implementation process in the Project.

E. Sustainability

59. The Project is assessed *less likely to be sustainable*. The main reasons are (i) lack of ownership of the Project by beneficiaries because they see it as a BWDB project, not their own;[61] (ii) rigid institutional culture of top-down program planning driven by the primarily structural engineering solution in BWDB; (iii) weak institutional setup as WMOs are dominated by large landowners and influential people and consequently have inadequate representation

[57] A significant portion of land acquired by BWDB is still contested by the landowners because they claim they did not receive full compensation. Up to 1,000 cases are pending in the courts.
[58] The project consultants prepared an O&M manual at the end of the Project.
[59] Furthermore, inadequate attention given to fisheries, agriculture, environmental issues, and rehabilitation of flood-distressed people, information dissemination and coordination among different stakeholders were also highlighted by the stakeholders during the OEM's consultation meetings with them. The stakeholders also pointed to lack of intra- and inter-agency coordination and interaction between TA experts and the communities.
[60] ADB's PCR noted that the procurement was efficient. However, the PCR prepared for the Government by SMEC & Associates clearly identified procurement delays.
[61] Water management groups were formed along village boundaries and those having no interest/stake in drainage congestion problem lacked interest in project activities.

from women, fisherfolk and landless people; (iv) inadequate BWDB capacity for community interaction and consultation;[62] (v) conflict between local government institutions and Project WMOs; (vi) no sustainable financial and organizational bases for local communities to undertake O&M of the drainage systems; and (vii) uncertainty surrounding the fate of the project area due to the adverse impact of climate change. The reemergence of drainage problems in 2005–2006 due to BWDB's failure to rotate tidal river basin management on time led to a loud outcry from the local population, politicians, and civil society groups. This shows a weak response from the EA.

60. Land tenure is a highly vexing and contentious issue in Bangladesh. The Project's plan to acquire land and give it to WMAs for generating funds for O&M was not a viable option because (i) the land area was relatively small, (ii) there was no definite answer as to when all land dispute claims will be resolved by the courts, and (iii) BWDB was unlikely to compensate for acquired land at market rate. Furthermore, it is likely to attract vested interests in leasing out land to interested individuals, thereby depriving the local disadvantaged population.

61. In April 2007, membership in water management groups accounted for only 15% of the beneficiaries, a substantially lower level of participation compared with the corresponding figure of 34.5% reported at project completion. Many of the groups were only on paper and had since then moved on and were not interested in BWDB-related activities. Also, at least two of the four NGOs engaged by the Project had moved on to microfinance activities and had no water management interests.

62. The piecemeal approach is not likely to solve the drainage congestion and flooding problem. The socioeconomic well-being of the people affected by drainage congestion and flooding is going to require considerable effort in reviving dead rivers through a comprehensive and holistic approach for the entire southwestern region of Bangladesh. The future sustainability of the Project to a large extent is likely to hinge on a true partnership among local stakeholders, community-based organizations, local government institutions, line departments, and BWDB—a mission difficult to attain in the present context.

IV. OTHER ASSESSMENTS

A. Impacts

1. On Institutions

63. The Project is assessed to have a limited impact on institutions. The Project had to concede to people's demand for a nonstructural solution to the drainage congestion and surface flooding problem after the public cut the embankment of Beel Bhaina in 1997. The technical merits of the public initiative were verified by the Institute of Water Modeling and CEGIS, and the Project had to accept the soundness of the rotational TRM approach. BWDB adopted the approach in the first planned rotational tidal river basin management for Beel Kedaria (during the Project) and Beel East Khuksia (after the Project). There is also a plan to apply the concept in Beel Kapalia in 2007–2008. However, contrary to public expectation, the OEM found considerable resistance from several BWDB engineering staff who discounted the value of

[62] At present, there are less than 300 water management positions in BWDB nationally, which is expected to decrease further to 100 positions by 2015 as a result of natural attrition. This does not necessarily mean that a higher staffing level would solve the problem. The water management staff in BWDB lack influence compared with their engineer counterparts.

nonstructural solutions and reemphasized the traditional structural solution, which is, constructing larger regulators.[63] For the first time, BWDB recognized the need to compensate for the crop income loss of landowners who had to forgo earnings while their land was used for silt deposition, and it made provision for compensating landowners in the new Development Project Proforma.[64]

64. The OEM differs with the PCR assessment of moderate impact on institutions.[65] The nine WMAs formed under the Project had limited scope and merely facilitated BWDB operations, including a mechanism for contracting labor for dredging. These associations, however, did not have the confidence of wider stakeholders and beneficiaries in the project area because they did not adequately represent the intended beneficiaries. The membership in water management groups had dropped from 34.5% in 2004 to 15% in 2007 and it was likely to drop further. Furthermore, lack of local government institutions undermined the formation of sustainable WMAs.

65. The staffing positions in the Water Management Division of BWDB have steadily declined and were likely to decline further, thereby limiting BWDB's interaction with the wider stakeholder groups. The current capacity of the division is limited to contacts with the Water Management Federation and WMAs. There are no avenues for direct communication between BWDB and the wider group of stakeholders in the project area. The Project provided various forms of training to the project staff and beneficiaries. The training tended to be generic in nature. The OEM was unable to assess the value of training as several beneficiaries could not recall the subject of the training. No training material was available for the OEM's assessment.

66. The Project did not lead to any new water resource management-related laws, regulations, or procedures in Bangladesh. However, the Government's National Water Policy was revised in 2000[66] and guidelines for the participation of beneficiaries were developed in the same year under a separate initiative, independent of the Project. A participatory planning process is still not institutionalized in BWDB. Major decisions still follow a top-down approach. The Cooperative Act and Rules were revised to facilitate a legal basis for the formation of WMAs as cooperatives.

[63] BWBD still believes that a large structural approach is required for solving drainage congestion and waterlogging, a position vehemently opposed by local civil society groups and NGOs as well as CEGIS. The latter has done extensive environmental and social impact assessment and confirmed that the rotational TRM was the best option to address the problem (The OEM Stakeholder Consultation Meeting, Dhaka, 31 May 2007).

[64] CEGIS has been contracted in 2007 to undertake a study to provide recommendations for a compensation mechanism.

[65] There had been instances where public opposition to the BWBD work was obstructed. For example, the TRM system in Beel East Khuksia was opened by the Board on 27 April 2006 and it was closed by local people on 15 July 2006. Similarly, there has been strong opposition to building a 40-vent regulator at Madhukhali River. BWBD contends that the Madhukhali regulator would cost less than $6 million but would generate $17.4 million annually from increased winter crop income. However, this proposal was heavily discounted by CEGIS (OEM Stakeholder Consultation Meeting, Dhaka, 31 May 2007).

[66] The National Water Policy (NWP), Section 4.14.a states: "For the foreseeable future, however, cost recovery for flood control and drainage (FCD) projects are not envisaged in this policy. In case of flood control, drainage and irrigation (FCDI) projects water rates will be charged for O&M as per Government rules." Local interpretation of the policy is that the Government is fully responsible for O&M of the project infrastructure. Although it is not said specifically, the OEM assumes that the reference to FCD projects refers to O&M costs. NWP (section c) says that leasing of lands is one financial option for the raising of O&M revenues. Additionally, the RRP, page 16, paras. 52 and 53, says that lands and water bodies will be turned over to the respective WMAs for leasing and generating income for O&M.

2. On the Environment

67. A SIEE was completed in August 1993, prior to loan approval. On the basis of that paper, the Project was classified as a category B project.[67] It also recommended additional studies regarding (i) the effects of the embankments on white fish migration in rivers and on spawning activity, and on the design of fish-friendly water-regulating structures to facilitate their entry into the polders during flooding; (ii) a method to preserve the sustainability of the fishery in the face of flood control drainage and irrigation and aquaculture projects; (iii) ways to increase communication among the polders; and (iv) a survey of peat deposits in Beel Dakatia (and elsewhere) to determine their extent and the possibility of developing them as an alternative fuel source. These recommendations were not addressed. While the PCR did not identify any adverse environmental impact, the OEM observed heavy silt deposition on riverbeds and drainage channels and the recent increase in flooding due to drainage congestion highlighted the persistent problem.[68]

68. The Project was essentially meant to be a rehabilitation project, which could not restore the previously existing large aquatic environment. However, the people-initiated TRM approach in both Beel Bhaina and Beel Kedaria has been recognized as a good initial step in that direction (footnote 27, Section 13.8). CEGIS prepared an environmental management plan, but it was not adopted as recommended.[69] The OEM also learned that a fisheries management plan for polder areas was also developed but was not adopted due to objections from influential fishpond owners and operators and lack of coordination between BWDB and DOF. The OEM, however, did not come across any negative environmental impacts related to excessive use of fertilizers and farm chemicals. To a limited extent, an ongoing integrated pest management program of DAE[70] also contributed to lessen the use of farm chemicals on selected crops in the project areas. Moreover, the higher market prices of fertilizers and farm chemicals seem to have squeezed the profit margins for farmers, resulting in no substantial increase in the use of chemicals.

3. On Socioeconomic Conditions

69. The overall developmental impacts in both the project and control areas have been positive, and the quality of life has reportedly improved over the years. However, these impacts are not attributable to the Project as most of the activities have been taken up by other line agencies, independent of the project activities. The OEM socioeconomic survey indicates that households in the project area are relatively better endowed with than those in the control area from the very beginning of the Project. However, poverty is still highly embedded in the project area and is not much different from that in the control area. The OEM found that (i) project benefits have been largely due to availability of reclaimed waterlogged areas, and (ii) benefits have accrued in favor of larger landholding and fishpond (*gher*)[71] operators. A number of landowners have had to lease, sell, or give up their land and have become de facto farm

[67] Demonstrating some adverse environmental impacts, but to a lesser degree than category A projects under ADB's environmental guidelines.

[68] During its field visit to Bhabodah regulator on 29 May 2007, the OEM was advised that fir the first time silt deposition was cleared from the river bed. No such action had been taken during or after the project implementation. Reportedly, the action was taken under a directive from the central Government.

[69] For example, CEGIS in 1998 recommended that given the large size, Beel Kedaria should be subdivided into smaller units, but this proposal was discounted and the whole beel area was used for the TRM approach. As a result, the outcomes were not satisfactory.

[70] This was carried out under DAE's ongoing regular program, and has had no influence on project or project-related activities.

[71] Fishponds are locally called *ghers*.

laborers. The area under fisheries, however, is increasing steadily, thereby reducing the cropping area by at least 1% annually.[72] This may have had negative consequences on the health of people dependent on fishing in polder areas for their livelihood. A summary of the socioeconomic survey appears in Appendix 11.

70. The local NGOs argued with the OEM that ADB violated its safeguard policy by not compensating the affected landowners whose land was temporarily used for the tidal river basins, although the landowners originally volunteered to give up the use of their land, given that its value was expected to increase due to silt deposition. The OEM noted that the expectation of land improvement was not consistent with actions taken by the EA; hence, there was only partial realization of land improvement. The OEM did not find any evidence to suggest that ADB violated its social safeguard policy. Nevertheless, any long-term adverse impact should be addressed by the EA.[73] While ADB's involuntary resettlement policy came into effect in 1995, the evaluation noted that no involuntary resettlement need was identified for and during the construction of 111 km road.

B. Asian Development Bank Performance

71. ADB's performance is rated *less than satisfactory*.[74] The project design process lacked active engagement with the affected communities. The scope of the Project addressed only one fourth of the CEP, and the interlinkages of the river and drainage conditions were not adequately addressed during the project design. Substantial differences emerged between the feasibility study and perceptions of the project consultants.[75] ADB fielded nine review and six special project administration missions and seven project officers were assigned over the life of the project (1994–2002). A comprehensive midterm review was planned (footnote 5) but did not take place. While the PCR stated that ADB frequently consulted with beneficiaries and civil society, a wide divide between the EA and civil society groups with respect to project modalities and technical solutions to drainage congestion and flood mitigation persisted up to the end of the Project and even after. The mission compositions frequently changed, which created difficulties in adequately communicating technical and management problems with the EAs and consultants.

72. In the OEM's view ADB should have adhered to the sequential requirement in project implementation, starting with the formation and establishment of WMOs so that they could have been engaged from the outset at the project design stage. The composition of WMOs formed by the Project did not adequately reflect the project target groups: women, the landless, small and marginal farmers, and fisherfolk. Furthermore, the need for additional environmental and social studies was highlighted by ADB only in early 1997. ADB transferred project administration responsibility to the Bangladesh Resident Mission from 1 July 2000, with the understanding that technical support would be provided by ADB headquarters. However, this expectation was not realized. After the Project was delegated to the Bangladesh Resident Mission, performance in terms of physical achievement improved but engagement of local stakeholders in decision-making did not improve.

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[72] Personal Communication, DAE Director, Field Services. The shift in land use is reportedly driven by substantially higher return to land from shrimp culture than from rice farming.

[73] The need for compensation has been recognized by the Government and CEGIS was commissioned to do a study at the time of the OEM. The Government also has made a budgetary provision to provide compensation to affected landowners for the new beels to be used for a TRM basin.

[74] The ADB PCR rated it satisfactory.

[75] As related by one of the project consultants.

73. While the organizational structure of the Project initially appeared logical, it broke down at an early stage because the responsibility of the project director was spread through five different offices in Khulna, Jessore, and Dhaka.[76] The disbursements were timely, and ADB responded to the Borrower's requests when required. However, neither the Regional Accounting Center of BWDB nor the ADB accounting staff understood the nature of the various engineering works and therefore mistakes arose in the allocation of costs to the various categories when reimbursement applications were submitted to ADB from BWDB.

C. Borrower Performance

74. The Borrower's[77] performance is rated *less than satisfactory*.[78] While the project loan became effective 3 months from loan approval, administrative approval was communicated by the Water Resource Ministry only after 1 year. This delay affected the fund flow required for undertaking project activities. The Project went through three revisions.[79] The first revision was based on the Overall Drainage Plan and the second involved pilot testing of the rotational TRM concept in the project area, including monitoring of concept implementation. The third revision resulted from the need to adjust the project components and to provide for additional rehabilitation work.

75. Throughout project implementation, the lead EA encountered steady public opposition to structural engineering solutions for easing the drainage congestion problem. In the end, the EA adopted the people-initiated TRM approach following the public cut of Beel Bhaina. The decision to drop agricultural development and fisheries management in the polder area at a late stage in the Project deprived the affected people of access to livelihood supporting services.

76. The Project Steering Committee was not effective. The project implementation arrangement with seven project directors was not successful and created tensions from the early stages of the Project. Even the two project directors in BWDB had poor communication. Also, the appointment of the consultants took a long time because authority was not delegated to BWDB. Lack of a clear government policy on land acquisition for drainage rehabilitation also contributed to the implementation delays. Because the Project engaged too many small contractors (1,742 contracts), the heavy workload for contract administration took the time of executive engineers away from technical supervision. The Project also experienced poor quality workmanship with small contractors.[80]

D. Technical Assistance to Khulna-Jessore Drainage Rehabilitation

77. The OEM concurs with ADB's PCR that the performance of the consultants is less than satisfactory. Delays in determining drainage design options and the feasibility of the rotational TRM option had a negative impact on project implementation. While the consultants worked on the Project, communication among them broke down at times. Project management for seven different groups of consultants located at Jessore, Khulna, and Dhaka became a difficult job for

[76] Two BWDB project directors, one for social mobilization (component A) and the other for drainage rehabilitation (component B); two project directors for agricultural development (component C) at DAE; and one project director for fisheries management (component D) at DOF.
[77] Applies to both the Government and the EAs.
[78] ADB's PCR rated the Borrower's performance as satisfactory.
[79] Ministry of Planning. 2003. *Project Completion Report: Implementation Monitoring and Evaluation Division*: IMED-04/2001 Revised.
[80] SMEC and Associates. 2002. *Project Completion Report.* Section 12.17.

BWDB and it led to unnecessary misunderstanding and duplication of some work. The consultancy input provided by an independent river morphologist fielded by ADB was appreciated by the other consultants and BWDB. The performance of the consultants fielded under TA 2012 was *less than satisfactory* because the water management plan was not effective and heavy emphasis was put on the formation of groups, without due attention to their quality and sustainability.

V. ISSUES, LESSONS, AND FOLLOW-UP ACTIONS

A. Issues

78. Despite the huge investment for alleviating drainage congestion and flooding, the problems still remain within and outside the project area. Major challenges are the (i) interdependency of river systems throughout the southwestern coastal region, (ii) heavy silt deposition on riverbeds and drainage channels, (iii) institutional culture within BWDB that is largely fixated on structural engineering solutions, (iv) lack of local ownership of drainage structures and willingness to develop a local mechanism for O&M, and (v) lack of commitment of BWDB and local stakeholders to cooperate and collaborate to address the problems. Some local NGOs, and civil society groups have played significant roles in highlighting the plight of people affected by drainage congestion and flooding in the project area, both nationally and internationally. However, there is no common agenda or agreement among them for a unified course of action.

79. The rotational TRM concept has proven to be technically sound, economically viable, and socially acceptable. However, there is limited awareness of the preconditions for successful operation. Continuous monitoring, silt management, size of a beel, sequential rotation of beels, and beel selection are some of the key areas often not well understood. Some people have started talking about a longer duration for beel rotation, even up to 11 years.[81] Furthermore, it is not clear if and under what conditions the conventional approach, that is, use of regulators and TRM, should be promoted within and outside the project area facing similar problems. Also, there are implications for compensating owners whose land would be used for silt deposition.[82]

80. There is a conflict of interest between farmers and shrimp culture entrepreneurs in water resource use within and outside the project area. The net income per hectare from shrimp culture far outweighs that from growing any food crop, and shrimp culture is often dominated by the local elite and affluent households while cropping is in the hands of the relatively less well-off households. There are no clear government policies regarding sustainable and equitable use of water resources.

81. The 21-vent Bhabodah regulator continues to be a major issue for the local beneficiaries as it is seen as contributing to the worsening of drainage congestion and not relieving it. The majority of the people favor dismantling the regulator and allowing free flow of the river so that the river can transport sediments and deposit silt where it is needed.

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[81] If this was the case, then the likelihood of TRM succeeding would be very slim as people would not be willing to give up their land for that long period.

[82] Compensation for lost income when farmers agree to forgo the use of their lands in the beel areas that will be required for future TRM operations will become a more serious issue than it is at present as this has already been seen in some of the TRM beels. CEGIS is currently conducting a study on the same issue of compensation and modalities for suitable mechanisms that can be put in place for future TRM operations. The results were expected to be available before the middle of 2007 but reportedly it has not been released yet. Whether the findings of this study will be acceptable to BWDB and the affected people remains to be seen.

82. The slow decision-making process in the recruitment of consultants, NGOs, contractors, and suppliers; and the limited consultations with stakeholders and their participation in decision-making processes undermined transparency in project implementation, which gave the activist NGOs and civil society groups more reason to be skeptical about the intent of the Project.

B. Lessons

83. A partial solution does not necessarily result in the intended project benefits where the interconnectivity and dependency of the project area rests on events and geomorphological conditions elsewhere. A holistic analysis of the drainage congested region (e.g., southwestern coastal area in this Project) is required before determining the scope of a project. The analysis needs to feed into decision making regarding the scope and coverage of the project area.

84. The project design often tends to be rushed and in the process several critical issues are overlooked or undermined. A project that involves the livelihood of a large number of people, particularly the disadvantaged groups, and stakeholders requires much time for robust consultation and full consideration of local indigenous knowledge systems to arrive at an acceptable solution.[83] The design process should be owned by the stakeholders involved, and appropriate institutional arrangements and implementation modalities need to be worked out to ensure local ownership and future sustainability. Due consideration should be given to nonstructural solutions wherever possible, and potential short- or long-term loss of income as a direct result of project activities also need to be factored in the design process. Balanced expertise, including a thorough knowledge of the local context, in the project design team is critical for the success of the Project. The planned project interventions need to be clearly sequenced.

85. The NGO/civil society groups fall broadly in three categories: (i) knowledgeable and sincerely committed to the cause and plight of poor and vulnerable people adversely affected by drainage congestion and flooding, (ii) looking for business opportunities or contract work, and (iii) capitalizing on the plight of affected people and seeking external recognition and personal benefits. It is crucial for a public institution like BWDB to work with the first group and forge with them a strong development partnership for the benefit of local people. This would be possible only if the institution recognizes committed local organizations as genuine partners. This would have a positive impact on ADB's ongoing/new projects, including the Southwest Integrated Water Management Project and Command Area Development Project II.

86. Continuous O&M is a necessary precondition to keep river and drainage channels open, and adequate provision for that must be built into national budgets, if not funded from other sources. However, leasing disputed government land for O&M is not a viable option. Furthermore, an active partnership between public institutions and local stakeholders is critical to develop a sustainable O&M mechanism.

87. There is a need for an effective grievance redress mechanism so that the project-affected people can voice their concerns without any fear of reprisal. Such a mechanism ought to have transparent provision for providing fair compensation to the adversely affected population.

[83] The OEM interview in Beel Dakatia with local farmers revealed that they know very little about the Project, but they have successfully applied local knowledge by using wooden planks to stop the intrusion of salt water in their cropping area.

88. ADB and the EA need to have a more proactive role in complex public sector projects—supported by active involvement of local government representatives and establishment of a more cohesive basis for stakeholder organization and participation—by paying close attention and giving advice on the policy and institutional development process in the EA. This would imply provision of staff at ADB with right skill mix. Similarly, the project steering committee need to be more proactive in guiding the project management.

89. The agreed-upon procurement plan and its updates should be followed and monitored to avoid processing delays, unnecessary splitting of large contracts into small ones, and procurement of goods and works that are not identified for the Project.

90. The project implementation arrangements in the Project Administration Memorandum should be spelled out in detail, including roles and responsibilities of concerned stakeholders, a pragmatic coordination mechanism, and accountability of the different parties including ADB headquarters, Bangladesh Resident Mission, EAs, implementing agencies, contractors, and consultants.

C. Follow-Up Actions

91. The evaluation has raised a number of issues that require follow-up actions by the Government. The actions would contribute to project relevance, effectiveness, efficiency, and sustainability. OED understands that ADB remains committed to supporting water resources development and management in Bangladesh and hence the evaluation recommends that ADB use findings of the evaluation in its policy dialogue with the Ministry of Water Resources. A sample of follow-up actions, the authority responsible for implementing the suggestions, and a time frame for implementing the suggestions are presented in Table 2.

Table 2: Follow-up Actions, Responsibilities, and Timeframes

Suggested Follow-Up Action	Responsible Authority	Time Line	Monitoring
1. Form an advisory group for water resource management, including BWDB, NGOs, civil society organizations, research institutions, knowledge experts and people's organizations to ensure active partnership with relevant stakeholders in problems of drainage congestion, silt management, and salinity intrusion in project areas. The advisory group is to meet at least every quarter starting on 1 January 2008.	MOWR	January 2008	BRM
2. Prepare a comprehensive approach to solve flooding, waterlogging, and silt management problems in congested drainage in southwestern Bangladesh (about 400,000 hectares), originally covered by the Coastal Embankment Systems and/or areas facing a similar problem of congested drainage. Among other things, the study should focus on (i) documenting indigenous knowledge in silt and water management in major river systems throughout Bangladesh; (ii) identifying best practices in silt management, and other water management problems including salinity intrusion, flooding, and irrigation applicable to Bangladesh; (iii) assessing operational	MOWR	October 2008	BRM/ SARD

Suggested Follow-Up Action	Responsible Authority	Time Line	Monitoring
compatibility between fixed structures (e.g., regulators) and nonstructural options like TRM, including the viability of continuing with the Bhabodah regulator to ease the problem of congested drainage; (iv) identifying preconditions for successful operation of rotational TRM systems for each viable beel; (v) assessing impacts of drainage systems on fisheries' natural habitat and environment; and (vi) preparing a holistic approach to silt management. The study needs to actively partner with local communities and credible NGOs for a successful outcome.			
3. Undertake a comprehensive institutional analysis of BWDB, local government institutions, and community-based organizations for (i) developing a self-sustaining mechanism for operating and maintaining drainage systems including a TRM system, through the involvement of local government institutions and beneficiaries; and (ii) managing water resources effectively in full partnership with local communities and relevant stakeholders.	MOWR	March 2008	BRM/ SARD

BRM = Bangladesh Resident Mission, BWDB = Bangladesh Water Development Board, MOWR = Ministry of Water Resources, NGO = nongovernment organization, SARD = South Asia Regional Department, TRM = tidal river management.

PROJECT DESIGN AND MONITORING FRAMEWORK AND ASSESSMENT RESULTS AT PROJECT COMPLETION AND PERFORMANCE EVALUATION

Design Summary	Expected Results	PCR Assessment Results	PPER Assessment Results and Comments
1. Sector/Area Goals			
Poverty reduction	Reduction in households living below poverty level from 75% to below 60%	Reduction in households living below poverty level from 75% to below 53% based on self-assessment	The self-assessment method is not appropriate to determine the incidence of poverty and thus is not used in estimation. Using the below $1/day indicator, the socioeconomic survey revealed that poverty in the project area remains high. Proportionately, there are poorer farming households in the control area (80%) than in the project areas (54%). In contrast, landless (37%) and fishing (54%) households are poorer in the project area than their counterparts in the control area.
Sustained agricultural growth	Incremental increase in food grain production of 63,000 tons/year	Incremental increase in food grain production of 74,935 tons/year	Incremental increase in food grain production of 51,365 tons/year[a]
2. Purpose			
Community management of natural resource base	Leasing of Government lands to legally registered WMAs Farmers adopt integrated pest and crop management practices; facilities operated to maximize agricultural and fisheries potential Farmstead gardening raises nutrition level.	BWDB leased 168.31 hectares (ha) of cultivable land, 106.11 ha of water body, and 81.62 km of embankment	Leasing of Government land was on an annual basis, but leased lands are disputed by landowners and nearly 1,000 court cases are pending. No statistical difference found between project and control area in adoption of integrated pest management and homestead gardening
Increased arable area and cropping intensity	30,900 ha of agricultural land able to increase production by one crop per year; cropping intensity increases from 137% to 157%	23,323 ha land brought to cultivation, and cropping intensity increased from 137% to 164%.	12,596 ha land brought to cultivation, and cropping intensity increased from 137% to 155% [a]

Design Summary	Expected Results	PCR Assessment Results	PPER Assessment Results and Comments
3. Outputs			
WMAs formed and registered	About 20 WMAs registered	9 WMAs registered	9 WMAs registered, with 507 WMGs formed
	WMA agreement in final design proposals prior to construction and certification of completed work	INA	WMAs were not actively involved in final design proposals prior to construction and certification of completed work except labor contracts.
Functioning drainage system covering 100,000 ha; with effective O&M program	Eight new and rehabilitated structures; 30 km of embankments rehabilitated (1.2 million cubic meters [mcm] earth work)	Two new structures; 123.3 kilometers (km) of flood embankments repaired	Two new regulators constructed at Sholmari and Ramdia; no records of structural rehabilitation, 123.3 km flood embankments repaired
	70 tidal irrigation inverts (11.3 mcm of excavation from drainage channels); 1.6 mcm river dredging	11.1 mcm drainage channel excavated 1.6 mcm river dredged	11.1 mcm drainage channel excavated; 1.6 mcm river dredged; no record of tidal irrigation inverts found.
	Needs-based operation and maintenance (O&M) budgets prepared annually, based on regulator assessments of system inventories	O&M budget at project preparation and at PCR was reported satisfactory. BWDB, in association with WMOs, has taken necessary measures to provide O&M funds.	O&M budget allocation was ad hoc and grossly inadequate to meet project needs.
Agricultural support provided:			
• Integrated pest management program	5,000 farm households provided with integrated pest and crop management training with 80% reduction in pesticide use	INA Paddy with fish culture increased by 12%	PPER survey results revealed that farmers have been using less farm chemicals in the past 5 to10 years due to squeeze in profit margins and DAE's ongoing integrated pest management program.
• Training program for women in development	5,000 farm households given extension services in home gardens, women in development, and integrated rice and freshwater fish projects.	INA	Based on PPER survey, more than 40% of households have home gardens, but respondents did not attribute the development to the

Design Summary	Expected Results	PCR Assessment Results	PPER Assessment Results and Comments
• Homestead gardening and nutritional support		INA	Project. Paddy with fish culture was not attributed to the project as the fish component was dropped when the project was redesigned.
• Assistance to reach available credit programs		INA	Project did not support credit program, but some NGOs provided microcredit; no official record exists.
• Technical support to manage black fish species		INA	No evidence found of technical support to manage blackfish species under the Project
4. Activities			
Mobilization of beneficiary participation		Actual expenses[b]	Actual expenses[b]
• Organize WMAs	NGO support: $1.2 million	$934,000	$934,000
• Conduct information campaigns	Information campaign: $0.1 million	$241,000	$241,000
• Develop land acquisition plan	TA: $0.92 million	$866,541	$866,541; no land acquisition or compensation plan developed
• Develop monitoring program	ADB provided an advisory TA attached to the loan to develop a benefit monitoring and evaluation system, including a review of the legal framework for registration of WMAs.	BWDB, in association in WMOs, has taken necessary measures for proper O&M of infrastructure.	A project benefit monitoring plan was developed but not implemented at PPER.
• Examine legal framework for registered WMAs		A water management federation was formed as an umbrella organization and WMAs were registered legally as cooperative societies.	A Federation of Water Management Associations was formed as an umbrella organization and WMAs were registered legally as cooperative societies.
Rehabilitation of embankment and drainage facilities			
• Rehabilitate facilities	Civil works base cost: $26.4 million	$25.01 million[b]	$25.01 million[b]

Design Summary	Expected Results	PCR Assessment Results	PPER Assessment Results and Comments
• Dredge congested rivers	River dredging: $13.3 million	$2.54 million[b]	$2.54 million[b]
• Excavate drainage channels	Drainage excavation: $3.08 million	$10.9 million[b]	$10.9 million[b]
• Rehabilitate embankments/ access roads	Rehabilitation costs: $5.3 million	$5.2 million[b]	$5.2 million[b]
• Procure maintenance dredging equipment	Dredging equipment: $1.3 million	INA. Lumped with total equipment costs	INA. Lumped with total equipment costs
• O&M during construction	O&M during construction: $3.2 million	$1.4 million	At the OEM, annual O&M was less than $100,000 for 2006–2007
Agricultural development/ fisheries management	Agricultural development base cost: $0.77 million	$0.21 million[b]	$0.21 million[b]
• Develop improved extension programs	Fisheries management: $0.2 million	$0.05 million[b]	$0.05 million
		The training materials prepared by consultants were used by beneficiaries in some training. No mention of extension programs aside from training	Sample training material not found. Fisheries management plan was reportedly prepared but not implemented.
Institutional strengthening	Training:		
• BWDB O&M training	• BWDB: $0.1 million	INA	INA
• DAE training	• DAE: $0.1 million	$37,000[b]	$37,000[b]
• Equipment, vehicles, etc.	• Beneficiaries: $0.6 million	$1.2 million[b]	$1.2 million[b]
Technical support (consulting services)			
• Engineering design and construction supervision	Engineering Consultants: $3.7 million	$5.3 million[b]	$5.3 million[b]

Design Summary	Expected Results	PCR Assessment Results	PPER Assessment Results and Comments
• Agricultural development	Agricultural Development Consultants (national): $0.2 million	$0.17 million[b]	$0.17 million[b]
• Beneficiary participation	Monitoring consultants: $0.15 million	$720,000[b]	$720,000[b]

BWDB = Bangladesh Water Development Board, CEGIS = Center for Environmental and Geographic Information Services, DAE = Department of Agricultural Extension, DOF = Department of Fisheries, INA = information not available, NGO = nongovernment organization, O&M = operation and maintenance, PPER = project performance evaluation report, WMA = water management association, WUG = water user group.

[a] All benefits are not accruable to the Project because productivity increases are associated with ongoing regular programs of the Department of Agricultural Extension.

[b] As per PCR figures.

Sources: ADB. 2004. *Project Completion Report on the Khulna-Jessore Drainage Rehabilitation Project.* Manila; and mission findings.

APPRAISAL AND ACTUAL PROJECT COSTS

Project Data

1. Project Cost ($ million)

Cost	Appraisal Estimate	Actual
Foreign Exchange Cost	19.8	14.2
Local Currency Cost	42.9	30.7
Total	**62.7**	**44.9**

2. Financing Plan ($'000)

Cost	Appraisal Estimate	Actual
A. Implementation Costs		
Borrower-Financed	12,700	12,325
ADB-Financed	48,100	31,617
Other External Financing	0	0
Subtotal (A)	**60,800**	**43,942**
B. IDC Costs		
Borrower-Financed	0	0
ADB-Financed	1,900	1,030
Subtotal	**1,900**	**1,030**
Total	**62,700**	**44,972**

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

3. Cost Breakdown by Project Component ('000)

Component	Appraisal Estimate	Actual
Part A: Mobilizing Beneficiary Participation (BWDB)	**1,450**	**1,247**
1. Consulting service, BME (local)	150	72
2. Training	1,300	1,175
(i) Information campaign expenses	100	241
(ii) NGO support for WMAs	1,200	934
Part B: Rehabilitation Civil Works (BWDB)	**36,675**	**35,657**
1. Civil Works	26,528	25,012
(i) River dredging	13,294	2,538
(ii) Drainage channels	3,084	10,929
(iii) Structures including Government procured sheet piles	10,211	6,705
(iv) Embankments/access roads	5,261	5,199
2. Equipment and vehicles	1,746	3,175
3. Consulting services	3,746	5,294
4. O&M during construction	3,218	1,399
5. Training on O&M for BWDB staff	100	0
6. Land acquisition	1,336	436
	770	**206**

Part C: Agriculture Development (DAE)		
1. Civil works for rehabilitation of training centers	160	0
2. Equipment/furniture	63	0
3. Consulting services	236	169
4. Extension programs	299	0
5. Training for DAE staff	12	37
6. NGO demonstration program	100	0
Part D: Fisheries Management (DOF)	**200**	**50**
Consulting services	200	50
Subtotal (A, B, C, D)	**39,095**	**37,160**
Administration	1,857	5,691
CDVAT and taxes	5,500	1,091
Base Cost	**46,502**	**43,942**
Physical contingencies	7,837	0
Price escalation	6,437	0
Service charge	1,900	1,030
Total Cost	**62,676**	**44,972**
Advisory Technical Assistance	1,025	0
Project Preparatory Technical Assistance	631	866
Grand Total	**64,322**	**45,838**

BME = benefit monitoring and evaluation, BWDB = Bangladesh Water Development Board, CDVAT = customs duties and value added taxes, DAE = Department of Agricultural Extension, DOF = Department of Fisheries, NGO = nongovernment organization, O&M = operation and maintenance, WMA = water management association.
Source: ADB. 2004. *Project Completion Report on the Khulna-Jessore Drainage Rehabilitation Project.* Manila.

PROCUREMENT OF EQUIPMENT AND VEHICLES

Item	Unit	Apprasial	Actual
A. Equipment			
1. Dredger with accessories (300 mm dia cutter section)	Number	1	1
2. Dredger with accessories (450 mm dia cutter section)	Number	0	1
3. Excavator (amphibious soft terrain)	Number	0	1
4. Excavator (long range)	Number	0	1
5. Computer	Number	14	16
6. Photocopier	Number	9	7
7. Facsimile Machine	Number	0	3
8. Telephones		0	2
9. Type Writers	Number	0	4
10. Instant Power Supply	Number	0	8
11. Air Coolers	Number	0	9
12. Microphone	Number	0	1
13. Survey Equipment	Number	0	12
14. Overhead Projector	Number	0	1
15. Television	Number	0	1
16. Video Cassette Player	Number	0	1
17. Multimedia Projector	Number	0	1
18. Binder	Number	0	1
19. Video Camera	Number	0	1
B. Vehicles			
1. Service Vehicles	Number	5	4
2. Motor Cycles	Number	16	19

Source: ADB. 2004. *Project Completion Report on the Khulna-Jessore Drainage Rehabilitation Project*. Manila.

WATER MANAGEMENT ORGANIZATION

Table A4.1: Formation of Water Management Groups in the Project Area

Number of Water Management Groups Formed by Zone										
Year	**Zone A**	**Zone B**	**Zone C**	**Zone D**	**Zone E**	**Zone F**	**Zone G**	**Zone H**	**Zone I**	**Total**
1996	41	—	—	—	5	—	—	—	—	46
1997	—	9	21	13	18	18	—	13	—	92
1998	—	10	12	11	37	64	23	79	20	256
1999	—	—	—	—	—	7	42	—	64	113
Total	**41**	**19**	**33**	**24**	**60**	**89**	**65**	**92**	**84**	**507**

— = not applicable.

Source: Bangladesh Water Development Board, Jessore Circle Office.

Table A4.2: Formation and Registration of Water Management Organizations by Interest Group

	Groups Formed					Groups Registered				
Zone	**WMG**	**LLG**	**FFG**	**WMA**	**WMF**	**WMG**	**LLG**	**FFG**	**WMA**	**WMF**
Zone A	46	6	6	1	—	46	6	1	1	—
Zone B	19	4	3	1	—	19	2	1	1	—
Zone C	33	6	6	1	—	33	6	2	1	—
Zone D	24	3	3	1	1	24	3	1	1	1
Zone E	55	6	6	1	—	55	6	5	1	—
Zone F	89	8	7	1	—	89	6	1	1	—
Zone G	67	8	6	1	—	67	6	1	1	—
Zone H	90	7	1	1	—	90	6	1	1	—
Zone I	84	10	10	1	—	84	6	—	1	—
Total	**507**	**58**	**48**	**9**	**—**	**507**	**6**	**13**	**9**	**—**

— = not applicable, FFG = fisherfolk group, LLG = landless group, WMA = water management association, WMF = water management federation, WMG = water management group.

Source: Bangladesh Water Development Board, Jessore Circle Office.

Table A4.3: Membership in Water Management Organizations

	Total Membership Number by Group					Members per Group		
Zone	**WMG**	**LLG**	**FFG**	**WMA[a]**	**WMA[b]**	**WMG**	**LLG**	**FFG**
Zone A	6,223	285	98	106	53	135	48	16
Zone B	1,480	209	40	48	24	78	52	13
Zone C	2,056	119	72	82	41	62	20	12
Zone D	3,625	125	36	56	28	151	42	12
Zone E	5,325	448	177	132	66	97	75	30
Zone F	7,525	596	170	196	98	85	75	24
Zone G	6,279	567	98	152	76	94	71	16
Zone H	7,855	344	39	196	98	87	49	39
Zone I	5,242	525	120	190	95	62	53	12
Total	**45,610**	**3,218**	**850**	**1,158**	**579**	**90**	**55**	**18**

FFG = fisherfolk group, LLG = landless group, WMA = water management association, WMG = water management group.

[a] Refers to water management association membership as per project guidelines.

[b] Refers to water management association membership as per cooperative rule.

Source: Bangladesh Water Development Board, Jessore Circle, Jessore.

Table A4.4: Funds Raised and Utilized by Water Management Organizations in the Project Area

Zone	Admission Fee	Shares	Savings	Others	Total	Deposited In Bank	IGA	Deposited In Bank	IGA
Zone A	42,387	97,350	575,346	34,730	749,813	471,928	1,500	62.9%	0.2%
Zone B	16,750	63,320	344,934	8,100	433,104	178,400	6,500	41.2%	1.5%
Zone C	19,840	101,930	886,741	24,790	1,033,301	940,853	119,010	91.1%	11.5%
Zone D	31,700	72,900	311,748	4,050	420,398	281,308	0	66.9%	0.0%
Zone E	27,058	181,125	958,633	40,305	1,207,121	333,007	125,000	27.6%	10.4%
Zone F	33,020	332,142	1,073,472	745,028	2,183,662	426,552	77,100	19.5%	3.5%
Zone G	30,980	249,000	866,594	125,367	1,271,941	636,958	135,000	50.1%	10.6%
Zone H	16,012	409,140	2,696,344	199,641	3,321,137	473,988	943,600	14.3%	28.4%
Zone I	31,695	302,900	1,198,200	47,000	1,579,795	375,057	247,100	23.7%	15.6%
Total	**249,442**	**1,809,807**	**8,912,012**	**1,229,011**	**12,200,272**	**4,118,051**	**1,654,810**	**33.8%**	**13.6%**

IGA = income-generating activities.

Source: Bangladesh Water Development Board, Jessore Circle Office.

SUMMARY OF PHYSICAL ACCOMPLISHMENT

	Rehabilitation Works	Unit	Apprasial	Actual
A.	**Excavation and Re-excavation of Drainage Channels**			
1.	River dredging	million cubic meters	1.50	1.55
2.	Excavation of drainage channels	million cubic meters	11.30	11.10
3.	Emergency re-excavation by dredgers	Kilometers	0.00	7.75
4.	Emergency re-excavation by labors	Kilometers	0.00	22.52
5.	Repair of flood embankments at various sections	Kilometers	0.00	123.30
6.	Marginal dykes	Kilometers	0.00	12.00
B.	**Construction of Structures**			
1.	Hydraulic structures	Number	8	7
2.	Pipe Sluice	Number	0	8
3.	Pipe Outlets	Number	0	13
4.	Rehabilitation of sluice gates	Number	19	19
5.	Dismantling of sluice gates	Number	34	0
6.	Vertical lift gates	Number	0	60
7.	Culvert/bridges	Number	20	38
8.	Boat berths	Number	0	1
9.	Foot bridges	Number	0	30
10.	Outlet structures	Number	0	20
11.	Construction of roads - macadam	Kilometers	0	2.10
12.	Construction of roads - asphalt	Kilometers	0	2.48
13.	Construction of roads - HBB	Kilometers	0	106.42
14.	Construction of perimeter embankment in Beel Kedaria TRM	Kilometers	0	10.00
15.	Construction of seassonal cross-dams	Number	0	4
16.	River bank protection	Number	0	3
17.	Permanent river closurers	Number	0	2
18.	WMA Office Buildings	Number	0	9

HBB = Herringbone Bond, TRM = tidal river management, WMA = water management association.
Source: ADB. 2004. *Project Completion Report on the Khulna-Jessore Drainage Rehabilitation Project.* Manila.

ASSESSMENT OF OVERALL PROJECT PERFORMANCE

Criterion	Assessment	Rating (0–3)	Weight (%)	Weight Rating
Relevance	Highly Relevant (3)		20	0.20
	Relevant (2)			
	Partly Relevant (1)	1		
	Irrevalent (0)			
Effectiveness	Highly Effective (3)			
	Effective (2)		30	0.30
	Less Effective (1)	1		
	Ineffective (0)			
Efficiency	Highly Efficient (3)			
	Efficient (2)		30	0.00
	Less Efficient (1)			
	Inefficient (0)	0		
Sustainability	Most Likely (3)			
	Likely (2)		20	0.20
	Less Likely (1)	1		
	Unlikely (0)			
Overall Rating	Highly Successful (HS)			
	Successful (S)		100	0.70
	Partly Successful (LS)			
	Unsuccessful ((U)			

Highly Successful (HS): Overall weighted average (OWA) is > 2.7.
Successful (S): OWA is within the range of 1.6 to 2.7.
Partly Successful (PS) : OWA is within the range of 0.8 to 1.5.
Unsuccessful (U): OWA is < 0.8.

Source: ADB. 2006. *Guidelines for Preparation of Project Performance Evaluation Report for Public Sector Operations*. Manila.

SUMMARY OF HISTORICAL DEVELOPMENT IN THE PROJECT AREA

A. Background

1. Tidal deltas have large areas of low-lying lands that, in the case of Bangladesh, extends throughout much of the country. Much of the country's low-lying landmass is the result of millions of years of sediment deposition brought by the major rivers rising from the Himalayan Ranges. The process continues to this day. Natural processes degrade the material that make up the mountain ranges, and the rivers carry the product of degradation down with their flow. River flow is usually determined by the cross section of the river itself and the slope of the riverbed. The steeper the slope of the riverbed, the faster the river flow; conversely, the flatter the slope of the riverbed, the more sluggish the river flow becomes.

2. One significant hydraulic fact is that the faster the river flow is, the more sediment it can carry with it, as its sediment-carrying capacity is a function of velocity. The significant point relating to the deposition of silt and sediment brought in with the incoming tide is that much of this is in suspension and is thus carried when the tidal flows are fast. When the flow slows down, which happens in less steep slopes, the flow will lose its ability to move much of this sediment. In the extreme case where the slope is almost flat as in the lower southwest region of Bangladesh, the rivers tend to drop most of their sediment load on the riverbed itself. This becomes a problem as the affected river length will soon accumulate the sediment dropped by the river itself and will become choked and will eventually "die."

B. Government Strategy: 1960s and 1970s

3. In the 1960s and early 1970s, flood control and drainage provisions were two key interventions in the Government's strategy for increasing monsoon season rice crops, particularly wet season (*aman*) rice. As a result, the Coastal Embankment Project (CEP)[1] was conceived in the mid-1960s. The CEP constructed what are essentially high earthen embankments along much of the southern coastline to parcel off and protect the land from daily tidal inundation by saline water as well as to protect it from monsoon rains and storm floods.[2] In addition to the embankments, CEP constructed a number of different types of drainage structures across river sections to protect the land within from flooding and also from tidal influx. The areas upstream of the polders were further subdivided into smaller polders with smaller earthen embankments.

4. The polder system worked well (primarily by denying entry of salty or brackish water to the land within the polders) for 10–15 years, as the land was developed intensively and gave significant increases in agricultural production until the mid-1980s. Subsequently, the polders and gated structures, such as regulators constructed during the CEP, over this same period of time became devices that throttled and restricted tidal flow. The obstruction led to accelerated silt deposition and sediment accumulation in the rivers and channels in the area. The situation was further exacerbated by the absence of any provision for regular and routine maintenance dredging in the CEP. In addition, river flows during monsoon season brought vast volumes of water, which simultaneously carried extremely high sediment loads washed down from the Himalayas. The polders and other structures impeded this sediment-laden flood flows.

[1] ADB. 1993. *Report and Recommendation of the President to the Board of Directors on the Proposed Loan and Technical Assistance Grant to Bangladesh for the Khulna-Jessore Drainage Rehabilitation Project.* Manila: Page 2, para. 7, and page 8, para. 30, refer to the CEP, which was funded by the United States Agency for international Development (USAID) as its major manifestation.

[2] This was one of the classic solutions that the Dutch have employed very successfully along their coastline.

Consequently, the floodwaters accumulated upstream of the polder embankments and the drainage structures. This caused widespread flooding and also deposited silt and sediment in the riverbeds and channels. The effect was the reduced carrying capacity of the rivers and channels, which led to further flooding due to severe congestion of drainage, canals, which progressively became worse. The cumulative impact was felt in terms of a decrease in income; worsening of sanitation conditions; loss of livelihood; and problem in gaining access to residents' homes, agricultural land, and infrastructure facilities. Strong competition for the rapidly diminishing resource base heightened tensions and conflicts between sectors of society and created a volatile social situation. In 1984 the Government requested Asian Development Bank (ADB) assistance to investigate investment possibilities for rehabilitating the land in the original CEP.

C. Public Protest Action

5. ADB approved project preparatory technical assistance (PPTA) in 1985. Subsequently, in 1986, ADB approved the Khulna Coastal Embankment Rehabilitation Project (KCERP)[3] together with advisory and operational TA (AOTA)[4] to provide support to the Implementing Agency. However, before any major civil works for the KCERP were started; public protests and civil actions including the cutting open of the embankment in Beel Dakatia forced the Government to suspend the planned implementation of the KCERP in 1990. The embankment was cut open to release the floodwaters that had become stagnant and at the same time to allow tidal inflows to let the water circulate. People affected by waterlogging formed committees and decided to reintroduce tidal flows and drainage into polder 25 in Beel Dhakatia. In September 1990 they breached the polder embankments at four locations. By 1992, more than 1,000 ha of "char" (newly risen) lands emerged and rice cultivation was seen in the char lands in October 1992.

In October 1997, citizens breached the right embankment along the Hari River just upstream of Sholgati Bazaar to enable tides to enter and leave Beel Bhaina[5] freely. By 1999, Beel Bhaina had raised land levels and the Hari River, which was heavily silted up before, was triple its width and its depth had increased hugely (to 10 meters deep near Sholgati Bazaar), showing again that free movement of tides will certainly keep the river channels open for drainage. The general land level within this beel rose by an average of 1 meter due to tidal sediment deposition. At places close to the opening, land rose by some 2 meters.

D. Design Options and Revisions

6. The Khulna-Jessore Drainage Rehabilitation Project (KJDRP) was formulated for ADB assistance in 1993 and was to remedy congestion by rehabilitating the tidal drainage system that had become clogged as a result of silt deposition. The detailed engineering design and construction supervision report prepared by SMEC and Associates in March 1997 listed five proposals for the overall drainage plan for the Project. Each proposal was studied by SMEC International from all points of view including engineering, sediment and morphology, environmental and social aspects, hydraulic modeling, and economics. The analysis concluded that all five proposals are technically feasible, and all showed economic internal rates of return

[3] ADB. 1986. *Report and Recommendation of the President to the Board of Directors on the Proposed Loan and Technical Assistance Grant to Bangladesh for the Khulna Coastal Embankment Rehabilitation Project.* Manila (Loan No. 819-BAN[SF], for $16.9 million, approved on 11 December 1986).

[4] ADB. 1987. *Technical Assistance Grant to Nepal for the Fifth Agricultural Credit Project.* Manila. TA No. 831-BAN, approved on 7 April 1987, for $1.2 million.

[5] Tutu, Ashraf-ul-Alam. 2006. *Peoples' Voice on ADB Projects in South West Coastal Region of Bangladesh.* Coastal Development Partnership.

(EIRR) of over 20%, while the Coastal Embankment Rehabilitation Project (CERP) showed an EIRR of 12.5%. The CERP proposal was the most environment-friendly, had the least major civil works, and used natural processes to flush out the sediment in the river system with storage proposed in the Beel Kedaria tidal basin. However, the land acquisition requirement was cited as the major reason for dropping this proposal.

7. Public dissatisfaction with the proposed solutions necessitated an environmental and social impact assessment study by the Environmental and Geographical Information Services (renamed Center for Environmental and Geographical Services). The 1998 study not only concurred with the correctness of the open cut demonstrations (proto-tidal river management) by the beneficiaries in Beels Dakatia and Bhaina, but also gave scientific and engineering support to formalize that practice as the most suitable design option for these areas in dealing with drainage congestion problems. This finding led to the next revision[6] in the project plan and the redesign of the Project in 1999, for the last phase of the Project starting in January 2000. During this phase, emphasis was placed on training and institutional strengthening of WMAs with a focus on the long-term operation and maintenance (O&M) of the drainage infrastructure. The smaller channels were to be maintained by the water management groups, and major works such as heavy dredging of outfall channels outside polders, and similar major earthworks in the construction of embankments for dividing future tidal basins would best be handled by the Bangladesh Water Development Board (BWDB). This left the main channels, regulators, and smaller structures and embankments requiring O&M.

8. After extensive consultation with WMAs, BWDB, and other stakeholders, the consultant prepared a costed pilot plan for annual maintenance of Beel Dakatia. However, this cost was to be met by revenue generated by leasing lands, water bodies, and embankments, which were owned by BWDB but transferred to WMAs for this purpose. Unfortunately, this proposal proved to be unworkable and impractical.

E. Impact of Fixed Structures across River Channels

9. There are two complete tidal cycles every 24 hours, with two incoming and two outgoing tides at sea and occurring in the river and tributary networks. As the southern part of the country is very low-lying, during the rainy season the rivers carry extremely large flows that need to be discharged to the sea. If there are impediments on the way, the rivers flow over their banks, causing extensive flooding as seen repeatedly in Bangladesh. Impediments include silted up river sections, channels blocked with sediment deposits as well as structures built across the river section that constrict the river flow. The runoff during the dry season (with water quality varying between fresh and brackish) from the river catchments and the resulting river and channel flows is low but still needs to be discharged to the sea. The sediment load in the incoming tides is very high,[7] and is primarily in the form of suspended sediment, which is a particular feature of the tidal river system in the project areas.[8]

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[6] SMEC International Pty Ltd. 2002. Project Completion Report: Khulna-Jessore Drainage Rehabilitation Project. *Turnover.* Manila: Section 2.2.4: page 2.6.

[7] Government of Bangladesh. 1998. *Environment and Social Impact Report of Khulna-Jessore Drainage Rehabilitation Project.* Dhaka: Environmental and Geographic Information Services of the Ministry of Water Resources.

[8] Average sediment concentration in both dry and wet seasons varies within the range of 1,500 to 2,000 milligrams per liter (mg/l) in the lower Sholmari, Ghangrail, and Teligati rivers. Much higher concentrations of sediment were found in the dry season in smaller rivers such as Hari and Hamkura. The average concentration in the Hari River in the dry season near its confluence with the Upper Bhadra River was as high as 8,000 mg/l (4–12 April 1996). In the wet season, the average concentration very near this location was around 2,200 mg/l (22–29 Aug 1996).

10. As the incoming tidal flows are seawater to brackish in salinity, they cannot be used for raising traditional crops. Salinity is minimal in the wet season and starts to rise in November at the end of the wet season. Maximum salinity[9] is reached in late March to early April. The values are highest near the Bay of Bengal (from 25 to 30 grams (g)/l and decrease further inland from the Bay. In the lower Sholmari or the Ghangrail, they vary from 15 g/l to 20 g/l. The installation of regulators with automatic and controlled lift gates is one method of controlling the inflow of saline water into the upper parts of the system on the incoming tide. These flap gates will close automatically when the tide reaches the regulator structure. The gates are designed to open automatically when the tide is going out to sea, and also when there is a buildup of drainage water from upstream, which will then drain to the sea.

11. When the incoming tide was stopped at the flap gates, the tide dropped its sediment load in the river channel area just downstream of the gates, or just at the face of the gate itself and continued to build up this deposit. This situation caused the rapid buildup of sediment against the face of the gate, and the flap gate could no longer function or operate, defeating its design purpose. These automatic gates remained nonfunctional until the sediment against the downstream face was cleared manually, or sometimes when the pressure on the upstream face became very high, which will be the case with monsoon floods. Even manually operated gates could be rendered nonoperational if they were not attended to very regularly. The reason for this was that even a small buildup of sediment on the downstream face could become a major impediment to the lifting of the gates. Thus, constant operation and maintenance are required to keep these flap and sluice gates functional, and the sediment must be removed by using flushing releases or by manual clearing/dredging of the built-up sediment.[10] During the wet season when the rainfall runoff was very high, the flap gates could usually be kept open by the flow of fresh water toward the sea.

F. Competing Needs and Persistence of the Problem

12. There are two primary problems: (i) drainage congestion, and (ii) entry of salty/brackish water onto agricultural lands from tidal inflows. Drainage congestion resulting from silting up of the river channels has seriously reduced their ability to discharge the runoff flows to the Bay of Bengal and leads to widespread flooding. Salty/brackish water from the Bay gaining entry to agricultural lands has serious negative effects primarily on rice growing and other agricultural activities that require salt-free water and soils. The two problems are seemingly mutually exclusive, but both use the same network of river channels. Drainage congestion and consequent widespread flooding have regularly caused untold hardship to numerous residents and need to be addressed as the major primary issue. Beneficiaries who have agriculture as their primary livelihood need to see that their lands are not overinundated and that the water on their lands is fresh and not saline, as rice is sensitive to salt. Beneficiaries who are primarily in fish farming and raising brackish water shrimp need to have low-lying lands that need to be flooded at all times and which require brackish water inputs from the incoming tides. These two groups have diametrically opposing sets of requirements. Tension between the two main groups of water users has continued even at the time of the OEM.

[9] EGIS. 1998. Environmental and Social Impact Assessment of KJDRP. Dhaka. Chapter 2, page 5, also gives salinity levels.

[10] SMEC International. 1997. *Khulna-Jessore Drainage Rehabilitation Project Feasibility Study for an Overall Drainage Plan*. Manila: ADB. Page 4.9, para. 4.8 confirms this and says: Removal of downstream deposits by routine O&M or dredging will be essential.

BASIC REQUIREMENTS FOR A SUCCESSFUL ROTATIONAL TIDAL RIVER MANAGEMENT OPERATION IN BANGLADESH

1. There is elegance in harnessing the tides themselves to carry out the deposition of sediment and silt to raise the level of low-lying lands and reclaim them for agricultural use. Any project area in particular and the surrounding areas must be considered as composite parts of the whole of the larger area that is subject to tidal movement and influence. Bangladesh is a country that is a classical tidal fan on a very large scale, with the apex in the north and the base in the Bay of Bengal, and the tidal rivers and channels forming large networks. The topography is flat and is generally only a few meters above the mean sea level. Some of the basic requirements for a successful rotational tidal river management (TRM) operation in the context of Bangladesh are discussed next.

2. **Embankment Enclosure.** The target beel must be enclosed by embankments and the tide allowed to enter through only one main opening in the enclosing embankment. The river channels must be kept open as far into the beel as possible. The tide must be allowed to enter and return to sea freely. This ensures that the incoming tide brings with it a huge load of sediment and as the tide enters and fills the enclosed beel, the flow cannot go anywhere further and the sediment therefore drops to the floor of the beel, and stays there. Over time this action results in raised land suitable for agricultural use. If the river channel within the beel is kept clean of sediment, the tide returning to the sea takes with it some of the deposited sediments, and the river channel is clean for the next incoming tide and return flows.

3. **Planning of the TRM Operations.** Beel areas are found all around the southwestern and other parts of Bangladesh. In the early 1960s and 1970s, embankments were constructed to make polders so as to protect land from the intrusion of saline tidal water. This resulted in massive flooding of land. TRM gives tide water free access to selected low-lying beels. For effective results, the beels need to be divided into smaller beels, with an average size of 500–600 hectares (ha). The relatively manageable size of the beels ensures raising of the land.[1]

4. When one TRM beel has achieved the desired raising of land, then another TRM beel will take the sediment load that comes in with the tide. As there are two tidal cycles every 24 hours, it is imperative that a new beel be prepared to receive the tidal inflows. This preparation has to be done while the first TRM basin is being operated, so that as soon as the completed basin is closed off, the new basin will become the new operational TRM beel/basin. It is intuitive that the new beel must be adjacent to or near the recently completed beel. However, depending on the location of the river channels and the distance from the Bay of Bengal, the volume of sediment that comes with the tides varies considerably. Therefore, it is difficult to make a sequential list of likely beels without full use of computer modeling such as the one being carried out by the Institute of Water Modeling and Center for Environmental and Geographical Services. If this rotation of TRM beels is not carried out very systematically and in a planned manner, then the incoming tides are more than likely to drop their sediment in the river channels themselves, which will further accelerate such deposition and will hamper the drainage ability of the rivers, to the detriment of all.

[1] Tides bring suspended sediment as they enter the beel. When they have nowhere else to go, they deposit the sediment on the beel land. When the beel area is small, the suspended sediment will accumulate into deeper deposits and raise the land faster than when the beel area is large.

5. To continue to benefit from the use of the TRM basins, it is therefore essential that the whole area be analyzed by digital modeling of flows and the sequence of rotation determined. It has been demonstrated that an average of 3 to 4 years is a sufficient period for an average beel to have its lands raised so that agricultural activities can be undertaken.

6. **Concurrence of Affected Landowners.** The tides in the river need free access to the whole beel area twice a day. Thus, it is important that the whole beel area set side for TRM must not be used for any other purpose. This requires a priori advance concurrence of all affected landowners to set aside their land for the duration of basin preparation. Intensive consultations and a clear agreement from the concerned communities and affected landowners are also preconditions for the selection of a beel for the next rotation. Furthermore, adequate advance planning is required from the Bangladesh Water Development Board and communities to ensure that the scheduled activities take place within the planned time frame.

7. **Provision for Compensation to Affected Landowners.** While it is recognized that the land value would appreciate after the beel areas are raised and made suitable for agricultural production, it is important to also recognize that the landowners, particularly the poor ones who would have to depend on their only land for livelihood, would forgo incomes from their land in one form or another during the time their land is used for TRM. There is a compelling reason for making adequate provision for compensating landowners' lost income.[2] The OEM noted that the landowners gave up their land for TRM for 3 years in Beel Kedaria, but they did not allow its use in the fourth year when the next river basin was not ready for rotation.[3]

8. **Sustained Provision for Operation and Maintenance Requirements.** The river channels must be kept clean and open for the tidal flows to proceed unimpeded. Much of the maintenance can be done by the local beneficiaries regularly on a daily basis. However, there is a continuous requirement to spread the deposited silt to locally lower areas within the beel itself so that raising of the beel lands will be even. An area of approximately 600 ha was considered as an appropriate and manageable size for the Beel Bhaina basin. As this maintenance is a regular activity, it is essential for the sustainability of the approach that a robust operation and maintenance arrangement including financing should be in place for successful completion of the conversion of the low lands into agriculturally productive farm lands.

[2] The OEM understands that provisions have been made in the Development Project Proforma for providing compensation for the affected land in Beel Kapalia (new one), and CEGIS is conducting a study in 2007 to determine a compensation mechanism. However, the retroactive claims from landowners of prior beels used for TRM—for example, Beel East Khuksia, Beel Bhaina, and Beel Kedaria—have prominently surfaced, and Bangladesh Water Development Board has problems in managing such claims.

[3] As a result, the gains made during the 3 years were reversed due to flooding.

OPERATION AND MAINTENANCE

1. Operation and maintenance (O&M) is a significant part of any solution to mitigate the congestion of drainage canals and to minimize flooding of productive lands or sedimentation of river channels in the future. The National Water Policy (NWP)[1] states that, for the foreseeable future, cost recovery for flood control and drainage (FCD) projects is not envisaged in this policy. In the case of flood control, drainage, and irrigation projects, water rates will be charged for O&M as per Government rules. The local interpretation of the policy is that the Government is fully responsible for O&M of project infrastructure. Although it is not stated explicitly, the local understanding is that cost recovery for FCD refers to resources for O&M. However, the Policy also states that leasing lands is one of the financial options for raising O&M revenues.[2]

2. In the Project context, the proposal was to raise O&M revenues by leasing government-owned lands and water bodies to the water management associations (WMAs).[3] The O&M resources were classified into three categories: minor, routine, and emergency works. The Project required water management groups and WMAs to be responsible for minor O&M. Bangladesh Water Development Board (BWDB) allocated to WMAs, on an annually renewable basis, 168.31 ha of cultivable land, 106.11 ha of water bodies, and 81.62 ha of embankments for on-leasing to derive revenues for O&M.

3. At the time of the OEM, all allocations had lapsed. The titles of the majority of the lots allocated for leasing by BWDB through WMAs reportedly have been contested by parties other than BWDB. These lands were acquired by BWDB in the 1960s and the landowners reportedly did not receive full compensation and thus have not really relinquished their property rights. There are between 650 and 1,000 pending court cases. Thus it is not clear which of the surrounding actual land and water bodies can be leased to WMAs. The funds collected by WMAs in the past by leasing BWDB lands had not been utilized for the intended purpose and most remained with the associations as idle capital. This was due to the disagreement on the modus operandi for fund utilization. Similarly, the water management groups also had collected a small amount as membership fee and regular contribution from their members. These funds also are reportedly not being used. However, some of the groups have used their collected funds to run microcredit schemes. These factors collectively have had an adverse impact and led to very little, if any, routine O&M works.

4. The need for an adequately funded and effective O&M plan was recognized during the initial stages of project implementation.[4] It was thought to be of greater importance for the project area than for other parts of Bangladesh because the downstream tidal rivers carry massive amounts of sediments. In the dry season, these sediments move upstream in tidal water, which is saline because of lack of fresh water inflows. As a result, sediments can quickly accumulate downstream from the regulators, such as in the outlet channels of Sholmari and Ramdia regulators, and also downstream of seasonal cross-dams in Hari and Upper Bhadra rivers under the tidal river management scheme. Furthermore, faulty operation of the gates or lack of routine maintenance for them, and the ill-timed construction or removal of seasonal

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[1] Government of Bangladesh. 2000. *National Water Policy, 2000*. Dhaka: Ministry of Water Resources (Section 4.14.a).

[2] See footnote 1, Section 4.14.C.

[3] ADB. 1993. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan and Technical Assistance Grant to the People's Republic of Bangladesh for the Khulna-Jessore Drainage Rehabilitation Project.* Manila (page 16, paras. 52–53).

[4] SMEC and Associates. 2003. *PCR: Khulna-Jessore Drainage Rehabilitation Project.* Manila: para 11.1.

cross-dams can result in the entry of large volumes of sediments and saline water into the drainage channels of the project area.

5. To meet O&M requirements, the project consultants assisted BWDB in (i) procuring a 300-millimeter (mm) diameter cutter suction dredger, a 450 mm diameter cutter section dredger, an amphibious soft terrain excavator, and a long-range excavator; (ii) preparing an O&M manual for BWDB and WMAs; and (iii) training BWDB and WMA staff in basic O&M activities. While the O&M plan for the Project outlined the rights and responsibilities of BWDB and WMAs, it did not clearly recognize the roles and responsibilities of water management groups. The manual was made available only toward the end of the Project; hence, the effort was too little and too late. The OEM noted that the manual was not fully internalized by BWDB and WMAs because resources available for implementation during and beyond project completion became a limiting factor. One of the primary reasons was the substantial resource gap between what was proposed and what was actually available. The manual did not propose a funding mechanism for O&M. The project completion report prepared by SMEC and Associates concluded that the insufficient and untimely provision of funds for O&M activities was the main constraint to effective O&M. The funding status for O&M remained similar to the pre-project stage (National Water Policy, para. 11.6). The Project disbursed $1.16 million (National Water Policy, Table 12.2 as of September 2002), that is, 2.8% of the total project cost for O&M. Less than one fourth of the O&M expenditure was funded through the Government's counterpart contribution.

6. Voicing their concern to the OEM, the project beneficiaries stated that the water management groups, WMAs, and water management federation did not adequately represent the beneficiaries that the project intended to serve. Instead, those organizations were dominated by landlords with extensive landholdings—for whom many of the target beneficiaries worked either as sharecroppers or as farm laborer—and wealthy, powerful people. The OEM findings suggested that there was no practical mechanism and sustainable basis for generating funds for O&M other than dependence on the annual budgetary allocation by BWDB. In March 2007, only 15% of the water management groups were still operational. Wide fluctuations in the Government's annual budgetary allocation for the O&M of project infrastructure and allied activities have historically made it difficult to systematically plan meaningful O&M activities.

7. The Government regulation requires that at least 25% of the civil work be completed by labor contracting societies. The societies contracted by WMAs on behalf of BWDB are not bound to use exclusively local labor. BWDB contends that at peak times, local laborers are not available and thus the contracting societies have to outsource from other places, outside the project area. This interpretation is highly contested by the local beneficiaries and civil society groups.

ECONOMIC REEVALUATION

1. The Khulna-Jessore Drainage Rehabilitation Project (KJDRP) supported the Government's efforts to reduce poverty by reducing drainage congestion and mitigating surface flooding. Drainage improvements were expected to increase agricultural production, raise incomes, and generate on-farm employment. A well-functioning drainage infrastructure was expected to bring more land into crop production and allow more productive land use throughout the year. The Project covered eight subdistricts (*upazilas)* of the districts of Khulna and Jessore encompassing an area of 100,600 hectares (ha). Adjoining areas had been subject to drainage congestion problems leading to flooding. The result is either noncultivation or a reduction in the number of cropping per year.

2. Economic reevaluation was carried out for the Project at project performance evaluation. This was done to reflect actual and existing conditions that occurred especially during the Project and after its completion. The analysis utilized data from a variety of sources: crop production, flooded area and land utilization obtained from Government agencies and official publications, research institutions monitoring and studying the area, the socioeconomic survey conducted for the Project evaluation in March–April 2007, relevant statistical databases, and adjusted price estimates used in the project completion reports (PCRs) of the KJDRP and the Command Area Development Project in Bangladesh. The economic benefits from the Project are the resumption of normal activities in polder areas that have been subject to flooding. Using the with- and without-project scenarios, the economic internal rate of return (EIRR) was estimated by assessing the net benefits using the weighted average return per ha from all crops, multiplied by the total incremental cropped area in each year. The costs of project investment and operation and maintenance O&M) up to 2004 were based on actual and cost estimates in the Asian Development Bank (ADB) PCR for the Project, and the investment cost of preparing tidal river management (TRM) and annual O&M costs were obtained from the Bangladesh Water Development Board (BWDB). These were validated by the Operations Evaluation Mission (OEM).

3. The economic analysis in the evaluation differed from the PCR on four aspects: (i) the cropping intensity[1] and year-round flooding in the PCR were based purely on a hypothetical with- or without-project scenario, while the OEM used the differences between counterfactual and actual achievements;[2] (ii) the crop yield and production data in the evaluation exercise was based on multiple sources and included actual production figures from 1994 to 2005, which was extrapolated to obtain data for 2006–2022 using average annual crop growth rates based on yield and production data from Government agencies and other publications, including results of the household survey, while the PCR used the weighted average return per ha;[3] (iii) the cost of preparing and constructing a TRM basin was not applied in the PCR; (iv) fisheries production was not used in the EIRR recalculation, given that the fisheries component was dropped from the Project and hence the corresponding benefits from

[1] The PCR assumed cropping intensity to increase linearly by 2% per year until the end of the project life. This means that by 2022, cropping intensity in the area would reach 269%. However, considering the area limitations and actual area utilization due to the recent flood situation, the construction of beels under the TRM option every 3 years, the trend of cropping intensity increases based on actual data, and the lack of operation and maintenance for drainage facilities, the OEM estimated cropping intensity increases to be about 1% per year.

[2] The study utilized flood and crop production data from the Department of Agricultural Extension and from official sources such as the Bangladesh statistical yearbooks and statistical bulletins. Actual land utilization was determined using indices of area per crop.

[3] The computation of average return per ha in the PCR was based on a hypothetical assumption about per ha yield rather than the actual data. The consultant who conducted economic analysis for the PCR could not provide a verifiable basis for the calculation.

fish production are considered not attributable to the Project.[4] As a consequence, the potential benefits from the Project were reduced, translating into lower EIRR estimates.

4. The major assumptions underlying the EIRR estimation are as follows: (i) the economic analysis covered 28 years (1994–2022) to encompass the period covered in the PCR and to reflect the economic life of the Project, estimated at 20 years after project completion; (ii) the analysis was done at the world price level in the national currency (taka) and standard conversion factors were used to convert financial prices to economic prices; (iii) all project costs and benefits were expressed in 2006 constant prices; and (iv) O&M costs increased by 14% between 2004 and 2006, using the consumer price index. The assumptions and data sources used in the economic reevaluation are summarized in Table A10.1. Tables A10.2 and A10.3 presents the area and production by crop in without- and with-project scenarios.

5. The Project was expected to have an impact on the rural economy through enhanced agricultural production. The results of the analysis suggest that the net cropped area as of 2003 was 122,623 hectares (ha) with a cropping intensity of 155%. These figures are lower than the PCR estimates of a net cropped area of 133,857 ha with a cropping intensity of 164%, but still higher than the appraisal estimates. The cropping intensity is expected to remain below 160% even with the provision of TRM (which is expected to bring an estimated additional 600 ha every 3 years), if the state of O&M and the trend in waterlogged areas remained constant.

6. The Project recorded lower annual estimates of both incremental production and area. The total incremental production from 2002 to 2022 was estimated at 51,365 tons per year, much lower than both the PCR estimate of 97,994 tons and the appraisal estimate of 98,263 tons. In terms of area, the OEM estimate of 12,596 ha was lower than the net incremental cropped area estimate of 23,323 ha reported by the PCR and the 23,318 ha estimated at appraisal. In terms of employment contribution, an estimated 2.31 million person-days[5] was expected over the entire life of the Project.

7. Overall, the base estimated EIRR was 4.08%, which was lower than both the project completion (20.6%) and appraisal (19.4%) estimates. Sensitivity analysis was conducted to determine the effects of costs and revenue changes on project viability, and project resilience. Although the reestimation already showed that the project was not economically feasible, the results indicated that an increase in benefits by 10% will move the EIRR by only 0.68%. The EIRR calculation and results of the sensitivity analysis are summarized in Tables A10.4 and A10.5.

[4] The fisheries component was dropped during the project redesign stage due to (i) its similarity in scope to a project funded by another agency, (ii) poor resource allocation and institutional support, and (iii) project delays. Although a consultant was hired to formulate a fisheries management plan, that plan was never implemented or adopted by project beneficiaries. The Department of Fisheries in both Khulna and Jessore claimed that any increase in fisheries in the project area was solely due to the efforts of their staff, and the Project had little to do with the expansion in fisheries.

[5] This was computed based on the average number of person-days required to produce one ton of cereal (41 days) and noncereal (51 days) crops. The same estimates were used in the PCR.

Table A10.1. Assumptions in Economic Reevaluation of the Khulna-Jessore Drainage Rehabilitation Project (KJDRP)

Area	(i)	The actual crop area from 1994 to 1995 was based on the Feasibility Study Report for the KJDRP completed by SMEC International for ADB in March 1997, and this was used to estimate the total cropped area for 1996–2022. The production area per crop was based on its relative share of the total crop area using 1994 and 1995 data.
	(ii)	To capture changes in actual land utilization (a product of several factors including flooding/inundation/waterlogging in the area), the index of land utilization per crop was used. The base year index was 1995. Land utilization index from 2006–2022 was the average annual land utilization index from 1994–2005.
	(iii)	Under the with-project scenario, the crop area is expected to increase by an increment of 600 hectares every 3 years, given the provision of a new TRM system starting in 2002. Originally, eight basins were planned and the Mission considers that to still be feasible. The construction of the scheduled TRM basin for 2005 was delayed by a year and was completed in 2006.
Production	(i)	Crop production data was obtained (1994–2005) or estimated (2006–2022) using time-series per hectare yields derived from the Statistical Yearbook of Bangladesh, Yearbook of Agricultural Statistics, monthly statistical bulletins, and data from the DAE-Khulna. Yields were validated by the OEM through interviews and the survey of households conducted under this study.
	(ii)	For rice, yield estimates from each variety were obtained from the BRRI. The BRRI data was also compared with data from Bangladesh statistical publications and DAE, and was found to be consistent.
	(iii)	Production data for vegetables is the average yield of all summer and winter vegetables as enumerated in the monthly statistical bulletins published by the Bangladesh Bureau of Statistics.
	(iii)	Under the with-project scenario, yields for 1994–2005 were yield data from secondary sources. The average annual growth rates for 1994–2005 for each crop were used to estimate 2006–2022 production.
Prices and Costs	(i)	The cost of production for each crop adopted the cost estimates used in the project completion report completed in 2004 but was adjusted to 2006 prices to facilitate comparison and consistency.
	(ii)	The output price was based on the producer's prices (2005) under the FAOSTAT database and was triangulated through OEM interviews and PPER survey. Figures were adjusted to 2006 prices. The price for local or traditional paddy was assumed to be 20% higher than that for paddy high yielding varieties.
	(iii)	The analysis adopted the 2004 operation and maintenance and investment costs based on the project completion report. Cost was adjusted to 2006 prices. The costs in US dollars were converted to taka at an exchange rate of $1:Tk69.
	(iv)	The conversion factor used to convert market to economic prices (shadow prices) for each crop was adopted from the project completion report of the Command Area Development Project in Bangladesh completed in December 2006.
	(v)	The price of by-products from rice and wheat production was 5% of the total net revenue for these crops. This was the average of the price ratios of the by-product and main crop based on the PCR (6%) and statistical bulletins (4%).

ADB = Asian Development Bank, BRRI = Bangladesh Rice Research Institute, DAE = Department of Agricultural Extension, FAOSTAT = Food and Agricultural Organization of the United Nations Statistical database, HYV = high yielding varieties, KJDRP = Khulna-Jessore Drainage Rehabilitation Project, OEM = Operations Evaluation Mission, TRM = tidal river management.

Table A10.2: Distribution of Cropping Area and Production (ha) by Crop, Without-Project Scenario
Khulna-Jessore Drainage Rehabilitation Project, 1994–2022

Without Project Scenario															
Crops	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Area															
B. Aus (L)	5,293	6,095	5,560	5,774	5,667	5,133	4,919	4,812	4,491	4,491	4,384	3,743	4,897	4,897	4,897
T. Aus (HYV)	3,535	4,223	3,853	4,001	3,927	3,556	3,408	3,334	3,112	3,112	3,038	2,593	3,393	3,393	3,393
B. Aman (L)	5,618	7,706	7,785	8,021	8,021	7,077	7,863	7,863	7,785	7,863	7,785	7,234	7,730	7,730	7,730
T. Aman (L)	20,746	19,730	19,931	20,535	20,535	18,119	20,133	20,133	19,931	20,133	19,931	18,522	19,790	19,790	19,790
T. Aman (HYV)	32,039	33,327	33,667	34,687	34,687	30,606	34,007	34,007	33,667	34,007	33,667	31,287	33,429	33,429	33,429
Boro (L)	584	600	621	628	650	795	824	849	849	866	888	916	789	789	789
Boro (HYV)	20,033	22,562	23,363	23,630	24,431	29,905	30,973	31,907	31,907	32,575	33,376	34,444	29,651	29,651	29,651
Wheat	2,721	2,823	3,090	3,120	3,536	3,863	3,655	3,388	3,269	3,090	2,823	2,466	3,230	3,230	3,230
Sugarcane	509	419	408	408	408	404	396	392	377	389	381	366	393	393	393
Jute	2,331	1,603	1,313	1,448	1,642	1,371	1,159	1,275	1,294	1,255	1,159	1,120	1,304	1,304	1,304
Oilseeds	5,402	5,190	5,124	5,299	5,285	4,760	4,184	4,024	3,951	3,812	4,053	6,269	4,676	4,676	4,676
Pulses	5,988	4,403	4,298	4,432	4,251	2,969	2,775	2,588	2,442	2,348	2,565	1,874	3,054	3,054	3,054
Potato	1,192	1,029	1,038	1,046	1,064	1,918	1,901	1,953	1,866	1,918	2,119	2,555	1,738	1,738	1,738
Vegetables	5,252	4,523	4,687	4,820	4,908	5,288	5,572	5,675	5,750	5,889	6,030	6,473	5,509	5,509	5,509
Banana	133	135	136	136	136	135	139	148	154	156	170	185	150	150	150
Papaya	61	82	88	90	93	94	105	117	118	118	129	52	100	100	100
Total Cropped	111,437	114,450	114,962	118,077	119,239	115,994	122,013	122,464	120,962	122,023	122,496	120,098	119,833	119,833	119,833
Net Cultivated Area	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962
Cropping Intensity	1.41	1.40	1.46	1.50	1.51	1.47	1.55	1.55	1.53	1.55	1.55	1.52	1.52	1.52	1.52
Production															
B. Aus (L)	4,817	5,303	4,782	5,312	5,348	4,671	5,066	5,101	5,120	5,210	8,681	4,154	5,696	5,696	5,696
T. Aus (HYV)	6,363	7,221	6,434	7,041	7,061	5,903	6,203	6,435	6,254	6,317	3,797	4,953	6,644	6,644	6,644
B. Aman (L)	7,135	9,016	9,497	10,106	8,823	7,855	10,851	11,638	10,976	11,402	11,521	9,911	10,707	10,707	10,707
T. Aman (L)	26,347	23,084	24,316	25,874	22,589	20,113	27,783	29,796	28,103	29,192	29,498	25,375	27,414	27,414	27,414
T. Aman (HYV)	67,923	69,320	69,354	75,271	71,109	58,764	76,856	84,338	80,128	82,637	84,841	71,959	77,663	77,663	77,663
Boro (L)	829	912	926	911	1,007	1,264	1,307	1,560	1,485	1,698	1,731	1,905	1,701	1,701	1,701
Boro (HYV)	55,091	57,984	63,781	66,164	71,583	92,405	96,635	103,379	102,103	105,542	111,141	119,520	105,149	105,149	105,149
Wheat	5,102	5,575	6,104	6,474	8,045	8,499	8,041	7,368	7,273	6,644	5,575	4,994	6,594	6,594	6,594
Sugarcane	20,258	16,896	16,935	17,658	17,831	16,332	16,252	15,841	15,263	15,939	15,265	15,121	16,303	16,303	16,303
Jute	4,487	2,805	2,134	2,535	3,037	2,365	2,057	2,358	2,459	2,322	2,289	2,996	3,613	3,613	3,613
Oilseeds	4,606	4,497	4,404	4,712	4,601	4,227	3,940	3,838	3,889	3,435	3,652	5,648	4,237	4,237	4,237
Pulses	4,529	3,349	3,265	3,418	3,262	2,292	2,168	2,024	1,865	1,803	1,970	1,439	2,349	2,349	2,349
Potato	13,201	11,628	11,856	11,929	12,261	21,871	21,814	25,491	23,793	24,269	30,885	38,454	26,934	26,934	26,934
Vegetables	29,464	25,374	26,293	27,038	27,532	29,666	31,262	31,839	32,257	33,039	34,071	39,227	34,716	34,716	34,716
Banana	2,181	2,228	2,206	2,094	2,175	1,944	1,990	2,110	2,275	2,260	2,462	3,124	2,536	2,536	2,536
Papaya	459	615	642	660	690	681	766	756	803	801	857	393	754	754	754

Without Project Scenario														
Crops	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Area														
B. Aus (L)	4,897	4,897	4,897	4,897	4,897	4,897	4,897	4,897	4,897	4,897	4,897	4,897	4,897	4,897
T. Aus (HYV)	3,393	3,393	3,393	3,393	3,393	3,393	3,393	3,393	3,393	3,393	3,393	3,393	3,393	3,393
B. Aman (L)	7,730	7,730	7,730	7,730	7,730	7,730	7,730	7,730	7,730	7,730	7,730	7,730	7,730	7,730
T. Aman (L)	19,790	19,790	19,790	19,790	19,790	19,790	19,790	19,790	19,790	19,790	19,790	19,790	19,790	19,790
T. Aman (HYV)	33,429	33,429	33,429	33,429	33,429	33,429	33,429	33,429	33,429	33,429	33,429	33,429	33,429	33,429
Boro (L)	789	789	789	789	789	789	789	789	789	789	789	789	789	789
Boro (HYV)	29,651	29,651	29,651	29,651	29,651	29,651	29,651	29,651	29,651	29,651	29,651	29,651	29,651	29,651
Wheat	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230
Sugarcane	393	393	393	393	393	393	393	393	393	393	393	393	393	393
Jute	1,304	1,304	1,304	1,304	1,304	1,304	1,304	1,304	1,304	1,304	1,304	1,304	1,304	1,304
Oilseeds	4,676	4,676	4,676	4,676	4,676	4,676	4,676	4,676	4,676	4,676	4,676	4,676	4,676	4,676
Pulses	3,054	3,054	3,054	3,054	3,054	3,054	3,054	3,054	3,054	3,054	3,054	3,054	3,054	3,054
Potato	1,738	1,738	1,738	1,738	1,738	1,738	1,738	1,738	1,738	1,738	1,738	1,738	1,738	1,738
Vegetables	5,509	5,509	5,509	5,509	5,509	5,509	5,509	5,509	5,509	5,509	5,509	5,509	5,509	5,509
Banana	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Papaya	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Total Cropped	119,833	119,833	119,833	119,833	119,833	119,833	119,833	119,833	119,833	119,833	119,833	119,833	119,833	119,833
Net Cultivated Area	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962
Cropping Intensity	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52
Production														
B. Aus (L)	5,696	5,696	5,696	5,696	5,696	5,696	5,696	5,696	5,696	5,696	5,696	5,696	5,696	5,696
T. Aus (HYV)	6,644	6,644	6,644	6,644	6,644	6,644	6,644	6,644	6,644	6,644	6,644	6,644	6,644	6,644
B. Aman (L)	10,707	10,707	10,707	10,707	10,707	10,707	10,707	10,707	10,707	10,707	10,707	10,707	10,707	10,707
T. Aman (L)	27,414	27,414	27,414	27,414	27,414	27,414	27,414	27,414	27,414	27,414	27,414	27,414	27,414	27,414
T. Aman (HYV)	77,663	77,663	77,663	77,663	77,663	77,663	77,663	77,663	77,663	77,663	77,663	77,663	77,663	77,663
Boro (L)	1,701	1,701	1,701	1,701	1,701	1,701	1,701	1,701	1,701	1,701	1,701	1,701	1,701	1,701
Boro (HYV)	105,149	105,149	105,149	105,149	105,149	105,149	105,149	105,149	105,149	105,149	105,149	105,149	105,149	105,149
Wheat	6,594	6,594	6,594	6,594	6,594	6,594	6,594	6,594	6,594	6,594	6,594	6,594	6,594	6,594
Sugarcane	16,303	16,303	16,303	16,303	16,303	16,303	16,303	16,303	16,303	16,303	16,303	16,303	16,303	16,303
Jute	3,613	3,613	3,613	3,613	3,613	3,613	3,613	3,613	3,613	3,613	3,613	3,613	3,613	3,613
Oilseeds	4,237	4,237	4,237	4,237	4,237	4,237	4,237	4,237	4,237	4,237	4,237	4,237	4,237	4,237
Pulses	2,349	2,349	2,349	2,349	2,349	2,349	2,349	2,349	2,349	2,349	2,349	2,349	2,349	2,349
Potato	26,934	26,934	26,934	26,934	26,934	26,934	26,934	26,934	26,934	26,934	26,934	26,934	26,934	26,934
Vegetables	34,716	34,716	34,716	34,716	34,716	34,716	34,716	34,716	34,716	34,716	34,716	34,716	34,716	34,716
Banana	2,536	2,536	2,536	2,536	2,536	2,536	2,536	2,536	2,536	2,536	2,536	2,536	2,536	2,536
Papaya	754	754	754	754	754	754	754	754	754	754	754	754	754	754

HYV = high yielding varieties, L = local variety.

Sources: (i) SMEC International PTY, LTD. 2003. *Overall Drainage Plan: Khulna-Jessore Drainage Rehabilitation Project Feasibility Study Report*. Manila; (ii) *Bangladesh Monthly Statistical Bulletin* (various issues); (iii) Bangladesh Rice Research Institute; (iv) statistical yearbooks of Bangladesh (various years); and Department of Agricultural Extension, Khulna.

Table A10.3: Distribution of Cropping Area and Production (ha) by Crop, With-Project Scenario
Khulna-Jessore Drainage Rehabilitation Project, 1994–2022

With Project Scenario															
Crops	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Area															
B. Aus (L)	5,293	6,095	5,560	5,774	5,667	5,133	4,919	4,812	4,521	4,521	4,414	3,773	4,958	4,958	4,958
T. Aus (HYV)	3,535	4,223	3,853	4,001	3,927	3,556	3,408	3,334	3,132	3,132	3,058	2,614	3,434	3,434	3,434
B. Aman (L)	5,618	7,706	7,785	8,021	8,021	7,077	7,863	7,863	7,820	7,899	7,820	7,270	7,800	7,800	7,800
T. Aman (L)	20,746	19,730	19,931	20,535	20,535	18,119	20,133	20,133	20,039	20,240	20,039	18,630	20,006	20,006	20,006
T. Aman (HYV)	32,039	33,327	33,667	34,687	34,687	30,606	34,007	34,007	33,841	34,181	33,841	31,460	33,776	33,776	33,776
Boro (L)	584	600	621	628	650	795	824	849	852	869	891	919	795	795	795
Boro (HYV)	20,033	22,562	23,363	23,630	24,431	29,905	30,973	31,907	32,020	32,688	33,489	34,557	29,877	29,877	29,877
Wheat	2,721	2,823	3,090	3,120	3,536	3,863	3,655	3,388	3,283	3,105	2,838	2,481	3,260	3,260	3,260
Sugarcane	509	419	408	408	408	404	396	392	380	391	383	368	398	398	398
Jute	2,331	1,603	1,313	1,448	1,642	1,371	1,159	1,275	1,304	1,266	1,169	1,131	1,325	1,325	1,325
Oilseeds	5,402	5,190	5,124	5,299	5,285	4,760	4,184	4,024	3,979	3,840	4,081	6,297	4,732	4,732	4,732
Pulses	5,988	4,403	4,298	4,432	4,251	2,969	2,775	2,588	2,469	2,376	2,592	1,901	3,109	3,109	3,109
Potato	1,192	1,029	1,038	1,046	1,064	1,918	1,901	1,953	1,872	1,924	2,125	2,561	1,750	1,750	1,750
Vegetables	5,252	4,523	4,687	4,820	4,908	5,288	5,572	5,675	5,776	5,915	6,056	6,499	5,561	5,561	5,561
Banana	133	135	136	136	136	135	139	148	155	157	171	186	151	151	151
Papaya	61	82	88	90	93	94	105	117	118	119	129	53	101	101	101
Total Cropped	111,437	114,450	114,962	118,077	119,239	115,994	122,013	122,464	121,562	122,623	123,096	120,698	121,033	121,033	121,033
Net Cultivated Area	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962
Cropping Intensity	1.41	1.45	1.46	1.50	1.51	1.47	1.55	1.55	1.54	1.55	1.56	1.53	1.53	1.53	1.53
Production															
B. Aus (L)	4,817	5,303	4,782	5,312	5,348	4,671	5,066	5,101	5,154	5,245	8,740	4,188	5,766	6,042	6,331
T. Aus (HYV)	6,363	7,221	6,434	7,041	7,061	5,903	6,203	6,435	6,296	6,359	3,823	4,992	6,725	6,895	7,068
B. Aman (L)	7,135	9,016	9,497	10,106	8,823	7,855	10,851	11,638	11,026	11,453	11,574	9,959	10,805	10,925	11,046
T. Aman (L)	26,347	23,084	24,316	25,874	22,589	20,113	27,783	29,796	28,255	29,348	29,658	25,523	27,712	28,019	28,330
T. Aman (HYV)	67,923	69,320	69,354	75,271	71,109	58,764	76,856	84,338	80,541	83,059	85,279	72,358	78,470	79,262	80,062
Boro (L)	829	912	926	911	1,007	1,264	1,307	1,560	1,490	1,704	1,737	1,912	1,715	1,778	1,844
Boro (HYV)	55,091	57,984	63,781	66,164	71,583	92,405	96,635	103,379	102,465	105,908	111,518	119,912	105,951	108,278	110,657
Wheat	5,102	5,575	6,104	6,474	8,045	8,499	8,041	7,368	7,306	6,676	5,605	5,024	6,654	6,708	6,763
Sugarcane	20,258	16,896	16,935	17,658	17,831	16,332	16,252	15,841	15,363	16,041	15,364	15,223	16,508	16,574	16,640
Jute	4,487	2,805	2,134	2,535	3,037	2,365	2,057	2,358	2,478	2,342	2,309	3,024	3,672	3,804	3,942
Oilseeds	4,606	4,497	4,404	4,712	4,601	4,227	3,940	3,838	3,916	3,460	3,677	5,674	4,288	4,312	4,337
Pulses	4,529	3,349	3,265	3,418	3,262	2,292	2,168	2,024	1,886	1,824	1,991	1,460	2,391	2,395	2,398
Potato	13,201	11,628	11,856	11,929	12,261	21,871	21,814	25,491	23,869	24,343	30,971	38,543	27,117	27,923	28,754
Vegetables	29,464	25,374	26,293	27,038	27,532	29,666	31,262	31,839	32,403	33,185	34,218	39,384	35,044	36,441	37,893
Banana	2,181	2,228	2,206	2,094	2,175	1,944	1,990	2,110	2,285	2,271	2,472	3,136	2,560	2,571	2,583
Papaya	459	615	642	660	690	681	766	756	806	804	859	396	760	761	762

With Project Scenario														
Crops	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Area														
B. Aus (L)	4,988	4,988	5,018	5,018	5,018	5,049	5,049	5,049	5,079	5,079	5,079	5,109	5,109	5,109
T. Aus (HYV)	3,455	3,455	3,476	3,476	3,476	3,496	3,496	3,496	3,517	3,517	3,517	3,537	3,537	3,537
B. Aman (L)	7,836	7,836	7,871	7,871	7,871	7,906	7,906	7,906	7,942	7,942	7,942	7,977	7,977	7,977
T. Aman (L)	20,113	20,113	20,221	20,221	20,221	20,328	20,328	20,328	20,436	20,436	20,436	20,543	20,543	20,543
T. Aman (HYV)	33,950	33,950	34,123	34,123	34,123	34,297	34,297	34,297	34,471	34,471	34,471	34,644	34,644	34,644
Boro (L)	798	798	801	801	801	804	804	804	807	807	807	811	811	811
Boro (HYV)	29,990	29,990	30,103	30,103	30,103	30,216	30,216	30,216	30,329	30,329	30,329	30,443	30,443	30,443
Wheat	3,274	3,274	3,289	3,289	3,289	3,304	3,304	3,304	3,318	3,318	3,318	3,333	3,333	3,333
Sugarcane	400	400	403	403	403	405	405	405	408	408	408	410	410	410
Jute	1,335	1,335	1,346	1,346	1,346	1,356	1,356	1,356	1,367	1,367	1,367	1,377	1,377	1,377
Oilseeds	4,761	4,761	4,789	4,789	4,789	4,817	4,817	4,817	4,845	4,845	4,845	4,873	4,873	4,873
Pulses	3,137	3,137	3,165	3,165	3,165	3,192	3,192	3,192	3,220	3,220	3,220	3,248	3,248	3,248
Potato	1,756	1,756	1,762	1,762	1,762	1,767	1,767	1,767	1,773	1,773	1,773	1,779	1,779	1,779
Vegetables	5,587	5,587	5,613	5,613	5,613	5,639	5,639	5,639	5,665	5,665	5,665	5,691	5,691	5,691
Banana	152	152	152	152	152	153	153	153	154	154	154	155	155	155
Papaya	102	102	102	102	102	102	102	102	103	103	103	103	103	103
Total Cropped	121,633	121,633	122,233	122,233	122,233	122,833	122,833	122,833	123,433	123,433	123,433	124,033	124,033	124,033
Net Cultivated Area	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962	78,962
Cropping Intensity	1.54	1.54	1.55	1.55	1.55	1.56	1.56	1.56	1.56	1.56	1.56	1.57	1.57	1.57
Production														
B. Aus (L)	6,633	6,951	7,283	7,631	7,996	8,378	8,779	9,198	9,638	10,099	10,582	11,088	11,618	12,173
T. Aus (HYV)	7,247	7,429	7,617	7,809	8,006	8,207	8,414	8,626	8,844	9,067	9,296	9,530	9,770	10,017
B. Aman (L)	11,168	11,292	11,418	11,544	11,672	11,802	11,933	12,065	12,199	12,334	12,471	12,610	12,749	12,891
T. Aman (L)	28,644	28,962	29,283	29,608	29,937	30,269	30,605	30,944	31,287	31,634	31,985	32,340	32,699	33,062
T. Aman (HYV)	80,870	81,687	82,511	83,344	84,186	85,036	85,894	86,761	87,637	88,522	89,416	90,318	91,230	92,151
Boro (L)	1,913	1,984	2,058	2,134	2,213	2,296	2,381	2,469	2,561	2,656	2,755	2,857	2,964	3,074
Boro (HYV)	113,087	115,571	118,110	120,704	123,356	126,065	128,835	131,664	134,557	137,512	140,533	143,620	146,774	149,998
Wheat	6,817	6,873	6,928	6,985	7,041	7,098	7,156	7,214	7,273	7,332	7,391	7,451	7,511	7,572
Sugarcane	16,706	16,773	16,839	16,906	16,974	17,041	17,109	17,177	17,245	17,314	17,383	17,452	17,522	17,591
Jute	4,085	4,233	4,386	4,545	4,709	4,879	5,056	5,239	5,429	5,625	5,829	6,040	6,258	6,485
Oilseeds	4,362	4,386	4,411	4,436	4,461	4,487	4,512	4,538	4,564	4,590	4,616	4,642	4,668	4,695
Pulses	2,402	2,405	2,409	2,412	2,416	2,419	2,423	2,426	2,430	2,433	2,437	2,440	2,444	2,447
Potato	29,609	30,489	31,396	32,329	33,290	34,280	35,300	36,349	37,430	38,543	39,689	40,869	42,084	43,336
Vegetables	39,403	40,973	42,605	44,303	46,069	47,904	49,813	51,798	53,862	56,009	58,240	60,561	62,974	65,484
Banana	2,594	2,606	2,617	2,629	2,640	2,652	2,664	2,675	2,687	2,699	2,711	2,723	2,735	2,747
Papaya	763	764	765	766	767	768	769	770	771	772	773	774	775	776

HYV = high yielding varieties, L = local variety.

Note: The assumption used to calculate the area and production is in Table A10.1. The additional area due to the construction of TRM was distributed among the crops using their relative shares to total area.

Sources: (i) SMEC International PTY, LTD. 2003. *Overall Drainage Plan: Khulna-Jessore Drainage Rehabilitation Project Feasibility Study Report*. Manila; (ii) *Bangladesh Monthly Statistical Bulletin* (various issues); (iii) Bangladesh Rice Research Institute; (iv) statistical yearbooks of Bangladesh (various years); and Department of Agricultural Extension, Khulna.

Table A10.4: Economic Cost Benefit Stream

(taka at 2006 constant prices)

No.	Year	Investment	O&M	Incremental Revenue	Net Cash Flow
1	1995	87,851,375			(87,851,375)
2	1996	350,104,582	455,975		(350,560,558)
3	1997	443,528,763	787,465		(444,316,229)
4	1998	494,467,859	1,977,442		(496,445,301)
5	1999	330,279,847	7,955,358		(338,235,205)
6	2000	316,977,426	11,344,978		(328,322,404)
7	2001	651,053,184	20,315,828		(671,369,012)
8	2002	775,148,033	34,953,656	4,001,718	(806,099,971)
9	2003	165,388,698	10,343,186	4,173,427	(171,558,457)
10	2004		46,465,954	4,710,363	(41,755,590)
11	2005		46,465,954	4,267,283	(42,198,671)
12	2006	116,400,000	46,465,954	9,081,748	(153,784,206)
13	2007		46,465,954	71,488,068	25,022,114
14	2008		46,465,954	135,377,592	88,911,638
15	2009	116,400,000	46,465,954	189,361,149	26,495,195
16	2010		46,465,954	256,347,042	209,881,088
17	2011		46,465,954	313,516,977	267,051,023
18	2012	116,400,000	46,465,954	383,782,258	220,916,304
19	2013		46,465,954	455,759,718	409,293,764
20	2014		46,465,954	518,067,833	471,601,879
21	2015	116,400,000	46,465,954	593,622,834	430,756,880
22	2016		46,465,954	671,046,664	624,580,711
23	2017		46,465,954	738,963,098	692,497,144
24	2018	116,400,000	46,465,954	820,293,862	657,427,908
25	2019		46,465,954	903,666,599	857,200,645
26	2020		46,465,954	977,710,994	931,245,040
27	2021	116,400,000	46,465,954	1,065,354,909	902,488,956
28	2022		46,465,954	1,155,232,350	1,108,766,397
				EIRR	4.08%

EIRR = economic internal rate of return, No. = number, O&M = operation and maintenance.

Table A10.5: Sensitivity Analysis: Summary

Scenario	EIRR (%)
Base	4.08
Costs increased by 20%	2.62
Costs increased by 10%	3.32
Revenue declined by 10%	3.33
Benefits increased by 10%	4.76

EIRR = economic internal rate of return.

SUMMARY OF SOCIOECONOMIC SURVEY (MARCH–APRIL 2007)

A. Background

1. A socioeconomic survey of 354 households was conducted for the project design exercise in 1993.[1] The study covered 15 waterlogging-affected and five unaffected villages. The study used the self-categorization method to determine if a household was poor or non-poor.[2] Another socioeconomic survey was conducted for the Asian Development Bank's project completion report. A preferred option would have been to repeat the impact evaluation survey on the same households at the time of the project performance evaluation. Unfortunately, no data for either survey was accessible to the Operations Evaluation Mission (OEM). In the absence of post-project data, an independent assessment of project impacts obliged the Mission to conduct a socioeconomic survey of households in and outside the project area. The households outside the project area represented control group respondents (counterfactuals) and were considered drainage congestion-affected households who had coped with the natural events and managed their lives over the years.

B. Methodology

2. A socioeconomic survey questionnaire was developed by the Mission and was pretested in a rural area outside Dhaka. Pretesting guided the finalization of the questionnaire and conduct of the survey. The survey was designed for three distinct beneficiary groups—crop farmers, fisherfolk, and landless laborers. The Mission trained a group of enumerators and a supervisor both in Dhaka and in Khulna and familiarized them with the content and interpretation of questionnaires so that relevant data/information could be recorded accurately. The master copy of the questionnaire was translated into the Bangla language to facilitate the interview process. All interviews were conducted by experienced field staff of a firm contracted for the survey work. The institutional development specialist (national consultant) provided the required support in the field and monitored the data collection process. Data entry, cleaning, and verification were done in Dhaka.

3. The survey adopted a stratified random sampling method covering representative zones and villages in the two districts. As no records were available for the control villages, the survey team sought assistance from local key informants and identified those villages for data collection. Attempts were also made to capture three beneficiary groups as well. The survey sample size distribution appears in Table A11.1 and the villages covered by the study are noted in footnote 3.[3] The time and resource constraint led to a total of 360 households surveyed. The location of the control villages varied from 2 to 10 kilometers (km) from the project villages. The size of the two districts and the number of water management groups formed suggested two-thirds coverage in Jessore and one-third in Khulna. In addition, the survey team also

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[1] Bangladesh Institute of Development Studies. 1993. Social *Survey cum Action Plan on Coastal Embankment Rehabilitation Project –II* Dhaka (August).

[2] The self-categorization method involved is based on respondents' perception about their capacity to meet basic minimum consumption needs. The chronic deficit and occasional deficit households are considered poor while breakeven and surplus households are classified as non-poor.

[3] The sample villages covered by the survey included Andulia, Chatiani, Garakhola, Jokai, Kartickkul, Krishna Nagar, Linebeel Pabla, Rushnibag, Sachibunia in Khulna; and Dahakhola, Dumurtala, Fedaipur, Hatgacha, Imam Nagar, Kapalia, Monoharpur, Sharadanga, in Jessore district, respectively, in the project area; and Diana, Damudar, Jadaypur, Putimary, and Raoyor Mahal in Khulna; and Dhigulia, Goakhola, Jhanpa, Sharkhola, and Sundari in Jessore as control areas.

conducted 24 focus group interviews with farmers, landless laborers, and fisherfolk for additional information and triangulation of some of the key survey data.

Table A11.1: Sample Distribution of Household Surveyed

	Farmers		Landless Workers		Fisherfolk		
District	Project	Control	Project	Control	Project	Control	**Total**
Khulna	58	13	26	06	12	05	120
Jessore	107	22	54	14	31	12	240
Total	**165**	**35**	**80**	**20**	**43**	**17**	
							360
	200		**100**		**60**		
(%)	56		28		16		100

Source: Operations Evaluation Mission. 2007. Household Socioeconomic Survey. Khulna and Jessore Districts, Bangladesh (March–April).

C. Household Characteristics

1. Family Size and Educational Attainment

4. In the project area, an average survey household had 4.4, 4.3, and 4.4 members in the farmer, landless laborer, and fisherfolk groups, respectively. The control area households were somewhat larger: 4.7, 4.5 and 5.0 members, respectively. The survey households were relatively smaller than the national average (5.5 members). This may be associated with access to information and education as well as recent trends in nucleus families, which seemingly is a departure from the traditional joint-family households.

5. Approximately, half of the children in the project households and more than two thirds in the control households received nonformal education, while about one fourth of the project children and less than one fifth of those in control households received 1 to 5 years schooling. Of the total 446 school-aged children in the project area, only 20 children had more than 10 years of schooling. Similarly, of the 125 school-aged children in the control area, only 4 received more than 10 years of schooling. In the fisherfolk and landless laborer households, no child had more than 10 years of schooling.

2. Occupation of Household Heads and Members

6. Farming and fishing are, respectively, the main source of livelihood for farmers and fisherfolk. Both groups also had day labor as a secondary source of income. Primary occupations for the landless are rickshaw pulling and day labor, while secondary occupations are small businesses and agriculture. In the last 5 years, the changes in occupation had been very minimal.[4] Secondary occupation is relatively more pronounced in the control area (60%) than in the project area (22%). The occupational structure represents a typical landscape of rural Bangladesh. The occupational structure of household members closely followed that of the household heads. Average daily wage rates were more or less similar in both project and control areas and varied between Tk90 ($1.30) and Tk120 ($1.74) for unskilled labor (farming and fishing) and between Tk160 and Tk180 ($2.32–$2.61) for self-employed skilled persons, including small businesses. In general, fisherfolk earned 10% higher wages than farm laborers.

[4] Only five of the households in the project area changed their occupation for higher income opportunities.

D. Household Consumption Expenditure and Food Consumption Patterns

7. Overall, food accounted for 68% of household expenditure, with slightly more than half for rice, the staple food of Bangladesh. In general, project area farming and landless labor households spent somewhat less on food than did their control area counterparts. On the other hand, control area fisherfolk spent marginally less on food than did the project area households. Also, per capita food expenditure was relatively higher for the project households than for the control households. Landless households spent much less on nonfood items. The detailed breakdown of household consumption expenditure is presented in Table A11.2.

Table A11.2: Monthly Household Consumption Expenditure
(Mean Tk)

	Farmers		Landless		Fisherfolk		All	
	Project	Control	Project	Control	Project	Control	Project	Control
Consumption Item	**n=165**	**n=35**	**n=80**	**n=20**	**n=43**	**n=17**	**n=288**	**n=72**
Rice	1,718	1,730	1,175*	1,428	1,457	1,341	1,450	1,500
Vegetables	635	555	378	386	548	586	520	509
Fish/egg/meat/milk	643	392	305	270	407	408	452*	357
Spices/salt/oil	294	219	203	186	258	274	252	226
Other food items	210	181	165*	74	198	154	191*	136
Food Expenditure	**3,501**	**3,077**	**2,226**	**2,343**	**2,867**	**2,764**	**2,864**	**2,728**
Education of children	248	194	141*	93	252	315	214	201
Health services	218	199	165*	108	234	280	206	195
Social function/ festival	292*	137	141*	27	257	319	230*	161
Entertainment	170	181	76	78	151	172	133	144
Clothes/shoes	635*	238	206	206	415*	519	419*	321
Jewelry	93	0	180	0	0	0	91	0
Transport	230	230	84	67	192	206	168	168
Others	63	139	77	70	118	161	86	123
Nonfood Expenditure	**1,949***	**1,317**	**1,070***	**648**	**1,618**	**1,973**	**1,546**	**1,313**
Total Expenditure	**5,450***	**4,393**	**3,296**	**2,991**	**4,486**	**4,737**	**4,410**	**4,040**
Household food share (%)	**64**	**70**	**68***	**78**	**64***	**58**	**65**	**68**
Household size	4.4	4.7	4.3	4.5	4.4	5	4.4	4.7
Per capita food	**796***	**655**	**518**	**521**	**652***	**553**	**651***	**580**
Per capita nonfood	**443***	**280**	**249***	**144**	**368**	**395**	**351***	**279**
Rice share in food expenditure (%)	**49***	**56**	**53***	**61**	**51**	**49**	**51**	**55**

n = number of respondents; * = p-<0.05.
Source: Operations Evaluation Mission. 2007. Household Socioeconomic Survey. Khulna and Jessore Districts, Bangladesh (March–April).

8. Across all categories, rice and vegetables were the main food expenditure items. Overall, the general perception among the respondents was that expenditure on food items had considerably increased in 2007 compared with 2002. The food consumption pattern of both project and control area households comprised rice, pulses, potato, green vegetables, tomatoes, and fish, while landless households had very little fish, milk, and meat in their diet.

E. Home Production Food Supply and Coping Strategies

9. The farmer households in both control and project areas on average felt that their home production was sufficient for nearly 10.6 months; however, some households had food deficit for up to 6 months. The home production of landless and fisherfolk households, on average, met their requirements for 8.7 months. March, April, and August represented the most difficult months for food supply in several households in all three categories. The respondents used varied coping strategies to manage food in difficult months. They borrowed money (24%), worked for wages (21%), sold other stocks (13%), sold livestock (4%), borrowed food (4%), and went without food (4%). The farmers in the control area managed with the common means: borrowing money (43%), working for wages (34%), selling livestock (31%), borrowing food (23%), selling other stocks (14%), going without food (11%), and selling or mortgaging land (9%). The same coping mechanisms were used by the landless and fisherfolk. In cases of insufficient food for the household, women were the most deprived members, reflecting the traditional South Asian rural social culture. In general, the household food situation was better or the same in 2007 compared with 5 or 10 years ago.

F. Saving Patterns

10. The major source of savings in farmer households was from farming (38% in the project area and 9% in the control), small businesses (7% in the project area and 3% in the control), and livestock (4% in the project area and 6% in the control). Savings in 7% of the farming households also came from fishing. Landless households reported no form or source of saving. The fisherfolk had savings from farming and fishing activities and, for a small number of them, from livestock/poultry rearing activities.

G. Income

11. The average annual per capita income for farming households in the project area in 2006–2007 was Tk26,866 ($389), of which 69% and 31%, respectively, were attributed to farm and nonfarm incomes (Table A11.3). Of the total farm income, 61% came from rice production. In the control area, the average annual per capita income averaged Tk20,938 ($303), 41% from farm and 59% from nonfarm sources (Table A11.3). Fishing households' average annual per capita income was lower in the project area ($447) than in the control area ($508). This can be partly explained by the higher nonfarm incomes generated by fisherfolk outside the project area. Across groups, the landless households had larger average annual per capita income both in the control ($1,013) and project ($756) areas. Their incomes came basically from small businesses, or from their work as day workers or rickshaw/van pullers. They also had relatively smaller households. The differences in incomes between project and control groups were statistically significant at 5% level for all three categories. However, differences in incomes are associated with nearly two times larger landholding size operated by project households compared to the control groups, which remained consistently different over the project period and afterwards. Once differences in landholding size are adjusted, net income effect due to Project became statistically insignificant.

Table A11.3: Mean Per Capita Income in the Control and Project Areas
($/capita)

	Farming Households		Fisherfolk Households		Landless Households	
	Control Area	Project Area	Control Area	Project Area	Control Area	Project Area
Source of Income	n=25	n=145	n=17	n=43	n=16	n=81
Farm activities	125.36	269.28	205.77	214.78	0	54.36
	(290.02)	(241.60)	(207.06)	(211.93)	0	(219.93)
Non-farm activities	178.09	120.1	302.59	231.92	1013.07	701.75
	(337.17)	(243.23)	(460.48)	(421.55)	(647.66)	(647.47)
Total	**303.45**	**389.37**	**508.36**	**446.7**	**1013.07**	**756.11**
	(432.66)	(326.96)	(474.76)	(439.96)	(647.66)	(625.64)

n = number of respondents, OEM = operations evaluation mission.
Notes: The average household size for each group was used to determine the per capita income for the control area and the project area. The exchange rate used was $1:Tk69. Figures in parentheses are standard deviations.
Source: Operations Evaluation Mission. 2007. Household Socioeconomic Survey. Khulna and Jessore Districts, Bangladesh (March–April).

H. Household Borrowing Patterns

12. The households borrowed from moneylenders, banks/cooperatives, nongovernment organizations (NGOs), and friend/relatives to buy food, run a small business, purchase a van/rickshaw, etc. The average amount borrowed by farmers was 40% more in the project area than in their control area counterparts (Tk7,043 vs. Tk5,000). Landless households in the control area did not borrow any money in 2006–2007 but those in the project area borrowed Tk4,500. Similarly, fisherfolk borrowed on average Tk5,062 in the project area and Tk5,833 in the control area. Interest rates varied from 12% to 25%, depending on the source of loan. Notably, borrowing from money lenders had been declining. The explanation is that institutional sources such as banks and NGOs are available and the communication network in the rural society has improved. More important, money lending as a practice is not socially appreciated, particularly in the Muslim- dominated society.

I. Land Ownership

13. The average land owned by faming households in 2007 was 1.01 hectares (ha) in the project area and 0.59 ha in the control area. The average cultivated area was 0.93 ha and 0.52 ha, respectively, in the project and control areas (Table A11.4). An average project household had 71% more owned and 79% more cultivated land. Proportionately, more land was cultivated in relation to area owned in the project area compared with the control area.

Table A11.4: Mean Land Area of Farming Households
(ha)

	Control Area	Project Area	Ratio
Land Attribute	n=34	n=158	Project/control
Owned	0.59	1.01	1.71
	(0.45)	(0.70)	
Cultivated	0.52	0.93	1.79
	(0.42)	(0.70)	
Cultivated/Owned area	88%	92%	

ha = hectare, n = number of respondents.
Source: Operations Evaluation Mission. 2007. Household Socioeconomic Survey. Khulna and Jessore Districts, Bangladesh (March–April).

14. In the project area, 36% and 25% of the respondents, respectively, reported improving status of land ownership and area cultivated in the past 5 years, while 10% reported a deteriorating status. In the control area, 23% and 34% reported improvements in land ownership and land cultivation; however, 83% reported losing some areas to flooding during some parts of the year. There are no lands leased in or leased out in the project area, while an average of 0.13 ha was on lease in the control areas.

J. Land Distribution Pattern

15. The land distribution pattern was significantly different between the project and control area farming households (Table A11.5) right from the beginning of the Project and hence the Project had very little impact on the land size distribution. Hence, differences in land size distribution cannot be attributed to the Project. More than half of the households in the control area had 0.5 ha or less land; only 29% of households in the project area were in the same category. On the other hand, more than twice as many households in the project area owned land larger than 2 ha. Similarly, 3 in 10 households had between 1 and 2 ha land area compared with less than 3% of the control area farming households. The owned land area was near perfectly correlated to cultivated area (r = 0.98).

Table A11.5: Land Size Distribution of Farming Households
(% households)

	Owned Land Area		Cultivated Land Area	
Land Size	**Control Area**	**Project Area**	**Control Area**	**Project Area**
0. 5 ha or less	52.9	29.1	61.7	35.4
0.5001–1 ha	38.2	27.9	29.4	27.9
1.0001–2 ha	2.9	30.4	5.9	23.4
Over 2 ha	5.9	12.7	2.9	12.3

Notes: Chi-square statistics - significant at p<0.001.
Pearson correlation coefficients are 0.98 (all households), 0.99 (control households)
Source: Operations Evaluation Mission. 2007. Household Socioeconomic Survey. Khulna and Jessore Districts, Bangladesh (March–April).

K. Agricultural Practices

1. Cropping Pattern, Crop Production, and Input Use

16. In both project and control areas, the main crops grown are rice, vegetables, potato, oilseeds, and other crops like banana and papaya. The major cropping pattern in the 2006/07 season was rice, December–April; vegetables, November–February; oilseeds, November–February; and potato, December–March. In crop year 2006/07, the area under rice cultivation was 0.73 ha in the project area and 0.42 ha in the control area (p<0.05). The project area households obtained on average 18% more rice yield per ha than did the control area households (3.9 vs 3.3 tons/ha, p<0.05).[5] No remarkable change was observed in cropping area and crop production combination over the last 3 years in both control and project areas. The level of modern agricultural inputs was relatively higher per ha in the project area than in the control area. Higher yields and associated higher levels of modern agricultural inputs in project area are attributable to the agricultural extension service of the DAE, but not the Project.

[5] Based on average yields for crop years 2004/05, 2005/06, and 2006/07.

2. Home Gardening

17. Slightly more than two fifths of the households had home gardens (Table A11.6). The area under home gardens showed an increasing trend in both control and project areas. Households in the project area planted more crop varieties than did their counterparts in the control area. However, proportionately more households in the control area than in the project area obtained cash income from home gardening. Also, proportionately more households believed that home gardening provided social opportunities for interaction, particularly for girls and women. While noticeable positive changes have occurred in vegetable consumption in households, the Project has had no significant contribution. The respondents felt that the changes in home gardening would have happened anyway even without the Project. This is not surprising because no tangible agricultural development efforts were made under the Project to increase home gardening.

Table A11.6: Project Impact on Home Gardening and Adoption of Integrated Pest Management

	Respondents Reporting (%)		
Indicator	**Project Households**	**Control Households**	**Chi-squared Statistics**
Home gardens			
Have home garden	43	42	NS
Have increased area for home garden	80	76	NS
Have more varieties in home garden	80	55	*
Home garden provides more employment	25	38	NS
Home garden provides more cash income	28	48	**
Home garden provides more social opportunities	20	41	**
Home gardens led to increased vegetable consumption in the household	43	51	NS
Vegetable consumption has increased over the past 5 years	80	93	NS
Vegetable consumption has increased over the past 10 years	80	94	NS
Project helped introduce new crops in home gardens	11	15	NS
Project helped introduce new improved crop varieties in home gardens	23	16	NS
Project encouraged more land allocation to home gardening	11	13	NS
Project provided nutritional education promoting vegetable intake	22	16	NS
Home gardening changes without the project would have happened anyway	91	93	NS
Agricultural information, chemical use, and IPM			
Department of Agriculture assisted with agricultural information	0	22	***
Agricultural information would have been obtained anyway	3	22	**
Farmers are using less farm chemicals than 5 years ago	31	50	***
Farmers are using less farm chemicals than 10 years ago	11	41	***
Farmers are using nonconventional pest control methods	89	61	***
Farmers are using biological method of pest control	11	0	NS
Farmers are using cultural method of pest control	60	61	NS
Farmers are using environment-friendly method of pest control	29	39	NS

NS = statistically not significant between project and control group respondents.

***, ** and * denote statistical significance at 1%, 5%, and 10%, respectively.

Source: Operations Evaluation Mission. 2007. Household Socioeconomic Survey. Khulna and Jessore Districts, Bangladesh (March–April).

3. Agricultural Information

18. Agricultural extension activities were virtually nonexistent in the project area and only one fifth of the households in the control area received agricultural information in one form or another. This is consistent with the fact that the conventional agricultural development program funded by the Government tends to be localized in nonproject areas. The Project did not play any role in disseminating agricultural information (Table A11.6).

4. Pest Management

19. Farmer respondents reported that they had been using less farm chemicals in the past 5 to 10 years than in earlier years, proportionately more so in the control areas. The nonconventional method of pest control was relatively more prevalent in the project area than in the control area. However, the Project has had no direct role in encouraging the use of environment-friendly chemicals, biological control, or any other pest control methods to reduce pesticide use (Table A11.6).

L. Beneficiary Participation

20. One of the main thrusts of the Project was to increase the participation of beneficiaries to ensure project sustainability. The formation of water management groups, associations, committees, and a federation at different hierarchical levels was seen as a prerequisite to maintain potential gains after project completion. However, the survey results revealed that only 11% of the farmer respondents were members of water management groups in 2007, and only 17% of the respondents had some interest in joining a water management group. Membership in the water management group for the landless and fisherfolk stood at 14% and 19%, respectively. Overall, only 15% of the respondents across groups were members of water management groups, considerably fewer than at project completion in 2004.[6] The survey results also indicated that 60% among the member respondents, noted that membership had been declining. The major reasons given for not joining or quitting the water management groups included (i) lack of interest (47%), (ii) internal politics and external influence in operation (27%), (iii) domination by a few elite people (27%), (iv) lack of time (22%), and (v) weak organization and management (19%).

M. Socioeconomic Impact

21. Table A11.7 summarizes the socioeconomic impact of the Project as perceived by the respondents. Overall, the project area experienced positive changes due to development interventions from both Government and external assistance activities and programs. It was difficult to disaggregate the contribution of the Khulna-Jessore Drainage Rehabilitation Project. The respondents were asked if the perceived changes would have happened without the project interventions. In the majority of the cases, they observed that indeed the changes would have happened anyway. In aggregate terms, while it is not precise to apportion project impact, the differences between the impact of development intervention and counterfactuals (achievement without the Project) may infer to the relative impact of the Project in various socioeconomic areas. The responses indicate that 32% of the farming households could have had some employment benefits from the Project (presumably due to increase in cultivable area and employment as laborers in sediment removal), and 31% in the same group felt some increase in income. Proportionately, more fisherfolk perceived benefits from the project-related activities

[6] The PCR reported that 34.5% of beneficiaries had joined water management groups in 2004.

and this perception may have had to do with the operation of regulators and cross-dams. In general terms, landless households benefited the least from the Project.

Table A11.7: Respondents' Perception on Socio-economic Impact of KJDRP

	Developmental Impact in the Project Area			Likely Developmental Impact Without the Project		
	Percentage Households Reporting			Percentage Households Reporting		
Developmental Impact	**Farmers**	**Fisherfolk**	**Landless**	**Farmers**	**Fisherfolk**	**Landless**
Increase in employment	96	70	60	64	30	48
Increase in income	92	77	84	61	7	66
Improvement in health	60	72	84	44	0	75
Improvement in housing	57	67	58	47	44	53
Improvement in schooling	46	81	54	42	42	54
Improvement in women's status	35	37	40	21	0	26
Improvement in savings	27	23	5	25	0	5
Improvement in indebtedness	24	30	21	22	9	18
Reduction in travel time	77	58	70	55	35	56
Improvement in women's role	39	23	16	39	12	8
Overall impact	17	0	30	2	0	30

Source: Operations Evaluation Mission. 2007. Household Socioeconomic Survey. Khulna and Jessore Districts, Bangladesh (March–April).

N. Poverty Status

22. Poverty in the project and surrounding areas is still considerably high. The survey data show that, based on the Millennium Development Goal of $1 per day norm, proportionately more of the control area farming population was poorer than the project area farming population (Table A11.8).

Table A11.8: Population Below One and Two Dollar a Day in the Control and Project Areas

	Farming Households		Fisherfolk Households		Landless Households	
Poverty Measure	**Control Area**	**Project Area**	**Control Area**	**Project Area**	**Control Area**	**Project Area**
Below $1 a day	80	53.79	47.06	53.49	12.5	37.04
Below $2 a day	80	88.97	76.47	83.72	31.25	53.09

Source: Operations Evaluation Mission. 2007. Household Socioeconomic Survey. Khulna and Jessore Districts, Bangladesh (March–April).

23. This was to a large extent associated with the relatively less resource endowment of the control area households. For example, on a per capita basis project area individuals had 83% more land than the control area individuals (Table A11.9). Interestingly, fewer landless individuals were observed in the control area than in the project area. Presumably, the landless people were relatively more mobile and sought income opportunities outside their villages. The project area and control area household members exhibited a relatively narrower gap when the $2 per day norm was applied. However, more than half of the project area landless household members and more than four fifths of the fisherfolk and farming household members earned less than $2 per day. While the number of people below $1 per day was significantly lower in the Project area compared to the control area ($p<0.05$), the differences are largely associated with resource endowments.

Table A11.9: Per Capita Land Area

(ha)

Land Type	Control Area	Project Area	Ratio Project/Control
Owned land	0.13	0.23	183%
Cultivated land	0.11	0.21	191%
Household size	4.7	4.4	94%

Source: Operations Evaluation Mission. 2007. Household Socioeconomic Survey. Khulna and Jessore Districts, Bangladesh (March–April).

MANAGEMENT RESPONSE TO THE PROJECT PERFORMANCE EVALUATION REPORT FOR KHULNA-JESSORE DRAINAGE REHABILITATION PROJECT IN BANGLADESH (Loan 1289-BAN[SF])

On 11 January 2008, the Officer-in-Charge, Operations Evaluation Department, received the following response from the Managing Director General on behalf of Management:

1. We appreciate OED's Project Performance Evaluation Report (PPER) for the Khulna-Jessore Drainage Rehabilitation Project (KJDRP) in Bangladesh. Generally, we found it well-prepared.

2. **Present Development of KJDRP.** There are several encouraging recent developments that we feel could have been better captured in the PPER. The Bangladesh Water Development Board (BWDB) has been taking necessary measures since early 2006 to resume tidal river management (TRM) and has succeeded in East Khuksia Beel. To date, most of the works have been completed and the local drainage condition has improved as a result. The Government has also approved a Development Project Proforma (DPP) amounting $20 million from its own resources to continue operations and maintenance and TRM during the coming 6-7 years. Finally, efforts are being made from BWDB's side to form a Multi-Stakeholder Forum (MSF) to carry forward the process in a participatory, integrated and holistic manner.

3. **Project Rating.** The project is rated as *unsuccessful*. However, we note that our earlier points about the evaluation methodology were not adequately reflected in the final analysis.[1] If this had been done, we believe that the economic internal rate of return (EIRR) would have exceeded 6% (as compared to 4.1% in the PPER), with the result that the Project would have been rated "*less efficient*," and in turn the overall Project rating would have been *Partly Successful*.

4. **PPER Recommendations.** We are in general agreement with the PPER's lessons and follow-up recommendations. All three follow-up recommendations are the responsibility of the Ministry of Water Resources and BWDB. OED proposes that ADB monitor the implementation of the recommendations. We note that ADB has been and will continue to be proactive in addressing various implementation issues. ADB has made enormous efforts to encourage the establishment of the MSF and to engage in dialogue with development partners and stakeholders on other various areas in which BWDB should become more inclusive and efficient.

[1] Our main concerns include the following: First, the initial 12 years of incremental net revenue are negative in the PPER, which could be due to underestimation of cropped area and yield, as well as incremental fish production facilitated by the improved drainage conditions. The cropped area under two major rice crops (Boro and Aman using high yielding varieties) grows fairly slowly up to 2008, and is kept constant or decreasing thereafter, which we feel is unrealistic. Second, the analysis does not reflect any changes in the cropping pattern between pre- and post- project conditions, despite the physical changes in the drainage conditions. Third, the methodology in the economic analysis is more of a financial analysis. Shadow prices are not included, which usually tends to reduce the EIRR.

5. We also note that SARD has been actively following up on the continuation of TRM since 2004. For example, in June 2006, Bangladesh Resident Mission (BRM) facilitated a meeting between BWDB and the local nongovernment organizations (NGOs), which updated NGOs about BWDB's future plans in the area. BRM also participated in a local consultation meeting and a roundtable meeting arranged by the local newspaper "Shomokal" on the KJDRP. In March 2007, the Government approved the DPP of the follow-on project to improve drainage, which will be financed entirely from the Government's revenue budget. To a large extent this approval was due to ADB's constant dialogue with the Government. In June 2007, ADB facilitated an informal agreement among the concerned parties, including NGOs, to establish the MSF in order to monitor and support further interventions in the KJDRP area. SARD is closely monitoring the situation, and providing active facilitation and support as needed.