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PROJECT PERFORMANCE ASSESSMENT REPORT

BANGLADESH

COASTAL EMBANKMENT REHABILITATION PROJECT
(CREDIT 2783-BD)

February 11, 2005

Sector, Thematic, and Global Evaluation Group
Operations Evaluation Department

CURRENCY EQUIVALENTS

Currency Unit = Bangladesh Taka (TK)

1995	US$1.00	=	Tk 40.25 (appraisal)
2002	US$1.00	=	Tk 57.90 (completion)

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
BWDB	Bangladesh Water Development Board
CAS	Country Assistance Strategy
CERP	Coastal Embankment (Rehabilitation) Project
DC	Deputy Commissioner
DoF	Department of Fisheries
EC	European Community
EP	entitled person
ERR	economic rate of return
FAP	Flood Action Plan
FD	Forest Department
FFW	Food for Work Programme
FPIU	Forestry Project Implementation Unit
GOB	Government of Bangladesh
HYV	high-yielding variety
ICB	international competitive bidding
ICR	Implementation Completion Report
IDA	International Development Association
MoWR	Ministry of Water Resources
NCB	national competitive bidding
NGO	nongovernmental organization
O&M	operation and maintenance
PAP	project affected person
PIU	Project Implementation Unit
RBPP	River Bank Protection Project
PWP	Priority Works Program
RAP	Resettlement Action Plan
SRP	Systems Rehabilitation Project (Credit 2099-BD)
TOR	terms of reference
WFP	World Food Programme

FISCAL YEAR

Government: July 1 - June 30

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OED Mission: Enhancing development effectiveness through excellence and independence in evaluation.

About this Report

The Operations Evaluation Department assesses the programs and activities of the World Bank for two purposes: first, to ensure the integrity of the Bank's self-evaluation process and to verify that the Bank's work is producing the expected results, and second, to help develop improved directions, policies, and procedures through the dissemination of lessons drawn from experience. As part of this work, OED annually assesses about 25 percent of the Bank's lending operations. In selecting operations for assessment, preference is given to those that are innovative, large, or complex; those that are relevant to upcoming studies or country evaluations; those for which Executive Directors or Bank management have requested assessments; and those that are likely to generate important lessons. The projects, topics, and analytical approaches selected for assessment support larger evaluation studies.

A Project Performance Assessment Report (PPAR) is based on a review of the Implementation Completion Report (a self-evaluation by the responsible Bank department) and fieldwork conducted by OED. To prepare PPARs, OED staff examine project files and other documents, interview operational staff, and in most cases visit the borrowing country for onsite discussions with project staff and beneficiaries. The PPAR thereby seeks to validate and augment the information provided in the ICR, as well as examine issues of special interest to broader OED studies.

Each PPAR is subject to a peer review process and OED management approval. Once cleared internally, the PPAR is reviewed by the responsible Bank department and amended as necessary. The completed PPAR is then sent to the borrower for review; the borrowers' comments are attached to the document that is sent to the Bank's Board of Executive Directors. After an assessment report has been sent to the Board, it is disclosed to the public.

About the OED Rating System

The time-tested evaluation methods used by OED are suited to the broad range of the World Bank's work. The methods offer both rigor and a necessary level of flexibility to adapt to lending instrument, project design, or sectoral approach. OED evaluators all apply the same basic method to arrive at their project ratings. Following is the definition and rating scale used for each evaluation criterion (more information is available on the OED website: http://worldbank.org/oed/eta-mainpage.html).

Relevance of Objectives: The extent to which the project's objectives are consistent with the country's current development priorities and with current Bank country and sectoral assistance strategies and corporate goals (expressed in Poverty Reduction Strategy Papers, Country Assistance Strategies, Sector Strategy Papers, Operational Policies). *Possible ratings:* High, Substantial, Modest, Negligible.

Efficacy: The extent to which the project's objectives were achieved, or expected to be achieved, taking into account their relative importance. *Possible ratings:* High, Substantial, Modest, Negligible.

Efficiency: The extent to which the project achieved, or is expected to achieve, a return higher than the opportunity cost of capital and benefits at least cost compared to alternatives. *Possible ratings:* High, Substantial, Modest, Negligible. This rating is not generally applied to adjustment operations.

Sustainability: The resilience to risk of net benefits flows over time. *Possible ratings:* Highly Likely, Likely, Unlikely, Highly Unlikely, Not Evaluable.

Institutional Development Impact: The extent to which a project improves the ability of a country or region to make more efficient, equitable and sustainable use of its human, financial, and natural resources through: (a) better definition, stability, transparency, enforceability, and predictability of institutional arrangements and/or (b) better alignment of the mission and capacity of an organization with its mandate, which derives from these institutional arrangements. Institutional Development Impact includes both intended and unintended effects of a project. *Possible ratings:* High, Substantial, Modest, Negligible.

Outcome: The extent to which the project's major relevant objectives were achieved, or are expected to be achieved, efficiently. *Possible ratings:* Highly Satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory, Highly Unsatisfactory.

Bank Performance: The extent to which services provided by the Bank ensured quality at entry and supported implementation through appropriate supervision (including ensuring adequate transition arrangements for regular operation of the project). *Possible ratings:* Highly Satisfactory, Satisfactory, Unsatisfactory, Highly Unsatisfactory.

Borrower Performance: The extent to which the borrower assumed ownership and responsibility to ensure quality of preparation and implementation, and complied with covenants and agreements, towards the achievement of development objectives and sustainability. Possible ratings: Highly Satisfactory, Satisfactory, Unsatisfactory, Highly Unsatisfactory.

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This report was prepared by George T. Keith Pitman, who assessed the project with Kristin S. Little in April 2004. The report was edited by William Hurlbut, and Soon-Won Pak provided administrative support.

Principal Ratings and Key Staff Responsible

BANGLADESH COASTAL EMBANKMENT REHABILITATION PROJECT (CREDIT 2783-BDG)

	*ICR**	*ICR Review**	*PPAR*
Outcome	Satisfactory	Moderately Satisfactory	Moderately Satisfactory
Sustainability	Likely	Unlikely	Unlikely
Institutional Development Impact	Modest	Modest	Modest
Bank Performance	Satisfactory	Satisfactory	Satisfactory
Borrower Performance	Satisfactory	Satisfactory	Satisfactory

* The Implementation Completion Report (ICR) is a self-evaluation by the responsible operational division of the Bank. The ICR Review is an intermediate OED product that seeks to independently verify the findings of the ICR.

Project	*Task Manager*	*Division Chief/ Sector Manager*	*Country Director*
Appraisal (1995)	Henry P. Gassner	Ridwan Ali	Paul Isenman
Completion (2002)	S.A.M. Rafiquzzaman	Constance A. Bernard	Frederick Thomas Temple

Preface

This is the Project Performance Assessment Report (PPAR) prepared by the Operations Evaluation Department (OED) for the Bangladesh Coastal Embankment Rehabilitation Project that was approved in November 1995 for a credit of US$53.0 million. A supplementary IDA credit of US$16.5 million was approved in May 1999 primarily to finance emergency works after the 1997 cyclone, cost overruns, and a few additional activities. The European Commission cofinanced US$19.7 million, of which US$17.6 million was disbursed. On closing, two years behind schedule in December 2002, US$1.56 million of the IDA credit was cancelled due to misprocurement as was an undisbursed amount of US$1.03 million. Total project costs at completion were US$97.6 million compared with the appraisal estimate of US$87.8 million.

This report is based on the Implementation Completion Report (ICR) prepared by the South Asia Region (Report No. 26149 dated June 2003), the Memorandum and Recommendation of the President, Staff Appraisal Reports, loan documents, project files, and discussions with Bank staff. An OED mission visited Bangladesh in April 2004 and met stakeholders to discuss the effectiveness of the Bank's assistance with development and financing partners, project implementing agencies, private sector agencies, and beneficiaries. The cooperation and assistance of central government, Bangladesh Water Development Board, and regional officials and staff, nongovernmental stakeholders, and other interested parties are gratefully acknowledged.

This project was selected for performance assessment to support an OED evaluation of the Bank's natural disaster management experience scheduled for September 2005: *"Natural Disaster Emergency Reconstruction – An Overview of Bank Assistance."* Bangladesh is one of the evaluation's case study countries because it is chronically prone to natural disasters, has had significant external assistance to cope with and mitigate disasters, and offers a wealth of experience and lessons.

Following standard OED procedures, this draft PPAR was sent to the borrower for comments, but none were received.

Summary

The Bangladesh Coastal Embankment Rehabilitation Project (CERP) was initiated in response to the devastating cyclone of 1987, and approved in 1995. The project closed in 2003. The overall project objective was to improve security of life, property, crops, and livestock along the cyclone-prone coastal areas. Project objectives were to (a) provide cyclone protection, including improving the security of persons living in the protected areas, reducing damage to houses and other buildings and infrastructure, and minimizing the loss of crops and livestock; (b) improve agricultural production, through preventing saline inundation during normal weather and improved cropping patterns due to reduced cyclone risks; and (c) introduce improved technology in the design and construction of protection works, and improved methods of embankment maintenance.

The project partially achieved its objectives with several shortcomings and the outcome is rated as moderately satisfactory. The most important issue affecting the outcome rating was the partial progress toward mitigating inadequate embankment maintenance and lack of progress on reforming systemic institutional problems. Cyclone protection was provided – but not to the extent planned. Only 14 of the 21 polders targeted for rehabilitation were protected completely by new or renovated embankments that filled critical gaps in the sea defenses, leaving 7 polders at risk of rapid inundation from cyclones. Even so, farmers, aided by many non-project interventions, were able to capitalize on improved agricultural conditions provided by rehabilitated embankments and substantially upgraded internal drainage. Based on incremental agricultural output, the project yielded an economic rate of return of about 13 percent (without quantifying environmental and human benefits) compared with the appraisal estimate of 19 percent.

The project successfully introduced new technical design standards for coastal embankments and piloted social forestry on the embankment slopes – albeit on a smaller scale than envisaged at appraisal. Landless households were given housing plots and rights to forestry produce in return for maintenance, but the results have been mixed to date. A large foreshore afforestation program to control coastal erosion and damage from tidal surges was only partially implemented due to poor coordination among the government's implementing agencies and irregular funding of technical assistance and NGO social mobilizers by development partners. Improved operation and maintenance of the coastal embankment by the Bangladesh Water Development Board proved to be elusive, a task made more difficult by continued inadequate budgets and ineffective institutional strengthening. In consequence of the above, institutional development impact is rated as modest.

Sustainability is rated as unlikely. The project clearly demonstrated that improved technical design of the coastal embankments combined with social forestry made the structure more robust and reduced the rate of deterioration. However, the whole embankment is only as strong as its weakest link – thus the "patch, mend, and upgrade" approach (while providing local protection) does not guarantee the integrity of the coastal polders. Already parts of the rehabilitated embankments are deteriorating, although not as fast as the original structure, and in several small areas sections have been eroded away. The key development challenge of how to ensure adequate funding to maintain the

polders and bring them all up to the CERP design standard was not surmounted. Currently, the outlook is bleak because government's many conflicting priorities ensure that available budgets are spread too thinly to ensure even the minimal maintenance standards. And improving all embankments to CERP design standard will remain elusive without substantial external funding. There is also clearly a case to be made for devolving the cost of maintaining polders to all beneficiaries in order to mitigate inadequate budget allocation from the center.

Despite these shortcomings, both borrower and Bank performance are rated as satisfactory overall. Even though the project was spread over a very large and complex array of islands and wetlands and there were unexpected setbacks due to the 1997 cyclone, it was completed on schedule and provided significant benefits to Bangladesh's coastal inhabitants who are among the poorest in the country.

Experience with this project confirms a number of OED lessons:

- There is a need to pay continuous attention to implementation performance in disaster-related operations to ensure that such operations are practical and do not sideline needed sector reforms. Issues that particularly require attention are ensuring that the Borrower has the institutional capacity to manage and monitor social mobilization and resettlement and is conversant with the Bank's procurement procedures and guidelines (in this operation, the Borrower's attention to social mobilization and resettlement languished once donor financing ceased).

- Technical and social/organizational assistance essential for the introduction of new innovations or ways of doing business must be fully funded for the duration of a project. Failure to do so may cause serious implementation delays. This project also highlighted the importance of harmonization of policies among donors for subsectors in which they share common concerns and investment. If development partners are unwilling to commit to the duration of the project, then alternative ways of financing technical assistance should be explored.

- Coastal defenses should be renovated to higher engineering standards in homogenous units. This not only has greater sustainability than isolated repairs of existing infrastructure but it also provides a model that can be monitored to test the success of the innovation – an important design consideration.

Gregory K. Ingram
Director-General
Operations Evaluation

1. Background

1. Bangladesh is the most disaster prone of the least developed countries. Between 1970 and 1998, 171 large-scale water-related hazards such as cyclones, storm-surges, droughts, floods, and river erosion disasters killed an estimated half million people and affected more than 400 million. The poor are hit hardest because they live at greater density in the most poorly constructed housing in settlements on lands prone to hazards – particularly along the 700 kilometers of coast affected by storm surges.

2. Promotion of agriculture in the coastal belt and population growth encouraged wide-scale settlement in the area. Historically, the marshy coastal belt was an agriculturally unproductive semi-saline wetland whose sparse population was dominated by fishermen. Population grew from the 19th century with the influx of labor to serve *Zamindars* (landlords) who began to build earthen dykes that excluded tidal flooding and allowed planting of one winter and two summer rice crops. By the early 1990s, overspill from the crowded inland areas had increased the population of the coastal belt to about 35 million – almost 8 million of whom were living in the zone periodically swept by cyclonic tidal surges.[1] Private operation and maintenance of the coastal dykes ceased with the abolition of the *Zamindari* system in 1954 and the infrastructure deteriorated until the initiation of the 1961 Coastal Embankment Project supported by extensive foreign assistance. Between 1960 and 1990 agricultural production increased markedly because the original 46 polders had grown to 126, and the length of protective embankments from 2,600 kilometers to 4,800 kilometers.

3. Coastal embankments were generally designed to minimize the impacts of cyclone surges of one-in-10 years return period and to prevent saline water intrusion at high tide. Polders also required drainage sluices to remove excess rainfall and avoid internal flooding during the monsoon and after cyclones. Flushing sluices were added to provide irrigation and, where necessary, to create opportunities for shrimp culture and salt production.

4. The Bank became involved in coastal area protection through the Coastal Area Rehabilitation Project (Cr 339-BD) following the devastating cyclone of November 1970 whose winds and tidal surge of seven meters killed more than 200,000 people and inundated 8,100 square kilometers. The government requested further Bank assistance in June 1985 after a further 10,000 were killed by the May cyclone and this initiated preparation of the Cyclone Protection Project – presented to the Board as the Coastal Embankment Protection Project in 1995 – the subject of this assessment.

5. While the Bank was quick to field an emergency damage appraisal mission, it took another seven years for the project to be finalized. An integrated approach was proposed involving roads and highways, school and health clinic reconstruction, foreshore and embankment afforestation, flood protection and drainage works. The Bank's position was

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1. The coastal belt comprises 12 districts: Bergerhat, Barguna, Bhola, Chittagong, Cox's Bazaar, Feni, Khulna, Lakshmipur, Noakhali, Patuakhali, Pirojpur and Satkhira. Average population density in the coastal zone is 743 per square kilometer and it grew at 1.36 percent annually (1991-2001) compared with the national rate of 1.48 percent. Population data are from *Living in the Coast – People and Livelihoods*, Ministry of Water Resources, March 2004.

that better design and involvement of project beneficiaries were needed to ensure sustainability of polders and embankments, and that this could be achieved using the Bank's Technical Assistance V line of credit that was established for just such emergencies. However, the government preferred to use grant funding and the European Commission agreed to finance consultants. Difficulties of internal multi-sector coordination further slowed approval within the Bangladesh Planning Commission. Even after the government's approval of the project concept (December 1986), the main implementing agency, the Bangladesh Water Development Board (BWDB), objected to the level of TA envisaged by the Bank. After this was resolved, the then Ministry of Irrigation, Water, Drainage and Flood Control (now the Ministry of Water Resources) unilaterally changed the conditions for the selection and appointment of the EC consultants, as well as reducing their input, resulting in deadlock. Spurred by the cyclone of November 1988 that killed a further 2,000, an initial Executive Project Summary was agreed in February 1989.

6. By 1989, the Bank had become increasingly disillusioned with the performance of BWDB and imposed conditions of Board presentation and effectiveness to reduce project risks, the most difficult of which were that land for embankments had to be acquired two years in advance of construction and that all project-affected people had to be equably compensated – thus pushing back appraisal and Board presentation by a further two years. A huge cyclone in April 1991 caused 140,000 deaths and refocused attention on coastal polders that had continued to deteriorate – as the Staff Appraisal Report notes, "had the embankments been in better condition, the damage would have been much less severe." At the government's request, the Bank coordinated donor assistance and identified a Priority Works Program of urgently needed embankment repair and rehabilitation. As a result, the scope of the proposed project was reduced. First, other donors took care of school reconstruction and roads and highways. Second, the Board approved an emergency priority works program in early 1992 for the worst affected areas in seven polders using existing credits, Japanese and EC funding.[2] Recognizing that the initial project objective to save lives and reduce property damage had been made redundant by the long delays, the project name was changed to the Coastal Embankment Rehabilitation Project (CERP).

7. The CERP preappraisal of March 1993 highlighted four main issues that had to be addressed, spurred by the findings on the independent commission set up to investigate resettlement aspects of India's Bank-financed Narmada dams. The Morse Commission Report of 1992 noted in reference to India that: "It seems clear that engineering and economic imperatives have driven the projects to the exclusion of human and environmental concerns." Thus, it was agreed that in Bangladesh, squatters, in addition to landowners, would have to be resettled; resectioning and retirement of embankments would need more land than initially envisaged and the owners properly compensated; and operation and maintenance (O&M) would require local participation. Community involvement was also

2. The first Bangladesh Coastal Embankment and Reconstruction Priority Works program, supported by savings from four credits (1467-BD, 1784-BD, 1870-BD, and 2048-BD) totaling US$19.0 million equivalent, was approved in FY92. Total program costs of US$71.7 million were cofinanced by a Japanese PHRD Grant (US$26.6 million equivalent) and by the European Community (EC) (US$5.2 million equivalent). After two one-year extensions and additional transfers from credits 1467-BD, 1870-BD and 2048-BD, the credit was closed in June 1996, at which time credit disbursement was US$29.6 million equivalent.

required to implement foreshore afforestation (to dissipate wave energy) spread over 4,734 kilometers as this was probably beyond the Forest Department's resources. While project consultants financed by the EC were undertaking surveys to define the land acquisition and resettlement needs, project preparation was further delayed as a result of conditionality associated with the Bank's reform agenda for the water sector in general, and the BWDB in particular.

8. In September 1993, the Bank informed the Ministry of Finance that it would be unable to finance new water sector projects – excepting the CERP and the River Bank Protection Project because of their "emergency" nature – until a program of institutional reform had been implemented. Specific problems that had to be addressed by BWDB were inadequate attention to O&M, rapid deterioration of completed facilities, lack of involvement of beneficiaries, and an ineffective managerial Board. Nothing was done by BWDD. So in July 1994 the Bank gave notice that it would neither finance CERP nor the River Bank Protection Project (RBPP) designed to stop erosion on the west bank of the River Jamuna-Brahmaputra.[3] In response, BWDB put forward its own reform program for Bank agreement and, following its implementation, CERP was reinstalled in the lending program and approved in November 1995. In the interim, particular attention was given to harmonizing the individual resettlement policies of four Bank-financed projects: Jamuna Bridge, Roads and Highways Project, RBPP, and CERP.

2. The Project

Objectives

9. The overall objective was to improve security of life, property, crops, and livestock along the cyclone-prone coastal areas. The specific objectives of the project were to: (1) provide cyclone protection, including improving the security of persons living in the protected areas, reducing damage to houses and other buildings and infrastructure and minimizing the loss of crops and livestock; (2) improve agricultural production, through preventing saline inundation during normal weather and improved cropping patterns due to reduced cyclone risks; and (3) introduce improved technology in the design and construction of protection works, and improved methods of embankment maintenance. The third objective was innovative because it piloted the idea that stakeholders could be induced to undertake maintenance of embankments in return for user-rights to the forestry produce from afforestation and planting on the embankments. Project objectives are related to components and costs in Table 1.

3. Letter to the Bangladesh Ministry of Finance, July 12, 1994.

Table 1: Project Objectives, Components, and Costs

Objectives	*Components*	*Costs (US$, million)*		
		Appraisal	Addition	Actual
1. Provide cyclone protection, including improving the security of persons living in the protected areas, reducing damage to houses and other buildings and infrastructure and minimizing the loss of crops and livestock 2. Improve agricultural production through prevention of saline water intrusion during normal weather and improve crop production by reducing cyclone damage	■ Rehabilitation and improvement of 21 polders in the coastal area. Civil works including 78 km of resectioned and 73 km of new seaward-facing embankment, 7 km of coastal protection using revetments, new and replacement cross-drainage structures, finish earlier uncompleted work, and mitigation of erosion damage on Sandwip Island. Repairs to existing embankments, drainage networks and regulators and provision of new sluices	44.6		62.0 [a]
	■ Acquire 675 ha of land for project works	3.3		3.7
	■ Involuntary Resettlement. Compensate about 1,800 families that would lose property, resettle 700 squatter families and provide homestead plots for 1,300 other landless families	0.4		
	■ Community Development Fund for provison of water and sanitation, community education and training and income generating activities (EC)	0.4		-
	■ Investigation, surveys and studies	0.5		4.2
	■ Engineering and administration including vehicles and equipment	4.0		
3. Introduce improved technology for the design and construction of protection works, and improved methods of embankment maintenance	■ Lease of private foreshore for afforestation	1.8		1.7
	■ Afforestation of 1,900 ha of embankments and 4,700 of foreshore facilitated through community participation	5.3		4.2
	■ Technical assistance to support project supervision, design improvements, afforestation, social development and improved operation and maintenance	10.6		12.1 [b]
	■ Improved operation and maintenance	5.4		5.5
	Project Baseline Cost	***75.9***		***87.9***
Supplemental Credit (1999)			**Addition**	**Actual**
	■ Emergency repairs to embankments resulting from the 1997 cyclones in the CERP area and an additional 46 polders		5.5	5.5
	■ Upgrading emergency repairs to meet standard specifications for embankments and to cover cost overruns of CERP		5.2	[a]
	■ Feasibility study for a second phase CERP project		4.1	4.1
	■ Support for NGO and resettlement consultants		1.7	[b]
	Price and physical contingencies	11.9		-
	Total Project Cost	***87.8***		***97.6***

Notes: a. The amounts in the supplemental credit for emergency repairs are included in total cost for civil works; b. the amount for NGOs and resettlement consultants is included in the TA total. Actual amounts vary because of exchange rate differences and cost variations.

Implementing Arrangements

10. The line agency of Ministry of Water Resources, the Bangladesh Water Development Board (BWDB), managed the project through a special Project Implementation Unit (PIU) established in Chittagong and suboffices in Cox's Bazaar, Noakhali, and Barisal. The BWDB Project Director was assisted by three deputy directors responsible for construction, O&M, and resettlement. The Forest Department (FD) maintained its own PIU in Chittagong and was responsible for foreshore afforestation, technical assistance, and funding NGOs to establish nurseries and assist BWDB in its embankment forestry activities. The working relationship between BWDB and the FD was governed by a separate agreement. A project Coordinating Committee of the main line agencies, chaired by the Project Director, met quarterly and also included representatives of the Ministry of Agriculture (agricultural extension), an elected representative of the participating NGOs, and, as an observer, a representative of the project consultants. In addition, District Project Coordinating Committees headed by the respective Deputy Commissioners monitored local progress, particularly on land acquisition activities. Similar committees were replicated at the Thana and Union level and their main function was to disseminate information on project activities, and catalyze community and beneficiary participation.

Implementation

11. Although the project experienced delays caused by slow counterpart staffing, difficulties over land acquisition, award of construction and consultants' contracts, and cyclonic damage, it closed on schedule. The initial round of national competitive bid (NCB) contracts and direct contract awards experienced a year's delay because of the unfamiliarity of BWDB regional and local staff with the Bank's procurement requirements, and the large number and wide geographic spread of the contracts. Indeed, this unfamiliarity led to nine NCB contracts and five direct contract awards with landless contracting societies being declared as misprocurement and ineligible for Bank-financing.[4]

12. The action of the sea and river changed the foreshore during the long appraisal process and subsequent contract delays, and a major cyclone in May 1997 that damaged 220 kilometers and destroyed 54 kilometers of embankments, led to increased costs. In many cases project works had to be redesigned, embankments realigned, and some of the earlier work needed more extensive rehabilitation than anticipated. Funds diverted for emergency repairs and increased use of design consultants depleted the EC grant funds allocated for the resettlement and social mobilization consultants even as the scope of the land acquisition, resettlement planning, and social mobilization activities increased. The inability of the EC to replenish its grant quickly required the Bank to provide bridging funds from the emergency supplement credit agreed in 1999. Even so, there was an 18-month hiatus in NGO activity that undermined the social mitigation aspects of the project's resettlement, compensation, and afforestation activities that remained unfinished at project completion (see paras 14, 33).

4. The 9 NCB contracts were worth US$908,856, the direct contracts US$110,355.

There was also pressure on the government's general budget because the extensive inland floods of 1998 affected 30 million people and reduced GDP by an estimated 1.1 percent.[5]

13. The BWDB arrangement with the Forest Department on foreshore afforestation was never easy and finally collapsed in 1999. In part this was because the FD had greater difficulty than BWDB in working with NGOs, an issue highlighted during appraisal. BWDB took over the management of the afforestation NGOs, but not without delays as contracts were renegotiated and the backlog of unfinished FD certification was sorted out. In consequence, and because of changed physical conditions, foreshore afforestation did not reach its targets.

14. Involuntary resettlement planning and implementation was in accordance with the Bank's safeguard policy (OP4.3 Involuntary Resettlement) except for the few remaining compensation payments. At the time of the OED mission, about 4 percent of final compensation payments were outstanding due mainly to legal disputes over land ownership.

15. Resettlement and compensation for lost land and assets did not go according to schedule and took less land than planned (588 hectares compared with 675 hectares) but affected far more people – in all 6,022 – than anticipated. Even so, it did not create any major problems or major delays during implementation – an improvement over past BWDB projects.[6]

16. The Resettlement Action Plan (RAP) was supervised and monitored using technical assistance consultants and facilitated through local BWDB-appointed NGOs working within the communities. The NGOs were withdrawn from March 2003 and the TA was terminated from June 2003 when donor funding ceased. BWDB has no follow-up or staff monitoring RAP activities even though they are not fully complete. As such, the current status is unsurveyed. New settlers were not registered or formally given homestead plots beyond December 2002 but, according to BWDB, there is a free-flow of settlers coming and going. For example, in polder 59/3C and polder 59/3B, 21 and 175 people respectively who lost their lands to erosion have settled on the embankment as a last resort and they are not officially listed as embankment settlers.

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5. The 1998 riverine floods were the longest in living memory – lasting from June to October – and the loss of production and cost of mitigation increased the fiscal deficit from 4.2 percent in FY98 to 5.3 percent in FY99. The flood inundated close to 100,000 square kilometers of land. More than 30 million Bangladeshis were displaced, with 20 million rendered homeless. Hundreds of people were killed directly by the floods, and several hundred thousand cases of diarrhea were confirmed.

6. It was anticipated that 1,800 private households, 200 of which would require involuntary resettlement, would lose land or other property assets and that 700 squatters on the embankments would have to be relocated. An additional 1,300 landless families were to be given usufruct rights and leases to live on the land side of the embankments. By project completion, 4,866 landowners had been affected and 543 had to be resettled. One thousand, one hundred fifty six squatters have been relocated later than anticipated to synchronize with the delayed reafforestation program..

3. Evaluation

EXPECTED BENEFITS

17. The project was expected to directly benefit 1.2 million people living in the project area. The primary benefits would be reduction in the loss of lives, property, crops, and livestock, and improvements in agricultural productivity and incomes phased in over a period of 7 years and lasting 30 years. This was to be achieved through prevention of salinity intrusion during normal tidal cycles, protection against tidal surges caused by cyclones having a return period of less than 20 years, and improved maintenance. Specifically, the average cropping intensity over the net cultivable area of 49,900 hectares was expected to increase from the 1994 baseline of 136 percent to 155 percent.[7] This, allied with improved management, inputs and high-yielding crop varieties, was expected to raise crop production by an incremental 87,700 metric tons or 55 percent, thereby increasing net farm incomes by 47 percent. It was estimated that cyclones would reduce these production improvements – by 50 percent for a 1-in-20 year event, and by 40 percent for a 1-in-10 year event. Similarly, livestock losses would be reduced to 10 percent for cyclones of 1-in-10 years or more. Property, roads, and culverts would also sustain much less damage with the project. Benefits would also arise from afforestation of the foreshore, and embankments that would reduce maintenance costs and provide economic benefits (timber, fuel wood, fruits, and fodder). No attempt was made to quantify lives saved by the proposed project interventions.

COUNTERFACTUAL

18. In the absence of the project it was assumed that the breaches in the seaward-facing embankments would remain or increase due to lack of rehabilitation/rebuilding and continued poor maintenance. In consequence, it was assumed that within two years all high-yielding varieties of summer Kharif rice would switch to salt-tolerant local varieties, yields would decline by 10 percent, and crop production would fall by 17,300 tons. Saline soil conditions would continue to limit dry season cropping. Property, roads, and culverts would be damaged by every cyclone and risk to life and livestock would remain high.[8]

19. The counterfactual made no allowance for other programs and projects implemented during the life of the project that helped to develop the coastal belt. The Bank's Forest Resources Management Project (Credit 2397-BD for US$49.6 million approved in 1992) provided over 60,000 ha of mangrove and new conventional forests along the coast of the Bay of Bengal and overlapped the CERP project area. In addition, there were 18 other projects and programs financed independently of the Bank by either the government or other donors that overlapped implementation of the CERP. The most relevant was the ADB's Coastal Greenbelt Project that included the parts of the CERP area. The remaining 16 projects covered coastal protection, cyclone shelters, agricultural, fisheries, public health and

7. Cropping intensity is an index of land use. If only one crop is grown over an area per year, the cropping intensity is 100 percent. If two crops are grown over the whole area – for example, Aman rice and winter vegetables – the cropping intensity would be 200 percent.

8. Over 140,000 people were killed and 40 percent of livestock was lost in the 1991 cyclone.

most had some effect on the realization of the agricultural and human development potential of the coastal belt (Annex B5).

20. Monitoring and evaluation to be implemented through the consultants financed by the EC was given a fairly high profile at appraisal. Benchmark studies were undertaken for 17 of the 21 polders under the related Systems Rehabilitation Project (Credit 2099-BD). Even though no monitoring and evaluation of "without project" control polders was established, the scope of M&E activities was very comprehensive and would have yielded very useful data about project impacts. The land acquisition and resettlement component was thoroughly monitored and evaluated throughout implementation and fully complied with the Bank's safeguard policy. However, monitoring of agricultural, socio-economic, and environmental impacts was not undertaken because funding for technical assistance was inadequate and irregular after 1999 (para. 12), and was further diluted by the additional work caused by the 1997 cyclone.

OUTCOME

21. **The outcome of the Coastal Embankment Rehabilitation Project is rated moderately satisfactory based on the relative importance of the objectives.** The most important issue affecting the outcome rating was the partial progress toward mitigating inadequate embankment maintenance and lack of progress on reforming systemic institutional problems, objective 3 (Table 2).

Table 2: Ratings for Achievement of Project Objectives

Objectives	Importance	Relevance	Efficacy	Efficiency	OUTCOME
Physical					
1. Provide cyclone protection, including improving the security of persons living in the protected areas, reducing damage to houses and other buildings and infrastructure and minimizing the loss of crops and livestock	Substantial	High	Modest	Substantial	Satisfactory
2. Improve agricultural production through prevention of saline water intrusion during normal weather and improve crop production by reducing cyclone damage	Substantial	High	Substantial	Substantial	Satisfactory
Institutional					
3. Introduce improved technology for the design and construction of protection works, and improved methods of embankment maintenance.	High	High	Modest	Modest	Moderately Satisfactory
Overall rating	-	***High***	***Modest***	***Substantial***	***Moderately Satisfactory***

22. The reform elements supporting the third objective, which were the primary reason the project took so long to prepare and appraise, resonate most closely with the Bank's

country strategy and are therefore of the highest importance. The basis for individual ratings is elaborated in the sections that follow

RELEVANCE

23. **Relevance was high at appraisal and remains high.** The project's first objective, to reduce vulnerability to natural hazards through investment in infrastructure, supported the government's 1996 National Environmental Action Plan, its 1999 National Water Management Plan and the Bank's 2020 Long-run Perspective Study for Bangladesh (1996). The more detailed Bangladesh Climate Change and Sustainable Development Study (2000) identified measures to improve coastal defenses as part of a national long-term strategy to address the impact of sea-level rise due to global warming: "the prospect is sufficiently likely and alarming to warrant precautionary action at the national as well as at the international level."

24. The second objective, to improve agricultural production, was and is totally consistent with the government's and the Bank's strategy for Bangladesh's agriculture and to ameliorate rural poverty.

25. The third objective, to involve local beneficiaries, was highly relevant. The 1995 Country Assistance Strategy emphasized, *inter alia*, improving collaboration of government and NGOs in delivery of basic services and increasing involvement of communities and stakeholders in the design and monitoring of development programs. The 1998 CAS reinforced the recommendations of OED's 1997 Country Assistance Evaluation, specifically that partnerships with other donors, NGOs, and civil society should be increased to overcome vested interests and build client ownership. In 1999 the CAS progress report reemphasized the importance of capacity building to give stakeholders (the poor in particular) a "voice" in reducing the afflictions of poverty.

26. The Bank's latest Country Assistance Strategy (2001) notes Bangladesh's economy is also vulnerable to natural disasters of catastrophic proportions: "In recognition of this, IDA must be prepared to consider additional assistance for post-disaster recovery through operations similar to those provided in the aftermath of the 1998 flood. This would be incremental to the investments for coastal embankments and riverbank protection that have been proposed to strengthen disaster mitigation capacity. IDA would support building the Government's capacity in managing these disasters and implementing a long-term flood control action plan." In addition, one of its four main thrusts was to implement an integrated approach to rural development, including supporting growth in agriculture and non-farm activities, making opportunities and assets available to the poor, and improving rural infrastructure.

Efficacy

27. **Overall efficacy is rated modest.** While one objective was fully achieved, achievement on the other two was partial with significant shortcomings.

Objective 1: Cyclone protection was provided – but not to the extent planned.

28. Only 14 of the 21 polders targeted for rehabilitation were completely protected by new or renovated embankments that filled critical gaps in the defenses, leaving seven polders at risk of rapid inundation from cyclones. The major reason is that continued coastal erosion and the 1997 cyclone either made rehabilitation alone impracticable (major and expensive realignment was needed) or destroyed works executed under the project. Minor reasons are local depression of embankment crest levels (due to manual construction and poor fill compaction), poor maintenance of some sections, gully erosion of embankment slopes from rainfall and "public cuts" (para. 37).[9] In consequence, although only 86 percent of new or rehabilitated embankments were constructed, these used more than double the number of sluices and gates planned. The target of 381 kilometers of internal drainage works was slightly exceeded; conversely, only 22 kilometers or 17 percent of internal embankments were built because of cost overruns on other project components.

29. Improved drainage works and drainage sluices have been very effective in creating conditions for the introduction of high-yielding varieties of rice and halting cutting of embankments by inhabitants to regulate water levels for productive purposes. For example, in the delta of the River Meghna, seven new sluices in the Ramgati polder have removed drainage congestion from about 7,000 hectares – about a quarter of the total poldered area – and this has completely curtailed cutting of the embankments by farmers to let flood water out, a major problem in the past. In the same polder, however, erosion of 6 kilometers of embankment, including 2.2 kilometers of CERP works, allows tidal flooding of 1,500 hectares. Elsewhere, insufficient sluices have led to continued public cuts: in Matabari polder in Cox's Bazaar, for example, there are 13 public cuts in the sea-facing embankments to facilitate shrimp culture, salt cultivation, and irrigation.

30. The only real test of the efficacy of project infrastructure against cyclonic storm surges occurred in 1997 and 1998. Compared with earlier events of similar magnitude striking the same area of coastline, the loss of life was significantly reduced (Table 3).[10] Several independent and government observers have concluded that the risk to life declined because of improved warning systems, better cyclone shelters, and better inland transport and communications facilities – and after the 1991 cyclone over 1,200 cyclone shelters were built, many of them multipurpose structures.[11] As only a small proportion of project works

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9. "Public cuts" is the term used to describe holes made in the embankments to allow water in or out. Generally, farmers cut the embankment to let out rainwater flooding in the absence of a sluice; conversely, fishermen make cuts to allow their boats in and provide saline water for fish culture, while others manufacture salt. Public cuts are symptoms of unresolved conflicts of interest and lack of relevant engineering solutions.

10. Damage from cyclonic tidal surge depends on its timing and the state of the tide: damage from a cyclone over a low spring tide could be an order of magnitude less than a similar magnitude event over a high spring tide. If fields are clear of crops, agricultural damage will be minimal. Thus, only seasonally unaffected indicators are shown. The data in Table 3 is drawn from several sources: Banglapedia (2004); Nirapad Barta (2004). Table 3 also shows that property damage is highly correlated with very high wind speeds.

11. Cyclone shelters were built using funding from Saudi Arabia, EU, Japan, Care, the Red Crescent, and other international agencies and NGOs.

had been completed by 1998, only a very small portion of the huge drop in fatalities can be attributed to the CERP project.

Table 3: Cyclones are now less fatal

	1970	1985	1991	1994	1997	1998
Wind speed km/hr	223	154	225	200	225	150
Storm surge, m	6 to 9	3 to 5	6 to 8	4	5	3
Number killed	500,000	11,070	138,000	170	126	19
Property Damaged (number)	400,000	94,000	820,000	na	612,000	3,200

Note: na – no reliable estimate available

Objective 2: Agricultural production improved

31. The agricultural picture is more positive and indicates that project embankments were successful in keeping out saline water intrusion during spring tides and storms. Although the project did not monitor agricultural production, the Ministry of Agriculture and Bangladesh Bureau of Statistics independently collate *Thana* (parish) data seasonally and this enabled trends in production to be determined by the FAO ICR team. The benefited area, at 40,200 hectares, was 60 percent of the appraisal target because of incomplete polders. Within project polders the cropping intensity increased by 18 percent and the weighted average crop yields increased by half or 0.97 tons/hectare over the pre-project equivalent of 1.94 tons/hectare. Most of the increase was due to diversification to cash crops encouraged by better transport links and the spread of high-yielding varieties of rice (Annex B). An *ex post* impact assessment was commissioned by the BWDB and generally confirmed these findings from a detailed evaluation of three polders compared with the baseline survey, and one control site.[12]

Objective 3: Design and construction of protection works was improved and innovative methods of embankment maintenance were introduced – but sustainability is an issue.

32. Better design decreased the seaward slope of embankments from 1:3 to 1:7 and protected them with a layer of compacted clay, thereby increasing embankment stability and reducing erosion risks from wave action. Important innovations were to introduce social forestry on the embankment, and allow homestead rights at the foot of the landward slope and harvesting of forestry products in return for embankment maintenance. The rationale was that trees of appropriate species planted on the embankment help hold the embankment soil firmly through their root network and thus reduce erosion and dissipate wave energy. In addition, BWDB was to give additional attention to inculcating a "maintenance culture" within its organization. However, none of these activities reached the targets set at appraisal.

33. **Social forestry targets were only partially met.** Just over a third of the ambitious target of 1,900 hectares of newly planted forestry on embankments was achieved, and only

12. BWDB. 2003. *Impact Assessment Study of Coastal Embankment Rehabilitation Project (Phase-II) IDA Credit 2783-DB*. Design and Planning Consultants in association with Associated Engineers (BD) Ltd. and Development Planners and Consultants. Final Report, January 2003.

21 percent of sea-facing slopes can be regarded as fully protected (Table 3).[13] As progress was slow and uneven, some embankments were well-forested, others only marginally so.[14] Taking 50 percent forest cover as a cut-off, overall about 40 percent of the project area was afforded some protection as three quarters of the length of their sea-facing embankments was planted. It is uncertain, however, how much of the afforestation can be attributed to the project: the Forest Department's Coastal Greenbelt Project (ADB) and Forest Resources Management Project (IDA) covered an additional 647 hectares on embankment and 3,353 hectares on the foreshore in the same target areas.

Table 3: Embankment afforestation was only partially successful

Plantation Coverage Compared with SAR Target	Better than 80%	Between 50 and 80%	Less than 50 %	Total
Number of Polders	5	5	11	21
Total Polder Area, ha (and percent of total area)	31,345 (16%)	41,763 (22%)	119,492 (62%)	192,600 (100%)
Sea-facing Embankments, km (and percent of total length)	78 (21%)	206 (54%)	97 (25%)	381 (100%)

34. Embankment areas with afforestation and foreshore protection are generally in a better state of maintenance than areas not planted. Embankment settlers are looking after the trees and undertaking minor maintenance. Most importantly, they do not allow cattle to enter and damage the embankment areas – a major problem in the past. Planted areas also provide a sheltered habitat that encourages biodiversity, particularly grasses and other species that bind the soil.

35. In many areas, however, sustaining newly-planted forests on embankments was challenging. A detailed Bank supervision review and an impact assessment of four polders indicated that fewer than 60 percent of seedlings survived the first year even though necessary agrochemical inputs were made available by the FD.[15] Primary reasons were the uneven quality of rootstock raised in local nurseries or established by the participating NGOs, unavailability of good quality water, and lack of timely incentives for embankment dwellers. Many of the embankments were constructed using semi-saline soils borrowed from the foreshore, and lack of good quality water precluded adequate leaching of salts. Even in non-saline soils, plants died for lack of fresh water.

36. Many embankment settlers were uncertain about what they had agreed when they signed contracts with the BWDB. First, NGOs were not always there to provide guidance on

13. The ICR notes that SAR afforestation targets were reduced during implementation to take account of practical field realties – this was despite extensive field surveys at appraisal. OED evaluated against the SAR targets.

14. The main reason for the shortfall was slow activation and mobilization of NGOs responsible for social organization under the Forest Department and subsequent inadequate and irregular financial support from government and the donors (para. 12). Finally, under BWDB management, embankment afforestation started in 1998, two years behind schedule.

15. Supervision report, August-September 2002.

social forestry because of the irregular financial support for them (para.12), and second, the four-year subsistence payment to settlers whilst the plantations matured were very irregular even when NGOs were present. In all areas, support for embankment settlers dried up before the end of the four-year subsistence period when the EC-sponsored NGOs departed in March 2003. As a result, lack of own resources forced some embankment settlers (most of whom had earlier been landless) to move to where they could find work – a choice catalyzed by lack of social acceptance by the indigenous population. And in some areas, these departing embankment settlers cut down the trees to provide income, in others the trees perished in their absence.[16] The findings give further support to a conclusion of OED's 2004 social development study that social development is key to project success.[17]

37. Generally, OED's assessment team found that embankment settlers stayed when they had supplementary sources of income. In the southern Patuakhali District at Kuakata, for example, 76 settlers occupy and maintain social forestry on 7 kilometers of embankment. Although they find the income from the plantations is insufficient to meet their subsistence needs, tourism provides adequate supplemental employment (laboring, rickshaw driving, etc.) to close the gap. Settlers were confident that income would improve when the plantations matured over the next five years. On the embankment east of Kuakata, however, embankment settlers were fishermen and had little interest in social forestry, a lack of interest partly fostered by unavailability of fresh water and an unresolved dispute about resettlement allowances with the responsible NGO. In consequence, all of the plantation had perished and the embankment was showing signs of erosion.

38. The 2002 impact assessment (BWDB ibid) of three polders found that social forestry provided income for 885 poor families and also allowed many to establish vegetable gardens. Incomes from forestry were higher than polders without social forestry (Table 4), but these specific findings cannot be generalized for the whole project.

Table 4: Improved annual incomes from social forestry on embankments

Polder	Total households	Number of trees sold/used	Average no. of trees sold/used per household	Average income from trees (Tk.)
With project sample				
40/2 Patharghata	63	352	5.6	9,938
59/2 Ramgoti	85	277	3.3	5,266
70 Matarbari	28	131	4.7	4,387
Without project control				
64/1 Banshkhali	53	41	0.8	2,732.

Source: BWDB 2003 *ibid*, Chapter 4

39. There is now no systematic inventory of the current status of social forestry in the CERP project. All social monitoring and evaluation ceased when donor funding dried up and

16. Feedback for a discussion meeting chaired by the Deputy Commissioner Cox's Bazaar, 25 April, 2004.

17. OED. 2004. An OED Review of Social Development in Bank Activities. February 17, 2004

the NGOs departed. BWDB maintains no records or the capacity to continue social or agro-forestry M&E.

40. **The foreshore afforestation component was generally unsuccessful.** Less than a fifth of the SAR target of 4,737 hectares of plantation was achieved. Six polders – Anowara, Baskhali, Chakoria, Chaufaldandi, Kutubia, and Shoronkhola – covering 37,700 hectares or 19 percent of the project area have full foreshore protection. Two other polders, Chanua and Moheskhali (covering a further 4,300 hectares), have partial protection and bring the total protected area to 22 percent of the CERP area. Even then it is uncertain how far the project contributed to the total foreshore protection established given the FD's own programs (para. 33). Whatever the attribution, however, these project are now complete and neither BWDB nor the FD have funds to continue foreshore afforestation.

41. The foreshore afforestation component was unsuccessful because there are few incentives for stakeholders. Foreshore land belongs to the state and is administered by the local Deputy Commissioner (DC) who has the authority to lease it out, generally for fishing-related activities – shrimp and fish ponds, and shrimp trawling – and for salt production, all lucrative activities that fill the district coffers, unlike mangrove afforestation. In contrast to farmers within the polders, fisherman see the coastal embankment as trespassing on their livelihoods, and there have been numerous cases when fisherman cut the embankments to allow ingress of salt water into former creeks, rivers, and wetlands. Similar practices are also widespread inland where wetlands have been cut off from rivers by embankments.

42. Generally, the Deputy Commissioners stipulated that 20 percent of the foreshore land leased by fisherman and salt produces should be used for afforestation. Not all leasees agreed and even for those who did, the DC had few resources or inclination to police influential stakeholders. In consequence, considerable areas of the foreshore planting have been removed by fishermen and replaced with commercial fishing activities. The areas that remain are where the embankments are set back from the coastline or population and fishing pressure are relatively low.

43. **Although a plan for improved operation and maintenance was prepared, the BWDB maintenance culture has not changed.** The primary reason is that the plan depends on increased funding from BWDB and continued community participation in maintenance. BWDB has worked well at the things it does best – new works and rehabilitation – but remains unable to use NGOs as interlocutors to mobilize communities because of insufficient budget. Most communities visited by OED complained that no money was forthcoming from BWDB for routine O&M, or even to settle arrears of resettlement and subsistence claims.

44. The Project Implementation Unit estimated in 2002 that annual costs of routine physical maintenance and support of various community maintenance groups was Taka 56 million (US$1.4 million). Over the period 1996-2004, the actual budget averaged 59 percent of needs, this average being raised by a government allocation in the last year of the project of Taka 83 million. If this outlier is omitted, the coverage for the period declines to 45 percent. A further difficulty was that the Bank's efforts to induce BWDB to separate staff and budgets for new work and O&M failed. As part of its cost-cutting exercise enforced from the center, BWDB downsized field units and merged all activities. Consequently, as before

the project, lucrative capital works receive the bulk of funding that remains after staff costs are met. For example, in the Patuakhali O&M Circle, actual O&M needs were Taka 10 million but only 2 million was received. Thus, most sluices are inoperable, breaches in embankments remain unrepaired, and routine maintenance is minimal.

Efficiency

45. **Efficiency is rated substantial.** The period since the project was implemented has been remarkable by the absence of large cyclones and the associated damage. This has lowered the perception of risk and farmers have invested more. At appraisal, based on an analysis of 11 of the 21 polders (covering 64 percent of project costs), it was expected that the project would yield an economic rate of return (ERR) of 19 percent, excluding any benefits from lives saved. The *ex post* ICR evaluation projected that the ERR had increased to 25 percent because of the greater than anticipated agricultural benefits (para. 29) and optimistic assumption about afforestation benefits. Subsequently, BWDB completed an assessment of the same 11 polders in January 2003 and lowered the average ERR to 13 percent primarily because of increased capital costs. Five polders were found to be uneconomic: Sandwip (7 percent), Kurushkul (7 percent), Teknaf (9 percent), and Ramgati (11 percent). BWDB notes, however, that "if other project benefits like roads, markets, employment, environment, health hazard, etc. would be taken into consideration, the benefit would be much higher. From these points of view, it can be concluded that the execution of the polders is justifiable. The polder projects have been a good case where social, environmental, financial and economic variables are showing positive trends towards improvements."[18] OED can only concur.

Institutional Development Impact

46. **Overall institutional development impact is rated as modest at best.** BWDB was very effective in areas of its comparative advantage – civil engineering – but it was less successful in developing skills in social mobilization and working with the Project Director appointed by Forest Department. Indeed, the dual implementation failed due to lack of coordination and eventually the FD was excluded from the project and never fielded any staff. While BWDB was successful in recruiting NGOs to initiate the forestry component, social mobilization, and resettlement, BWDB only modestly internalized the need to factor beneficiaries' views into engineering decisions. Thus, as soon as donor pressure and finance to address social issues ceased, social concerns were dropped from its agenda. While management plans for polder O&M were developed by consultants, management systems for embankment and foreshore plantations remain to be implemented primarily because of lack of budget and *ad hoc* maintenance in response to emergency needs.

47. In contrast to business-as-usual performance of the BWDB, a new institutional model for embankment maintenance – social forestry and embankment maintenance groups

18. BWDB. 2003. Impact Assessment Study of Coastal Embankment Rehabilitation Project (Phase-II) IDA Credit 2783-DB. Design and Planning Consultants in association with Associated Engineers (BD) Ltd. and Development Planners and Consultants. Final Report, January 2003.

financed by the proceeds to secure stakeholder ownership– was successfully piloted and beneficiary interest is high. Although it has not proved to be universally successful, the reasons are clear: problematic logistics and inadequate cross-sectoral coordination slowed the launch of the program while lack of adequate budget to complete schemes already started undermined their continued success.

Sustainability

48. **Sustainability is unlikely.** Budgets from government for O&M are insufficient to sustain project works, and the longer-term viability of beneficiary embankment maintenance is uncertain. The situation is now even more difficult because the food-for-work program under the World Food Programme (WFP), used to finance earthworks construction and maintenance, was phased out over the period 2001-03.

49. Technical sustainability is uncertain. Even if there were sufficient budget and human resources to maintain project achievements, project works are generally only part of the coastal embankment cyclone protection works and are newly fixed patches within existing embankments. Thus, for example, in Matabari polder, the CERP works comprise only 27 percent of the sea-facing embankment and a 300-meter stretch has been damaged and awaits repair.[19] This is a minor problem, however, compared with the 17 kilometers or 98 percent of the original embankment adjacent to the CERP works that needs major repair. In addition, public cuts require replacement with sluices.

50. There is also a problem of erosion by the sea or by rivers. Although this could be avoided if the embankments are set back from the shoreline, there is huge social pressure not to exclude any agricultural land. As a result, many embankments are subject to erosion, and retiring sections of threatened embankments is a major and ongoing task for BWDB that takes most of the O&M budget. Thus, for example, in Ramgati polder, a quarter of the 4.3 kilometers of project resectioned embankment has been eroded, and a 6 kilometer breach in the embankment destroyed 2.2 kilometers of new and retired embankment. Even though project works may be more robustly designed and afforded additional protection by afforestation, agricultural benefits within the polders can only be guaranteed if the whole polder is adequately maintained – and this is clearly not the case.

51. Social sustainability is also an issue because of the conflict between the interests of fisherman and farmers that leads to public cuts of the embankments. Unless or until all stakeholders interests are included in the planning of embankment works including retirement, sluices, internal drainage, and afforestation, and a conflict resolution mechanism established, it is likely that unilateral action to safeguard family incomes will take a higher priority than a group consensus to safeguard the integrity of the polder through collective action.

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19. The CERP project built 4.48 kilometers of resection embankment and 2.29 kilometers of new (retired) embankment.

BANK PERFORMANCE

52. **Bank performance is rated as satisfactory.** Identification and appraisal was satisfactory, albeit delayed by the standoff over agreeing a reform program for BWDB. Technical design was sound and appropriate and led to improved embankment design and higher quality civil works. Beneficiary participation was encouraged for the first time and linking social forestry to O&M was a notable achievement. Supervision was proactive and timely and the supplemental credit provided essential bridging funds for the TA, addressed more recent cyclone damage repairs and allowed some integrated planning for coastal zone management to be initiated.

BORROWER PERFORMANCE

53. **Borrower performance was uneven but overall it is rated satisfactory.** Government ownership was high, although this was not matched by sufficient funding of O&M once the project had been completed. Expecting the FD to work in close cooperation with BWDB was probably optimistic given their totally different interests and skills. Instead, the FD preferred to maintain its independence and in doing so it secured significant ADB support for the Coastal Greenbelt Project and dropped out of the CERP project.

54. Given these changing circumstances, overall BWDB managed the multidimensional project well. It effectively used foreign consultants and local NGOs to achieve project objectives over a very large and geographically diverse project area. Even so, land acquisition encountered some problems because local government organizations and polder inhabitants were not adequately consulted on designs and preparation works. Procurement, despite BWDB's years of experience with the Bank, was a major issue and is indicative of the lack of institutional memory and learning within BWDB. Similarly, BWDB's attention to social issues – resettlement in particular – languished once donor oversight ceased. Systematic attention to monitoring and evaluation was poor notwithstanding the generally useful 2002 impact assessment.

4. Findings and Lessons

Findings

55. The protection afforded by the coastal embankment against normal spring tides and small cyclones yields a continuous stream of human and agricultural benefits that have justified the rehabilitation effort. It is not possible, however, to attribute all the benefits to the Bank-financed project as there are numerous other programs supported by other donors, government, and NGOs that affect the benefit stream – these include, among others, agricultural extension, improvements to social capital, raising of environmental awareness, growth of flood and disaster warning, and nurturing of coping strategies. The number of deaths related to severe cyclones showed a marked decline during the life of the project, but this was due to the paucity of extreme events and the building of effective cyclone warning

and evacuation systems by government and the NGO community, not the Bank's assistance *per se*.

56. The project clearly demonstrated that improved technical design of the coastal embankments combined with social forestry made the structure more robust and reduced its rate of deterioration. However, the whole embankment is only as strong as its weakest link – thus the "patch, mend, and upgrade" approach (while providing local protection) does not guarantee the integrity of the coastal polders. In hindsight, it would have been better to apply the new design paradigm to a few select polders and upgrade them totally – with a well designed M&E this would have served as a good demonstration of the sustainability of the design. Without such an approach there is marked differential deterioration between the existing embankment and those sections strengthened by the project. General dissatisfaction with the quality of O&M and the continued lack of reform in BWDB caused the Bank to cancel a proposed follow-on project, a decision sustained though 2004.

57. **The future?** The key development issue is how to ensure adequate funding to systematically maintain the polders and bring them all up to the CERP design standard. Currently, the outlook is bleak because government's many conflicting priorities result in available budgets being spread too thinly to ensure even the minimal maintenance standards. Improving to CERP design standard, however, will remain elusive without substantial external funding. There is also clearly a case to be made for devolving the cost of maintenance of coastal polders to all beneficiaries in order to mitigate inadequate budget allocation from the center. This will require considerable awareness-raising, consultation, and social mobilization to identify and implement resource mobilization in either cash or kind.

58. Following a joint multi-ministry initiative, the government prepared a Policy Note in 1999 that highlighted the importance of sound and integrated coastal costal zone management: "ICZM offers a means of balancing the competing demands of different users of the same resources and of managing the resources to optimize the benefits that is consistent with the country's goals....it has to prove to be an effective general framework for dealing with conflicts arising from interactions of the various uses of coastal areas. It aims at coordinated development and management." The Policy Note identified the issue of poor departmental co-ordination as one of the key challenges for coastal development and established a process to overcome this problem supported by the Netherlands and latterly the United Kingdom.[20] One of the outputs from this process is a draft Coastal Zone Policy (2003). Specifically, it identifies the longer-term objective as the reduction of poverty, development of sustainable livelihoods, and the integration of the coastal zone into the national planning process.

59. This integrated approach to coastal development moves beyond the focus on reducing vulnerabilities and emphasizes development opportunities that can be instrumental in reducing the poverty of coastal communities. These wider development goals include those

20. The Project Development Office – Integrated Coastal Zone Management was established in 2001 under the lead of the Ministry of Water Resources. It acts a forum to bring together policymakers, technicians, NGOs, and international community interested in coastal development.

set out in the Interim Poverty Reduction Strategy Paper – as well as assisting Bangladesh to meet existing international obligations under such agreements as the Kyoto Protocol, the RAMSAR Convention, and the Millennium Development Goals. How the ICZM process will balance the infrastructure and social development needs is still unclear – but at least it is moving in the right direction.

Lessons

60. Experience with this project confirms a number of OED lessons:

- There is a need to pay continuous attention to implementation performance in disaster-related operations to ensure that such operations are practical and do not sideline needed sector reforms. Issues that particularly require attention are ensuring that the Borrower has the institutional capacity to manage and monitor social mobilization and resettlement and is conversant with the Bank's procurement procedures and guidelines (in this operation, the Borrower's attention to social mobilization and resettlement languished once donor financing ceased).

- Technical and social/organizational assistance essential for the introduction of new innovations or ways of doing business must be fully funded for the duration of a project. Failure to do so may cause serious implementation delays. This project also highlighted the importance of harmonization of policies among donors for subsectors in which they share common concerns and investment. If development partners are unwilling to commit to the duration of the project, then alternative ways of financing technical assistance should be explored.

- Coastal defenses should be renovated to higher engineering standards in homogenous units. This not only has greater sustainability than isolated repairs of existing infrastructure but it also provides a model that can be monitored to test the success of the innovation – an important design consideration.

Annex A: Basic Data Sheet

BANGLADESH COASTAL EMBANKMENT REHABILITATION PROJECT (CREDIT 2783-BD)

Key Project Data *(amounts in US$ million)*

	Appraisal estimate	*Revised estimate*	*Actual or current estimate*	*Actual as % of appraisal estimate*
Total project costs	87.8	97.6	97.6	111%
Loan amount	47.95	--	43.82	96%
Cofinancing	16.87	--	15.77	79%
Cancellation	--	--	2.59	--

Cumulative Estimated and Actual Disbursements

	FY96	*FY97*	*FY98*	*FY99*	*FY00*	*FY01*	*FY02*	*FY03*	*FY04*
Appraisal estimate (US$M)	9.0	28.3	45.0	49.4	51.1	52.1	52.8	53.0	53.0
Actual (US$M)	0.0	8.4	24.8	42.7	52.7	57.6	60.0	60.0	60.0
Actual as % of appraisal	--	29%	55%	86%	103%	110%	113%	113%	113%

Date of final disbursement: 5/12/2003

Project Dates

	Original	*Actual*
PCD	--	07/13/1989
Appraisal	--	10/16/1995
Board approval	--	11/09/1995
Signing	--	11/21/1995
Effectiveness	06/18/1996	06/18/1996
Closing date	12/31/2002	12/31/2002

Staff Inputs (staff weeks)

	Actual.latest estimates	
	No. of staffweeks	***US$('000)***
Supervision	145	508
ICR	12.6	63
Total	157.6	571

SWs and amount shown against Appraisal/Negotiation includes amount for Identification/Preparation. Supervision amounts are as of June 2003 and ICR amount is the budget amount for FAO/CP.

Mission Data

Project cycle	Month/year	No. of persons and speciality Count	SPECIALTY	Performance Rating Implem. Progress	Dev. Objective
Supervision					
	06/30/1996 - Update/PSR#2			S	S
	01/15/1997 -PSR #3	*5*	SR. OPERATIONS OFFICER (1); DISBURSEMENT OFFICER (1); IRRIGATION ENGINEER (1); RESETTLEMENT SPECIALIST (1); AGRICULTURIST (1)	S	S
	05/11/1997 -PSR#4	*4*	DISBURSEMENT OFFICER (1); PROCUREMENT SPECIALIST (1); IRRIGATION ENGINEER (1); RESETTLEMENT SPECIALIST (1)	S	S
	02/15/1998 -PSR#05	*8*	IRRIGATION ENGINEER (2); PRINCIPAL AGRICULTURIST (1); RESETTLEMENT SPECIALIST (1); DISBURSEMENT OFFICER (1); FINANCIAL MGMT. SPEC. (1); PRINCIPAL TEAM ASSISTANT (1); TEAM ASSISTANT (1)	S	S
	10/08/1998 Update/PSR#06			S	S
	02/15/1998 -PSR#07	*10*	AGRICULTURIST (2); IRRIGATION ENGINEER (1); RESETTLEMENT (1); PROCUREMENT (1); FINANCIAL MGT. (1); DISBURSEMENT (1); ECONOMIST (1), Operations Officer (1), Team Assistant (1)	S	S
	02/16/1999 -PSR#08 (MTR)	*10*	AGRICULTURIST (2); IRRIGATION ENGINEER (1); RESETTLEMENT (1); PROCUREMENT (1); FINANCIAL MGT. (1); DISBURSEMENT (1); ECONOMIST (1), Operations Officer (1), Team Assistant (1)	S	S
	01/04/2000 Update/PSR#9			S	S
	04/22/2000 -PSR#10	*6*	TASK TEAM LEADER/ECON. (1); ENGINEER (1); OPERATIONS OFFICER (1); PROCUREMENT SPEC. (1); FINANCIAL MGMT. SPEC. (1); DISBURSEMENT SPEC. (1)	S	S
	10/29/2000 -PSR#11	*6*	ECONOMIST (1); IRRIGATION ENGINEER (1); NR ECONOMIST (1); PROCUREMENT SPECIALIST (1); SOCIOLOGIST (1); FIN. MGT. SPECIALIST (1)	S	S

Project cycle	Month/year	No. of persons and specialty Count	SPECIALTY	Performance Rating Implem. Progress	Dev. Objective
	12/10/2001 Update/PSR#12			S	S
	06/17/2001 -PSR#13	7	AGRICULTURIST (1); IRRIGATION ENGINEER (1); RESETTLEMENT (1); PROCUREMENT (1); FINANCIAL MGT. (1); DISBURSEMENT (1); ENGINEER (1)	U	S
	11/27/2001 Update/PSR#14 &15			S	S
	02/17/2002 PSR#16	9	ECONOMIST (2); IRRIGATION ENGINEER (1); RESETTLEMENT (1); PROCUREMENT (1); FMS (1); DISBURSEMENT (1); EU/ (1); EU/ENGINEER (1)	S	S
	09/15/2002 PSR#17	8	Agriculturist (1), ECONOMIST (1); IRRIGATION ENGINEER (1); RESETTLEMENT (1); PROCUREMENT (1); FMS (1); DISBURSEMENT (1); EU/ENGINEER (1)	S	S
ICR					

Initial Summary (PSR#1) was prepared as of 05/15/1996.

Other Project Data

Borrower/Executing Agency:

FOLLOW-ON OPERATIONS

Operation	Credit no.	Amount (US$ million)	Board date
None	proposed project was cancelled	-	-

Annex B: Project Performance Indicators

Table B1: Project Costs – Planned and Actual (Million)

	Appraisal Estimate			*Actual/Latest Estimate*			*Percentage of Appraisal*		
	IDA	*Govt.*	*CoF.*	*IDA*	*Govt.*	*CoF.*	*IDA*	*Govt.*	*CoF.*
Civil Works (excluding FFW)	45.00	5.00	0.00	50.20	7.80		111.6	156.0	0.0
Earth works – FFW		3.60			3.60			100.0	
Improved O&M	3.90	2.10		3.70	2.00		94.9	95.2	
Afforestation			5.80			4.20			72.4
Private Foreshore Leasing			2.10			1.70			81.0
Surveys and Studies	0.40	0.10		0.50			125.0	0.0	
Land Acquisition		3.50			3.50			100.0	
Resettlement			0.40			0.40			100.0
BWDB Engineering and Administration	3.20			2.50			78.1		
Technical Assistance/ Project Support			10.30	1.30		10.00			97.1
Technical Assistance/ Training			1.10			0.80			72.7
Technical Assistance/ Preparation of CERP II				4.10					
Vehicles and Equipment - procurement and operating cost	0.50	0.80		0.60	0.70		120.0	87.5	
Total Financing	53.00	15.10	19.70	62.90	17.60	17.10	118.7	116.6	86.8

Table B2. Actual and Projected ERRs and Effects of Changes in Yields, Cropping Intensity and Crop Mix

Polder	Cost/a	Relative Cost	Weighted Yield (by Crop Area)			Cropping Intensity			Crop Pattern /b		EIRR (%)	
	(Tk '000)	(%)	W/O	ICR	SAR	W/O	ICR	SAR	SAR (%)	ICR (%)	SAR	ICR
Sharankhola	207487	0.07	0.81	2.10	1.70	1.08	1.42	1.39	27.8	67.8	28.1	21.2
Pathargata	122549	0.04	1.38	2.14	2.13	1.2	1.21	1.41	22	91.4	18.7	9.6
Kuakata	140062	0.05	1.32	2.75	2.13	1.22	1.66	1.36	35.5	107.6	7.9	44.3
Ramgati	321124	0.11	1.48	1.82	1.83	1.53	2.07	1.71	19.2	55.7	6.9	12.4
Sudharam	366383	0.13	1.83	2.75	2.30	1.43	1.48	1.58	-7.9	10.3	28.1	33
Companigonj	456967	0.16	1.46	2.73	2.05	1.36	1.60	1.47	14.5	39.7	17.8	32.6
Kursuhkul	142039	0.05	2.90	3.52	3.54	1.43	1.68	2.11	40.8	58.7	21.2	8.8
Teknaf	313485	0.11	2.77	3.34	3.32	1.53	1.45	2.28	27.7	40.2	21.3	11.8
Matharbari	208720	0.07	3.70	4.39	4.26	1.62	1.93	1.81	5.2	27.3	6.6	17.3
Sandwip	404301	0.14	1.63	2.52	2.20	1.69	1.92	1.88	80.1	69.3	24.5	12.9
Hatiya	167207	0.06	1.28	3.48	1.88	1.3	2.05	1.47	15.8	34.2	17.8	179
Total	285032 3	1	1.85	2.80	2.43	1.44	1.69	1.70	49.30	49.30	19.2	28.6
Relative to W/O		-	1	1.52	1.31	1.00	1.18	1.18	-	-	-	-

Notes:
a/ Project Cost (Investment and O&M), 1996-2002.
b/ Percentage of Income Change from W/O explained by crop mix and crop area changes

Table B3: Physical achievements of the CERP project

Outcome / Impact Indicators:	Projected in SAR	Actual/Latest Estimate
Rehabilitation and improvement works		
Major civil works		
Construction of new (retired) embankments (km)	73	69
Rehabilitation/re-sectioning of existing embankments (km)	78	61
Construction of new regulators and drainage sluices	23	40
New or repaired protection works	7	13
Minor civil works		
Rehabilitation of drainage network (km)	381	115
Rehabilitation/re-sectioning of existing embankments (km)	127	22
Repaired or replaced structures	143	Not available
Afforestation		
Embankment slopes (ha)	1,900	665
Embankment slopes (km)	570	211
Foreshore plantation (ha)	4,900	898
Improved O&M		
Routine/periodic maintenance (number of polders)	21	21
Communities organized for O&M	1,977	658
Embankments maintained (km)	575	887
Coverage of Plans for O&M (number of polders)	21	21

Table B4: Status of Afforestation in CERP - II

	Embankment Afforestation			Foreshore Afforestation		
	Planned	Actual	% Target	Planned	Actual	% Target
Sharakhola	48	16	33	95	23	24
Patherghatha	41	12	30	55	10	18
Kuakata	47	31	67	129	1	1
Ramghati	49	31	64	77	7	9
Sudharam	93	45	49	114	0	0
Companiganj	68	42	62	96	0	0
Sonagazi	30	0	0	160	0	0
Sitakundu	80	13	16	54	25	46
Patenga	68	3	4	240	67	20
Anowara	82	49	59	174	35	20
Baskhali	213	58	27	285	69	24
Chanua	113	45	39	160	56	35
Chakoria	173	54	31	218	70	32
Kuruskhali	47	15	31	94	40	43
Cox's Bazaar	65	12	18	195	76	39
Teknaf	66	19	29	367	39	11
Moheskhali	58	46	79	180	94	52
Matherbari	54	19	34	101	62	61
Kutobdia	132	23	17	597	134	22
Sandwip	263	120	46	1,200	85	7
Hatiya	115	16	14	46	5	11
Total	***1,902***	***665***	***0***	***4,637***	***898***	***0***

Table B5: Bangladesh – Projects Covering Coastal Areas

BDT in Million

Sl	Name of agency and project	Project period	Location (District)	Total cost (project aid)	Sources of project aid
Bangladesh Water Development Board (BWDB)					
01	***Integrated Planning for Sustainable Water Management (IPSWAM) project***	1999-2004	Patuakhali, Khulna	870.60 (870.60)	Netherlands (GoN)
02	***Char Development and Settlement Project-II***	1999-2004	Chittagong, Feni, Noakhali	1367.60 (1033.70)	Netherlands
03	***Estuary Development Program***	2002-2007	Coastal Area - Lower Meghna	553.00 (484.50)	Netherlands
Local Government Engineering Department (LGED)					
04	***Construction of Multi-purpose Cyclone Shelter Centres with Japanese Assistance (Phase-II)***	1998-2004	Coastal districts	1267.10 (993.00)	JICA
05	***Rural Development Project in Greater Noakhali & Chittagong Districts***	2001-2005	Feni, Lakshmipur, Noakhali, Chittagong, Cox's Bazaar	1984.2 (544.0)	IDB
06	***Cyclone Rehabilitation Project: Entire Coastal Areas (Phase-II)***	2002-2006	Coastal districts	1800.00 (1350.00)	OPEC
Department of Fisheries (DoF)					
07	***Fisheries extension project in Patuakhali & Barguna Districts***	1994-2004	Patuakhali, Barguna	318.05 (308.69)	DANIDA,
08	***Greater Noakhali Aquaculture Extension Project***	1994-2005	Noakhali, Feni, Lakshmipur	358.1 (341.1)	DANIDA,
09	***Fourth Fisheries Project***	1999-2006	All over BD	3003.5 (2395.90)	DfID, GEF, IDA,
Department of Agriculture Extension (DAE)					
10	***Barisal, Patuakhali, Jhalokati and Barguna Small Holder Support Project***	1999-2005	Barisal, Patuakhali, Jhalokati, Barguna	754.6 (489.2)	IDB
Department of Public Health Engineering (DPHE)					
11	***Water Supply, Sanitation, Drainage and Waste Disposal Project in Municipality, Thana and Growth Centre***	1996-2007	Noakhali, Feni, Lakshmipur, Patuakhali, Barguna	2529.70 (2106.80)	DANIDA
12	***Water Supply Project in Coastal Area***	1998-2003	All coastal districts	615.29 (528.51)	IDB
13	***Rural Water Supply and Sanitation Project in Coastal Area***	1999-2005	Coastal Districts	1265.90 (821.69)	DANIDA
14	***Arsenic Mitigation Project***	2001-2004	Chittagong, Barisal	669.4 (433.1)	DANIDA
CARE Bangladesh					
15	***Disaster Management Project***	1999-ongoing	Partly in CZ (Barisal, Chittagong)	13.40	USAID, GoB
16	***Reducing Vulnerability to Climate Change (RVCC) Project***	2002-2005	Bagerhat,Gopalganj, Jessore, Khulna, Narail and Satkhira	7.59	CIDA

Source: BWDB, November 2004.

Table B6: Status of Seven Polders – Open to Tidal Flooding

Sl. No.	*Polder No.*	*Location of opening in the embankment*	*Reasons for opening*	*Impact*	*Measures by BWDB*
1	35/1, Sharankhola	Km. 3.50 to km. 4.25= .75 km; Khullia Union, Morelgonj, Bagerhat	Opening is located near junction point of the Balleswar % the Kacha river. Due to inadequate set back distance, the river erosion has engulfed the embankment.	Gross area 14,692 ha. Agricultural land partially affected in 6,900 ha. (46.96%) and thousands of cattle affected by tidal flooding.	A plan is underway to retire the embankment
2	59/2, Ramgoti	At Bahaddarhat area Km. 138.50 to km. 142.00=3.50 km and at Motirhat area Km 166.815 to Km.167.400 = 0.585 Total 4.085 Km, Ramgoti, Laxmipur	Due to severe erosion of the Meghna river the embankment has been engulfed.	Gross area 25,583 ha. Agricultural land partially affected in 5,000 ha. (19.54%) and thousands of cattle affected by tidal flooding.	Protective Works has been though of to arrest erosion of by river Meghna. Funds are being explored from GoB.
3	61.1, Sitakuda	Km. 1.300 to km. 1.805 = 0.505 km; Banshbaria Union, Sitakunda, Chittagong.	Embankment is open in a location with narrow foreshore due to direct hit of sea wave.	Gross area 10,170 ha. Agricultural land affected in 1,400 ha. (13.77%) and drainage structure damaged resulting drainage congestions.	Protection works have been taken up through GOB funding.
4	68, Teknaf	Km. 16.550 to km. 16.850 = 0.300 km; Shahporir Dwip, Teknaf At Km. 143.410 and km.15.610,25m and 40m respectively open Shahporirdwip, Teknaf	Embankment is open in a location with narrow foreshore due to direct hit of sea wave. To improve drainage system the local people have cut the embankment.	Gross area 4,366 ha. (a) Agricultural land partially affected in 2,550 ha (58.4%) due to tidal flooding. (b) Drainage congestions have damaged agricultural crops in lands of 850 ha. (19.47%).	Temporary protective works have been taken up. A plan is underway to provide hard protection works. Construction of 2 Nos. sluices programmed.
5	70, Matherbari	12m-embankment open at km. 1.40 km. Matherbari Cox's Bazaar.	Local shrimp cultivators have opposed to complete the embankment; as a result 12 m gap exists.	Gross area 3,000 ha. Agricultural land affected in 1,000 ha. (33.33%) This embankment section will remain extremely vulnerable to storm surges.	BWDB is having dialogue with the community members to close the gap.
6	72, Sandwip	Km. 6.00 km. 6.400 = 0.40 at Maightbanga, Sandwip, Chittagong.	The embankment has been eroded due to severe erosion of the Meghna river. Subsequently, the local people cut the embankment near the Maightbanga sluice for drainage, affecting the existing sluice.	Gross area 17,682 ha. Agricultural land partially affected in 3000 ha. (16.97%) standing agricultural crops, livestock population affected by tidal flooding.	BWDB has prepared a project to rehabilitate 72 polders, which includes this polder. The Government is reviewing the proposal.
7	73/1A&1B Hatiya	Km. 17.035 to .16.500; km. 21.960 to 18.960; km. 45.90 to 45.60 = Km.3.835 Hatiya, Noakhali.	The embankment has been eroded due to severe erosion of the Meghna river.	Gross area 17,333 ha. Agricultural land affected 2,000 ha. (12%)	BWDB has prepared a project to rehabilitate 72 polders, which includes this polder. The Government is reviewing the proposal.

Source: Data as of August 2002, provided by PIU, CERP, BWDB.