Evaluation Study

Sector Synthesis
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Irrigation and Drainage

Independent Evaluation Department

Asian Development Bank

ABBREVIATIONS

ADB	–	Asian Development Bank
ADF		Asian Development Fund
BME	–	benefit monitoring and evaluation
DMC	–	developing member country
EA	–	executing agency
EIRR	–	economic internal rate of return
FMIS	–	farmer-managed irrigation scheme
IA	–	implementing agency
IDS	–	irrigation and drainage sector
IRD	–	irrigation and rural development
ISF	–	irrigation service fee
MOA	–	memorandum of agreement
O&M	–	operation and maintenance
OCR	–	ordinary capital resources
PCR	–	project completion report
PPAR	–	project performance audit report
PPER	–	project performance evaluation report
TA	–	technical assistance
WUA	–	water users association

NOTES

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

Key Words

adb, asian development bank, beneficiary participation, agriculture productivity, institutional development, irrigation and drainage, irrigation service fee, operation and maintenance, evaluation

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The guidelines formally adopted by the Independent Evaluation Department on avoiding conflict of interest in its independent evaluations were observed in the preparation of this report. Mr. Wilfrido Montes was the consultant. To the knowledge of the management of the Independent Evaluation Department, there were no conflicts of interest of the persons preparing, reviewing, or approving this report.

EXECUTIVE SUMMARY

The purpose of a sector synthesis report is to consolidate and present key evaluation findings and lessons in a particular sector supported by the Asian Development Bank (ADB) across its developing member countries (DMCs) to inform future project preparation and implementation. This sector synthesis report presents (i) evaluation findings in the irrigation and drainage sector (IDS); (ii) identifies the key factors affecting project performance; and (iii) highlights the major issues and lessons that are useful to the operation of ongoing and formulation of future projects/programs in the sector. This is the second such report in the IDS, therefore it builds on the findings of the May 1995 sector synthesis report, which had covered evaluation findings up to 1994.

Since ADB started its operations in the IDS in 1969, it has extended a total of 139 loans amounting to $5.25 billion to finance 120 projects[1] as of 30 June 2009. Of the 139 loans in the IDS, 120 have been completed (and loan accounts closed), while 92 project completion reports (PCRs) and 46 project/program performance evaluation reports (PPERs) had been prepared as of 30 June 2009.

Based on the latest performance ratings, the completed projects exhibited improving performance shown by the increasing project success rate. While projects approved in the 1960s posted 33.3% success, those approved in the 1990s recorded a considerably higher level success rate (61.5%). Of the completed projects, 18 that were evaluated from 1995 to mid-June 2009 are covered in this synthesis. They were approved from 1977 to 1993, two thirds of them in the 1980s.

Key Findings. The objectives of the 18 evaluated IDS projects (the projects) were to support the Millennium Development Goals of reducing poverty and reducing the loss of environmental resources. The major objectives of the projects were to increase agricultural production, and improve the economic and social conditions of the rural population. Increased farm incomes, improved living conditions, and additional employment opportunities were to be achieved through the provision and/or improvement of irrigation and drainage facilities, which would increase crop yields, allow higher cropping intensities and crop diversification, and expand productive areas.

Most of the projects (88.9%) were designed with an irrigation component, half had a drainage component, while 38.9% had a combination of irrigation and drainage components. Two of the projects were to develop groundwater supply, 15 were to rehabilitate surface water development, and 1 was to rehabilitate an irrigation system damaged by floods. Project preparatory technical assistance (PPTA) preceded all except two of the evaluated projects, with project designs based on feasibility studies funded by the PPTAs. Changes in project design were found common in the evaluated projects. Six projects underwent reformulation primarily to enable them to adapt to site, environmental, and local conditions that were not foreseen or considered in the original design.

The IDS evaluated projects were reported to have improved or rehabilitated agricultural production areas ranging from 2,300 hectares (ha) to 292,000 ha and the Flood Rehabilitation Project (Loan 882- BAN[SF]) was projected to protect up to 500,000 ha against annual floods.

[1] As per the 2009 sector classification, the IDS falls under the irrigation, drainage and flood protection subsector of the agriculture and natural resources sector. Stand alone flood protection projects were excluded from the scope of this synthesis.

Seven of the projects had larger areas of coverage than the appraisal estimates, and 10 were completed with smaller areas. The higher-than-expected area covered by some of the projects could be attributed to a number of factors, including (i) savings, realized from the devaluation of the local currency, which were allocated for areas not previously included in the project scope; (ii) areas added by the government after the start of project implementation; and (iii) reformulation of the project wherein uneconomical or environmentally risky subcomponents were cancelled, and the intended funds reallocated to cover more areas with lower costing subcomponents. The lower-than-expected area for some projects may be attributed, among others, to: (i) large volume of unanticipated saline groundwater in a fresh groundwater project, affecting the number of tubewells that could be constructed; (ii) too complicated project design for a given terrain and locality; and (iii) reduction in scope due to government budgetary constraints, preventing timely counterpart funds.

The actual costs of almost three fourths of the evaluated projects were lower than the appraisal estimates, with cost underrun of 5.3% to 73.7%. The lower costs were due to (i) reduction in project scope, (ii) devaluation of the local currency against the United States dollar, and (iii) cancellation or replacement of components with those with lower cost. For 5 of the 18 projects, actual costs were higher than the appraisal estimates. The cost overrun of 35.3% to 161.6%, was a result of, among others, (i) the occurrence of another devastating flood a year after the 1987 flood, the effects of which were to be addressed by the project; (ii) delays in project implementation, which were a result of civil disturbances; and (iii) large increases in the cost of civil works, consulting services, land acquisition, and administration.

The time overrun of the evaluated projects, ranging from 22.2% to 153.8%, was caused by, among others, (i) delays in appointing project staff, fielding consultants, awarding civil works contracts, and preparing surveys and detailed designs; (ii) reformulation processes; (iii) unsatisfactory performance of contractors; (iv) acquisition of land or rights-of-way; and (v) lack of counterpart funds.

An increase in crop production is normally achieved when irrigation or drainage systems are rehabilitated or upgraded, and all the evaluated projects in the IDS except the Flood Rehabilitation Project exhibited increases in yield, cropping intensity, and agricultural land area. The evaluated IDS projects had varying degrees of effectiveness in organization and management. Institutional development activities in IDS projects have become a regular subcomponent and have been included in the project objectives in almost all the approved loans in the sector since 1995. However, the earlier evaluated projects did not have institutional development objectives.

The economic internal rates of return (EIRRs) of evaluated projects were generally lower than the appraisal estimates except for one that almost equaled the appraisal estimate. The common factors for the lower than expected EIRRs were the (i) deterioration in the international price of rice at the time of the evaluation, (ii) considerable increase in the use of fertilizers, and (iii) reduction in incremental irrigation area and lower incremental rice yields per hectare than projected at appraisal.

The evaluated projects had positive socioeconomic impacts in terms of increased farm incomes and improved access to markets and social services. In projects that showed increased agricultural production, an investigation of the incremental use of agrochemicals found that they were not adding to the levels of pollution. Drainage projects have positive effects on the environment because, aside from improving the soil environment for plant growth, they also help improve health conditions by removing stagnant water in depressions.

Half of the evaluated projects in the IDS were rated *partly successful*, 44.4% *successful*, and 5.6% *unsuccessful*. The level of success was related to how active beneficiary participation was included in planning, implementing, and operating the project.

Among the projects evaluated, only six had high levels of sustainability. Five projects may be sustainable depending on the availability of future funds for items such as operation and maintenance (O&M), formation of water users associations (WUAs), and erosion control. Seven were found to have low sustainability or to have components that were not sustained. Sustainability of the evaluated projects has generally depended on timely availability of funds for adequate maintenance.

Key Issues. Key issues that continue to be relevant to ongoing and future ADB operations in the IDS relate to the design of IDS projects, agricultural support services, strengthening of institutional capacities, improving O&M through participatory management, developing and managing water resources, benefit monitoring and evaluation, and irrigation service fees. The success or failure of a project largely depends on the soundness of a project's design, degree of the stakeholders' ownership of a project, and the sustainability of O&M of a project's facilities.

Key Lessons. Lessons drawn from the 18 evaluated projects were basically related to either project preparation or project implementation, monitoring and supervision. With regard to project preparation, experience showed the need for, among others, the following:

(i) thorough diligence in selecting a project, preparing a conceptual framework, and implementing design;
(ii) a holistic approach to upgrading and developing irrigation and drainage schemes;
(iii) participatory approaches to prevent or, at least, minimize system deterioration. Mechanisms for beneficiary participation in designing IDS projects should be carefully planned;
(iv) the formation/strengthening of WUAs to be specified in and funded by the project. High-level support will likely be required for about 2 years, with some support thereafter;
(v) a gradual and progressive process in project formulation that focuses on institutional upgrading and participation by all stakeholders; and
(vi) the inclusion of on-farm irrigation distribution systems and development of water management at the farm level in any irrigation project. Although these may represent a small incremental investment cost, they are necessary to ensure the benefits of broader irrigation development.

Implementation and operations-related lessons included the following:

(i) Project supervision from an ADB resident mission rather than from headquarters is often more effective, particularly when it results in a better understanding of local problems and more judicious and timely reallocation of loan proceeds.
(ii) Continuous O&M is a necessary precondition to keep river and drainage channels open. Adequate provision for O&M must be built into national budgets, if not funded from other sources.

(iii) ADB and the executing agency (EA) need to have a more proactive role in complex public sector projects by paying close attention and giving advice on the policy and institutional development process in the EA.

The IDS undergoes constant development to adjust to the changing needs of agricultural communities and it learns from experience. The approach of projects in the sector has gradually changed from top-down planning to beneficiary participation in planning. Increasing the participation of beneficiaries in the projects enhances the relevance of these endeavors and adds to the cost-effectiveness of the interventions being introduced by IDS projects. Furthermore, their participation helps ensure the continued O&M of the projects and thus better chances of attaining full cost recovery and sustainability. The history of ADB's activities in IDS shows a continuously improving process that augurs well for more involvement in this sector and greater confidence for success in achieving rural development goals.

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I. INTRODUCTION

1. This sector synthesis report presents (i) evaluation findings in the irrigation and drainage sector (IDS); (ii) identifies the key factors affecting project performance; and (iii) highlights the major issues and lessons that are relevant and significant to the operation of ongoing and formulation of future projects/programs in the sector. This is the second such report in the IDS, therefore it builds on the findings of the May 1995 sector synthesis report, which had covered evaluation findings up to 1994. The synthesis report is based on a review of the findings in evaluation reports of irrigation and drainage projects prepared by the Independent Evaluation Department (IED), primarily project performance audit/evaluation reports (PPAR/PPER) and reevaluation studies circulated from 1995. It also takes into account information and data stored in the evaluation information system.

II. ADB OPERATIONS IN THE IRRIGATION AND DRAINAGE SECTOR

A. ADB Strategy

2. The IDS continues to be an important sector in ADB's operations since the agriculture sector still accounts for a major share of the economy of ADB's developing member countries (DMCs). In 2008, the share of agriculture to total value added in the DMCs ranged from a low of 5.4% in Kazakhstan to a high of 35.6% in Papua New Guinea.[1] The sector is seen as one of the means for reducing poverty, which remains largely a rural phenomenon in Asia and the Pacific. Therefore, agriculture was envisioned to be given higher priority since interventions in the sector are more naturally targeted to benefit the poor. ADB's investments in agriculture reached a high of 35.9% of total lending in 1982, with 27.1% of the aggregate loans in the 1980s channeled to the sector. However, there has been a downtrend, with the share averaging 12.1% in the 1990s and 7.7% in the 2000s (until August 2009).

3. ADB's support for the IDS is shown in Water for All,[2] its water policy approved in 2001. Water for All highlights the need to "move rapidly from an era of disaggregated water sector investments aimed primarily at creating assets to an era of holistic, integrated investments to promote efficient water use." Water is a dwindling natural resource and competition for available water resources is increasing (with the need to provide drinking water and sanitation as the first priority). Thus, food production to meet the needs in 2025 will have to be accompanied by a dramatic increase in the overall efficiency of irrigation water use. It is assumed that regional food production needs in 2025 will be met by (i) expanding irrigated areas to 230 million hectares (ha), and (ii) increasing productivity.

4. The IDS is also seen as a priority in the 2008−2020 Long-Term Strategic Framework. In its efforts to maximize results, efficiency, and impact, ADB[3] employs its financial and institutional resources in five core areas: (i) infrastructure, (ii) environment, (iii) regional cooperation and integration, (iv) finance sector development, and (v) education. Infrastructure includes rural infrastructure, which in turn covers irrigation and water management.

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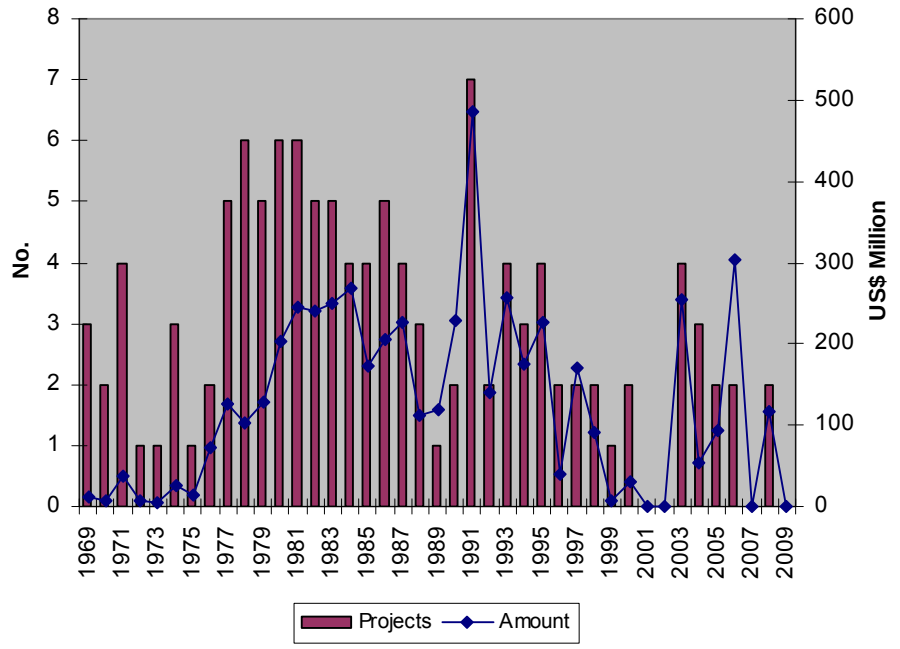
[1] ADB. 2009. *Key Indicators for Asia and the Pacific 2009*. Manila.
[2] ADB. 2001. *Water for All: The Water Policy of ADB*. Manila.
[3] ADB. 2008. *Strategy 2020: The Long-Term Strategic Framework of the Asian Development Bank (2008–2020)*. Manila

B. The IDS Portfolio

5. Since ADB started its operations in the IDS in 1969, it has extended a total of 139 loans amounting to $5.25 billion to finance 120 projects[4] as of 30 June 2009 (Appendix 1). In addition, ADB administered nine grants amounting to $154.1 million for five projects.[5] On the average, ADB's aggregate investments in the IDS accounted for 27.8% of the total loans and grants to the agriculture and natural resources (ANR) sector. The amount of loan approvals fluctuated annually (Figure 1), with the 1980s getting 38.9% or the biggest slice of ADB's aggregate investments in the IDS since the 1970s.

Figure 1: ADB Loans and Grants to the Irrigation and Drainage Sector



ADB = Asian Development Bank, No. = number, US$ = United States dollar.

6. The average share of the IDS in the total loan and grant activities for the ANR sector has dwindled from 34.7% in the 1970s to 34.2% in the 1980s, 28.2% in the 1990s, and 18.4% in the 2000s. Group B[6] countries received the most number of projects (40%) and more than half of the dollar investments (50.8%) from 1969 to end-June 2009, with Pakistan alone getting 16.0% and 28.7%, respectively. Investments in the IDS, which are basically long-term in nature, peaked in the 1980s with a total of $2,041 million. The 1990s trailed behind the 1980s with a slightly lower investment level of $1,820 million. IDS projects were mainly funded from the Asian Development Fund ([ADF] 64.2% of the number of loans and grants and 59.1% of the amount).

7. ADB operations in the IDS were generally directed toward developing surface water and groundwater for agricultural productivity. The operations were aimed largely at assisting DMCs

[4] As per the 2009 sector classification, IDS falls under the irrigation, drainage and flood protection subsector of the agriculture and natural resources sector. Stand alone flood protection projects were excluded from the scope of this synthesis.

[5] Grants to the IDS started in 2003.

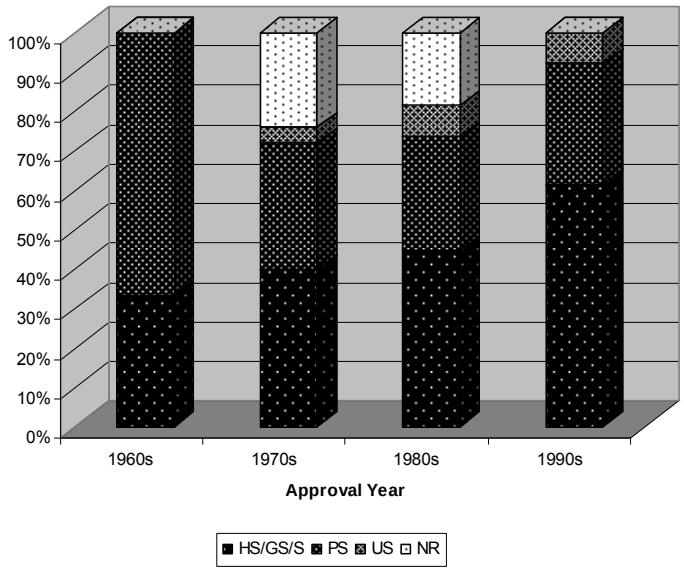
[6] Group B countries include Armenia, Azerbaijan, Bangladesh, Georgia, India,3 Marshall Islands, Federated States of Micronesia, Pakistan, Palau,3 Papua New Guinea, Sri Lanka, Uzbekistan, Viet Nam

increase food production (mainly rice), farm income, and employment opportunities by providing necessary capital investments. The operations included mostly rehabilitation or upgrading of existing irrigation and drainage facilities, while some projects included developing new water sources or drainage systems and repairing infrastructure that had been damaged by natural events.

C. Evaluation of IDS Operations

8. Of the 139 loans in the IDS, 120 have been completed (and loan accounts closed), while 92 project completion reports (PCRs) and 46 PPER had been prepared as of 30 June 2009. A closer look at the 92 completed projects showed a generally improving performance throughout the years. Based on the latest performance rating[7] of the completed projects, those approved in the 1960s had a success rate of 33.3%. This record improved, with the 1970 approvals registering 40.0% success, followed by 44.7% in the 1980s and 61.5% in the 1990s (Figure 2). The better success rates exhibited by the relatively more recent projects may be attributed to the experience gained and lessons from earlier projects, which could have helped enhance the quality at entry and project implementation.

Figure 2: Latest Performance Rating of IDS Projects



GS = generally successful, HS = highly successful, IDS = irrigation and drainage sector, NR = not rated, PS = partly successful, S = successful, US = unsuccessful.

9. Of the 92 completed projects, 18, which were evaluated from 1995 to mid-June 2009, are the subject of this synthesis (Appendix 2). They were approved from 1977 to 1993, with two thirds of them in the 1980s. Total ADB investments in the 18 amounted to $927.5 million (Table 1), 11.0% and 2.7% of ADB's aggregate lending to the ANR sector and to all sectors, respectively. Group B countries received 66.7% and 55.5% of the total number of projects and amount, respectively. Bangladesh accounted for the most number (27.8%) of the evaluated projects.

[7] A project's rating was based either on its PPER, PCR validation report, or PCR, whichever is the latest available. A total of 13 projects were not rated.

Table 1: Loan Projects in the Irrigation and Drainage Sector
by Country Group[a]

Country Group/Country	No. of Projects	Amount ($M)	% Share	
			Projects	Amount
Group A	**2**	**50.4**	**11.1**	**5.4**
Nepal	2	50.4	11.1	5.4
Group B	**12**	**514.9**	**66.7**	**55.5**
Bangladesh	5	212.3	27.8	22.9
Pakistan	4	154.5	22.2	16.7
Sri Lanka	2	71.6	11.1	7.7
Viet Nam	1	76.5	5.6	8.2
Group C	**4**	**362.2**	**22.2**	**39.0**
Indonesia	4	362.2	22.2	39.0
Total	**18**	**927.5**	**100.0**	**100.0**

IED = Independent Evaluation Department, M = million, No. = number, PPER = project performance evaluation report.
[a] For loan projects with PPERs circulated from 1995 to 30 June 2009.
Source of Basic Data: IED's Evaluation Database.

10. The objectives of the evaluated IDS projects were consistent with the Millennium Development Goals of reducing poverty and reducing the loss of environmental resources. The major objectives were to increase agricultural production, and improve the economic and social conditions of the rural population. Increased farm incomes, improved living conditions, and additional employment opportunities were to be achieved by providing and/or improving irrigation and drainage facilities, which would result in increased crop yields, allow higher cropping intensities and crop diversification, and expand productive areas. All the projects had a combination of any or all of the following─irrigation, drainage, flood protection, and other components (Supplementary Appendix A). Almost 90% of the 18 projects had an irrigation component, while half had drainage.

III. EVALUATION FINDINGS ON PROJECT IMPLEMENTATION AND PERFORMANCE

11. This chapter reviews the implementation experience and performance results of evaluated projects in the IDS. In particular, it discusses the impacts of changes on project design and scope, institutional capabilities of implementing agencies (IAs), broader physical achievements including factors affecting performance, project cost, implementation period, socioeconomic and environmental impacts, gender effects, and the overall sustainability and performance classification of the evaluated projects.

A. Implementation Experience

1. Project Design

12. The evaluated projects were designed according to suitable water sources and appropriate interventions in the project areas. Most of the projects (88.9%) were designed with an irrigation component, 50% had a drainage component, while 38.9% had a combination of irrigation and drainage components Of the 18 projects, 2 were for developing groundwater supply; 15 for rehabilitating surface water development, and 1 for rehabilitating an irrigation system damaged by floods. Three projects were designed to address drainage concerns for agricultural production. Supplementary Appendix B summarizes information on the project designs and reformulation experience of the evaluated projects.

13. Project preparatory technical assistance (PPTA) preceded all the evaluated projects (except the Flood Rehabilitation Project[8] in Bangladesh and the Irrigation and Flood Protection Rehabilitation Project[9] in Viet Nam), with project designs based on feasibility studies funded by the PPTAs. The Bangladesh project was implemented to restore the affected portions of an irrigation system to preflood conditions, and, as such, the project design process did not undergo the stepwise study and investigation that project preparation would normally entail. Subprojects for the project were selected on the basis of a set of criteria provided in the loan agreement. The design of the Viet Nam project was based on French consultants' studies of the irrigation schemes, followed by local engineers' feasibility studies. The evaluation report for the Viet Nam Project stated that "…Project objectives were not well defined, partly reflecting lack of detailed project preparation." The Project was prepared without a PPTA on the assumption that the executing agency was ready to undertake the Project. Also, "…the lack of a PPTA reflected the Ministry of Agriculture and Rural Development's belief in the urgency of rehabilitation combined with ADB's wish to be the first multilateral agency to commence a project in Viet Nam following the resumption of lending."

14. Changes in project design were common in the evaluated projects. Six projects underwent reformulation, primarily to adapt them to site, environment, and local conditions that were not foreseen or considered in the original design. The East Rapti Irrigation Project[10] (Nepal) was reformulated to make the Project more cost-effective and to prevent possible adverse environmental effects by replacing the weir and canal system with a program of rehabilitation and support for existing farmer-managed irrigation schemes (FMIS). The South Rohri Fresh Groundwater Irrigation Project's[11] (Pakistan) reformulation involved a reduction in area due to a larger saline groundwater presence than was considered at appraisal. The Second Hill Irrigation Project[12] (Nepal) was reformulated to remove bottlenecks that had prevented the Project's smooth progress and to increase the involvement of the farmers. The Kirinda Oya Irrigation and Settlement Project[13] (Sri Lanka) and the Pabna Irrigation and Rural Development Project[14] (Bangladesh) necessitated reformulation mainly due to a significant cost overrun. The Irrigation Package Project[15] (Indonesia) was reformulated to reduce project components because of the shortage of counterpart funds.

15. Some evaluated projects, e.g., the Integrated Irrigation Sector Project[16] (Indonesia), underwent changes in the design of subcomponents due to inadequate data at appraisal. The Chashma Command Area Development Project[17] (Pakistan) involved changes indicating that project design was essentially an ongoing process.

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[8] ADB. 1996. *Project Performance Audit Report: Flood Rehabilitation Project in Bangladesh*. Manila.
[9] ADB. 2005. *Project Performance Audit Report: Irrigation and Flood Protection Rehabilitation Project in Viet Nam.* Manila.
[10] ADB. 2002. *Project Performance Audit Report: East Rapti Irrigation Project in Nepal.* Manila.
[11] ADB. 1995. *Project Performance Audit Report: South Rohri Fresh Groundwater Irrigation Project in Pakistan.* Manila.
[12] ADB. 2000. *Project Performance Audit Report: Second Hill Irrigation Project in Nepal.* Manila.
[13] ADB. 2001. *Project Performance Audit Report: Kirinda Oya Irrigation and Settlement Project in Sri Lanka*. Manila.
[14] ADB. 1996. *Project Performance Audit Report: Pabna Irrigation and Rural Development Project in Bangladesh*. Manila.
[15] ADB. 1996. *Project Performance Audit Report: Irrigation Package Project in Indonesia*. Manila.
[16] ADB. 2001. *Project Performance Audit Report: Integrated Irrigation Sector in Indonesia*. Manila.
[17] ADB. 1998. *Project Performance Audit Report: Chashma Command Area Development Project in Pakistan*. Manila.

2. Physical Achievements

16. The evaluated projects were reported to have improved or rehabilitated agricultural production areas ranging from 2,300 ha to 292,000 ha. Also evaluated was the Flood Rehabilitation Project (Loan 882- BAN[SF]), which was projected to protect up to 500,000 ha from annual floods. Supplementary Appendix C summarizes the physical achievements of the projects.

17. The PCRs and PPERs showed that the projects influenced agricultural productivity over an aggregate area of 1.53 million ha. Areas covered ranged from 100,000 ha to 500,000 ha for 5 projects and from 2,300 ha to 56,000 ha for 13. Seven projects had larger areas than the appraisal estimates, and 10 had smaller areas at completion.

18. The larger-than-expected area covered by some projects compared with appraisal estimates could be attributed to the following: (i) savings, realized from the devaluation of the local currency, allocated for areas not previously included in the project scope such as in agriculture area development operations involving additional lands for clearing and leveling within the project area; (ii) improved conveyance efficiency of canals, thereby increasing the volume of irrigation water distributed and thus covering more area than envisaged; (iii) areas added by the government after the start of project implementation; and (iv) reformulation of the project by cancelling uneconomical or environmentally risky subcomponents such that the intended funds were allocated to cover additional areas with lower costing subcomponents.

19. Some benefited areas were smaller than the appraisal estimate because of the following reasons: (i) the unanticipated large amount of saline groundwater in a fresh groundwater project, which affected the number of tubewells that could be constructed; (ii) project design that was too complicated for a given terrain and locality, with terrain conditions hampering the needed monitoring and supervision, e.g., in the Second Hill Irrigation Project; (iii) design and survey errors at appraisal; (iv) delayed implementation, causing a related project to implement its own measures, thus reducing the need for the intended intervention; (v) reduction in scope because government budgetary constraints prevent provision of timely counterpart funds; and (vi) a trade credit facility that had no takers due to complicated loan requirements compared with existing sources.

3. Project Cost

20. The actual costs of the evaluated projects ranged from $12.9 million to $250.1 million (average, $64.3 million). The unit project cost per hectare varied widely. The lowest project cost of $77 per ha was for the Flood Rehabilitation Project, and the highest, for the Pabna Irrigation and Rural Development Project at $19,383/ha. Although the Pabna Project was much scaled down due to the reformulation in 1982, the cost was still around 37% more than planned, mainly because of long delays and major increases in the cost of civil works, land acquisition, administration, and consulting services. The average total project unit cost per ha was $757. Supplementary Appendix C summarizes the costs of the projects.

21. The actual costs for almost three fourths of the evaluated projects were lower than the appraisal estimates. The cost underrun of 5.3% to 73.7% was due to (i) reduction in project scope, (ii) devaluation of the local currency against the United States dollar, (iii) cancellation or replacement of components with those costing less, (iv) lower consultancy costs and lower contract rates for civil works, and (v) high allowances in contingencies due to projected changes in currency rates and international inflation.

22. The actual costs for five projects were higher than the appraisal estimates, with cost overrun ranging from 35.3% to 161.6%. While the cost overrun for three projects was less than 40%, that for the remaining two was over 140%. Specifically, the Flood Rehabilitation Project exceeded expected total cost by 140.5% following the occurrence of another devastating flood a year after the 1987 flood, the effects of which were to be addressed by the Project. The Walawe Irrigation Improvement Project[18] also significantly overshot appraisal estimates by 161.6% mainly because of delays in project implementation, which in turn were a result of civil disturbances from mid-1987 to early 1990. Other reasons for the cost overrun included large increases in the cost of civil works, consulting services, land acquisition, and administration.

4. Implementation Period

23. The implementation period for the evaluated projects ranged from 4.2 to 17.1 years, and all were completed after the expected dates. The time overrun ranged from 22.2% to 153.8%. Physical completion of more than half of the projects was delayed by more than 3 years, with group B countries responsible for 70% of these projects. Specifically, three of Bangladesh's evaluated projects experienced delays of more than 3 years. Supplementary Appendix C summarizes information on the implementation periods of the projects.

24. The implementation period was affected by the following: (i) delays in appointing project staff, fielding consultants, awarding civil works contracts, and preparing surveys and detailed designs; (ii) reformulation processes; (iii) unsatisfactory performance of contractors; (iv) acquisition of land or rights-of-way; (v) lack of counterpart funds; (vi) changes in design or additions to project scope; (vii) lack of coordination at the national and local government levels; (viii) controversies concerning site selection; (ix) delays in releasing funds; (x) political unrest; (xi) weather conditions; (xii) slow action of ADB in issuing no-objection letters; (xiii) sequencing and coordination of interrelated activities; and (xiv) government compliance with loan conditions.

B. Performance Results

1. Crop Production

25. An increase in crop production is normally achieved when irrigation or drainage systems are rehabilitated or upgraded. All the evaluated projects in the IDS except the Flood Rehabilitation Project exhibited increases in yields, cropping intensity, and agricultural land for areas that were definitely reached by the irrigation or drainage system as it was constructed. Yields were reported to have increased by 5%–40%, and some farms produced up to 6.0 tons of rice per ha from the combination of irrigation and use of high-yielding varieties. Cropping intensities improved by 100%–200%. Six of the evaluated projects had incremental irrigated areas from 14% to 98% of the appraisal estimates, while five were able to irrigate from 2% to 63% more than their appraisal estimates. The combined area targets of the projects were about 92% of the appraisal estimates, excluding the Flood Rehabilitation Project.

2. Organization and Management

26. The evaluated IDS projects had varying degrees of effectiveness in organization and management. Six projects were satisfactory, eight were fairly satisfactory, and four had

[18] ADB. 2000. *Project Performance Audit Report: Walawe Irrigation Improvement Project in Sri Lanka*. Manila.

unsatisfactory project management and organization. Supplementary Appendix D summarizes information on the organization and management performance of the projects.

27. Projects that had unsatisfactory project management and organization had the following characteristics: (i) lack of government guidance; (ii) slow decision making in the hiring of consultants, evaluating contract bids, and awarding contracts; (iii) overcomplicated organizational setup at appraisal; (iv) project office far from sites; (v) high turnover of project staff; (vi) changes in government structures; (vii) lack of authority of the coordinating director; and (viii) ADB's inadequate assessment of the capacity of the government agencies involved in the project.

28. On the other hand, projects that were implemented with satisfactory organization and management had (i) close and continuous coordination among local agencies, communities, ADB, and consultants; (ii) executing agency/ies with prior experience in implementing similar projects; (iii) project directors with appropriate financial responsibility for the timely release of funds in the field without the need to get the approval of the central office; and (iv) project engineers with experience in implementing a wide range of project activities.

29. Managing and organizing some projects were difficult because of factors such as (i) a wide-ranging scope with numerous agencies to coordinate, (ii) delays in engaging field consultants, and (iii) the terrain and location of field offices with respect to project sites.

30. Despite the deficient coordination among the involved agencies, implementation in several projects was satisfactory since the concentration of responsibilities in one agency facilitated implementation. In another project, the physical accomplishments of each agency were implemented as distinct projects, without the intended integrated approach.

31. ADB’s performance in the evaluated projects was mostly adequate except in the South Rohri Fresh Groundwater Irrigation Project, where ADB should have played a more decisive role in facilitating the early appointment of the project coordinator; in establishing the project coordination unit, project units, and steering committee; and in holding regular meetings of the steering committee.

32. Proximity of project supervisory staff to the ADB resident office made access easier and improved their understanding of project difficulties, as in the Ganges-Kobadak Rehabilitation Project.[19]

3. Institutional Development

33. Institutional development activities in IDS projects have become a regular subcomponent and have been included in the project objectives in almost all approved loans in the sector since 1995. However, the earlier evaluated projects did not have institutional development objectives. In the later projects, these activities were either tied to the loan commitments or considered as definite subcomponents of a project. Supplementary Appendix E summarizes information on institutional development in the projects.

34. Major activities in this subcomponent dealt with strengthening the capability of IAs, and organizing project beneficiaries into associations and training them to participate in implementing projects. Some projects, such as the East Rapti Irrigation Project, involved the

[19] ADB. 1998. *Project Performance Audit Report: Ganges-Kobadak Rehabilitation Project in Bangladesh*. Manila.

participation of beneficiaries in selecting the project, and then in implementation and eventual operation and maintenance (O&M) of the developed system. The approach and experience of the East Rapti Project can help guide the development of future FMISs.

35. In the Integrated Irrigation Sector Project, WUAs were organized with leaders being chosen by the project managers instead of by the members. This practice affected the proper development of the management capacities of the WUAs for irrigation O&M. Consequently, a large number of WUAs have become inactive.

36. The level of beneficiary participation obtained with the payment of an irrigation service fee (ISF) is linked to the concerns of institutional development activities. The Integrated Irrigation Sector Project experienced a slow and complex introduction of the ISF, and collections were problematic. Government subsidies for O&M may have given the impression that there is little need to be serious about collecting the ISF.

37. Of the 18 evaluated IDS projects, nine were reported to have developed farmer beneficiaries into functional organizations (WUAs, water management organizations or farmer organizations) involved in the O&M of the developed systems.

38. Sustainability of WUAs in the management and O&M of the irrigation facility also depends on how early in the phase of project development they become involved. In the East Rapti Irrigation Project, the FMISs were in place before the project was reformulated to rehabilitate existing water systems instead of constructing an irrigation infrastructure. Members of the WUAs would be better oriented if they were aware from the conceptualization phase that they are the ”owners” and primary beneficiaries of the project; thus, they would pay more attention to how the project is being designed, its scope, how much it would cost to build, and how much the O&M cost would be. They might even give valuable suggestions to the design consultants based on their long years of experience in the agriculture sector. Since they would be well-oriented to the costs and benefits of building and operating the project, paying the ISF would be expected to be a natural part of their farm production activities.

39. Among the evaluated projects, four had TAs supporting institutional development for a government agency. The Irrigation and Flood Rehabilitation Project in Viet Nam was accompanied by a TA for strengthening the resettlement management capacity in the Ministry of Agriculture and Rural Development.[20] The TA was rated successful as it strengthened the Central Project Office’s resettlement management capacity for both the Project and Red River Delta Water Resources Sector Project.[21] The TA made a significant contribution to the reasonably timely and effective resettlement of persons affected by rehabilitation of the Hanoi dike. It also contributed to the establishment of effective resettlement systems within the Government and to the decentralization of resettlement activities to the district level, with positive impacts on responsiveness and linkages. The Northeast Minor Irrigation Project[22] had a TA for strengthening the Department of Agricultural Extension (DAE). When the project was implemented, however, the responsibilities of DAE were transferred to the Ministry of Agriculture due to slow progress during the first 2 years of the project.

[20] ADB. 1998. *Technical Assistance to Viet Nam for Strengthening of Resettlement Management Capacity in the Ministry of Agriculture and Rural Development*. Manila.

[21] ADB. 1994. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Socialist Republic of Viet Nam for the Red River Delta Water Resources Sector Project*. Manila.

[22] ADB. 2003. *Project Performance Audit Report: Northeast Minor Irrigation Project in Bangladesh*. Manila.

4. Economic Results

40. The economic internal rates of return (EIRRs) of the evaluated projects were generally lower than the estimates at appraisal, except for the East Rapti Irrigation Project (Loan 867-NEP), which had a recalculated EIRR of 16% against the appraisal estimate of 15.9%. The common factors responsible for the lower than expected EIRRs were the (i) deterioration in the international price of rice at the time of the evaluation, (ii) considerable increase in the use of fertilizers, and (iii) reduction in incremental irrigation area and lower incremental rice yields per hectare than projected at appraisal. Supplementary Appendix F summarizes information on the economic results of the projects.

41. Other reasons for the differences in estimates include cost considerations that were excluded at the time of appraisal, such as (i) opportunity costs of water and electric power for other economic uses; (ii) distortions in financial prices against economic values of crops (resulting in farmers planting rice and sugarcane because these were much more financially attractive than wheat and cotton, which on the other hand, had higher economic value); and (iii) attribution of proportionate benefits that may be derived from costs of road developments giving access to areas irrigated by the project as against the costs of roads constructed by the project but not within the irrigated areas. Among the considerations in the economic reevaluation of the Northeast Minor Irrigation Project was that the shallow tubewells developed were concentrated in about half of the district compared with road improvement works scattered over the whole area. Thus, in these cases, the economic analysis cannot offset all the costs of the road improvement component against increased agricultural production from groundwater development as was assumed in the appraisal and the PCR (Supplementary Appendix F).

42. The Second On-Farm Water Management Project[23] had an EIRR of about 27% at the time of evaluation. The EIRR was estimated to be 30% at appraisal and 19.4% at completion. The project completed earlier investments that did not realize their full potential benefits because of significant weaknesses in on-farm facilities. Correcting those weaknesses represented only a marginal increase in investment costs to make the entire investment more effective in realizing agricultural benefits. The economic gains of these farm-level initiatives illustrate the shortcomings common in the design of irrigation projects that give insufficient attention to the need for on-farm water management to realize agricultural productivity targets.

43. The Ganges-Kobadak Irrigation Rehabilitation Project in Bangladesh posted the biggest fall in EIRR. From the appraisal estimate of 73.4%, the EIRR at evaluation was estimated at 15%. The significantly lower EIRR was attributed to long delays in project implementation, overoptimistic expectations of incremental production at the time of appraisal, and a substantial reduction in the price of rice.

5. Socioeconomic Impact

44. The positive socioeconomic impacts of the evaluated projects are seen in the increased farm incomes and improved access to markets and social services. All improvements in income were attributed to increases in agricultural production except in the Second Hill Irrigation Project in Nepal where the reported sources of income were largely nonfarm. Supplementary Appendix G summarizes information on the socioeconomic impacts of the projects.

[23] ADB. 1998. *Project Performance Audit Report: Second On-Farm Water Management Project in Pakistan*. Manila.

45. Key informant interviews reported improved incomes, but the improvement usually could not be quantified for lack of available benefit monitoring data, especially in projects in which proper baseline data were never generated.

6. Impact on Women

46. Only seven of the evaluated projects had aspects concerning women's involvement in development. The East Rapti Irrigation Project had provisions regarding women and WUA. As a result, all the FMISs had at least two female members, as did the WUA executive committees, the decision-making bodies. In this project, the Evaluation Mission confirmed that women were active in irrigation system repair and maintenance even after project completion. In the Integrated Irrigation Sector Project, women were included on a pilot basis in technology transfer and institutional development programs for household heads. Supplementary Appendix H summarizes information on the impact of the projects on women.

47. The other projects did not have specific activities for women. In general the project designs were not gender-specific, as they were intended to provide benefits for the population at large. The Evaluation Mission's common opinion is that the increased farm incomes have benefited women, but the lack of benefit monitoring and evaluation (BME) data makes it difficult to confirm the nature or extent of impacts specific to women. The rapid appraisal conducted by the Mission for the Irrigated Command Area Development Project[24] revealed increased participation of women in farm production and marketing activities in the project areas. This result was attributed mainly to the training activities conducted by the project.

7. Environmental Impact

48. An investigation of the incremental use of agrochemicals in agricultural production in the projects showed that it did not add to the levels of pollution in five of six projects. The use of pesticides was also observed to be under control, with some governments banning specific pesticides. A reduction in overall pesticide usage was observed in some project areas. The Khulna Project noted that an integrated pest management program of the Department of Agricultural Extension contributed (although only to a limited extent) to lessening the use of farm chemicals on selected crops in the project areas. Also, the higher market prices of fertilizers and farm chemicals seem to have squeezed the profit margins of farmers, resulting in no substantial increase in the use of chemicals. Supplementary Appendix I summarizes information on the environmental impacts of the projects.

49. Drainage projects have positive effects on the environment. Aside from improving the soil environment for plant growth, they also help improve human health conditions by removing stagnant water in depressions.

50. In the Irrigated Command Area Development Project, the conversion of erosion-prone grassland and sparse secondary growth forest into irrigated rice fields helped stabilize the environment and deterred farmers from further practicing shifting cultivation in the project area.

51. The reformulated East Rapti Irrigation Project averted the threat in the original project's design of diverting most of the Rapti River water during the dry winter months, which would have had severe negative effects on Royal Chitwan National Park downstream.

[24] ADB. 1998. *Project Performance Audit Report: Irrigated Command Area Development Project in Indonesia*. Manila.

8. Performance Rating

52. About 50% of the evaluated projects were rated partly successful; 44.4%, successful; and 5.6%, unsuccessful (Appendix 3). It is noteworthy that BME was planned for several projects but was not carried out for all, especially the baseline conditions. Thus, the extent of the impacts of project interventions, though generally delivered, could not be quantified.

53. Around two thirds of the evaluated projects were located in group B countries—five in Bangladesh, four in Pakistan, two in Sri Lanka, and one in Viet Nam. Bangladesh and Pakistan, combined, contributed four successful projects (two each), accounting for half of the projects rated successful. Indonesia's three partly successful projects accounted for 33.3% of the number of projects in that category. Each country had its own share of successful and partly successful projects. The two projects in Nepal showed diverse performance, with the Second Hill Irrigation Project fraught with design, implementation, and environmental problems, while the East Rapti Irrigation Project had effective experience in the participatory approach. PPER ratings generally confirmed the PCR ratings, except for two. IED upgraded the overall rating for the Irrigation and Flood Protection Rehabilitation Project from partly successful to successful mainly because of the improved economic performance of the irrigation scheme, based on O&M time and cost savings identified in postcompletion surveys (Box 1). On the other hand, IED downgraded the overall rating for the Khulna-Jessore Drainage Rehabilitation Project as the evaluation found the Project to be partly relevant, less effective, inefficient, and less likely to be sustainable.

54. There was no noticeable relationship between area size and level of success. Level of success may be related to how well beneficiary participation was developed in planning, implementing, and operating the project.

Box 1: Irrigation and Flood Protection Rehabilitation Project

1. The Project's objective was to rehabilitate 45 kilometers of the Hanoi dike and two irrigation systems (Song Chu and North Nghe An) with an irrigated area of 80,000 hectares (ha) in North Central region. The Project's purpose was to avoid loss of lives and mitigate economic loss in case of flooding caused by dike failure. The project investment would result in sustained paddy (unhusked rice) production of 440,000 tons on 80,000 ha for the Song Chu and North Nghe An irrigation schemes. Project objectives were not well-defined, partly reflecting lack of detailed project preparation.

2. Project cost was estimated at $96 million. In addition, grant-funded advisory technical assistance of $1.8 million was planned to strengthen operation and maintenance (O&M). The Project was executed by the Ministry of Water Resources, the predecessor of the Ministry of Agriculture and Rural Development. The Project was approved in October 1993 and completed in June 2001.

3. Overall the Project was rated successful. This is higher than the project completion report rating of partly successful mainly because of improved economic performance of the irrigation scheme, based on O&M time and cost savings identified in postcompletion surveys. The main lesson from the project experience is the desirability of a holistic approach to irrigation scheme upgrading and development. This would assess the need for upgrading lower level irrigation and drainage systems as well as headworks and main system work often financed by multilateral lending institutions. Thus, the approach should define lower level requirements at the outset and outline a program to address the most critical constraints. This would allow irrigation scheme upgrading to proceed in an orderly and participatory manner, rather than the ad hoc, top-down approach dictated by the project design. This study suggests that (i) rehabilitation of secondary structures should be completed by the irrigation management companies, (ii) guidelines for tertiary canal upgrading should be developed, (iii) systems should be defined to encourage ownership of irrigation assets by farmers/villagers and thus reduce theft of gates, and (iv) participatory irrigation management on hydraulic boundaries should be extended to all canals.

Source: ADB. 2005. *Project Performance Audit Report on the Irrigation and Flood Protection Rehabilitation Project*. Manila.

9. Sustainability

55. Among the evaluated projects, seven were found to have low sustainability or to have components that were not sustained, and six had high levels of sustainability. Five projects may be sustainable, depending on the availability of future funds for items such as O&M, WUA formation, and erosion control. Sustainability of the evaluated projects has generally depended on timely availability of funds for adequate maintenance. For instance, the FMISs in the East Rapti Irrigation Project were all operating and had functional WUAs that demonstrate the basic ability to carry out O&M. The WUAs have adequate incentives in the high levels of cropping intensity and crop production to continue to satisfactorily perform O&M. In the meantime, two projects appeared to have doubtful sustainability: the Second Hill Irrigation Project and some subprojects of the Integrated Irrigation Sector Project were subject to the detrimental effects of erosion and unprotected watersheds linked to the systems. Supplementary Appendix J summarizes information on the sustainability of the projects.

56. The low sustainability of some of the projects was a result of any or a combination of the following factors: (i) occurrence of structural failure or existing risks due to the location of important structures, (ii) lack of funds for O&M, (iii) lack of beneficiary participation or formation of WUAs and commitment to pay ISFs, and (iv) inadequate routine and periodic maintenance works.

57. Projects assessed as highly sustainable exhibited a combination of the following attributes: (i) availability of O&M funds either from the government or the WUAs, (ii) well-performing WUAs with a strong sense of ownership of tertiary and farm-level irrigation facilities, (iii) beneficiaries' realization of financial benefits and belief that they come from well-maintained irrigation facilities, and (iv) owner-operated equipment or facilities such as tubewells.

58. A closer look at the WUAs[25] revealed that they played a major role in the sustainability of most of the projects. The sustainability of 16 of the 17[26] evaluated projects was influenced by the performance of the WUAs. The more sustainable projects had WUAs that were (i) involved in planning, designing, constructing, and supervising rehabilitation and improvement works, and had adequate incentive (in sustaining high levels of cropping intensity and crop production) to continue to satisfactorily perform O&M as in the case of the East Rapti Irrigation Project in Nepal; and (ii) strengthened through a follow-up TA implemented by a committed agency, as in the case of the Walawe Irrigation Improvement Project in Sri Lanka (footnote 18). Experience from the rest of the evaluated projects showed the importance of the following factors, among others, in helping ensure well-performing WUAs: (i) clear policies and guidelines for people's participation to avoid confusion and uncertainty in institutionalizing WUAs; (ii) adequate representation from the different people in the project area, not just the large landowners and influential people, and the origin of the members (who should come from the project area); (iii) use of a bottom-up approach in organizing WUAs, and advocating active farmer participation at the different stages of a project; (iv) authority of WUAs in determining the use of ISF they

[25] WUAs are also called water management associations, water management organizations, water users cooperatives, or water users groups. Farmer organization was a more general term used in some projects.

[26] This excludes the Flood Rehabilitation Project (Loan 882-BAN[SF]), which is an emergency loan. The irrigation schemes under the Irrigation and Flood Protection Rehabilitation Project were managed by irrigation management companies, fully funded by irrigation service fees. The transfer of at least tertiary canal management to WUAs was expected to have a positive impact.

collect; and (v) a change in corporate culture at all levels, ensuring full support for WUAs from all levels of the government (Appendix 4).

IV. KEY ISSUES AND LESSONS

A. Key Issues

59. Key issues that have continuing relevance for ongoing and future ADB operations in the IDS concern the following aspects: design of IDS projects, agricultural support services, strengthening of institutional capacities, improving O&M through participatory management, developing and managing water resources, BME, and ISFs. The summary information on the key issues are in supplementary appendixes K to Q.

1. Design of IDS Projects

60. The design of an IDS project will always be a major factor in its success or failure. The evaluated projects show that the following considerations are important in the design phase of IDS projects:

(i) thorough preparation of pre-engineering technical data such as surveys, geotechnical investigations, and dependable water flow at source based on years of monitoring data;
(ii) soundness of technical design that is appropriate to local conditions and capabilities, and within economical unit cost limits;
(iii) rehabilitating and upgrading an IDS project would generally experience better economic results than a new development project;
(iv) scope for developing on-farm distribution systems that would increase economic returns by completing a previous irrigation system that extended only up to the main distribution canals;
(v) availability of benchmark description of beneficiaries or stakeholders on which the designer can base the appropriate design for sustainable O&M;
(vi) involvement of the beneficiaries and stakeholders right from the early stage of conceptualization and design of the proposed project;
(vii) limiting the scope to manageable geographical boundaries, homogeneous economic conditions, and uniformity of approach to subprojects; and
(viii) opportunity cost of water for irrigation against other competing economic uses.

61. Measures to further improve the design of IDS projects would lie in the selection criteria and preparation works. Project selection is influenced by the changing relevance of activities in time. The projects in Indonesia saw the country's transition from a rice-importing country to a self-sufficient one and a nascent exporter. This occurred at a time when the world market price of rice was deteriorating. Under these circumstances, there appeared to be no clear justification for routinely undertaking large-scale irrigation development schemes in Indonesia except for the specific purpose of poverty reduction through small-scale communal irrigation facilities in the relatively backward regions with limited alternative opportunities for increasing employment and income (as shown by the experience from the Second Irrigation Package Project).

62. Rehabilitating and improving existing irrigation systems can have a low unit cost per area, considering that the cost of the old system is a sunk cost. Thus, such projects have better chances of being selected than new developments. However, as pointed out in the evaluation report of the Irrigation Package Project, this raises the question of why irrigation systems are left

to deteriorate to such an extent that large sums of money have to be invested in their rehabilitation (Supplementary Appendix K). It is therefore important to review the cause of deterioration of the system being proposed for rehabilitation. Among others, the pricing of water induces farmers to invest to improve on farm irrigation.

63. Development of on-farm irrigation systems and on-farm water management practices would be worthwhile projects in the IDS for completing an aspect that may have been left out of a previous project that was designed to be constructed up to the main and secondary canals only. An irrigation project is justified by the economic returns to the irrigated area that it will make productive. However, after water is delivered to a farm entrance, it still has to be distributed properly and efficiently throughout the farm to reach the intended production area. The efficiency of the whole system therefore depends on each individual farmer user's performance in his/her on-farm irrigation system. In many cases, on-farm distribution systems still require additional investments from the farmer for, e.g., construction of canals with proper lining or installation of a piping network throughout the farm.

64. There may be areas with existing systems where efficiencies in on-farm distribution systems can still be improved after assessing soil-plant-water relationships. Such assessment may lead to recommendations to improve farmer irrigation practices or to install or construct improvements that would enhance water management. Implementation of such may then lead to higher efficiency in water use and thus result in excess water for irrigating other areas.

65. For projects with multiple subprojects, it would be expedient if procedures for the subprojects are standardized using basic design models.

66. Circumstances may change from the time of project design, and may necessitate corresponding revisions in project design. Some evaluated projects showed how they can be greatly improved with timely reformulation. This option should always be open so that it can be seriously considered in case the project design proves to be inappropriate during implementation. Due diligence in preparing technical, government, and community aspects will promote an effective and sustainable project design (Supplementary Appendix K).

2. Participatory Approach

67. Stakeholders' ownership is one of the factors that spell the difference between a project's success or failure. For projects using the participatory approach, beneficiaries or intended users have to be involved as early as possible. Beneficiary participation is not merely to obtain their endorsement of a development concept, but also to determine what their needs are, i.e., the type of development that is needed, considering that they will later be paying for the cost of the investment. Participation of the beneficiaries during the feasibility and design stages can minimize the kind of errors experienced in previous projects. In addition, it will help develop in the beneficiaries a sense of ownership and responsibility for a project. Benchmark data with a detailed assessment of community capabilities, cropping practices, production systems, irrigation practices, and efficiencies may be utilized in designing a project. During implementation, a continuing BME is needed, and a working management information system should be in place early on.

68. A participatory approach for O&M and sustainability should also be considered in the project design. The beneficiaries' awareness of the costs and how they were derived will promote efficient project implementation and help them install in their WUAs procedures that may be important for the system's O&M and sustainability. Topics such as how the O&M funds

will be generated by the WUA or how payments for services will be charged to individual members should be considered.

3. Pricing Policies and Agricultural Support Services

69. Providing agricultural support services continues to be a necessary complement to IDS interventions, especially when the target areas are far from cities or major production centers. In such areas, technology transfer, farmer organizations, and farm-to-market roads would still be of economic value combined with the irrigation or drainage system (Supplementary Appendix L).

4. Strengthening Institutional Capacity

70. Responsibilities for monitoring project planning and implementation, and continuing postproject administration by the government and beneficiary institutions require corresponding capacity and authority. Thus, for strengthening institutional capacities, it is necessary to involve not only technology transfer and training but, more importantly, the granting of authority to effectively carry out the responsibilities given. Some projects operated well with financial responsibility being given to the field unit, as it could respond in a timely manner to project situations. Another project experienced a 2-year delay due to lack of authority of the IA.

71. Another crucial factor in project implementation is coordination among agencies involved in a project. Pooling of responsibilities can be efficient. However, if implementation would be hampered by lack of cooperation, the lead agency may have to take the initiative of pushing the project through (Supplementary Appendix M).

5. Improving O&M through Participatory Management

72. With the focus of IDS projects moving toward development of communal irrigation rather than large-scale systems, O&M by participatory management is becoming more necessary. Such participation will have to be in place at the early stages of project design, and appropriate resources should be allotted for that activity.

73. As pointed out in one evaluation report, there may be the risk of a monopoly by larger landowners or dominant ethnic groups, and the attendant need for a regulatory and enforcement framework and, possibly, for moderate subsidies to assist low income or ethnic groups less able to afford the privately managed services. To safeguard the interests of these groups of water users, it is necessary to define the precise role of the government agencies in the sector (Supplementary Appendix N).

6. Irrigation Technology

74. The project experience in Bangladesh raised key concerns on ADB's approach to flood protection and irrigation in that country. There was a debate on the advisability of large embankments and pump surface irrigation compared with private tubewell irrigation.[27] Pump surface irrigation schemes protected from floods behind embankments are expensive to build, operate, and maintain, and are typically public sector undertakings. One project in Bangladesh showed that beneficiaries pay neither for such investments nor for operation and upkeep. The result is (i) economic inefficiency, as large Government financial subsidies have proportionate

[27] A potential drawback is arsenic contamination of groundwater in parts of southern Bangladesh.

economic costs; and (ii) significant shortfalls in local funds resulting in delayed completion, inappropriate maintenance, and inefficient operation.

7. Development and Management of Water Resources

75. In many agricultural areas, a proper inventory of the quality and quantity of available groundwater or surface water is still lacking. An evaluated project included the drilling of test tubewells to determine and monitor the depth of the groundwater table in the command area. The data would rationalize the efforts of farmers in the community who wish to set up their own deep tubewell or shallow tubewells. It would greatly help in planning irrigation systems if municipal or provincial governments were able to generate data on the available water sources in their areas and constantly update them for use in future projects.

76. Water management technology on the proper use of water, and also on the use of distribution equipment such as pumps and pipes for on-farm distribution, continues to have a large potential for growth. The spreading of practical knowledge on soil-plant-water relationships, such as water-holding capacities of different types of soil, and moisture and aeration requirements of roots for optimum plant growth, may improve the use of irrigation, lessen wastage, and increase planting areas without the need to invest in costly new water source systems. It can be assumed that a considerable percentage of farms can still improve their efficiencies in using water, and thus increase production while reducing water consumption (Supplementary Appendix O).

8. Benefit Monitoring and Evaluation

77. Baseline data collection and continued monitoring and evaluation are important aspects of a project. However, they are not always done/done properly. Evaluation of an IDS project[28] pointed out that it is desirable that a benchmark or socioeconomic survey be conducted at the outset of the prefeasibility or feasibility study, that a follow-up project BME survey be undertaken before starting engineering design if either the time that elapsed or other events necessitate it, and that at least another survey be timed with the completion of the project. Unless the information from the surveys is used in determining feasibility and engineering design and is integrated with the management information system, project BME is not only costly but also pointless.

78. Some standard survey procedures that would help in project design and community organization may have to be developed. Some projects had BME reports that were incomplete in scope and nonrepresentative of the project area. The data were not comprehensive enough to allow proper assessment of the project impact on beneficiary households and communities.

79. Improved BME methods can help enhance project economic performance especially in confirming the production area actually developed by a project. EIRRs are computed on areas being developed, and therefore such confirmation is critical in ascertaining the actual gains of irrigation projects. Acknowledgment by the beneficiary of the actual area being served will also be useful in area-based determination of ISFs and can therefore act as a check on claims by the agencies on service areas developed.

[28] ADB. 1995. *Project Performance Audit Report: Second Irrigation Package Project*. Manila. (Loan 627-INO, approved on 19 May 1983, for $52 million)

80. BME can also tackle questions on pricing and how it is determined at the farmgate (Supplementary Appendix P). A study on how the products are sold and who buys them could explain why the farmer implements certain production or marketing practices. As noted in one evaluation report, with proper price incentives, farmers are able to diversify to cash crops without much extension support.

9. Irrigation Service Fees

81. Proper O&M is crucial to the sustainability of a project, and collection of ISFs can facilitate proper O&M. A number of issues are related to ISFs, including the (i) extent of cost recovery, (ii) adequacy and timeliness of funds for O&M, (iii) role of the WUAs, and (iv) role of the government. To have a firm ground on the key issues on ISFs, however, the purposes for which they are collected have to be clearly defined. As shown in Supplementary Appendix D, the varying origins and purposes of the ISF will form the basis for its amount and sources. Furthermore, it would be an advantage if initial amounts are agreed upon at the start of the project rather than set toward the completion of the project.

82. ISF for cost recovery may be more feasible for WUAs that have complete control over the water source and the delivery of service, e.g., in some tubewell systems. Furthermore, O&M may be within the capacity of the associations to handle, and the system of collecting from the members may be simple enough and may even be demand-oriented.

83. For irrigation mains that are shared by several communities or associations, memoranda of agreement (MOAs) among the stakeholders and the local governments would have to be prepared in such a way that they are also enforceable. Local customs and procedures would have to be considered, i.e., whether the ISF will be collected from individual farmers through associations or directly by government agencies. The MOAs should also consider sanctions and penalties for delinquent farmers.

84. Priority on the use of the ISF also has to be defined and agreed upon by the stakeholders from the start of project conceptualization. O&M expenses will have to be considered more important than cost recovery, but a definite contribution from the WUA to cost recovery should be in place in the project MOAs.

85. IDS projects can consider improving the payment schemes for the use of irrigation water (Supplementary Appendix Q). WUAs may also need to develop schemes on how the association can collect payments per volume of use. There are several modalities for payment schemes, and WUAs may choose or develop one that would suit the general membership. Payments based on volume used encourage the practice of sound water management at the farm level. Metering systems appropriate for particular projects would have to be selected with due diligence and the cost of owning and operating the metering equipment or systems should be considered in the economic justification of the proposed project.

10. Crosscutting Issues

86. Though crosscutting issues such as women in development, environmental protection, and poverty reduction were not the major targets of the evaluated projects, they have to be considered when designing and implementing IDS projects. The projects' objective of increased agricultural production benefits generally all in the community and the increase in income somehow helps reduce poverty. The irrigation systems, on the other hand, are to be operated with due consideration for the environment; otherwise, they will not be sustainable.

B. Lessons

87. The highlights of major lessons in the IDS are summarized in the following paras. A list of selected evaluation findings and lessons in the IDS is in Appendix 5, which includes lessons given in the earlier sector synthesis.

1. Project Preparation

(i) Selecting a project after thorough diligence, preparing a conceptual framework, and implementing the design continue to be major considerations in the success and sustainability of IDS projects. Alternatives that may be more economical should be studied. Reformulations help improve the economic effectiveness of some projects.

(ii) Taking a holistic approach to upgrading and developing irrigation and drainage schemes is desirable.

(iii) A BME system needs to be standardized and integrated with the management information system. Socioeconomic surveys should become a routine part of a feasibility study, not only to more accurately ascertain the present agroeconomic conditions and household incomes, but also to involve potential beneficiaries in the planning of projects and choice of crops. The BME has to be defined in consultation with potential data users, and reports translated and made widely available.

(iv) The optimal approach to project formulation is a gradual and progressive process that focuses on institutional upgrading and participation by all stakeholders.

(v) Participatory approaches are essential if system deterioration is to be prevented or minimized. Mechanisms for beneficiary participation in the design of IDS projects should be carefully planned. Beneficiaries need to be fully involved in identifying, designing, and implementing projects if ownership is to be promoted.

(vi) Establishing sustainable WUAs requires time and great effort. Such an activity needs to be specified and funded by the project if it is to succeed. High-level support is likely required for about 2 years, with some support thereafter.

(vii) Because of the dominant effect of the price of rice on the viability of irrigation projects and the volatility of rice prices in the world market, it is necessary to exercise caution in designing irrigation projects that may lead to producing an exportable surplus of rice.

(viii) Many problems and inefficiencies of irrigation stem from the view that water retains the properties of a public good after it is derived from a source for growing crops, whereas, by and large, water then becomes in actuality a private tradable commodity. Establishing systems for collecting payments for volumes of water used also increases the efficiency of its use at the farm level.

(ix) In the design of rehabilitation projects, the optimum level of investment should be studied carefully because the impact of rehabilitation on agricultural production may not be as large as is often thought. Rehabilitation per se does not bring about appreciable increases in crop yield unless such rehabilitation makes a real difference in the availability of water. Therefore, potential benefits of rehabilitation schemes need to be carefully researched.

(x) Developing on-farm irrigation distribution systems and a water management scheme at the farm level may represent a small incremental investment cost, but they are necessary to ensure the benefits of broader irrigation development. They should be included as part of any irrigation project.

(xi) Developing the command area must be coordinated with dam construction. Watercourses should be constructed to permit irrigation soon after the dam is filled to avoid excessive delay in generating benefits.

(xii) The terms of reference for consultants should place more emphasis on building the capacity of local institutions rather than simply on preparing reports.

2. Project Implementation, Monitoring, and Supervision

(i) Project supervision from an ADB resident mission rather than from headquarters is often more effective, particularly when it results in a better understanding of local problems and more judicious and timely reallocation of loan proceeds.

(ii) 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. Leasing disputed government land for O&M is not a viable option.

(iii) ADB and the EA need to have a more proactive role in complex public sector projects—supported by the active involvement of the local government or its representatives, and establishment of a more cohesive basis for stakeholder organization and participation—by paying close attention to and giving advice on the policy and institutional development process in the EA.

(iv) Supervision missions need to more closely monitor the quality of project planning and construction work.

(v) Ideally, a project should be accomplished within the periods envisaged at appraisal. Implementation delays are sometimes due to justifiable reasons such as reformulations so as to adapt implementation to actual local conditions or to correct a defect that may have been overlooked at the planning stage. Some delays, however, could have been avoided, such as those due to administrative causes. These include delays in selecting and hiring consultants, contractors, and project staff; slow government processing or approval of particular loan requirements; and deficient project organization and management. These latter causes could be minimized by an appropriate level of activity by ADB as an external participant to check on the various agencies and levels involved in the documents and funds flow for the project.

V. CONCLUSIONS

88. The IDS undergoes constant development to adjust to the changing needs of agricultural communities and as it learns from experience with past projects. The approach of projects in the sector has gradually changed from top-down planning to beneficiary participation in the planning process. The objectives of recently approved project loans in the sector have also considered assisting communal irrigation system needs with support for institutional development, unlike previous projects, which called for the construction of large multipurpose infrastructure with little participation from the targeted beneficiaries.

89. Increasing the participation of beneficiaries in the projects enhances the relevance of these endeavors and adds to the cost-effectiveness of the interventions being introduced by IDS projects. Furthermore, their participation ensures the continued O&M of the projects and thus better chances of attaining full cost recovery and sustainability.

90. Irrigation projects differ from other types of development projects in that specific farmers or farmer groups become the end users of the water being distributed. Though meant to add to

the general productivity of the country, the investment should actually directly benefit specific farmers with a concomitant increase in income.

91. Thus, unlike a rural road project that can be used by most individuals in a community, irrigation systems have a limited number of direct beneficiaries, usually rice farmers. Furthermore, a road project is more easily understood and measured, say, in kilometers of road length constructed, but the area actually covered by an irrigation system cannot be quantified in the same simple manner.

92. These peculiarities of an essential aspect of rural development such as IDS projects therefore, would rely heavily on the diligence of an enlightened end user for its success and sustainability. It is important therefore for the beneficiaries to be informed of what the system will deliver, how much they will pay for it, and the benefits that they can expect, such as the probable market expansion due to a diversified farming system.

93. The history of ADB's activities in IDS shows a continuously improving process that augurs well for more involvement in this sector and with greater confidence for success in achieving rural development goals. The global shortage of specific food items during the past year supports further the case for IDS and related development assistance.

LOANS APPROVED IN THE IRRIGATION AND DRAINAGE SECTOR

(As of 30 June 2009)

Loan No.	Country	Project Name	Fund Type	Amount (US$M)	Approval Day	Approval Month	Approval Year	Country Group	Rating PCR	Rating PPER
49	AFG	Gawargan and Chardarrah Agricultural Development	ADF	5.2	15	Dec	1970	A		
204	AFG	Kajakai Gates	ADF	14.0	5	Dec	1974	A		
270	AFG	Gawargan-Chardarrah Agricultural Development (Supplementary)	ADF	10.8	29	Jun	1976	A		
348	AFG	Seraj Agricultural Development	ADF	1.5	27	Jul	1978	A	NR	
2227	AFG	Western Basins Water Resources Management	ADF	47.3	20	Dec	2005	A		
333	BAN	Meghna-Dhonagoda Irrigation	ADF	24.0	15	Dec	1977	B	NR	
378	BAN	Pabna Irrigation and Rural Development	ADF	38.0	12	Dec	1978	B	NR	PS
381	BAN	Low-Lift Pump Maintenance Program	ADF	8.9	14	Dec	1978	B	NR	GS
467	BAN	Tubewell	ADF	50.0	25	Sep	1980	B	NR	
558	BAN	Small-Scale Irrigation Sector	ADF	50.0	10	Dec	1981	B	GS	
593	BAN	Bhola Irrigation	ADF	27.2	4	Nov	1982	B	NR	
614	BAN	Second Tubewell	ADF	56.5	14	Dec	1982	B	NR	
671	BAN	Ganges-Kobadak Rehabilitation	ADF	37.0	14	Dec	1983	B	GS	GS
819	BAN	Khulna Coastal Embankment Rehabilitation	ADF	16.9	11	Dec	1986	B		
882	BAN	Flood Rehabilitation (Flood Control and Irrigation)	ADF	14.3	4	Feb	1988	B	NR	GS
883	BAN	Meghna-Dhonagoda Irrigation (Supplementary)	ADF	8.4	4	Feb	1988	B	NR	
1124	BAN	Dhaka Integrated Flood Protection	ADF	91.5	21	Nov	1991	B	S	
1125	BAN	Northeast Minor Irrigation	ADF	73.0	21	Nov	1991	B	PS	PS
1159	BAN	Second Bhola Irrigation	ADF	39.8	27	Feb	1992	B	S	
1289	BAN	Khulna-Jessore Drainage Rehabilitation	ADF	50.0	14	Dec	1993	B	S	US
1291	BAN	Southwest Area Water Resources Development	ADF	3.2	16	Dec	1993	B	PS	
1399	BAN	Command Area Development	ADF	30.0	7	Nov	1995	B	PS	
740	BHU	Chirang Hill Irrigation	ADF	3.5	17	Sep	1985	A		
1753	CAM	Stung Chinit Irrigation and Rural Infrastructure	ADF	16.0	5	Sep	2000	A		
2035	CAM	Northwest Irrigation Sector	ADF	18.0	9	Dec	2003	A		
2159	IND	Chhattisgarh Irrigation Development	OCR	46.1	29	Mar	2005	B		
2444	IND	Orissa Integrated Irrigated Agriculture and Water Management Investment Program - Tranche 1	OCR	16.5	26	Sep	2008	B		
12	INO	Tajum Irrigation	ADF	1.0	17	Jun	1969	C	NR	GS
58	INO	Gambarsari-Pesanggrahan Irrigation Rehabilitation	ADF	2.7	23	Dec	1970	C	NR	GS
81	INO	Sempor Dam and Irrigation	ADF	9.2	2	Dec	1971	C	NR	PS
92	INO	Wampu River Flood Control and Development	ADF	5.9	4	Apr	1972	C	NR	PS
301	INO	Lodoyo Irrigation	OCR	20.5	29	Jul	1977	C	NR	GS
352	INO	Bali Irrigation	OCR	18.0	7	Sep	1978	C	NR	GS
434	INO	Tulungagung Drainage	OCR	39.0	6	Dec	1979	C	NR	PS
475	INO	Cibaliung Irrigation	OCR	35.0	30	Oct	1980	C	NR	US
479	INO	Lower Citanduy Irrigation	OCR	55.2	13	Nov	1980	C	NR	PS
480	INO	Northern Sumatra Irrigation Study	OCR	5.7	13	Nov	1980	C	NR	
518	INO	Wadaslintang Multipurpose	OCR	87.7	23	Jun	1981	C	NR	GS
522	INO	Bali Irrigation Sector	OCR	33.6	17	Sep	1981	C	NR	PS
581	INO	Irrigation Package	OCR	77.0	14	Sep	1982	C	NR	PS
582	INO	Tulungagung II and Baro Raya Irrigation	OCR	4.4	14	Sep	1982	C	NR	
627	INO	Second Irrigation Package	OCR	52.0	19	May	1983	C	NR	PS
638	INO	Second Irrigation Sector	OCR	85.0	22	Sep	1983	C	NR	
639	INO	West Nusa Tenggara Irrigation Study	OCR	3.5	22	Sep	1983	C	NR	
685	INO	Arakundo-Jambu Aye Irrigation and Flood Control	OCR	68.0	5	Jul	1984	C	PS	
769	INO	Central Java Groundwater Irrigation Development	OCR	12.2	12	Dec	1985	C	NR	
799	INO	Third Irrigation Package	OCR	120.7	20	Nov	1986	C	GS	
818	INO	Irrigated Command Area Development	OCR	28.8	11	Dec	1986	C	NR	GS
860	INO	Third Irrigation Sector	ADF	60.0	17	Nov	1987	C	GS	
861	INO	Third Irrigation Sector	OCR	60.0	17	Nov	1987	C	GS	
1017	INO	Integrated Irrigation Sector	OCR	170.0	17	Apr	1990	C	PS	PS
1018	INO	Integrated Irrigation Sector	ADF	30.0	17	Apr	1990	C	PS	PS
1126	INO	Central Java Groundwater Irrigation Development	OCR	51.0	26	Nov	1991	C	S	
1296	INO	Second Integrated Irrigation Sector	OCR	100.0	20	Jan	1994	C	PS	
1378	INO	Farmer Managed Irrigation Systems	ADF	26.3	21	Sep	1995	C	S	
1579	INO	Northern Sumatra Irrigated Agriculture Sector	OCR	130.0	13	Nov	1997	C	S[a]	
2064	INO	Participatory Irrigation Sector	ADF	19.0	19	Dec	2003	C		
2065	INO	Participatory Irrigation Sector	OCR	54.0	19	Dec	2003	C		
1592	KAZ	Water Resources Management and Land Improvement	OCR	30.0	17	Dec	1997	C	S	
1593	KAZ	Water Resources Management and Land Improvement	ADF	10.0	17	Dec	1997	C	S	
86	KOR	Andong Dam Multipurpose Development	OCR	22.0	16	Dec	1971	GE	NR	GS
1488	LAO	Community-Managed Irrigation Sector	ADF	14.7	21	Nov	1996	A	S	
1788	LAO	Decentralized Irrigation Development and Management Sector	ADF	15.5	28	Nov	2000	A		
2086	LAO	Northern Community-Managed Irrigation Sector	ADF	10.0	5	Jul	2004	A		
446	MAL	Agricultural Drainage	OCR	25.4	19	Dec	1979	C	NR	PS
266	MYA	Third Sedawgyi Multipurpose Dam and Irrigation	ADF	45.9	22	Jun	1976	A	NR	
515	MYA	Pump Irrigation and Area Development	ADF	20.0	23	Jun	1981	A	NR	
85	NEP	Kankai Irrigation	ADF	4.5	14	Dec	1971	A	NR	GS
309	NEP	Kankai Irrigation (Supplementary and Extension)	ADF	3.4	11	Oct	1977	A	NR	
490	NEP	Hill Irrigation (Western Region)	ADF	11.7	9	Dec	1980	A	NR	US
560	NEP	Command Area Development	ADF	13.5	15	Dec	1981	A	NR	US
596	NEP	Second Hill Irrigation	ADF	20.0	4	Nov	1982	A	PS	PS
659	NEP	Kankai Diversion Structure Remedial	ADF	3.5	1	Dec	1983	A	NR	
867	NEP	East Rapti Irrigation	ADF	30.4	26	Nov	1987	A	GS	S
923	NEP	Irrigation Sector	ADF	36.3	22	Nov	1988	A	GS	

Loan No.	Country	Project Name	Fund Type	Amount (US$M)	Approval			Country Group	Rating	
					Day	Month	Year		PCR	PPER
1113	NEP	Rajapur Irrigation Rehabilitation	ADF	16.6	31	Oct	1991	A	S	
1311	NEP	Irrigation Management Transfer	ADF	12.9	13	Sep	1994	A	PS	
1437	NEP	Second Irrigation Sector	ADF	25.0	16	May	1996	A	PS	
1609	NEP	Community Groundwater Irrigation Sector	ADF	30.0	26	Feb	1998	A	S	
2102	NEP	Community-Managed Irrigated Agriculture Sector	ADF	20.0	17	Nov	2004	A		
330	PAK	Chashma Right Bank Irrigation	ADF	31.5	15	Dec	1977	B	NR	GS
428	PAK	South Rohri Fresh Groundwater Irrigation	ADF	47.0	27	Nov	1979	B	NR	GS
495	PAK	On-Farm Water Management	ADF	25.0	15	Dec	1980	B	NR	GS
700	PAK	Left Bank Outfall Drain (Stage I)	ADF	122.0	25	Oct	1984	B	S	
723	PAK	Chashma Command Area Development	ADF	40.0	13	Dec	1984	B	NR	PS
750	PAK	Small Dams	ADF	39.0	31	Oct	1985	B	PS	PS
772	PAK	Pat Feeder Canal Rehabilitation and Improvement	ADF	117.0	17	Dec	1985	B	PS	
800	PAK	Balochistan Groundwater and Trickle Irrigation	ADF	12.6	20	Nov	1986	B	PS	
871	PAK	Second On-Farm Water Management	ADF	28.5	8	Dec	1987	B	GS	GS
874	PAK	Chashma Right Bank Irrigation (Stage II)	ADF	48.0	10	Dec	1987	B	GS	
901	PAK	Khushab Salinity Control and Reclamation	ADF	53.0	22	Sep	1988	B	GS	
976	PAK	Swabi Salinity Control and Reclamation Project	ADF	118.0	26	Oct	1989	B	S	
1101	PAK	Kotri Barrage Rehabilitation	ADF	20.0	26	Sep	1991	B	S	
1146	PAK	Chashma Right Bank Irrigation (Stage III)	ADF	185.0	17	Dec	1991	B		
1209	PAK	Flood Damage Restoration (Sector)	ADF	100.0	15	Dec	1992	B	GS	
1294	PAK	Pehur High-Level Canal	ADF	127.6	22	Dec	1993	B	S	
1297	PAK	Third Punjab On-Farm Water Management	ADF	62.2	8	Mar	1994	B	S	
1413	PAK	National Drainage (Sector)	ADF	140.0	12	Dec	1995	B	US	
1679	PAK	Punjab Farmer-Managed Irrigation	ADF	7.8	25	Mar	1999	B		
2299	PAK	Punjab Irrigated Agriculture Investment Program - Tranche 1: Lower Bari Doab Canal Improvement	OCR	217.8	18	Dec	2006	B		
2300	PAK	Punjab Irrigated Agriculture Investment Program - Punjab Irrigated Agriculture Project Preparation Facility	ADF	10.0	18	Dec	2006	B		
19	PHI	Cotabato Irrigation	ADF	2.5	18	Nov	1969	C	NR	PS
152	PHI	Davao del Norte Irrigation	OCR	4.2	22	Nov	1973	C	NR	GS
210	PHI	Agusan del Sur Irrigation	ADF	5.8	17	Dec	1974	C	NR	PS
225	PHI	Pulangui River Irrigation	OCR	13.5	26	Jun	1975	C	NR	GS
285	PHI	Second Davao del Norte Irrigation	OCR	15.0	7	Dec	1976	C	NR	
305	PHI	Tago River Irrigation	OCR	22.0	1	Sep	1977	C		
341	PHI	Allah River Irrigation	OCR	23.5	11	May	1978	C	NR	
362	PHI	Second Agusan Irrigation	ADF	14.0	31	Oct	1978	C	NR	
406	PHI	Bukidnon Irrigation	ADF	15.0	26	Jul	1979	C	NR	
407	PHI	Third Mindanao Irrigation Study	OCR	1.7	26	Jul	1979	C	NR	
466	PHI	Second Laguna de Bay Irrigation	ADF	20.0	25	Sep	1980	C	NR	PS
580	PHI	Third Davao del Norte Irrigation	OCR	45.3	2	Sep	1982	C	NR	
667	PHI	Irrigation Sector Loan I (Southern Philippines)	OCR	67.4	12	Dec	1983	C	NR	
668	PHI	Fourth Mindanao Irrigation Study	OCR	1.5	12	Dec	1983	C		
727	PHI	Allah River Irrigation (Supplementary)	OCR	27.9	20	Dec	1984	C	NR	
1048	PHI	Irrigation Systems Improvement	OCR	9.0	8	Nov	1990	C	GS	
1049	PHI	Irrigation Systems Improvement	ADF	20.0	8	Nov	1990	C	GS	
1136	PHI	Kabulnan Irrigation and Area Development	ADF	48.0	28	Nov	1991	C	S	
1365	PHI	Second Irrigation Systems Improvement	OCR	15.0	30	Aug	1995	C	PS	
1366	PHI	Second Irrigation Systems Improvement	ADF	15.0	29	Aug	1995	C	PS	
1668	PHI	Southern Philippines Irrigation Sector	OCR	60.0	18	Dec	1998	C		
16	SRI	Walawe Development	ADF	7.7	23	Oct	1969	B	NR	PS
17	SRI	Walawe Development	OCR	0.9	23	Oct	1969	B	NR	PS
324	SRI	Kirindi Oya Irrigation and Settlement	ADF	24.0	9	Dec	1977	B	PS	PS
612	SRI	Kirindi Oya Irrigation and Settlement (Supplementary)	ADF	10.0	9	Dec	1982	B	PS	PS
695	SRI	Walawe Irrigation Improvement	ADF	11.0	27	Sep	1984	B	GS	GS
794	SRI	Kirindi Oya Irrigation and Settlement (Phase II)	ADF	26.6	30	Oct	1986	B	PS	PS
2124	TAJ	Irrigation Rehabilitation	ADF	22.7	10	Dec	2004	A		
206	THA	Nong Wai Pioneer Agriculture	ADF	5.0	10	Dec	1974	C	NR	GS
556	THA	Medium Scale Irrigation Package	ADF	15.0	10	Dec	1981	C	NR	GS
557	THA	Medium Scale Irrigation Package	OCR	25.0	10	Dec	1981	C	NR	GS
2069	UZB	Amu Zang Irrigation Rehabilitation	OCR	73.2	19	Dec	2003	B		
2492	UZB	Water Resources Management Sector	OCR	85.0	17	Dec	2008	B		
2493	UZB	Water Resources Management Sector	ADF	15.0	17	Dec	2008	B		
88	VIE	Bihn-Dinh Irrigation	ADF	2.5	18	Dec	1971	B	NR	PS
1259	VIE	Irrigation and Flood Protection Rehabilitation	ADF	76.5	26	Oct	1993	B	PS	S
2025	VIE	Phuoc Hua Water Resources	ADF	90.0	27	Nov	2003	B		
2273	VIE	Emergency Rehabilitation of Calamity Damage (including supplementary amount)	ADF	76.5	21	Nov	2006	B		

ADF = Asian Development Fund, AFG = Afghanistan, CAM = Cambodia, GE = graduate economy, GS = generally successful, HS = highly successful, IND = India, INO = Indonesia, KAZ = Kazakhstan, LAO = Lao People's Democratic Republic, MFF = multitranche financing facility, NEP = Nepal, No. = number, NR = no rating, OCR = ordinary capital resources, PAK = Pakistan, PHI = Philippines, PS = partly successful, S = successful, TAJ = Tajikistan, TA = technical assistance, US = unsuccessful, UZB = Uzbekistan.

[a] The PCR Validation Report rated the Project as partly successful.

Source: Lotus Notes Database on Loan, Technical Assistance Grant and Equity Approvals.

SUMMARY OF EVALUATION RESULTS IN THE IRRIGATION AND DRAINAGE SECTOR

			Loan Amount			Project Cost				Time Overrun		EIRR				
Project Title	PPER No.	Loan No.	AR ($M)	Reform-ulation ($M)	Actual ($M)	AR ($M)	Reformulation ($M)	Actual ($M)	Cost Overrun (%)	Yrs	%	AR (%)	Reformulation ($M)	PCR (%)	Actual (%)	Performance Rating
Kirindi Oya Irrigation and Settlement Project	PE-564	324/612/794-SRI(SF)	60.60		44.95	66.80		93.36	39.80	10.25	153.2	11.00-17.60		6.30	2.60	PS
Pabna Irrigation and Rural Development Project	PE-475	378-BAN(SF)	38.00		38.00	85.00		116.30	36.82	7.34	122.7	18.00		4.80-5.10	3.73	PS
South Rohri Fresh Groundwater Irrigation Project	PE-450	428-PAK(SF)	47.00	33.00	32.84	81.50	51.00	41.47	(18.68)	5.50	113.7	20.30		20.60	9.00	GS
Irrigation Package Project	PE-464	581-INO	81.35	no revision	76.89	155.30		91.07	(41.36)	3.92	78.5	n.c.	n.c.	12.20	9.80	PS
Waru Turi												23.60	12.20	12.50	2.90	
West Semarang												26.60	27.00	11.40	18.90	
Second Hill Irrigation Project	PE-506	596-NEP	20.00		11.08	24.30		8.85	(63.60)	5.00	76.1	15.00			6.50	PS
Second Irrigation Package Project	PE-435	627-INO	52.00		47.38	87.00		58.21	(33.10)	2.25	32.9	20.00		14.70	7.50	PS
Ganges-Kobadak Irrigation Rehabilitation Project	PE-499	671-BAN(SF)	37.00		43.32	49.30		66.68	26.06	3.92	58.6	73.40		14.50	15.00	GS
Walawe Irrigation Improvement Project	PE-533	695-SRI(SF)	11.00		14.93	13.70		35.84	161.60	5.92	117.3	35.00		15.2	10.50	GS
Chashma Command Area Development Project	PE-513	723-PAK(SF)	40.00		40.34	71.50		52.68	(26.32)	3.84	75.4	12.40		13.10	6.00	PS
Small Dams Project	PE-532	750-PAK(SF)	39.00		31.03	48.82		35.40	(27.49)	2.50		16.00			7.50	PS
Irrigated Command Area Development Project	PE-505	818-INO	28.80		18.39	52.10		42.73	(17.98)	1.28	24.8	20.10		15.10	11.60	GS
East Rapti Irrigation Project	PE-591	867-NEP(SF)	30.40	8.30	9.95	38.00	10.40	12.90	(66.05) [a]	4.59	78.7	15.90	13.70	18.30	6.00	S
Second On-Farm Water Management Project	PE-509	871-PAK(SF)	28.50		27.57	55.16		51.78	(6.13)	1.50	29.0	30.00		19.40	27.00	GS
Flood Rehabilitation Project	PE-466	882-BAN(SF)	14.30		12.34	16.00		38.49	140.54	2.50	153.8	n.c.		60.00	n.c.	GS
Integrated Irrigation Sector Project	PE-586	1017-INO, 1018-INO(SF)	200.00		197.98	264.00		250.10	(5.20)	2.00	44.4	15.90		13.40	8.30	PS
Northeast Minor Irrigation Project	PE-621	1125-BAN(SF)	73.00		22.59	93.10		24.46	(73.73)	1.25	22.2	36.00		15.00	17.00	PS

Irrigation and Flood Protection Rehabilitation Project	PE-666	1259-VIE(SF)	76.50	66.21	95.60	87.48	(8.49)	3.00	67.9	39.90	36.80	22.70	S
Khulna-Jessore Drainage Rehabilitation Project	PE-705	1289-BAN(SF)	50.00	32.65	62.70	44.90	(28.39)	3.50	50.97	19.40	20.60	4.08	US

[a]Actual Project cost was higher than the estimated cost at reformulation by 24%.

AR = audit report, EIRR = economic internal rate of return, GS = generally satisfactory, PPER = project performance evaluation report, PS = partly satisfactory, S = satisfactory.
Sources: Project performance audit/evaluation reports.

SUMMARY INFORMATION ON OVERALL PERFORMANCE RATING

Loan No.	Performance Rating
324/612/794-SRI (SF): Kirindi Oya Irrigation and Settlement Project	With the notable exception of the settlement component, the Project overall has performed below expectation although it remains relevant to Sri Lanka's development objectives. However, its relevance is reduced somewhat by the high cost and relatively small number of beneficiaries. Cost-effectiveness and implementation efficiency were low. The Project suffered from institutional problems and had little impact on institutional development. Although the implementing agency's accounting systems improved, project monitoring remains inadequate. Overall, the Project is rated partly successful.
378-BAN(SF): Pabna Irrigation and Rural Development Project	The Project is rated partly successful. The benefits of surface water irrigation were limited to a much narrower area than expected at appraisal. The Project was then optimally managed to maintain water levels compatible with capture fisheries and diversified crop production throughout the project area except for the limited irrigation area. It was noted that the greater stability of water levels in the project area was supportive of further economic development, especially in nonagricultural sectors and urban areas. Socioeconomic impacts included people's displacement following land acquisition, particularly for embankments, without planned resettlement. The Project contributed little to institutional development. Quantifiable economic returns supported the partly successful rating.
428-PAK(SF): South Rohri Fresh Groundwater Irrigation Project	Overall, the project was rated generally successful in achieving its major objectives.
581-INO: Irrigation Package Project	The project as a whole was rated partly successful.
596-NEP: Second Hill Irrigation Project	The project was considered to be partly successful.
627-INO: Second Irrigation Package Project	The project as a whole was rated partly successful.
671-BAN(SF): Ganges-Kobadak Irrigation Rehabilitation Project	Overall, the project was judged to be generally successful.
695-SRI(SF): Walawe Irrigation Improvement Project	The Project was rated generally successful. In the short term, project objectives were attained, and the rehabilitated areas demonstrated high productivity. Crop diversification away from rice exceeded expectations, and the area is now a major source of bananas and vegetables for urban markets. Farm income increased by about half. The Project was implemented more or less as planned, but at greatly increased cost and with substantial delays. Implementation was complicated by a serious insurgency problem that caused major problems for contractors and project staff, and damaged project facilities and equipment.
723-PAK(SF): Chashma Command Area Development Project	The project was rated as partly successful.
750-PAK(SF): Small Dams Project	On the whole, the Project was rated partly successful. The overall EIRR was estimated at 7.5%, assuming that the capital costs of the dams whose command areas are rehabilitated are treated as sunk costs. The EIRR of the new dams alone was calculated at 5.3%. The main constraint to economic performance was the slow rate of irrigation and agricultural development. However, it was expected that the gains of the past 3 years would continue, justifying a partly successful rating.

818-INO: Irrigated Command Area Development Project	The project as a whole was rated as generally successful.
867-NEP(SF): East Rapti Irrigation Project	The project was rated successful.
871-PAK(SF): Second On-Farm Water Management Project	Overall, the project was rated as generally successful.
882-BAN(SF): Flood Rehabilitation Project	The project achieved its objective of rehabilitating the flood control, drainage, and irrigation facilities destroyed by floods. Those facilities protect the affected communities from flood hazard, and permit an increase in cropping area and intensity. Most subprojects would be economically viable. Thus, the project was rated generally successful.
1017- and 1018-INO(SF): Integrated Irrigation Sector Project	The Project had an overall rating of partly successful. It substantially achieved most of its physical targets and improved the incomes and welfare of a large percentage of poor farm families in the areas covered. However, there were (i) substantive shortfalls in O&M, WUA development , and cost recovery targets; (ii) significant shortfalls in improvements in WID and executing agency institutional capacity; (iii) accelerated deterioration of watersheds; (iv) insufficient attention to tertiary irrigation and drainage canal development; (v) negligible long-term impact of TDU and seed production components; (vi) substantial noncompliance with major loan covenants on irrigation policy reforms; and (vii) questionable selection of some subprojects for investment.
1125-BAN(SF): Northeast Minor Irrigation Project	The principal objective of the Project was to increase crop production and farm incomes in the project area by expanding minor irrigation facilities. These outcomes were largely achieved, but not to the extent envisaged. The overall project rating was partly successful.
1259-VIE(SF): Irrigation and Flood Protection Rehabilitation Project	Overall the Project is rated successful. This is higher than the project completion report rating of partly successful mainly due to improved economic performance of the irrigation scheme, based on O&M time and cost savings identified in post-completion surveys.
1289-BAN(SF): Khulna-Jessore Drainage Rehabilitation Project	Overall, the Project was rated unsuccessful, but borderline partly successful. It was assessed as partly relevant, less effective, inefficient, and less likely to be sustainable.

EIRR = economic internal rate of return, O&M = operation and maintenance, TDU = tertiary development unit, WID = women in development, WUA = water users association.
Source: Independent Evaluation Department.

WATER USERS ASSOCIATIONS IN SELECTED ADB-FUNDED IRRIGATION AND DRAINAGE SECTOR PROJECTS[a]

No.	Loan No.	Country	Title	Project Rating[b]	Sustain-ability Rating[c]	WUAs		Remarks	
						Yes	No	WUAs	Sustainability
1	378(SF)	BAN	Pabna Irrigation and Rural Development Project	PS	NSR		x	WUAs were not formed mainly because of the delayed generation of project benefits.	Para. 61 of the PPER stated that "The costs of operating the Project and maintaining its facilities are high. Without recovery of these costs, which has not yet started, the Project could not last long without significant additional Government financing."
2	671(SF)	BAN	Ganges-Kobadak Irrigation Rehabilitation Project	GS	NSR	x		The WUAs were ineffective. Confusion and uncertainty surrounded the institutionalization of the WUAs, mainly because new policies and guidelines for people's participation were then being introduced and tested. The situation was made worse by an erratic water supply.	Para. 47 of the PPER stated that "…The benefits of the Project will be sustained if future O&M funds are sufficient…"
3	882(SF)	BAN	Flood Rehabilitation Project (Flood Control and Irrigation)	GS	NSR		x	This was an emergency project.	Para. 51 of the PPER stated that "Subprojects rehabilitated and constructed under the Project are, for the short term, sustainable... However, the long-term sustainability is threatened by inadequate routine and preventive maintenance resulting from a lack of funds..."
4	1125(SF)	BAN	Northeast Minor Irrigation Project	PS	LS	x		The farmers organizations were largely ad hoc, and needed support to develop as fully functioning water users associations that can (i) accept responsibility for maintaining the control structure, and (ii) construct/maintain an appropriate water distribution system within the command area.	The majority of demonstration tubewells established under the Project were being maintained by beneficiary farmers.
5	1289(SF)	BAN	Khulna-Jessore Drainage Rehabilitation Project	US	LLS	x		The WMOs were dominated by large landowners and influential people and consequently had inadequate representation from women, fisherfolk, and landless people. Also, there was a conflict between local government institutions and Project WMOs.	The main reasons for the less likely sustainability rating are (i) lack of ownership of the Project by beneficiaries because they see it as a BWDB project, not their own; (ii) rigid institutional culture of top-down program planning driven by the primarily structural engineering solution in BWDB; (iii) weak

No.	Loan No.	Country	Title	Project Rating[b]	Sustain-ability Rating[c]	WUAs Yes	WUAs No	Remarks: WUAs	Remarks: Sustainability
									institutional setup as WMOs are dominated by large landowners and influential people and consequently representation from women, fisherfolk, and landless people is inadequate; (iv) inadequate BWDB capacity for community interaction and consultation; (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.
6	581	INO	Irrigation Package Project	PS	NSR	x		The performance of WUAs varied. Para. 40 of the PPER states that "The PCR noted that 25 percent of the WUAs are not fully effective. PWRS officers responsible for the Kedung Asem Irrigation area consider that only 50 percent of the WUAs in the area are fully functioning according to the criteria established by PWRS."	The structural safety of other weirs needs to be checked, and the O&M of weirs including the control of activities that undermine the safety of weirs should be intensified. Unless these actions are taken, the performance of the facilities provided under the Project may not be sustainable. Further strengthening of WUAs is also important for better O&M of minor canals. An equally important factor is the commitment of the beneficiaries to the payment of ISF.
7	627	INO	Second Irrigation Package Project	PS	NSR	x		The farmers viewed the irrigation facilities as Government facilities and, thus, the Government was responsible for maintenance. The fees or rice the WUAs collected was for the maintenance of only the tertiary systems. However, not all WUAs were able to raise enough resources to properly maintain their respective tertiary systems.	The rigidity of the budgetary procedure and the relatively low priority given to O&M were policy issues that should have been brought to the attention of decision makers. In this connection, the creation and performance of WUAs were also important. An equally important factor was the commitment of the beneficiaries to the proper maintenance of the tertiary systems and the payment of ISF. Unless these issues are resolved, the performance of the facilities provided under the Project could not be sustained at their maximum potential levels.

No.	Loan No.	Country	Title	Project Rating[b]	Sustainability Rating[c]	WUAs Yes	WUAs No	Remarks: WUAs	Remarks: Sustainability
8	818(SF)	INO	Irrigated Command Area Development Project	GS	NSR	x		The effectiveness of the WUAs varied. ISF was collected in the Waru Turi subproject, but not at the level required by the Government. In the West Semarang subproject, collection of ISF was at an experimental stage then. The responsibility for O&M was envisaged to be transferred to the appropriate provincial public works department 2 years after the completion of the facilities. At the time of evaluation, this had not happened mainly due to the reluctance of the provincial governments since this meant a decline in the central Government's financial contribution to O&M.	Given the beneficiaries awareness of the need to properly maintain the irrigation facilities, long-term sustainability of the project benefits was assured.
9	1017/ 1018(SF)	INO	Integrated Irrigation Sector Project	PS	LLS	x		The development of self-sustaining WUAs was largely not achieved. WUAs had no control over the use of ISF collected from members. The top-down approach used for forming WUAs resulted in leaders being chosen from above rather than through a bottom-up organization. The focus on establishing WUAs to meet targets was easily disconnected from the substantive development of management capacity for irrigation O&M.	Fiscal austerity induced by the continued financial crisis and the move toward decentralization substantially reduced central Government funding for O&M, which was already inadequate prior to the crisis. Fiscal austerity had also affected financial incentives for farmers to use the level of inputs required for continued high rice yields. ISF policies had not been effective. ISF payments continued to dwindle and were not able to help reduce the fiscal burden on government resources for O&M. Turnover of small irrigation systems had some success, but the majority of WUAs in these systems remained incapable of performing adequate O&M, as do the large majority of WUAs on large-scale systems.

No.	Loan No.	Country	Title	Project Rating[b]	Sustain-ability Rating[c]	WUAs		Remarks	
						Yes	No	WUAs	Sustainability
10	596(SF)	NEP	Second Hill Irrigation Project	PS	NSR	x		WUAs were formed but appeared to be concerned primarily with organizing labor for routine maintenance. There was little farmer participation in designing the schemes. Management of the irrigation water supply was nearly nonexistent in most of the systems visited by the Evaluation Mission. In the absence of an organization to manage water rotation, farmers help themselves on a first-come-first-served basis. This resulted in a reduced direct supply to tailenders, unless the system had overcapacity.	The Evaluation Mission had doubts about the sustainability of about half of the irrigation systems visited. The work (i) involved to rectify some of the systems, and (ii) needed for continued periodic maintenance was not affordable to the farmers. If repeated in the same proportion throughout the Project as in the sample of visited schemes, it could be beyond Government resources without aid support.
11	867(SF)	NEP	East Rapti Irrigation Project	S	LS	x		The FMISs are all operating and have functional WUAs that have demonstrated a basic ability to carry out O&M. WUAs have adequate incentive (in sustaining high levels of cropping intensity and crop production) to continue to satisfactorily perform O&M. The members of the WUAs were involved in planning, designing, constructing, and supervising the rehabilitation and improvement works in their FMISs.	The FMISs are all operating and have functional WUAs that have demonstrated a basic ability to carry out O&M. WUAs have adequate incentive (in sustaining high levels of cropping intensity and crop production) to continue to satisfactorily perform O&M. An element of doubt regarding sustainability is related to future major repairs, if any. WUAs do not have the cash to handle such emergencies, and the district irrigation office's budget is not sufficient to allow it to help out to any great extent. However, the probability of a given scheme needing major repairs is much lower in the project area than among FMISs in the hills.
12	428(SF)	PAK	South Rohri Fresh Groundwater Irrigation Project	GS	NSR	x		WUAs were formed without the farmers' active participation. Contractors considered hiring labor from outside the project area as practical and expedient. Thus members of the WUAs seldom participated in the WC construction activities. This resulted in wasted opportunities for building effective WUAs.	Adequate maintenance and timely replacement of facilities were required. Short-term prospects were not good, given the low levels of cost recovery, the large and partially unpaid electricity bills, and continuing power cuts. Moreover, monitoring of the status of groundwater had practically ceased. In the longer term; however, implementation of the Government's new irrigation policy was expected to lay the groundwork for sustainability through increased emphasis on beneficiary participation.

No.	Loan No.	Country	Title	Project Rating[b]	Sustainability Rating[c]	WUAs Yes	WUAs No	Remarks: WUAs	Remarks: Sustainability
13	723(SF)	PAK	Chashma Command Area Development Project	PS	NSR	x		The performance of the WUAs was mixed, and there appeared little willingness on their part to adopt greater responsibility for ownership and/or operation of irrigation components above the WC level, which is in part due to the underrecovery of costs at the current levels of water charges.	At the time of the Evaluation Mission, WAPDA had not received funds for maintaining the flood control channels, and PID had spent inadequate resources for the drainage facilities under its control. PID had not provided funds for electricity essential to the operation of the subsurface drainage system. Both agencies were oriented primarily toward irrigation facilities rather than drainage and flood protection. This was particularly true for PID, which had no involvement in project implementation. It was expected that O&M costs for drainage were to be financed under the National Drainage Sector Project.
14	750(SF)	PAK	Small Dams Project	PS	LS	x		An attempt was made to establish WUAs. However, the WUAs were not formalized or given any responsibility, and they collapsed at the end of the construction phase. For the participatory management approach to work and develop into a partnership between the Government and FOs, a change in corporate culture was required at all levels. While senior management of SDO was supportive of the concept, further work was required to ensure that middle management and staff enter the relationship from the perspective of equality.	Project benefits are potentially sustainable. However, at present, they are threatened by the low O&M levels.
15	871(SF)	PAK	Second On-Farm Water Management Project	GS	NSR	x		Although the piloted model to strengthen WUAs was not successful, the establishment of WUAs created beneficiary groups that appeared to be able to maintain WCs in the way preexisting traditional groups did, and, in a limited number of cases, increased farmer responsibility for O&M of infrastructure upstream from the WCs. The WUAs also played a positive role in cost recovery by working with DOWM in identifying defaulters and expediting	Uncertainty on proper maintenance of irrigation canals and drains by PID was a significant risk to project benefits. The budget allocations then for O&M works were inadequate. Farmer groups interviewed by the Evaluation Mission reported the absence of any maintenance on minor canals and drains for periods in excess of 10 years. The backlog in maintenance work suggests a basic institutional inadequacy for maintenance works rather than simply shortage of funds for

No.	Loan No.	Country	Title	Project Rating[b]	Sustain-ability Rating[c]	WUAs		Remarks	
						Yes	No	WUAs	Sustainability
								payment.	upkeep. Such inadequacies were expected to be addressed by the then ongoing National Drainage Program of the Government.
16	0324(SF)/0612(SF)/0794(SF)	SRI	Kirindi Oya Irrigation and Settlement Project	PS	LLS	x		Many of the WUGs were operating satisfactorily. However, many settlers brought in from outside the project area appeared to have obtained their allotment by political influence. The settlers have not established residence in the project area and only visited the area for plowing, sowing, and harvesting. This hampered the development of a community spirit and functioning of WUGs, and (at that time) most had yet to take on responsibility for O&M.	The main threat to sustainability comes from developments in the catchment area and restricted water inflows to the reservoir. While water shortages over the past 14 years have been severe on many occasions, developments in the catchment suggest that increasing problems will be experienced. This will require much effort on the part of scheme management and water users to develop water saving systems. The second key area affecting sustainability is the level of, and responsibility for, O&M with the need to develop WUG funding of scheme O&M. In combination, these two major factors lead to a sustainability rating of less likely.
17	695(SF)	SRI	Walawe Irrigation Improvement Project	GS	NSR	x		A follow-up TA helped develop and implement a methodology for strengthening FOs in the Moraketiya branch canal command area of the Project. IWMI provided a no-cost 5-month extension to monitor and help institutionalize the approach to FO development and operation. This pilot project was successful and the Moraketiya branch canal area was then by far the best managed of all project tracts. However, the success achieved was not widely replicated in other areas, in part due to the lack of explicit support.	Sustainability, and farmer participation and funding of O&M are the two key issues facing the scheme. Both will require early attention if a second major rehabilitation program similar to the Project is to be avoided.

No.	Loan No.	Country	Title	Project Rating[b]	Sustainability Rating[c]	WUAs Yes	WUAs No	Remarks WUAs	Remarks Sustainability
18	1259(SF)	VIE	Irrigation and Flood Protection Rehabilitation Project	S	LS	x		MARD and IMCs did not fully institutionalize the TA's recommendations on aspects such as promoting and supporting WUCs to foster their continued functioning. Thus, the initial significant performance gains of WUCs were eroded.	The Hanoi dike subproject was likely to be sustainable as the dike is too important to Hanoi for the people's committees to allow it to deteriorate and threaten its integrity. However, further support was needed to clean up and maintain the northern Ha Tay section, and care was required in the further development of the Red River floodplain. The irrigation schemes had some problems because of the loss of tertiary gates and underfunded maintenance on unrehabilitated secondary canals. However, IMCs, irrigation enterprises/clusters, agricultural cooperatives, irrigation groups, and farmers were trying to maintain and develop their irrigation infrastructure—evidenced by the ongoing rehabilitation of secondary and tertiary canals.

BWDB = Bangladesh Water Development Board, DOWM = Directorate of On-Farm Water Management, FMIS = farmer-managed irrigation system, FO = farmer organization, GS = generally successful, IMC = irrigation management company, ISF = irrigation service fee, IWMI = International Irrigation Management Institute, LL = likely sustainable, LLS = less likely sustainable, MARD = Ministry of Agriculture and Rural Development, NSR = no specific rating, O&M = operation and maintenance, PCR = project completion report, PID = Provincial Irrigation Department, PPER = project/program performance evaluation report, PS = partly successful, PWRS = Provincial Water Resources Services, S = successful, SDO = small dams organization, TA = technical assistance, US = unsuccessful, WAPDA = Water and Power Development Authority, WC = watercourse, WMO = water management organization, WUA = water users association, WUC = water users cooperative, WUG = water users group.

a Based on the 18 project/program performance evaluation reports (PPERs) circulated from 1995 onward.

b Refers to PPER ratings.

c PPERs prior to 2000 did not give an explicit rating for a project's sustainability.

Sources: Project/program performance evaluation reports and project completion reports.

SUMMARY OF LESSONS

Loan No.	Lesson
324/612/794-SRI (SF): Kirindi Oya Irrigation and Settlement Project	(i) ADB has a special responsibility in approving projects. It should ensure that the optimal investment option has been selected. (ii) ADB must be able to challenge underlying assumptions and require that the proposed design reflect circumstances found in the target area. It should not be hurried into making politically driven decisions. (iii) Getting the design correct from the beginning, including institutional aspects, is a necessary condition for project success. (iv) Where irrigation schemes include areas of existing irrigation, it is important to clarify existing formal and informal water rights, and to ensure that water allocation between new and existing users is equitable. (v) Schemes in settlements can be highly charged politically. Major efforts are warranted to ensure that settlers move to their allotments to promote both social development and user management of irrigation and agricultural development.
378-BAN(SF): Pabna Irrigation and Rural Development Project	(i) Project experience demonstrates that the costs and benefits of land acquisition in Bangladesh's increasingly densely populated rural areas need to be investigated during project preparation. (ii) Overstating project benefits at appraisal must be avoided as it often affects design and leads to inefficient investment decisions. In designing projects aiming to increase crop outputs, the contributions of means other than the Project to enhance production must be recognized. (iii) During appraisal, assessment of future flood damage without embankments should, not only reflect crop losses incurred during past floods, but also consider changes—which would likely occur without the Project—that would offset some crop losses. Even in the absence of a project, farmers continually improve flood strategies, which increase crop output. (iv) Project experience highlights the fact that the complexity, sophistication, and number of components of a project should match the level of socioeconomic development in a project area and the capacity of the implementing agencies. (v) In projects like Pabna, stakeholder participation would help ensure cost recovery, adequate O&M, and overall sustainability. Moreover, an involuntary resettlement plan would help ensure that project benefits are not negated.
428-PAK(SF): South Rohri Fresh Groundwater Irrigation Project	(i) Project experience demonstrates how preparation of a conceptual framework is critical, not only in determining the rationale, formulation, objectives, and design of a project, but also in implementing it for economic efficiency and environmental preservation. (ii) In view of the importance to national development of resources such as land, water, and power, their competing uses should be assessed from a national perspective, taking account of all sources and demands. The currently proposed ADB-supported National Drainage Program reflects these concerns. (iii) Many problems and inefficiencies of irrigation stem from the view that water retains the properties of a public good after it is derived from a source for growing crops. But by and large, water then becomes in actuality a private tradable commodity. This implies that irrigation water has a market value and that legal water property rights need to be established along with institutions supportive of irrigation water as a private good. (iv) Project experience highlights that, because of their critical impact on quality performance, ADB should attach utmost importance to the institutional and agricultural aspects of irrigation projects. (v) Project experience confirms that farmers effect wide changes in cropping patterns and technology in response to policy-induced price incentives, even in the absence of commensurate field extension support

581-INO: Irrigation Package Project	(i) Well-designed and well-maintained schemes are essential for the success of irrigation schemes. This is particularly true, given the present and projected levels of the price of rice. Many feasibility studies and engineering designs have not been thorough. The Project experience points out, in particular, that it is necessary to take a river-basin approach to the management of water resources in areas with potential scarcity of water. An assessment of water resources should take into account drinking water and industrial water requirements as well as irrigation. (ii) In designing rehabilitation projects, the optimum level of investment should be studied carefully because the impact of rehabilitation on agricultural production may not be as large as is often thought. Rehabilitation per se does not bring about appreciable increases in crop yield unless the rehabilitation makes a real difference in the availability of water. (iii) Therefore, potential benefits of rehabilitation schemes need to be researched carefully. (iv) The appropriateness of the traditional objectives associated with irrigation projects requires review. Indonesia has already achieved rice self-sufficiency and is poised to become a rice-exporting country. Under the circumstances, economic viability, commitment of beneficiaries, and cost recovery should become increasingly important criteria in screening irrigation projects.
596-NEP: Second Hill Irrigation Project	Hill irrigation systems need to be based on sustainable and cost-effective engineering. The criteria for selecting systems should avoid political influence. Investment should concentrate on interventions to overcome key bottlenecks in existing systems. The cash and labor required for maintenance need to be agreed upon with farmers at the planning stage to ensure that systems are within the capacity of farmers to maintain. Alternatively, a specific Department of Irrigation budget needs to be allocated from the outset. Moreover, construction work should be of a high quality that will both last and not require significant quantities of material for maintenance. The executing agency should be required to undertake mandatory minimum maintenance and for a given period after project construction is completed. ADB supervision missions need to more closely monitor the quality of project planning and construction work. The terms of reference for consultants should place more emphasis on building the capacity of local institutions rather than simply preparing reports. Forecasts of the benefits of future irrigation projects should preferably not assume that farmers will adopt nonproject-supplied inputs where such inputs are not already available and widely used. If a project requires increased Government input subsidies, their cost should be assessed and government expenditure agreed upon with the government. Although hill irrigation projects may increase incomes from cropping, such earnings are becoming a small part of the total household farm income in the hill areas, with families being supported primarily through migratory labor. Future projects aimed at raising living standards in the hills may need to also consider activities other than agriculture and, in particular, target women as prime beneficiaries. A long-term vision would concentrate on the comparative advantage of the hill areas, perhaps focusing on high-value crops and their derived products along with well-balanced development of infrastructure, and the promotion and preservation of reserves of biodiversity and tourist value.
627-INO: Second Irrigation Package Project	Because of the dominant effect of the price of rice on the viability of irrigation projects and the volatility of rice prices in the world market, it is necessary to take a cautious view in the design of irrigation projects that may lead to producing exportable surplus of rice.

	The factors critical in selecting such projects are, inter alia, large realizable incremental benefits, suitability of the physical conditions, good O&M potential in terms of willingness to pay ISF, and community leadership and participation. Where conventional technologies are not economically viable, the use of cost-effective, small-scale, and viable technologies needs to be explored. Institutional capacity is a continuing concern in the sector. Improvements are needed in the procedures of the Directorate General of Water Resources Development for prequalifying contractors, quality control of feasibility studies and engineering design, the standard of construction supervision, cost recovery including the collection of ISF, and O&M including the organization of WUAs. For areas with soil, geological, and topographical problems such as Batang Ilung, more thorough technical studies including engineering design should be prepared prior to appraisal. A BME system needs to be standardized and integrated with the management information system. Socioeconomic surveys should become a routine part of a feasibility study, not only to more accurately ascertain the present agroeconomic conditions and household incomes, but also to involve potential beneficiaries in planning projects and choosing crops. To make better use of BME systems, the involvement of national agencies (such as the National Development Planning Agency) should be considered. The appropriateness of the traditional objectives associated with irrigation projects requires review. Indonesia has already achieved rice self-sufficiency and is poised to become a rice-exporting country. The impact of irrigation projects on employment increase is modest and may need to be viewed as an attendant benefit. Of the objectives mentioned in the AR, the objective of raising the living standards of farmers by raising incomes appears more relevant in the context of poverty reduction. Even in the pursuit of an income objective, it needs to be recognized that irrigation may be just one of the several options available to increase farmers' incomes. For this reason, planning for rural area development should become increasingly multisectoral.
671-BAN(SF): Ganges-Kobadak Irrigation Rehabilitation Project	In contrast to large, new irrigation systems, rehabilitation can yield large economic returns. Large irrigation schemes located along big rivers generally require expensive protection works with the commensurate provision of O&M budgets. The viability of such new schemes in Bangladesh is doubtful. If the sector policy could be changed so that productivity and modernization were achieved by increasing the farm size, economic development would be stimulated more broadly in rural areas. Rehabilitating existing irrigation schemes may affect their economic worth if the increased output turns a country from a food importer to a net exporter. Project supervision from a resident mission rather than from ADB headquarters is often more effective, particularly when it results in a better understanding of local problems and more judicious and timely reallocation of loan proceeds. The uncertainties in service delivery that characterize large irrigation schemes hinder cohesive water management at the farm level and reduce the farmer's willingness to pay ISFs. The collection of ISFs would be facilitated if such schemes became oriented to demand or need, and if a level of service similar to that of private tubewells (for which farmers are prepared to pay in addition to capital and depreciation costs) were provided. Uncertainty exists regarding the role and specific activities of BME units in large irrigation projects. Information systems geared to manage such projects may be more of a priority than the more traditional BME activities. There may be a case for strengthening the management information systems in such projects.
695-SRI(SF): Walawe	(i) Experience indicates that a different approach to formulating, designing, implementing, and operating an irrigation project is necessary to avoid (i) costly

Irrigation Improvement Project	cycles of repeat rehabilitation soon after completion, (ii) shortfalls of the resulting benefits, and (iii) lack of overall sustainability. The optimal approach is a gradual and progressive process that focuses on institutional upgrading and participation by all stakeholders. (ii) The problems experienced with irrigation management and passing responsibility for O&M to farmer organizations highlight a number of factors that are highly relevant to the irrigation sector in Sri Lanka and elsewhere. (1) Mechanisms for beneficiary participation in the design of irrigation projects should be carefully planned; tacking participatory approaches on to a project during or after implementation is less effective. (2) Smallholders often demonstrate resistance to change. In the project's case, it has proven difficult to change long-established and wasteful irrigation practices. (3) Participatory approaches are essential if system deterioration is to be prevented or minimized. (4) Pilot projects can help define the best approaches for developing beneficiary participation. (5) Establishing sustainable participatory management approaches is time-consuming and not well-suited to short-term TA inputs.
723-PAK(SF): Chashma Command Area Development Project	Drainage projects should be based on detailed studies that seek realistic understanding of the physical, institutional, and socioeconomic situation in the project area. Designs must reflect O&M needs and be adjusted as field conditions become better known and evolve over time. In complex irrigation and drainage ventures, integration of their various components is necessary, together with effective coordination among agencies involved and participation of beneficiary farmers, preferably through their associations. Explicit consideration of the resources, needs, objectives, and capabilities of farmers (who are private entrepreneurs and often rather poor) is indispensable.
750-PAK(SF): Small Dams Project	(i) The traditional approach to small dam and command area development is unlikely to generate high levels of social or economic benefit. New approaches will be required if acceptable performance is to be achieved, with a major focus on ownership, equity, and efficiency issues. (ii) Beneficiaries need to be fully involved in identification, design, and implementation if ownership is to be promoted. In particular, farmers should, where possible, construct their own watercourses with necessary support from project staff. (iii) The slow nature of change in traditional rain-fed agricultural societies requires that specific measures be taken to promote technology adoption. Where project outcomes depend on technological change, adequate agricultural extension and input supply must be emphasized both during and after the project. (iv) In Pakistan, involving a range of agencies in project implementation is difficult, even where quite a strong agency, such as the Agency for Barani Area Development (ABAD), is responsible for coordination. (v) Establishing sustainable WUAs requires time and great effort. To be successful, such an activity needs to be specified and funded under the project. High-level support will likely be required for about 2 years, with some more support thereafter. (vi) The timing of command area development and dam construction must be coordinated. Watercourses should be constructed to permit irrigation soon after filling of the dam to avoid excessive delay of the generation of benefits. (vii) Land acquisition and compensation procedures that were agreed on will need to be followed, in accordance with ADB's resettlement policy. (viii) Project monitoring should be partly or entirely funded by the loan.
818-INO: Irrigated Command Area	The Project called for effective interagency coordination at both the national and provincial levels to implement the government's prefinancing credit scheme to provide farmers with funding for land development. However, experience indicates that it was very difficult to coordinate multiple agencies (in this case: Bank Indonesia, Bank

Development Project	Rakyat Indonesia, National Land Board, Directorate General of Food Crops Agriculture, Directorate General of Water Resources Development, and provincial agencies). As a result, the land development component was delayed for more than 2 years during the initial project implementation phase. The Government has since abandoned its policy of full cost recovery for the land development program through the prefinancing credit scheme and instead has provided budgetary support for all land development activities. While there may be a need for several agencies to be involved in some project activities, a strategy should be formulated to minimize the number of agencies and to ensure that the role of each agency is clearly defined in project implementation. As the long-term sustainability of irrigation projects depends largely on the condition of the watershed, a watershed management and conservation component should be investigated and, if necessary, included in the project design. Its inclusion at the design stage could identify measures for controlling and/or mitigating destructive activities and other adverse phenomena that may occur at the project sites in the course of project implementation. This proactive strategy will, not only facilitate the resolution of problems as they occur, but also provide a strong basis for monitoring activities in the watershed area. In this respect, various exogenous risk factors must be identified early in the project identification stage and necessary alternatives be analyzed.
867-NEP(SF): East Rapti Irrigation Project	Lessons identified were as follows: (i) farmer participation should be strengthened at all stages of the project cycle, (ii) an integrated river basin approach should be adopted in selecting and designing subprojects, (iii) social and environmental dimensions should be addressed, (iv) irrigation facilities should be provided only after project beneficiaries express willingness to manage their operation and a strong WUA is formed, (v) construction quality control should be strengthened through effective monitoring by beneficiaries, (vi) agricultural support services should be provided, (vii) O&M monitoring and support should be extended well into the post-turnover stage, and (viii) management information systems should be improved. Project Selection. The approval process for the original Project included project preparatory TA, the usual processing missions, and various reviews. In hindsight, alternative solutions seem not to have been seriously examined, and the environmental and farming contexts (the presence of Royal Chitwan National Park downstream and the existence of a large number of FMISs in the project's command area) not adequately assessed. ADB procedures since 1987 have strengthened the environmental and social scrutiny that all proposed interventions must undergo. Alternative solutions of reaching project goals must be routinely examined throughout the selection and approval process. Even late in that process, a bad idea should be rejected rather than pursued despite reluctance to do so due to costs involved and possible negative reactions to the proponent of the change.
871-PAK(SF): Second On-Farm Water Management Project	On-farm irrigation and drainage projects are fundamentally high-return ventures because they represent a small incremental investment cost necessary to ensure the benefits of broader irrigation development. They should be included as an integral part of any irrigation project. Where incentives for government agencies to perform effectively are weak or absent, irrigated agriculture can improve much if farmer institutions are developed to take responsibility for infrastructure beyond the farm level as well. Accountability for project performance could be improved by forming an independent monitoring cell receiving comments and complaints from project users and reporting to the top management of the executing agency. Finally, promotion of economic efficiency and agricultural performance depends much on the proper pricing of irrigation water and agricultural inputs and outputs.
882-BAN(SF): Flood	Lessons learned:

Rehabilitation Project	Emergency projects should focus on immediate restoration of functions, rather than rehabilitation of facilities, so as to (i) immediately provide relief to the affected community, (ii) restore its economic activity, and (iii) reduce its vulnerability to damage from the next natural disaster. In emergency projects, it is more important to rank alternative potential restoration works through benefit-cost ratios rather than to determine the viability of these works.
1017- and 1018-INO(SF): Integrated Irrigation Sector Project	Lessons identified were as follows: Nationally managed provincial irrigation project activities need to be transferred to the local provincial water resources service (PWRS) and district water resources services. Future irrigation development projects should be formulated with mechanisms encouraging and ensuring the full participation and ownership of beneficiaries with the support of PWRS and district water resources service for future system management. WUA formation and operational efficiency are prerequisites to the implementation of government policy in many aspects of irrigation development. Regular coordination meetings within provincial and district Badan Perencana Pembangunan Daerah (BAPPEDA) are important to address the needs for interagency planning; identifying priorities; assessing proposals for scheme, subprojects, and sector M&E; as well as coordination of institutional development. More involvement of provincial and district authorities and beneficiaries in key policy directives is essential. Specific aspects have to be addressed in future irrigation projects to ensure optimal use of consulting resources.
1125-BAN(SF): Northeast Minor Irrigation Project	Lessons identified were the need for following: (i) Detailed project preparation. There is no substitute for careful and rigorous project preparation to underpin investments in rural development. Such preparation must incorporate extensive involvement and input from all stakeholder groups (particularly from the project beneficiaries), as well as detailed assessments of institutional capacity and capability. Adopting an investment proposal prepared by the Government needs to be examined very carefully to avoid the cancellation of such a substantial component. (ii) Postproject monitoring. Continued monitoring and expansion of the groundwater testing program initiated under the Project will be essential if groundwater development by the private sector is to expand significantly in the project area. (iii) Extension of project impacts. The "bridging" program undertaken by the Government after the ADB project account was closed has clearly demonstrated the impact of ongoing demonstration activities as a key ingredient to the further transfer of groundwater technologies into the project area. The bridging program significantly increased the impact of the Project by maintaining the momentum for minor irrigation development activities.

1259-VIE(SF): Irrigation and Flood Protection Rehabilitation Project	(i) The main lesson from the project experience is the desirability of taking a holistic approach to upgrading and developing irrigation schemes. (ii) Adequate setting and collection of ISFs contribute to effective scheme operation, maintenance, and development. (iii) A firm approach must be taken from the start in relation to canal damage, illegal use, and disposal of rubbish in canals─perhaps by establishing contracts with participating communes, developing commune regulations, and establishing appropriate incentive schemes. (iv) BME should provide useful data to the irrigation system management. This requires defining the evaluation system in consultation with potential data users, and translating reports and making them widely available. (v) Secondary data can provide useful information for evaluation, particularly to facilitate comparison between project investments and a control area. Viet Nam's system for collecting and processing rural statistics is now reliable and evaluation should maximize the use of such data. (vi) Schemes should be mapped adequately. Maps are an essential part of project planning and management, and should be readily available in the IMCs, irrigation enterprises, and clusters. Projects now have the capacity to develop sophisticated mapping systems to allow development of a geographic information system and preparation of maps in the range of scales required by management. (vii) Project-related documents should be stored permanently in an accessible location. (viii) Construction of assets such as relief wells must be accompanied by adequate and enforceable land use planning to ensure long-term access for O&M.
1289-BAN(SF): Khulna-Jessore Drainage Rehabilitation Project	(i) A partial solution does not necessarily result in the intended project benefits where the interconnectivity and dependency of the project area rest 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. (ii) 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. (iii) It is crucial for a public institution like BWDB to work with NGO/civil society groups knowledgeable and sincerely committed to the cause and plight of the poor and vulnerable people adversely affected by drainage congestion and flooding, and to forge a strong development partnership with them for the benefit of local people. (iv) 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. (v) There must be an effective grievance redress mechanism so that project-affected people can voice their concerns without any fear of reprisal. Such a mechanism ought to have a transparent provision for providing fair compensation to the adversely affected population. (vi) 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.
IRD Sector Synthesis, May 1995	Lessons identified were as follows: (i) there is a need to improve project formulation and design; (ii) IRD projects would be more successful if the policy environment and the institutional support structure for agriculture were conducive to economic growth; (iii) lessons from experience confirm that institutional support and capacity-building efforts are vital for the success of IRD projects; (iv) increased beneficiary participation at all stages of the project cycle improves project performance; (v) inherent constraints to implementing BME should be addressed during project formulation, and appropriate remedial measures should be built into the framework of project designs; (vi) a comprehensive approach to water resources management and development needs to be considered in the design of new irrigation projects; (vii) effective ADB supervision of IRD projects demands more comprehensive midterm reviews and a multidisciplinary focus in project supervision; and (viii) in view of ADB's operational thrust to promote small- and medium-scale irrigation projects, the relative advantages and greater viability of such projects should be more seriously considered in designing future projects in the irrigation sector

ADB = Asian Development Bank, AR = audit report, BME = benefit monitoring and evaluation, FMIS = farmer-managed irrigation scheme, IRD = irrigation and rural development, ISF = irrigation service fee, M&E = monitoring and evaluation, O&M = operation and maintenance, TA = technical assistance, WUA = water users association.

Sources: Entries for each project were taken from their respective project performance audit/evaluation reports; while the IRD Sector portion was taken from the 1995 Sector Synthesis of Postevaluation Findings in the Irrigation and Rural Development Sector.