ASIAN DEVELOPMENT BANK

PCR: VIE 25019

PROJECT COMPLETION REPORT

ON THE

IRRIGATION AND FLOOD PROTECTION REHABILITATION PROJECT

(Loan 1259-VIE[SF])

IN THE

SOCIALIST REPUBLIC OF VIET NAM

July 2004

CURRENCY EQUIVALENTS

Currency Unit – dong (D)

		At Appraisal (March 1993)	At Project Completion (December 2001)
D1,000.00	=	$0.094340	$0.066199
$1.00	=	D10,600.00	D15,104.00

ABBREVIATIONS

ADB	–	Asian Development Bank
BME	–	benefit monitoring and evaluation
CPO	–	Central Project Office
DDMFC	–	Department of Dike Management and Flood Control
EA	–	executing agency
EIRR	–	economic internal rate of return
ICB	–	international competitive bidding
IMC	–	irrigation (and drainage) management company
LCB	–	local competitive bidding
MARD	–	Ministry of Agriculture and Rural Development
MWR	–	Ministry of Water Resources
O&M	–	operation and maintenance
PCR	–	project completion report
p-m	–	person-month
PPTA	–	project preparatory technical assistance
SDR	–	special drawing rights
SPO	–	subproject office
TA	–	technical assistance
WUC	–	water users cooperative

WEIGHTS AND MEASURES

ha (hectare)	–	10,000 square meters
kg (kilogram)	–	1,000 gram
km (kilometer)	–	1,000 meters
km^2 (square kilometer)	–	100,000 square meters
m^2 (square meter)	–	10.76 square feet

NOTES

(i) The fiscal year (FY) of the Government ends on 31 December. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2004 ends on 31 December 2004.

(ii) In this report, "$" refers to US dollars.

CONTENTS

BASIC DATA

A. Loan Identification

1.	Country	Viet Nam
2.	Loan Number	1259-VIE(SF)
3.	Project Title	Irrigation and Flood Protection Rehabilitation Project
4.	Borrower	Socialist Republic of Viet Nam
5.	Executing Agency	Ministry of Agriculture and Rural Development
6.	Amount of Loan	SDR54,370,000
7.	Project Completion Report Number	PCR: VIE 820

B. Loan Data

1.	Appraisal	
	– Date Started	1 March 1993
	– Date Completed	11 March 1993
2.	Loan Negotiations	
	– Date Started	5 October 1993
	– Date Completed	5 October 1993
3.	Board Approval	26 October 1993
4.	Loan Agreement	30 October 1993
5.	Loan Effectiveness	
	– In Loan Agreement	28 January 1994
	– Actual	28 March 1994
	– Number of Extensions	1
6.	Closing Date	
	– In Loan Agreement	31 December 1998
	– Actual	8 April 2003
	– Number of Extensions	3
7.	Terms of Loan	
	– Service Charge	1% per annum
	– Maturity (number of years)	40
	– Grace Period (number of years)	10

8. Disbursements

a. Dates

Initial Disbursement	Final Disbursement	Time Interval (months)
25 August 1994	17 December 2001	88
Effective Date	**Original Closing Date**	**Time Interval (months)**
28 March 1994	31 December 1998	57

b. Amount ($ million)

Category or Subloan	Original Allocation	Last Revised Allocation	Amount Canceled	Net Amount Available	Amount Disbursed	Undis-bursed Balance
01-A-Civil Works	30.37	23.87	2.06	23.87	23.87	0
01-B-Civil Works	14.36	12.88	0.59	12.88	12.88	0
01-C-Civil Works	6.76	10.69	0.30	10.69	10.69	0
01-D-Civil Works	—	1.63	0.40	1.63	1.63	0
01-E-Civil Works	—	3.10	—	3.10	3.10	0
01-F-Civil Works	—	0.36	0.25	0.36	0.36	0
01-G-Civil Works	—	0.31	0.25	0.31	0.31	0
02-Materials	11.61	6.21	0.54	6.21	6.21	0
03-Equipment	0.94	0.98	0.03	0.98	0.98	0
04-Survey, Investigation, and Design	0.66	1.63	0.26	1.63	1.63	0
05-Consulting Services	2.77	2.97	0.44	2.97	2.97	0
06-Incremental Administration and Operating Costs	0.66	0.23	0.92	0.23	0.23	
07-Service Charge During Implementation	2.57	1.34	1.08	1.34	1.34	0
08-Unallocated	5.83	—	0.01	—	—	—
Total	**76.52**[a]	**66.20**	**7.13**	**66.20**	**66.20**	**0**

— = not available.

[a] The discrepancy of $3.19 million between the original loan allocation of $76.52 million and the total disbursements and loan cancellation of $73.33 million can be attributed to exchange rate changes between special drawing rights and US dollars.

9. Local Costs (Financed)
   – Amount ($) 36.7
   – Percent of Local Costs 63.3
   – Percent of Total Cost 41.9%

C. Project Data

1. Project Cost ($ million)

Cost	Appraisal Estimate	Actual
Foreign Exchange Cost	37.5	29.5
Local Currency Cost	58.1	58.0
Total	95.6	87.5

2. Financing Plan ($ million)

Cost	Appraisal Estimate	Actual
Implementation Costs		
Borrower-Financed	19.10	21.27
ADB-Financed	73.93	64.87
Other External Financing		
Total	**93.03**	**86.14**
IDC Costs		
Borrower-Financed	0	0
ADB-Financed	2.57	1.34
Other External Financing	0	0
Total	**95.60**	**87.48**

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

3. Cost Breakdown by Project Component ($ million)

Cost	Appraisal Estimate	Actual
Civil Works	68.2	66.1
Materials	13.9	6.2
Equipment	1.1	1.0
Survey, Investigation, and Design	1.7	3.6
Consultant Services	3.1	3.0
Land Acquisition	1.1	4.8
Administration	2.2	1.4
Tax and Duties	1.7	—
Service Charge	2.6	1.3
Total	**95.6**	**87.4**

4. Project Schedule

Item	Appraisal Estimate	Actual
Date of Contract with Consultants	January 1994	June 1995
Commencement of Services	June 1998	March 2001
Completion of Services:		
(i) Hanoi Dike Rehabilitation Subproject		
– Commencement of Construction	January 1994	October 1994
– Completion of Construction	June 1997	May 2001
(ii) Song Chu Irrigation Rehabilitation Subproject		
– Commencement of Construction	January 1994	October 1994
– Completion of Construction	June 1998	November 2000
(iii) North Nghe An Irrigation Rehabilitation Subproject		
– Commencement of Construction	January 1994	October 1994
– Completion of Construction	June 1998	April 2001
Additional Subprojects:		
(i) Hanoi Dike Extension		
– Commencement of Construction	—	March 2000

Item	Appraisal Estimate	Actual
– Completion of Construction		June 2001
(ii) Rao Nan System, Quang Binh Province		
– Commencement of Construction		March 2000
– Completion of Construction		June 2001
(iii) Bau Nhum System, Quang Tri Province		
– Commencement of Construction		March 2000
– Completion of Construction		June 2001
(iv) Khe May System, Quang Tri Province		
– Commencement of Construction		March 2000
– Completion of Construction		June 2001
(v) Nam Thach Han System, Quang Tri Province		
– Commencement of Construction		March 2000
– Completion of Construction		June 2001

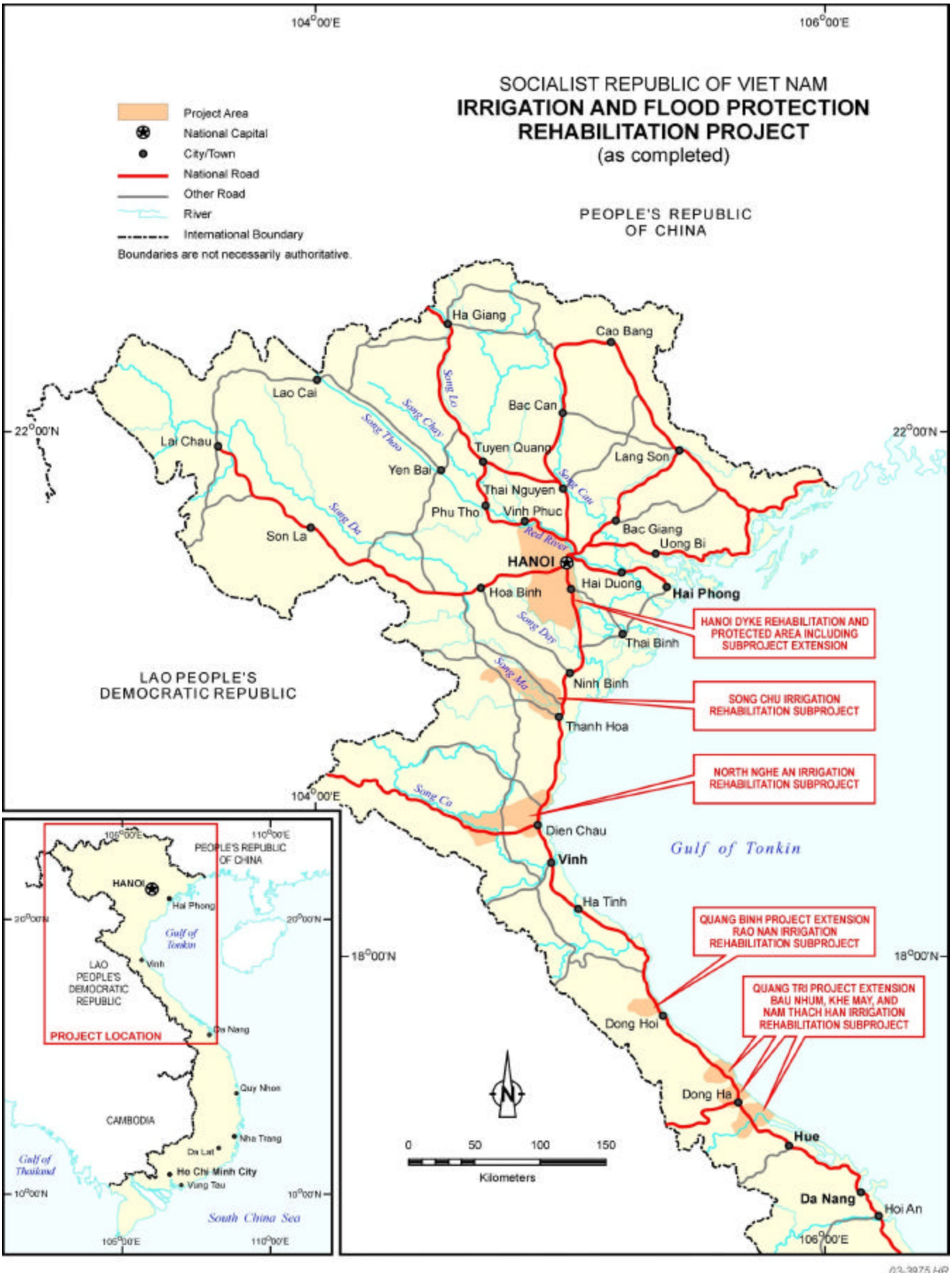
5. Project Performance Report Ratings

Implementation Period	Ratings	
	Development Objectives	Implementation Progress
From 26 Oct 1993 to 31 December 1993	Satisfactory	Satisfactory
From 1 Jan 1994 to 31 December 1994	Satisfactory	Satisfactory
From 1 Jan 1995 to 31 December 1995	Satisfactory	Satisfactory
From 1 Jan 1996 to 31 December 1996	Satisfactory	Satisfactory
From 1 Jan 1997 to 31 December 1997	Satisfactory	Satisfactory
From 1 Jan 1998 to 31 December 1998	Satisfactory	Satisfactory
From 1 Jan 1999 to 31 December 1999	Satisfactory	Satisfactory
From 1 Jan 2000 to 31 December 2000	Satisfactory	Satisfactory
From 1 Jan 2001 to 31 December 2001	Satisfactory	Satisfactory
From 1 Jan 2002 to 31 December 2002	Satisfactory	Satisfactory
From 1 Jan 2003 to 8 April 2003	Satisfactory	Satisfactory

D. Data on Asian Development Bank Missions

Name of Mission	Date	No. of Persons	No. of Person-Days	Specialization of Members
Fact-Finding	7–26 Sept 1992	6	120	f, d, e, n (3)
Appraisal	28 Feb–21 Mar 1993	10	169	a, b, c, d, f, g, i, n (3)
Inception	23–29 January 1994	3	21	d, j, m
Special Loan Administration	5–17 Sep 1994	1	13	f
Review	6–14 Dec 1994	1	9	d
Review	19 Sep–4 Oct 1995	2	32	k (2)
Special Loan Administration	24–30 Apr 1996	2	14	h, k
Midterm	26 May–6 Jun 1997	3	36	k, m, n
Special Loan Administration	23 Nov–4 Dec 1997	2	24	k, k
Special Loan Administration	14–24 Apr 1998	1	11	d
Review	16–26 Mar 1999	2	22	d, m
Special Loan Administration	14–18 Sep 1999	2	10	d, l
Special Loan Administration	21–26 May 2000	1	6	d
Review	16–27 Oct 2000	2	24	d, n
Project Completion Review	19 Sep–3 Oct 2003	3	58	l, n, o

a - agronomist, b - counsel, c - economist, d - engineer, e - environment specialist, f - financial analyst, g - programs officer, h - social development specialist, i - control officer, j - procurement specialist, k - project specialist, l - resettlement specialist, m - local staff member, n - staff consultant.


SOCIALIST REPUBLIC OF VIET NAM
IRRIGATION AND FLOOD PROTECTION REHABILITATION PROJECT
(as completed)
Project Area
National Capital
City/Town
National Road
Other Road
River
International Boundary
Boundaries are not necessarily authoritative.
PEOPLE'S REPUBLIC OF CHINA
LAO PEOPLE'S DEMOCRATIC REPUBLIC
CAMBODIA
Ha Giang
Cao Bang
Lao Cai
Bac Can
Lai Chau
Tuyen Quang
Lang Son
Yen Bai
Thai Nguyen
Phu Tho
Vinh Phuc
Bac Giang
Uong Bi
Son La
HANOI
Hoa Binh
Hai Duong
Hai Phong
Thai Binh
Ninh Binh
Thanh Hoa
Dien Chau
Vinh
Ha Tinh
Dong Hoi
Dong Ha
Hue
Da Nang
Hoi An
Song Lo
Song Chay
Song Thao
Song Da
Red River
Song Cau
Song Day
Song Ma
Song Ca
Gulf of Tonkin
HANOI DYKE REHABILITATION AND PROTECTED AREA INCLUDING SUBPROJECT EXTENSION
SONG CHU IRRIGATION REHABILITATION SUBPROJECT
NORTH NGHE AN IRRIGATION REHABILITATION SUBPROJECT
QUANG BINH PROJECT EXTENSION RAO NAN IRRIGATION REHABILITATION SUBPROJECT
QUANG TRI PROJECT EXTENSION BAU NHUM, KHE MAY, AND NAM THACH HAN IRRIGATION REHABILITATION SUBPROJECT
PROJECT LOCATION
Da Nang
Quy Nhon
Nha Trang
Da Lat
Ho Chi Minh City
Vung Tau
Gulf of Thailand
South China Sea
0 50 100 150
Kilometers
104°00'E
106°00'E
22°00'N
18°00'N
10°00'N
105°00'E
110°00'E
20°00'N

I. PROJECT DESCRIPTION

1. By 1993, when the Asian Development Bank (ADB) resumed lending operations in Viet Nam, the country was emerging from war reconstruction and beginning its transition to a market-oriented economy. While Viet Nam was the world's third largest rice exporter, the nation's water resources infrastructure, on which civil society security and rice production depend, had deteriorated, and the infrastructure's continued functioning was at risk.

2. The Irrigation and Flood Protection Rehabilitation Project[1] was designed to rehabilitate degraded infrastructure and thereby reduce local community vulnerability. The Project included three priority rehabilitation subprojects that improved (i) a 45-kilometer (km) dike section protecting Hanoi from Red River delta flooding; (ii) an irrigation scheme in Thanh Hoa Province, in the Ma River delta; and (iii) an irrigation scheme in North Nghe An Province, in the Ca River delta (Map). The Government prepared feasibility studies, cost estimates, and implementation schedules for the works. In ADB's judgment, project preparatory technical assistance (PPTA) was not required for loan approval.

3. The Project aimed to (i) prevent economic and social disasters that would result from the collapse of vital infrastructure and (ii) sustain and promote further agricultural production and economic development, to improve living conditions and quality of life in the Project's area. The Project would improve flood protection for 42,000 hectares (ha) of Hanoi City and adjacent Ha Tay Province and increase water supply for 80,000 ha in Thanh Hoa and Nghe An provinces, to sustain annual rice production of 440,000 tons. Positive social impacts were anticipated for the 1.75 million people protected by the Hanoi dike and the 1.3 million people who benefited from the Song Chu and North Nghe An schemes. Accompanying the loan was a $1.8 million grant-financed advisory technical assistance (TA) undertaking aimed at strengthening operation and maintenance (O&M).[2]

4. The Hanoi dike consisted predominantly of earthen flood embankments that were progressively raised to a current design standard of 100 years.[3] The dike incorporated low-quality materials and was not adequately founded in many locations. Excessive water seepage, sand boils, embankment cracking and slumping, riverbank erosion, and isolated collapses occurred at various locations.

5. The Song Chu and North Nghe An irrigation schemes were built in 1926 and 1936, respectively. Their diversion weirs and other major structural components (including a 0.5 km tunnel in North Nghe An) had deteriorated, limiting the ability to irrigate the full command areas.

6. The Ministry of Water Resources was the Project's Executing Agency (EA). As a condition of loan effectiveness, the Central Project Office (CPO) was established, and project management committees—subsequently known as subproject offices (SPOs)—were established in each subproject. In December 1995, the Ministry of Water Resources was restructured to form the Ministry of Agriculture and Rural Development (MARD). At the

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[1] ADB. 1993. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan and Technical Assistance Grant to the Socialist Republic of Viet Nam for the Irrigation and Flood Protection Rehabilitation Project*. Manila.

[2] ADB. 1993. *Technical Assistance to the Socialist Republic of Viet Nam for Operation and Maintenance Strengthening*. Manila.

[3] Flood design standards are determined in relation to the long-term average recurrence interval of the flood to be contained and safely conveyed within the river channel and corridor formed by flood control embankments (commonly referred to as dikes).

provincial level, provincial water resources services were integrated into agriculture and rural development departments.

7. During project implementation, two major changes of scope were approved. These included additional rehabilitation work on Hanoi dike (para. 12) and flood damage repair of water resources infrastructure in Quang Binh and Quang Tri provinces (para. 20). All subproject locations are shown on the Map.

II. EVALUATION OF DESIGN AND IMPLEMENTATION

A. Relevance of Design and Formulation

8. Strengthening the Hanoi dike addressed known weaknesses in the flood protection system, and rehabilitating weirs and other structures addressed the decline of the command area of the two irrigation subprojects, which was linked to infrastructure failure. The Project therefore aligned closely with Viet Nam's priorities.

9. A 1991 ADB economic review and operations paper[4] gave priority to infrastructure rehabilitation, public sector reform, cost recovery, and social sector reform. The Project's goal supported ADB's strategic priorities and was consistent with the Red River Delta Water Resources Sector Project, which aimed to rehabilitate and upgrade infrastructure serving about 100,000 ha.[5]

10. ADB accepted the EA's subproject evaluations, including those concerning rehabilitation needs and costs. For the Hanoi dike, the works were needed to eliminate structural weaknesses. For the irrigation subprojects, the assumption that the EA's project formulation represented an optimal investment option is not completely supported by the Project's achievements (paras. 16, 18, and 19). PPTA would have shown that hydrological constraints limit irrigation in the dry season and prevent the realization of the Project's full irrigation objective. In addition, tertiary and lower level canals and structures that determine access to water were not included.

B. Project Outputs

1. Hanoi Dike Rehabilitation Subproject

11. The Hanoi dike rehabilitation subproject benefits 42,000 ha. Serving the residential and livelihood needs of 2 million people, this area covers Hanoi City and nearby agricultural land.[6] The Appraisal Mission reported significant risk of dike collapse and thereby justified the investment in the reduction of flood risk for people's lives, assets, and livelihoods. Reduced O&M costs were also envisaged as project benefits.

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[4] ADB. 1991. *Economic Review and Bank Operations Paper for the Socialist Republic of Viet Nam*. Manila.

[5] ADB. 1994. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan and Technical Assistance Grant to the Socialist Republic of Viet Nam for the Red River Delta Water Resources Sector Project.* Manila.

[6] This area excludes the project extension in the south that, as noted in the Loan Agreement, provides little risk to Hanoi.

12. During project implementation, cost savings were made due to currency depreciation and the adoption of local cost norms (para. 26).[7] This enabled an extension of scope in August 1999 that included a further 16 km of dike between km 85 and km 101 (estimated to cost $11.5 million, including $1.6 million for office extensions).[8]

13. Due to the extension of work beyond the scope identified at appraisal, physical achievements exceeded targets. The work included (i) dike body strengthening and retaining wall construction; (ii) riverbank protection; (iii) clay slurry grouting and dike foundation strengthening; (iv) and other additions (impervious blankets, road resurfacing, and relief wells). The dike is now capable of withstanding large-scale flooding, as shown during the 1996 and 1999 floods.

14. Design arrangements were modified during an extended design phase, and other changes were made to reduce the land acquisition scope and resettlement (para. 73). Construction works were contracted using local competitive bidding (LCB), based on MARD's design norms. The anticipated reduction in O&M requirements may not have been achieved, due to a combination of inadequate compaction and the use of inappropriate materials.[9]

2. Irrigation Rehabilitation Subprojects

a. Song Chu Rehabilitation Subproject

15. The Song Chu irrigation system has a command area of 50,000 ha. This subproject aimed to rehabilitate and strengthen the diversion weir, associated intake structures that were damaged during floods and considered to be at risk of total failure, and other canals and structures. The works program included weir and headworks[10] rehabilitation and canal resectioning and lining.[11] International competitive bidding (ICB) and LCB were used, and the works were successfully completed in June 2001.

16. Cropping intensity was expected to increase from 192 to 209%, and the water supply for Thanh Hoa City would be assured. The rehabilitation works were successfully implemented and the perceived risk level was reduced, although reevaluating this is not possible.[12] The expected productivity gains arising from a further 21,717 ha being fully irrigated were not realized, with only 22% (4,737 ha) of the incremental target being achieved (of which 66% occurred before

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[7] Prior to 1994, the EA's contracting experience was exclusively with state-owned enterprises, for which the applicable cost norms often did not reflect true market value. For subsequent projects, attempts were made to reconcile such differences during loan processing. In addition, the value of the US dollar appreciated against the Vietnamese dong, changing from $1.00 = D10,940 in 1994 to $1.00 = D15,500 in 2002.

[8] The office extensions did not eventuate, and the $1.6 million was subsequently used for flood damage repair, along with a further $4.4 million of loan savings, under the irrigation extension subprojects (para. 20).

[9] The use of local cost norms and a desire to spread available funds over as large an area as possible may also have been factors leading to less-than-optimum construction quality.

[10] Headworks is the term applied to the structure controlling the quantity of water entering a canal.

[11] Beneficiaries and local governments rehabilitated a total of 191 km of tertiary and quaternary canals.

[12] At appraisal, the condition of some key infrastructure was judged to be so precarious that experts believed that without rehabilitation the diversion weir and intake structure would collapse in the near future. The probability for such failure, as determined by the Ministry of Water Resources, was high. This, however, was unsubstantiated and unverifiable as part of the Project Completion Report Mission.

most construction work started).[13] A further 5,450 ha of the incremental target (25%) depends on irrigation water reuse (generally by pumping) and was not part of the Project's scope.[14]

b. North Nghe An Rehabilitation Subproject

17. The North Nghe An scheme was designed to irrigate 30,000 ha. At appraisal, only 12,000 ha were classified as fully irrigated, due to constraints in conveying water through the intake and distribution network. This subproject aimed to rehabilitate and strengthen structures considered to be at risk of total failure, including the main diversion weir, main canals, major structures, and some secondary canals and drains. The works program included (i) rehabilitation of weir and headworks in Do Luong, (ii) canal resectioning and partial lining, (iii) tunnel rehabilitation and new tunnel construction, (iv) drain improvement in Vach Bac, and (v) weir construction and drain enlarging for Bau Ru sluice.[15]

18. The expected outcome from rehabilitation was to fully irrigate 30,000 ha. Cropping intensity was expected to increase from 186 to 200%, based on an increase of 17,764 ha in fully irrigated area. However, only 6,977 ha (39%) of the incremental target was achieved.

c. Summary of Findings

19. The low level of achievement in Song Chu and North Nghe An shows the following deficiencies in project preparation: (i) lack of a systems approach in assessing constraints and needs; (ii) overreliance on engineering solutions to a multifaceted development problem; (iii) lack of a comprehensive approach toward ensuring service to end users, resulting in inability to supply adequate water throughout the command area; (iv) lack of participation by water users and beneficiaries; (v) inattention to drainage improvements and irrigation water reuse in farmer-managed pumping schemes;[16] and (vi) incomplete system rehabilitation. In addition, an expected reduction in sedimentation at the weir intake for the North Nghe An scheme did not eventuate.

3. Irrigation Extension Subprojects

20. Following severe floods in central Viet Nam in 1999, ADB approved a change in scope that enabled $6.0 million to be used for repairing water resources infrastructure in Quang Binh and Quang Tri provinces. The new subprojects were the Rao Nan irrigation scheme in Quang Binh Province and the Bau Nhum, Khe May, and Nam Thach Han irrigation schemes in Quang Tri Province. In these subprojects, construction was undertaken from March 2000 to April 2001. No subproject assessment or baseline studies were made.

21. The Roa Nan scheme in Quang Binh Province was designed to irrigate 1,600 ha by pumping to the main canal from a low weir designed to separate fresh from saline water in the Giang River estuary. The subproject upgraded the weir, replaced the pumping station, and

[13] Other constraints to project success included water shortages in the dry season, poor condition of lower level canals and structures, and drainage problems.

[14] Pump stations were not rehabilitated, and pumping by farmers was relegated to tertiary system management.

[15] Following the midterm review in May and June 1997, the EA's request to extend work on Vach Bac drain and Bau Ru sluice, to reduce flooding of 3,000 ha (involving the reallocation of about $0.87 million), was approved (para. 56).

[16] Drainage improvement was only partially covered by the subproject, although 20% of the total area is waterlogged in normal years, increasing to 72% in wet years. Approximately 19% of the total irrigated area requires pumping to achieve full irrigation.

rehabilitated part of the primary and secondary canals. Pumping capacity far exceeded (by about 150%) demand, thereby locking the scheme into high operating costs.

22. Investment was directed at deferred maintenance or capital replacement, as opposed to flood damage repair. In 1999, the irrigation system supported a total of 1,030 ha of spring rice and 1,200 ha of autumn rice. After rehabilitation, this increased to 1,600 ha for both crops.

23. Bau Nhum invested $1,500 per ha in canal lining and drainage. Project impacts derive from moving from one crop of rice to two crops for the same command area of 300 ha.[17] Claimed benefits arising from improved drainage were not verifiable. O&M cost savings of D500 million per year are claimed. The Project Completion Report (PCR) Mission observed low construction quality and significant drainage constraints throughout the scheme.

24. Khe May is a small reservoir on the outskirts of the town of Dong Ha. The reservoir's command area of 60 ha was increased to 100 ha by raising the weir and lining the main canal. Project funds were also used to construct a multistory office building for a local irrigation (and drainage) management company (IMC). The investment cost was high, at about $4,000 per ha of command area.

25. Nam Thach Han has a command area of 5,266 ha, for which cropping intensity is reported to have increased from 100 to 200%, as a result of the Project. The subproject supported installation of Viet Nam's first rubber dam, to raise the reservoir level, together with rehabilitation of the concrete overflow, the canal lining, and a major flood control structure (An Tiem inverted siphon and gated flood sluice). These works, for the most part, do not constitute flood damage repair. The structural works appear to have been well executed, and benefits include flood damage avoidance for 14,000 ha and an additional irrigated crop.

C. Project Costs

26. At appraisal, total project cost was estimated at $95.6 million, with foreign exchange costs of $37.5 million (39%). A loan of $76.5 million (including $2.6 million in loan service charges) financed 80% of project cost. Due to overestimation of costs at appraisal (ADB's cost norms being higher than those adopted by the EA) and local currency devaluation, potential loan savings of $15.9 million were identified in March 1999.[18] Of this amount, $11.5 million were allocated in August 1999 for use on the Hanoi dike extension subproject. In January 2000, $6.0 million (including $1.6 million not used for the Hanoi dike extension subproject) were allocated for flood damage repair in the irrigation extension subprojects. An amount of $2.5 million was cancelled from the loan in April 2003 (para. 30).

27. Total project expenditure amounted to $87.5 million, $8.1 million below the appraisal estimate, and comprised $29.5 million in foreign exchange costs and $58.0 million in local currency costs (Basic Data, Table C.1). The combined expenditure for civil works and equipment and materials was $9.9 million below the appraisal estimate. Land compensation cost exceeded the appraisal estimate by a large margin ($3.7 million, compared with the appraisal estimate of $1.1 million). The major cause of this was the increased resettlement

[17] The benefit monitoring and evaluation reports incorrectly state irrigable areas at twice the actual values.

[18] The EA's cost norms that derived from fixed-rate contracting, through state-owned enterprises, reflected then-current and nationally acceptable construction standards. Unit rates used for the Project's cost estimate were closer to international rates. Ultimately, the established practices prevailed, leading in some cases to nonachievement of the Project's construction-quality specifications.

scope and land compensation escalation during project implementation (para. 73). Administration cost was only $662,000, compared with an appraisal estimate of $2.2 million.

28. ADB's financing was $66.2 million, $10.3 million lower than originally envisaged. However, the Government's financing increased by $2.2 million (from $19.1 million to $21.3 million), due to increased land compensation. ADB's share of financing fell from the 80% envisaged at appraisal to 76%, while the Government's share increased from 20 to 24%.

D. Disbursements

29. An imprest account, with a ceiling of $3.0 million, was established at the State Bank of Viet Nam in August 1994, and disbursement began that year.[19] Contract awards and disbursements remained low until 1995 and peaked in 2000. The peak annual disbursement was $18.4 million. Contract awards and disbursements reached $63.6 million and $66.2 million, respectively.

E. Project Schedule

30. The Project was to be implemented within 5 years, with construction works to be completed by 30 June 1998, and all withdrawals from the loan account were to be made by 31 December 1998. Due to implementation delays, three loan closing date extensions were made by ADB, at the Government's request, extending the closing date to 31 December 2001. The loan account was kept open, to enable the EA to liquidate advances to the imprest account, giving a final loan closing date of 8 April 2003, at which time the unused amount of $2.5 million was cancelled. Implementation remained slow up to the midterm review, by which time the completion ratio for the subprojects ranged from 15 to 40%. At project completion, some relief wells on the Hanoi dike were completed (50% of the physical target). The major reasons for delays were (i) insufficient familiarity with ADB's procedures, on the EA's part; (ii) internal government procedures for bidding and bid evaluation and contract award (for the Bai Thuong weir contract); (iii) short annual construction window and occurrence of floods (e.g., flooding damaged the cofferdam at Bai Thuong and delayed work by 3 months); and (iv) expanded scope of works (para. 46).

F. Implementation Arrangements

31. The Project was implemented through MARD's CPO, with on-site management by SPOs. The SPOs' role was to (i) prepare and manage implementation schedules, (ii) supervise construction and ensure quality control, (iii) manage and monitor progress, and (iv) liaise with other relevant agencies. Local institutions that assisted implementation include (i) peoples committees, (ii) agriculture and rural development departments that supported SPOs, (iii) IMCs, and (iv) concerned districts and communes. Although CPO capacity was limited, the office developed into an effective implementation focal point.

32. Engineering input was provided by Viet Nam Hydraulic Investigation and Design Corporation, in association with Viet Nam Institute of Water Resources Research. Civil works were undertaken through LCB contracts, with the exception of eight packages of ICB contracts for ADB protection on Hanoi dike and one for rehabilitation of Bai Thuong weir.

[19] Turnover ratio was satisfactory and reached 2.76. Of the approved retroactive financing of $300,000, only $49,000 were used.

33. Implementation of the irrigation extension subprojects was simplified, with CPO reporting to the Ministry of Planning and Investment and MARD for approval of proposed works. The provinces were given greater responsibility for contract administration and construction supervision and reported to CPO, increasing the efficiency of project implementation.

G. Conditions and Covenants

34. The Government and the Ministry of Water Resources and/or MARD generally complied with the loan covenants, although the covenant relating to relocation of project-affected settlers was complied with late. Compensation payments were not made on time, due partly to inadequate counterpart funding by the Government.[20] The requirement of preparing an agricultural and socioeconomic review for the Song Chu and North Nghe An irrigation subprojects was not met until September 1995. The EA delegated this task to the implementation consultants (para. 43).

H. Related Technical Assistance

1. Operation and Maintenance Strengthening

35. The goal of TA 1968-VIE[21] was to achieve effective and sustained water resources development and management. The TA was designed to provide institutional and policy reviews and rapid technology transfer, to enable the Government to improve O&M of its existing water resources infrastructure. From August 1995, the TA provided 66 person-months of consultant input over a 23-month period, as opposed to 57 person-months at design. Consultant performance was considered satisfactory, although consultants experienced considerable difficulty with the complexity of institutional relationships. The TA's major achievements were establishing water users cooperatives (WUCs) and demonstrating the benefits of increased participation in irrigation O&M within pilot areas. Unfortunately, MARD and IMCs did not fully institutionalize the TA's recommendations on such aspects as promoting and supporting WUCs, to foster their continued functioning; giving O&M responsibility to provincial and lower levels of administration; and earmarking collected users fees for related service areas. Subsequent WUC atrophy may have been averted, if more time was built into the TA for gains consolidation and mainstreaming institutional changes into MARD and IMCs. The TA completion report is presented in Appendix 5, and the TA is rated successful.

2. Operation and Maintenance Development in the Irrigation Sector

36. The small-scale TA 2869,[22] a follow-up to TA 1968-VIE, was designed to strengthen water users participation in irrigation management at four locations within the Song Chu and North Nghe An schemes.[23] Based on preliminary evaluation data, WUCs supported by the TA achieved significant performance gains, compared with beneficiaries in other areas, and improved water use efficiency, through their participation in O&M. Again, the WUC concept was not institutionalized, and initial gains have eroded. The TA is considered successful.

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[20] Appraisal estimates were exceeded, due to underestimation of resettlement impacts compounded by changes in regulations affecting compensation levels.

[21] ADB. 1993. *Technical Assistance to the Socialist Republic of Viet Nam for Operation and Maintenance Strengthening.* Manila.

[22] ADB. 1997. *Technical Assistance to the Socialist Republic of Viet Nam for the Operation and Maintenance Development in the Irrigation Sector*. Manila.

[23] The TA provided 4.9 person-months of individual consultant input, against 2.9 person-months at design.

3. Strengthening of Resettlement Management Capacity in the Ministry of Agriculture and Rural Development

37. The small-scale TA 3064-VIE[24] planning, management, and monitoring capacity of CPO's resettlement unit for the Project and the Red River Delta Water Resources Sector Project.[25] The TA was successful in building the capacity of CPO's resettlement unit and bringing the Government's policies and procedures into line with those of ADB, and the consultants exceeded expectations.

I. Consultant Recruitment and Procurement

38. A team of international consultants was recruited to finalize the detailed rehabilitation works design and assist the EA with project implementation and monitoring, including procurement and construction supervision. MARD's lack of familiarity with ADB's procedures was a major cause of recruitment delay. The consultants' inputs totaled 111 person-months within a period of 72 months (June 1995–June 2001), against 94 person-months at design.

39. Civil works and equipment were procured in accordance with ADB's *Guidelines for Procurement*, and most civil works contracts were awarded to prequalified local construction companies. However, due to the EA's lack of familiarity with ADB's guidelines, it was accorded some flexibility, to accommodate Viet Nam's state-dominated contracting procedures. In line with this, in 1995 and 1996, 29 LCB civil works contract packages, with a total value of about $5.0 million, were initially rejected by ADB (because they were not awarded to the lowest bidders), but these packages were eventually allowed (as exceptional cases). Various supply contracts (for construction materials, equipment, and vehicles procurement), totaling $12.6 million, were envisaged at appraisal. This proved impractical, and only three supply contracts, amounting to $722,000, were awarded, through international shopping. Most materials were included in the civil works contracts.

40. Inadequate technical specifications, bid evaluation shortcomings, and EA unfamiliarity with ADB's guidelines led to procurement delays. The implementation consultants assisted the EA in managing tendering and contract award processes for subsequent procurement packages, and, as the EA gained experience, these difficulties were overcome.

41. At appraisal, ADB agreed to finance up to $1.2 million, on a force account basis, for the Hanoi dike and preparatory works in the Song Chu and North Nghe An subprojects. The amount was later increased to roughly $1.5 million.

42. Various supply contracts estimated at more than $500,000 were awarded through ICB, and smaller contracts were awarded through international shopping or direct purchase. Supply contracts for materials and equipment totaled $7.2 million.

J. Performance of Consultants, Contractors, and Suppliers

43. International consultant performance was generally satisfactory. Although consultants were initially kept at arm's length by the EA and not used as a source of knowledge and technical capability for problem resolution, the implementation consultants produced appropriate

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

[25] The TA provided 13.5 person-months of consultant inputs, as opposed to 12 person-months at design.

design reports and construction guidelines. They were given limited powers in relation to quality control and construction oversight and, at least initially, served mainly as intermediaries for dealing with ADB on issues of resettlement and monitoring and environmental management and progress reporting. The situation improved as the EA's confidence grew. The consultants' contribution to the technical design of Bai Thuong weir was greatly appreciated. However, they failed to complete all design and operating guidelines for the relief wells, and the EA contested some of their recommendations.

44. The international contractor engaged to rehabilitate Bai Thuong weir under the Song Chu irrigation subproject was competent and, after some initial delays, achieved construction deadlines. International contractors were also used for some contracts under the Hanoi dike subproject, mainly for pressure relief well installation, and their performance was generally satisfactory.

45. Local civil works contractor performance was generally satisfactory, in relation to local standards. Work quality varied, however, and the standard of some parts of irrigation extension subprojects is poorer than that achieved elsewhere. On the Hanoi dike subproject, local contractors were not always sufficiently experienced to achieve the specifications for relief wells.

K. Performance of the Borrower and the Executing Agency

46. The EA's ability to design and implement civil engineering works was satisfactory, with the possible exception of techniques for seepage control for Hanoi dike and reconstruction of major hydraulic structures.[26] However, the EA had limited experience in construction supervision, monitoring, and reporting for competitively tendered works. The EA's own complex and time-consuming review and approval procedures exacerbated implementation delays. During implementation, the EA introduced measures to streamline procedures and develop the requisite skills and capacity. MARD strengthened CPO to handle an increased workload, but CPO's resources nevertheless remained limited.

47. SPOs reported independently to MARD's senior management, bypassing CPO. This led to coordination and reporting problems between CPO and SPOs. SPOs were generally effective in construction management but did not always ensure compliance with contract specifications.

48. The Government improved its resettlement and land acquisition regulations and increasingly aligned them with *The Bank's Policy on Involuntary Resettlement*, and, following an April 1998 government decree, the EA established a resettlement unit and increased compensation and assistance for affected households (para. 73).[27]

49. The EA did not readily assimilate TA recommendations to improve implementation. However, considering the public administrative environment in which the EA operated, its overall performance was satisfactory. The Government provided, with some delays, adequate counterpart funds to complete the Project, and its overall performance was satisfactory.

[26] ICB contracts were included in the Project, to fill the knowledge gap for such works.

[27] ADB staff member instructions on good governance, involuntary resettlement, and indigenous peoples were not issued until February 1994, whereas the Project was approved on 26 October 1993. ADB's policy (R179-95: *The Bank's Policy on Involuntary Resettlement*, 12 September.) was approved in November 1995 and became operational in January 1996. The *Handbook on Resettlement: A Guide to Good Practice* was issued in 1998.

L. Performance of the Asian Development Bank

50. On several occasions, the EA requested ADB support to build its capacity for implementing ADB procedures, but these requests were not acted upon, due either to a lack of TA resources or an expectation of job improvement.[28] Subsequent difficulties experienced by the EA in procuring goods and services, negotiating contracts, managing finances, and undertaking monitoring and reporting caused delays and showed that much more attention should have been given to the EA's acknowledged lack of experience in these areas.

51. ADB fielded three missions during the first 2 implementation years and annual missions during the remaining years. Given the EA's lack of relevant project implementation experience, this level of administrative support was not sufficient. However, during the Project's early implementation stage, ADB displayed flexibility in applying its procurement guidelines, to accommodate the Government's own procedures, which were being revised with ADB support.[29] Throughout the implementation period, ADB advised MARD on subproject preparation, social assessment, design standards, construction supervision and quality control, and resettlement issues. ADB should have pursued with more vigor MARD's formal review and adoption of relevant TA outputs. Significant reforms were made by the Government, as a result of its experience working on this Project and the consistently strong support given by ADB staff members, which helped overcome procedural obstacles. Overall, ADB's performance is considered satisfactory.

52. ADB should have been more rigorous in its screening of subprojects nominated for flood damage repair. In particular, the nature of the flood damage and the relationship of claimed damage to reduced scheme performance should have been established with greater certainty. The scope of work should have been developed on the basis of actual flood damage, and unsuitable or unrelated works should have been excluded. Similarly, the need for environmental impact and resettlement studies should have been fully investigated and reported.[30]

III. EVALUATION OF PERFORMANCE

A. Relevance

53. The Project targeted government priorities and, accordingly, stressed rehabilitation and upgrading of degraded water resources infrastructure. Key policy reforms occurred immediately prior to project appraisal, and these impacted agricultural productivity, which tended to overshadow project achievements (Appendix 6, para. 11).

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[28] Under the Project, loan-financed implementation consultants were provided to assist the EA in mainly technical areas. The accompanying TA 1968-VIE (footnote 21) was also provided. Follow-up small-scale TAs were provided to strengthen water user participation and improve resettlement planning. ADB. 1994. *Technical Assistance to the Socialist Republic of Viet Nam for the Capacity Building in the Water Resources Sector*. Manila. accompanied Loan 1344-VIE(SF) (footnote 5). The TA produced comprehensive technical reports whose recommendations for improvements in project planning, design, execution, and system operations were limited to the Bac Hung Hai irrigation system. This TA was rated partly successful (ADB. 2002. *Project Completion Report on the Red River Delta Water Resources Sector Project*. Manila).

[29] ADB assistance was provided through ADB. 1994. *Technical Assistance to the Socialist Republic of Viet Nam for the Institutional Strengthening of Special Procurement Unit of the State Planning Committee*. Manila, and ADB. 1994. *Technical Assistance to the Socialist Republic of Viet Nam for the Institutional Strengthening of the National Office for Procurement Evaluation*. Manila.

[30] Resettlement done under the irrigation extension subprojects neither fully complied with ADB's then current guidelines nor followed the precedents developed under other subprojects (para. 73).

54. Agricultural production was declining, due to deteriorating irrigation headworks and distribution systems that constrained water delivery efficiency and reduced effective irrigation command areas. The Project was designed to reverse this decline by ensuring reliable water for irrigated agriculture, leading to increased rural incomes. The Project's relevance could have been increased if the focus was directed at irrigation's role within agriculture's socioeconomic context, rather than at mostly engineering aspects.

55. Changes to project design were introduced during the Project's midterm review.[31] These included making the EA responsible for developing a resettlement plan for the Hanoi dike subproject, preparing a follow-on small-scale TA (TA 2869–VIE [footnote 22]) for pilot participatory approaches for irrigation systems O&M, and extending the loan closing date. For the Song Chu and North Nghe An subprojects, small changes were made in the original scope, to allow some extension of canal rehabilitation and reallocation and cover increased costs on some items. The changes introduced were highly relevant and addressed project design weaknesses.

56. Based on loan savings identified during the 1997 midterm review, CPO and SPOs sought to extend the scope of rehabilitation for the irrigation subprojects.[32] In 1998, a request was also made to use loan savings to rehabilitate canals serving less than 500 ha. Although these works were considered appropriate, in that they would help ensure achievement of project objectives, action could not be taken by ADB because the EA considered low-level canals a purely provincial responsibility and a lack of unanimity existed among the Government's decision-making group. Hence, an official request was not made for a major change of scope involving loan savings use in irrigation subprojects.[33] The Hanoi dike extension was approved in August 1999, and this change of scope is considered to be only partly relevant. The 2000 change in scope, to use $6.0 million of loan savings for flood damage repair of water resources infrastructure in Quang Binh and Quang Tri provinces, was irrelevant to the original project objectives. Overall, the Project is assessed as relevant.

B. Efficacy in Achievement of Purpose

57. The Project's purpose for Hanoi dike was to improve protection against floods for a 42,000 ha area of Hanoi City and adjacent Ha Tay Province. The strengthened Hanoi dike improved security for the city's residents, but the intervention's efficacy is indeterminate. The relief wells' efficacy remains unclear. Flood protection embankments require constant vigilance, to ensure the system's structural integrity; prevent encroachment of human activity; detect and repair newly developed weak points (due to burrowing animals, minor slip failures, or embankment erosion, cracking, subsidence, etc.); and repair urgently any flood-induced damage. MARD's Department of Dike Management and Flood Control is capable and responsive to these needs, but its financial resources are limited.[34] The Hanoi dike subproject is assessed as highly efficacious.

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[31] Mission from 26 May to 6 June 1997.

[32] In the Song Chu irrigation scheme, the request covered the lining of an additional 22.5 km of the main canal and 45 km of a secondary canal. For the North Nghe An irrigation scheme, rehabilitation of 15 km of the Vach Bac drain and enlargement of the Bau Du sluice were requested.

[33] Some minor changes in scope were made to extend canal lining in the irrigation subprojects and for work on the Vach Bac drain and Bau Du sluice enlargement.

[34] In this context, the prediction of reduced O&M costs as a result of project interventions is misleading.

58. For the Song Chu and North Nghe An irrigation subprojects, the Project's purpose was to provide a reliable supply of irrigation water for 80,000 ha of cultivated areas in Thanh Hoa and Nghe An provinces, with the aim of achieving sustained rice production of 440,000 tons annually. The benefit monitoring and evaluation (BME) reports describing agricultural practices and productivity and financial performance did not include a baseline survey and did not assess changes in the with and without project situations.[35] Agricultural productivity grew rapidly throughout most of Viet Nam during the 1990s, in response to policy reforms that created greater incentives for improved input supplies and intensification, new land tenure arrangements, new or improved high yielding varieties, and more efficient water use. As these changes are not disaggregated within the BME, commune-level data from the Government Statistics Office were used to separate with and without project effects.

59. This analysis showed that the Project increased cropping intensity but had limited impact on rice yields. The Project only achieved an incremental increase of 11,714 ha in fully irrigated areas, against a target of 39,481 ha (30%), due to constraints beyond the Project's scope. Design weaknesses, including failing to integrate infrastructure improvements with water use decision making and address systems as a whole, led to a decoupling of project outcomes from outputs. The sustainability of returns through reduced risk of infrastructure failure cannot be reevaluated.[36] These schemes are rated less efficacious.

60. The irrigation extension subprojects repaired some flood damage but contributed little to development goals, agricultural productivity gains, or full irrigation achievement. They are considered to be inefficacious. Overall, the Project is assessed as less efficacious.

C. Efficiency in Achievement of Outputs and Purpose

61. The Project has three dissimilar investment packages: (i) Hanoi flood protection, (ii) irrigation scheme rehabilitation, and (iii) flood damage repair. Project outputs were achieved, but delays resulted from the EA's inexperience in ADB-financed projects and the need to follow Viet Nam's own, equally complex, project administration regulations and procedures.

62. The Hanoi dike subproject reduced the flooding frequency and intensity in Hanoi and thereby avoided damage to property, business outputs and agricultural production, and infrastructure. The economic internal rate of return (EIRR) was reestimated using the appraisal methodology, although a lower estimate of avoided damage was used, to offset a perceived overestimation at appraisal. This gives a base EIRR for Hanoi dike rehabilitation at over 62%, compared with 54% at appraisal. Cost savings amounting to about $17 million (35% of the appraisal estimate) more than compensate for the lower estimate of damage avoided. The EIRR indicates that the investment was highly efficient.

63. Each irrigation rehabilitation subproject's EIRR was reestimated using the appraisal approach. Their relatively low achievement of purpose (paras. 58 and 59) limits the benefits from a second irrigated crop. EIRRs based on increased agricultural production were found to be 6.4 and 8.4% for Song Chu and North Nghe An. Including reduced risk of structural failure

[35] The BME program included surveys in 1995, 1997, and 2000. The program provided limited environmental monitoring, based on periodic rather than continuous assessments. The terms of reference for environmental monitoring were themselves scant. Their major thrust was overuse of agrochemicals.

[36] The approach adopted during appraisal, based on risk of failure of the production systems, is considered inappropriate, because the approach is not based on measurable risk factors and does not consider risk reduction through such alternative actions as preventive maintenance.

of key infrastructure increases EIRRs to 7.3 and 9.5% (using the same assessment of risk adopted at appraisal). These EIRRs are low, due to (i) nonachievement of fully irrigated status; (ii) ongoing water distribution and availability constraints; (iii) limited yield response to the increased availability of water, compared with control areas; (iv) declining economic value of rice;[37] and (v) exclusion of lower level canals from scheme rehabilitation. The investment for the irrigation subprojects is therefore assessed as less efficient.[38]

64. Investment efficiency in flood damage repairs in the irrigation extension subprojects is difficult to assess, due to a lack of adequate prior feasibility assessments. Indicative impact data suggest that investment was inefficient, due mostly to the inclusion of works not strictly related to flood damage. The Project's overall EIRR, excluding the irrigation extension subprojects, is estimated to be 36.8%. The Project is assessed to be efficient.

D. Preliminary Assessment of Sustainability

65. Capital reinvestment and improved regular maintenance are prerequisites for project sustainability. As a result of O&M strengthening achieved under TA 1968-VIE (footnote 21), IMCs now have a higher water use fee collection rate, and fees cover current maintenance expenditure levels. For improved sustainability, however, fees collected from any scheme should be reinvested in that scheme and not used for other, sometimes unrelated, uses. Secondly, while the current maintenance level is covered by user fees, considering whether this is sufficient to maintain major infrastructure components is necessary. There are indications of significant deterioration in infrastructure that was considered to be in good working condition at appraisal, showing that insufficient reinvestment is built into the maintenance program. The current approach to asset management is oriented toward deferred maintenance and periodic capital reinvestment. Hanoi dike, however, is the exception, with higher maintenance levels and ongoing programs to consolidate the dike's integrity.

66. Project outcome sustainability is at risk, due to the partial rehabilitation of each scheme and inadequate consideration given to the socioeconomic context of irrigated agriculture. The promotion of participatory irrigation management under TA 1968-VIE and TA 2869-VIE (footnotes 21 and 22) demonstrated significant benefits from greater water user participation, which might compensate for design weaknesses. However, these lessons were not institutionalized.

67. Competition for available water is likely to become an increasing constraint within the economic life of irrigation infrastructure. The issues remain regarding the lack of a systems approach, need for institutional reform, and low participation of water users. Given MARD's current attention to such issues, project sustainability may improve. However, project sustainability (including the irrigation extension subprojects) is currently assessed as less likely.

E. Environmental, Sociocultural, and Other Impacts

68. The Project's environmental impacts are assessed to be neutral to negative. The Hanoi dike subproject created significant environmental benefits, through toe protection, sand boil reduction, and erosion reduction. However, the dike is now a main transport corridor for Hanoi

[37] Economic value of rice was D1,919 per kilogram (kg) at appraisal and was D1,500 per kg in 2002.

[38] The efficiency of the irrigation rehabilitation subprojects would have been greater if lessons learned from previous ADB projects had been fully incorporated in Project design. The major weakness is the lack of an independent feasibility study, to identify and rank constraints within the socioeconomic context of irrigated agriculture.

and increases congestion, noise, and pollution. The irrigation schemes created some negative environmental effects, including (i) blocked navigation and fish movement, due to river structures; (ii) reduced in-stream flows; (iii) increased use of fertilizers and other agricultural chemicals (56% increase from 1995 to 2000); and (iv) changed wetland functions, due to drainage improvements in some parts.

69. Beneficiaries believe the Project to have improved their quality of life, with improved access to water being the recurring theme. Access to water improved families' health status and reduced the number of water use conflicts among communes. Continuation of such conflicts can be attributed to a lack of water user participation in project implementation and the Project's concentration on infrastructure at the primary and secondary levels. Families believe themselves to have improved living standards, as a result of yield increases and agricultural diversification.

70. The Project was unable to address equity issues in project areas. Households complaining of limited or no access to water at appraisal still had little or no water at project completion, reflecting the focus on headworks and primary and secondary canal infrastructure. Households at the system's end received little or no benefit from the Project and, in some cases, suffer from poor drainage and waterlogged soil.

71. Gender roles are an important aspect of irrigated agriculture, a type of agriculture that increasingly involves women. With women contributing 60% of all labor, the increased water supply and use of herbicides did not bring about a reduction in their labor but rather an increase in labor to cope with the additional third crop.

72. The overall wealth of households, as assessed by the BME survey, increased. The number of households classified as low-income declined by 47 and 49% in Song Chu and North Nghe An, respectively, while the number of high-income households increased by 114% in Song Chu and 14% in North Nghe An. The Project generated some direct employment for local communities, and direct employment provided significant benefits and improved scheme ownership and maintenance.

73. Resettlement and land loss, related to infrastructure construction and management, represent the largest sociocultural impacts. The appraisal estimate for resettlement was 66 households. This increased to 307, with a further 1,616 households affected. Hanoi dike's construction and the provision of related access for maintenance impacted 188 ha during the construction phase. Inadequate resettlement planning, ongoing changes to the national policies and institutional responsibilities for resettlement, and difficulties in providing timely compensation were the main problems. The Project supported the development of resettlement procedures and processes that helped minimize resettlement's negative impacts. Resettlement arrangements provided successful outcomes, and resettled families generally achieved better circumstances than before the Project. Some equity issues arose, due to changing compensation rates and in response to changes in government regulations. Resettlement undertaken in the Quang Binh and Quang Tri subprojects did not reflect the lessons learned in the main subprojects, suggesting that the EA and ADB paid inadequate attention to this issue.

74. For the Hanoi dike subproject, approximately 2 million beneficiaries have reduced vulnerability to flood damage. For the irrigation subprojects, a total of 44,578 rural households benefit from irrigation system improvements. Although the economic benefit to water users in the irrigation subprojects was less than expected, the Project's overall environmental, sociocultural, and other impacts are assessed as moderate.

IV. OVERALL ASSESSMENT AND RECOMMENDATIONS

A. Overall Assessment

75. The Project was well implemented, although with significant delays, and MARD's ability to design, implement, and supervise important engineering works was improved from the experience. Hanoi dike's rehabilitation was highly successful, in terms of implementation and assessed efficacy and efficiency. The irrigation investments, which provided necessary rehabilitation and upgrading, raised major infrastructure to an adequate standard, but these investments did not raise major infrastructure to a standard sufficient to achieve expected project outcomes. The limited agricultural productivity gains, compounded by the declining economic price of rice, gave lower EIRRs than were predicted at appraisal. The irrigation subprojects are assessed to be partly successful and the irrigation extension subprojects unsuccessful. Overall, the Project is rated partly successful.[39]

B. Lessons Learned

1. Project Formulation and Design

76. The lack of PPTA contributed to reduced cost-effectiveness and inefficient use of funds. These negative contributions were manifested in a decoupling of project outputs from development outcomes. The major lesson learned was that greater attention needs to be given to project preparation. ADB should have ensured, before loan approval, that the EA's implementation procedures were compatible with ADB's and that probable sources of delay were eliminated through mutual agreement. ADB also missed an excellent opportunity to provide capacity-building TA to the EA.

77. The predominantly engineering approach failed to address constraints facing water users in irrigated agriculture. A wider systems approach that builds water user and water resource institution involvement would provide a more complete project formulation that is capable of achieving the stated goals. Future projects should include more effective involvement of primary stakeholders (farmer beneficiaries, water management groups, and IMCs) in project design.

2. Resettlement

78. The amount of resettlement required under the Project far exceeded the appraisal estimate. Although the EA managed to resettle most affected people and compensate those who lost assets in a manner that increased well-being and produced little discontent, the lack of a resettlement plan caused significant delays and increased counterpart fund requirements. In addition, project-gained experience was not applied to the irrigation extension subprojects. Resettlement planning should be integral to project preparation, including that for project extensions.

3. Operation and Maintenance

79. O&M continues to be less than that needed to ensure the schemes' integrity. IMCs retained the practice of not providing maintenance to new infrastructure for a period of 3–5

[39] This PCR is part of a sample of PCRs independently reviewed by the Operations Evaluation Department. The review has validated the methodology used and the rating given.

years, thus setting the stage for ongoing cycles of capital reinvestment that water user fees do not cover. Currently, water fees pay for routine O&M but do not provide reserves for capital reinvestment. IMCs showed themselves to be effective implementers, but their capacity to manage irrigation systems should be strengthened in all future projects. Most IMCs do not have O&M or business plans on which water fees and scheme performance can be based. A need also exists for greater accountability within IMCs for scheme performance.

4. Use of Loan Savings

80. Loan savings use, to carry out flood damage repairs in subprojects outside the original project area, was not cost-effective.[40] The irrigation extension subprojects did not have clear objectives or adequate needs and options assessments, and their selection criteria were not sufficiently rigorous to eliminate unsuitable schemes or works.[41] These subprojects are considered unsuccessful, and they detract from the Project's otherwise successful rating.

5. Benefit Monitoring and Evaluation

81. The EA did not understand the potential value of effective BME, and monitoring and evaluation during implementation were therefore sporadic. At project completion, no permanent BME unit existed for Hanoi dike or the irrigation subprojects. All future projects should give close attention to establishing effective monitoring and evaluation functions, and making these functions consistent with the Project Performance Management System and operational prior to commencement of any construction activities. Attention should also be paid to the terms of reference for monitoring and evaluation, to ensure that control areas are included and that these are consistent with project-impacted areas.

6. Capacity Building

82. Many project implementation delays and performance-related difficulties can be traced to the EA's lack of familiarity with ADB's project implementation guidelines and procedures. The EA's need for capacity building should have been more carefully examined during project preparation, and appropriate TA should have been included to complement physical works. CPO's implementing capacity is limited, due to its low status within MARD. CPO's role and status should therefore be strengthened, and CPO should be more effectively integrated into MARD.

7. Procurement and Technical Specifications

83. The relief wells for the Hanoi dike subproject were a completely new technique in Viet Nam, and their design should have been based on detailed geological investigations carried out as part of project preparation. The technical difficulties, however, proved too challenging for some local contractors. As a result, the number of installed relief wells fell short of specifications, and some wells have low efficiency. When new technical solutions are introduced, greater care is needed to engage suitably qualified and experienced consultants and contractors.

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[40] Flood damage repair outside the project area should be undertaken, under a separate loan, as emergency assistance. Loan savings could have been cancelled and used for such assistance.

[41] Subprojects were selected from among those irrigation schemes that functioned prior to the 1999 floods and for which flood damage could be repaired within the Project's limited remaining time. In their realization, however, the scope of work was not limited to flood damage repair

C. Recommendations

84. Recommendations specific to the Project and its accompanying TA, as well as those relevant to ADB's future operations in Viet Nam's water resources sector, are provided in Appendix 9.

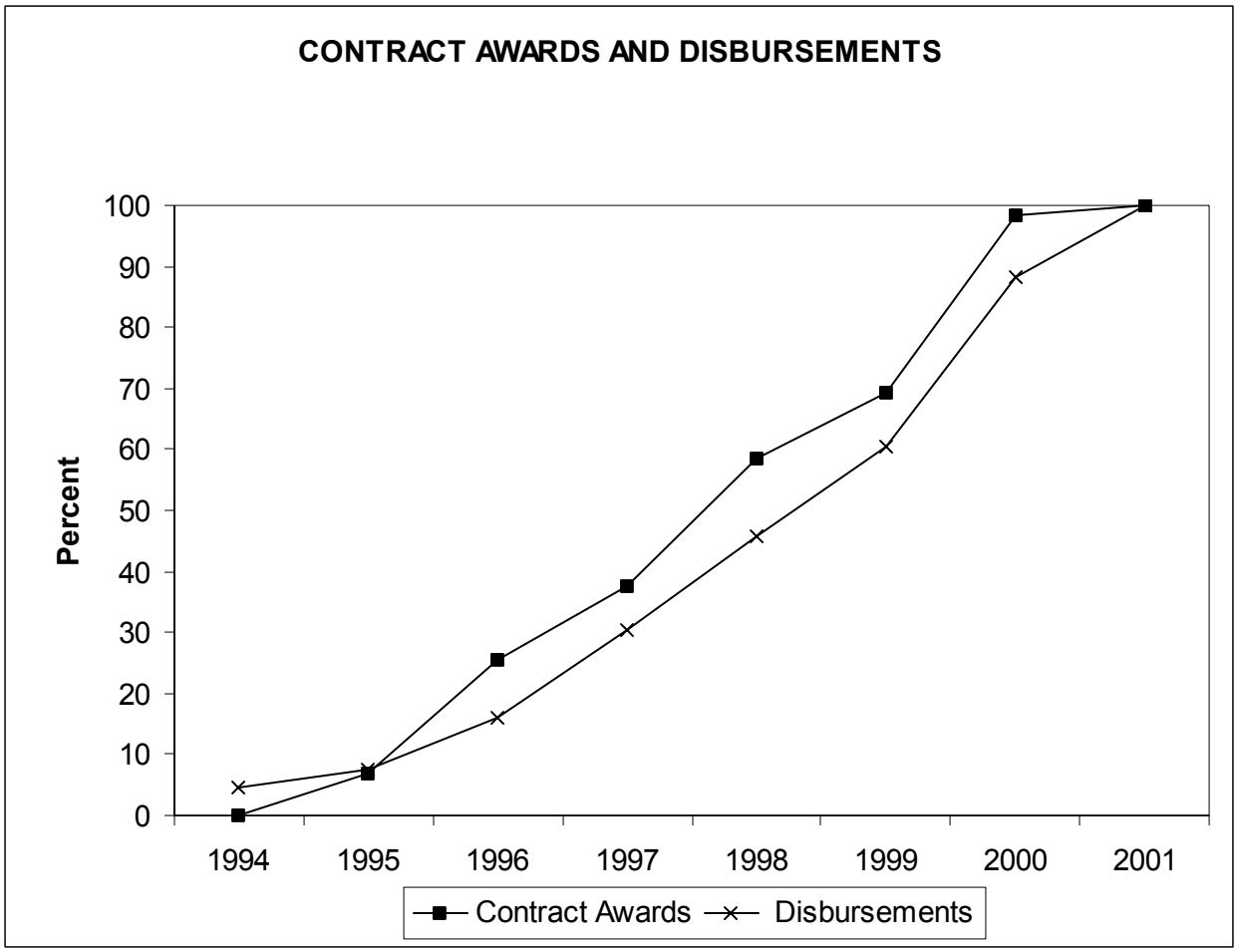
85. ADB has a special responsibility to ensure that its funds are used economically and efficiently. In addition, given Viet Nam's critical shortage of investment funds, ADB should not permit any shortcutting of normal preparatory activities. Hence, greater effort should be given to preparing projects and selecting the most cost-effective measures to achieve project objectives. The following specific recommendations are made:

(i) ADB must validate underlying assumptions and require that proposed project designs reflect circumstances in the field, including institutional and socioeconomic factors. PPTA should be used to assess causative factors to poor performance and formulate the most appropriate combination of interventions. This requires a holistic, systems-based approach to problem analysis and selection of appropriate response strategies, with participation by beneficiaries and project-affected people as an integral part of project preparation. Assessments of institutional and stakeholder perspectives should be carried out.

(ii) Loan proceeds should only be used for the purposes for which loans are approved, and attainment of immediate project objectives must be the main consideration in determining whether to cancel or use surplus loan proceeds.

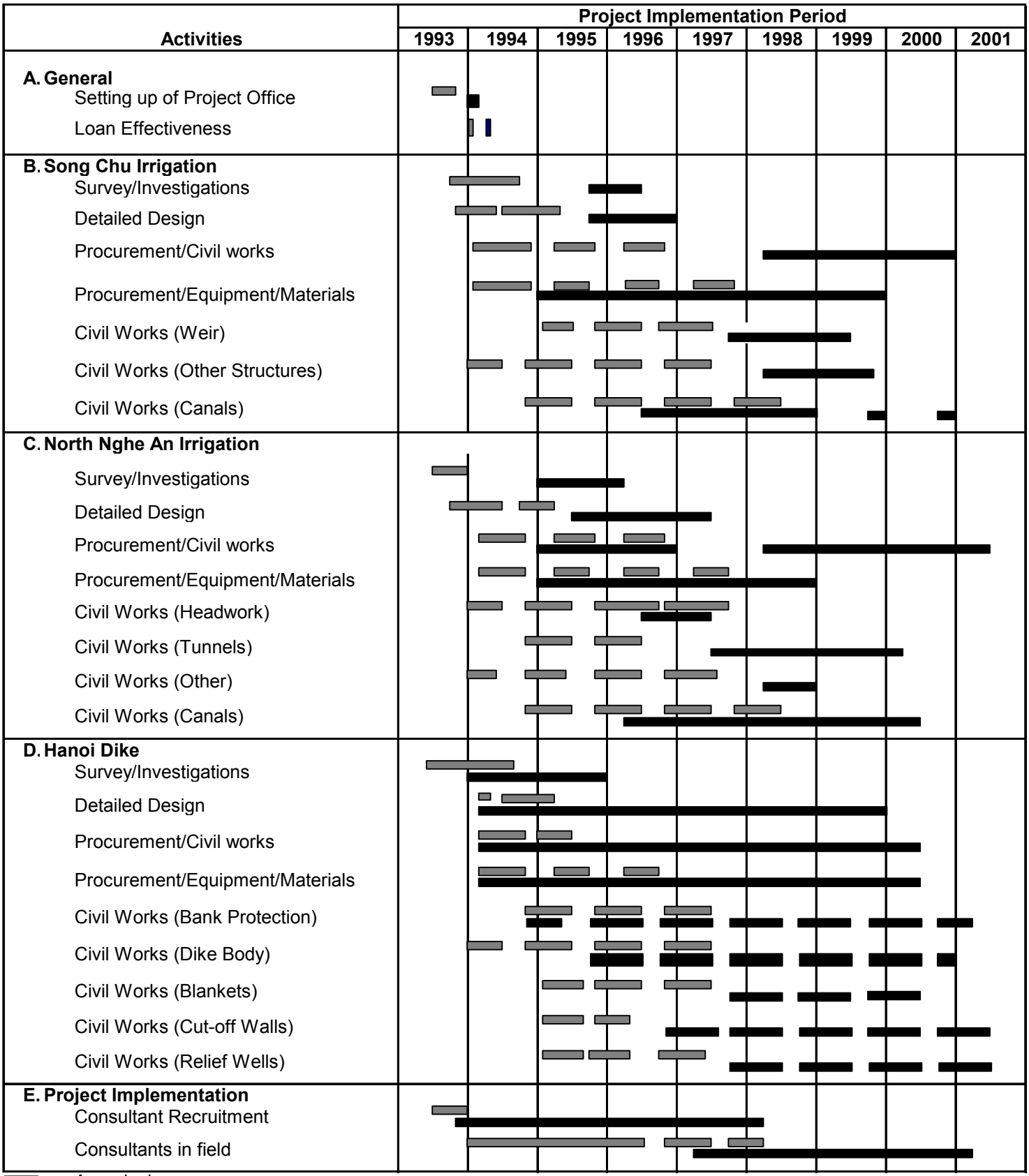
(iii) Implementation capacities of executing agencies should be carefully assessed and appropriate provisions made to allocate funds for technical and training support. ADB should be responsive to requests for capacity building or support for assistance in project implementation, particularly in relation to social and environmental analyses, and technical assistance should be included whenever weaknesses are noticeable in such areas within executing agencies.

86. For future project implementation, CPO should be integrated more fully into MARD's structure and given appropriate powers and resources. There should be clear career development paths for staff members assigned to CPO. Future sector programs should assist IMCs making the transition from irrigation administrators to water management service providers.



Source: Loan Financial Information System.

PROJECT IMPLEMENTATION SCHEDULE



Source: Report and Recommendation of the President.

SUMMARY OF SUPPLY CONTRACTS
Materials and Equipment

No.	Procurement Mode	Contract Signing	Source	Amount ($)	Approval Date	Nature of Goods and Quantity
1.	IS	7-Mar-96	Thailand	134,950	12-Mar-96	Geotextile (250,000 square meters)
2.	Direct	8-Nov-95	Viet Nam	321,906	—	Cement and steel bars
3.	IS	25-Aug-96	Republic of Korea	298,080	16-Aug-96	Geotextile (496,800 square meters)
4.	ICB	26-Aug-98	Viet Nam	157,558	16-Nov-96	Materials for river bank protection at Lien Tri
5.	ICB	26-Dec-96	Viet Nam	473,756	27-Nov-96	Materials for river bank protection at Lien Tri
6.	ICB	18-Dec-96	PRC	1,029,725	25-Nov-96	Materials for rehabilitation of Bai Thuong weir
7.	Direct	9-Sep-96	Viet Nam	89,802	—	Cement and steel bars
8.	ICB	2-Mar-98	Viet Nam	537,895	28-Jan-98	Materials for river bank protection at Phu Gia II
9.	ICB	2-Mar-98	Viet Nam	147,673	28-Jan-98	Materials for river bank protection at Lien Tri
10.	ICB	27-Dec-97	Viet Nam	131,833	17-Dec-97	Materials for Ba Giang I
11.	ICB	30-Jul-99	Viet Nam	206,545	14-Jun-99	Materials for river bank protection at Lien Tri II
12.	ICB	30-Jul-99	Viet Nam	497,471	14-Jun-99	Materials for river bank protection at Phu Gia III
13.	ICB	14-Apr-97	Viet Nam	434,268	13-Apr-00	Materials for river bank protection on Hanoi dike
14.	ICB	15-Apr-00	Viet Nam	529,071	13-Apr-00	Materials for river bank protection on Hanoi dike
15.	ICB	18-Apr-00	Viet Nam	139,944	13-Apr-00	Materials for river bank protection on Hanoi dike
16.	ICB	17-Apr-00	Viet Nam	555,951	13-Apr-00	Materials for river bank protection on Hanoi dike
17.	ICB	14-Apr-00	Viet Nam	526,257	13-Apr-00	Materials for An Canh III on Hanoi dike
18.	IS	7-Jun-95	Japan	374,424	13-Jan-95	Toyota Land Cruiser (12 units)
19.	Direct	12-Jun-95	Viet Nam	18,114	—	Equipment for consultant's office
20.	Direct	13-Jan-95	Viet Nam	50,319	—	Equipment for CPO and consultant's office
21.	Direct	11-Oct-96	Viet Nam	71,122	—	Various items of equipment
22.	Direct	17-Dec-98	Viet Nam	41,990	—	Various items of equipment
23.	Direct	15-Feb-00	Viet Nam	40,764	—	Various items of equipment
24.	Direct	15-Feb-00	Viet Nam	128,161	—	Various items of equipment
25.	Direct	24-Apr-97	Viet Nam	45,372	—	Various items of equipment
26.	Direct	24-Apr-97	Viet Nam	44,560	—	Various items of equipment

— = not available.

CPO = central project office; ICB = international competitve bidding; IS = international shopping.

Source: Loan Financial Information System.

STATUS OF COMPLIANCE WITH MAJOR LOAN COVENANTS

Covenant	Reference in Loan Agreement	Status of Compliance
The Borrower shall cause the Project to be carried out with due diligence and efficiency and in conformity with sound administrative, financial, engineering, environmental, and irrigation practices.	Loan Agreement, Section 4.01	Complied with.
The Borrower shall make available, promptly as needed, the funds, facilities, services, land, and other resources that are required, in addition to the loan proceeds, for carrying out the Project and for the operation and maintenance of project facilities.	Loan Agreement, Section 4.02	Complied with.
In the carrying out the Project, the Borrower shall cause competent and qualified consultants and contractors, acceptable to the Borrower and the Asian Development Bank (ADB), to be employed to an extent and upon terms and conditions satisfactory to the Borrower and ADB.	Loan Agreement, Section 4.03(a)	Complied with.
The Borrower shall cause the Project to be carried out in accordance with plans, design standards and specifications, work schedules, and construction methods acceptable to the Borrower and ADB. The Borrower shall furnish or cause to be furnished to ADB promptly, after their preparation, such plans, design, standards, specifications and work schedules and any material modifications subsequently made therein, in such detail as ADB shall reasonably request.	Loan Agreement, Section 4.03(b)	Complied with.
The Borrower shall ensure that the activities of its departments and agencies, with respect to carrying out the Project and operating the Project's facilities, are conducted and coordinated in accordance with sound administrative policies and procedures.	Loan Agreement, Section 4.04	Complied with.
The Borrower shall make arrangements satisfactory to ADB for insurance of the Project's facilities, to such extent and against such risks and in such amounts as shall be consistent with sound practice.	Loan Agreement, Section 4.05(a)	Complied with.
Without limiting the generality of the foregoing, the Borrower undertakes to insure, or cause to be insured, the goods to be imported for the Project and to be financed out of the loan's proceeds against hazards incident to the acquisition, transportation, and delivery thereof to the place of use or installation, and for such insurance any indemnity shall be payable in currency freely usable to replace or repair such goods.	Loan Agreement, Section 4.05(b)	Complied with. Contracts for imported goods were based on CIF (Cost, Insurance and Freight).
The Borrower shall maintain, or cause to be maintained records and accounts adequate to identify the goods and	Loan Agreement, Section 4.06(a)	Complied with.

Covenant	Reference in Loan Agreement	Status of Compliance
services and other items of expenditures financed out of the loan, to disclose the use thereof in the Project, to record the Project's progress (including the cost thereof).		
The Borrower shall (i) maintain separate accounts for the Project; (ii) have such accounts and related financial statements audited annually; (iii) send to ADB, not later than 6 months after the end of each related fiscal year, unaudited copies of such accounts and financial statements and, not later than 9 months after the end of each related fiscal year, certified copies of such audited accounts and financial statements and the auditors' report relating thereto, all in the English language.	Loan Agreement, Section 4.06(b)	Complied with. Audit reports were received on time.
The Borrower shall furnish to ADB quarterly reports on the carrying out of the Project and on the operation and management of the Project facilities.	Loan Agreement, Section 4.07 (b)	Complied with.
The Borrower shall ensure that the Central Project Office (CPO) is headed by the vice minister of the Ministry of Water Resources (MWR), as project director. CPO shall consist of a senior official of MWR, as project manager, and adequate numbers of full-time technical and administrative professional and supporting staff members of MWR.	Loan Agreement, Schedule 6, para. 1	Complied with.
The Borrower shall ensure that the project management committees are each headed by a senior official of MWR, as subproject manager, and provided with adequate office space and facilities.	Loan Agreement, Schedule 6, para. 2	Complied with.
The Borrower, in consultation with ADB, shall take the necessary steps to select and engage the consultants as soon as possible after the effective date.	Loan Agreement, Schedule 6, para. 3	Delayed compliance. Consultants were fielded in June 1995.
The Borrower shall ensure that the consultants complete an agricultural and socioeconomic review for parts B and C of the Project, not later than 6 months after the effective date.	Loan Agreement, Schedule 6, para. 4	Delayed compliance. Agricultural and socioeconomic reviews for Song Chu and North Nghe An schemes were done by the implementation consultants in September 1995.
The Borrower, in consultation with ADB, shall within 3 years of the effective date undertake a comprehensive midterm review of the Project's design and implementation.	Loan Agreement, Schedule 6, para. 5	Complied with. Midterm review undertaken in May and June 1997.
The Borrower shall ensure that CPO shall submit to ADB semiannual reports, in English and in formats acceptable	Loan Agreement, Schedule 6, para. 6	Complied with.

Covenant	Reference in Loan Agreement	Status of Compliance
to ADB, describing the status of project implementation and evaluating project benefits.		
The Borrower shall provide semiannual reports to ADB on the status of operation and maintenance of the Project's facilities at each subproject.	Loan Agreement, Schedule 6, para. 8	Complied with.
The Borrower shall take all necessary steps to: (i) ensure that the Project's design is carried out in such a way as to minimize the relocation of people living in the project area; (ii) ensure that all lands, rights, or privileges required for the Project are acquired promptly; (iii) ensure that adequate budgetary allocations are made for payments of compensation to people displaced by the Project; and (iv) ensure that displaced people are promptly, fairly, and adequately compensated.	Loan Agreement, Schedule 6, para. 9	Late compliance, due to delayed provision of counterpart funding.
The Borrower, through MWR, shall keep ADB informed of (i) annual budgetary expenditures of the Borrower for capital investments for water resources development, (ii) all policy decisions affecting the water resources sector, and (iii) all developments related to the financing of operation and maintenance of irrigation and flood control facilities.	Loan Agreement, Schedule 6, para. 10	Complied with.
The Borrower, in consultation with ADB, shall review the findings and recommendations of the technical assistance consultants and, in particular, shall prepare a work plan for adoption and implementation of cost recovery and operation and maintenance strengthening measures, based on such findings and recommendations.	Loan Agreement, Schedule 6, para. 11	Complied with.

TECHNICAL ASSISTANCE COMPLETION REPORT

Division: MKAE

TA 1968-VIE: Operation and Maintenance Strengthening[1]			Amount Approved: $1,800,000 Revised Amount: $1,800,000
Executing Agency: Ministry of Water Resources and Ministry of Agriculture and Rural Development (MARD)	Source of Funding: Japan Special Fund	Amount Undisbursed: $14,287	Amount Utilized: $1,785,713

Dates				
Approval: 24 Oct 1993	Signing: 30 Oct 1993	Fielding of Consultants: 16 Aug 1995	TA Completion Original: 31 May 1997 Actual: 30 July 1997	Account Closing: Original: 31 May 1997 Actual: 30 June 1998

Description

Loan 1259-VIE(SF)[2] provided $76.5 million for water resources infrastructure strengthening at three subproject sites. At the time of appraisal (March 1993), Viet Nam's water sector agencies had poor management information systems and were isolated from new technology and management systems for water resources infrastructure. The resultant focus on capital investment in infrastructure, as opposed to effective asset operation and maintenance (O&M), resulted in less-than-full realization of many of irrigated agriculture's potential benefits. To help correct this, the technical assistance (TA) was designed to provide institutional and policy reviews and rapid technology transfer that would enable the Government to improve O&M of its existing water resources infrastructure.

Objectives and Scope

The TA's objective was to develop water institution capacity, to sustain water resources development and management. The TA comprised three components: (i) O&M policy review (including local-level institutional frameworks and mechanisms for O&M, current levels of O&M expenditure, physical and operational status of facilities, O&M budgets, irrigation scheme management efficiency, and recommended policy and institutional reforms); (ii) staff member training (including training needs assessment, study tours provision, and in-country training); and (iii) pilot O&M strengthening at Song Chu and North Nghe An irrigation schemes (including training for O&M staff members).

Against the backdrop of the Ministry of Agriculture and Rural Development's (MARD's) limited exposure to new developments in the water resources sector and the renewed support from multilateral development banks, from 1993 onward, the TA was relevant, and its objectives and scope were appropriate. The TA's design is considered to have been less than optimal, given the (i) relatively low capacity of MARD to manage international consultants, (ii) ambiguous institutional relationship among MARD, provincial agricultural and rural development agencies, irrigation (and drainage) management companies (IMCs), and communes; and (iii) lack of financing under the loan to improve tertiary-level facilities at the two pilot schemes. Prior agreement on arrangements to review and approve TA outputs and subsequently incorporate the outputs into MARD's standard operating procedures would have been appropriate.

Evaluation of Inputs

Consultants. The TA design provided the services of 13 international consultants for 57 person-months (p-m), spread over two phases and amounting to 23 calendar months. The first phase of 46 p-m of input covered the initial reviews and the planning and establishment of the pilot areas. The second phase of 11p-m of input covered evaluation of the pilot areas and incorporation of lessons learned into policy and institutional reviews. By completion, the TA used a total of 66 p-m of consultant input (47 p-m in the first phase, 11 p-m in the second phase, and 8 p-m during the irrigation shutdown period). The changes to scheduling reflect the difficulties experienced in getting MARD to agree to proposed pilot programs and obtaining financing for essential infrastructure improvements that were not covered by the loan. Project delays meant that some essential parts of the headworks (the structure controlling the quantity of water entering a canal) and main canal system were not ready in time to meet the original schedule. The consultants completed the assignment within budget. However, insufficient time existed for a complete impacts evaluation. This was compounded by MARD's protracted approval processes. Overall, consultant performance was satisfactory.

Training. The consultants arranged a variety of workshops and training courses and study tours. Formal training was provided through the Hanoi Water Resources University, including on-the-job training with the respective IMCs. Water users training was delivered through a core training group that included two domestic external consultants and three

[1] ADB. 1993. *Technical Assistance to the Socialist Republic of Viet Nam for Operation and Maintenance Strengthening*. Manila.

[2] ADB. 1993. *Report and Recommendation of the President to the Board on a Proposed Loan and Technical Assistance Grant to the Socialist Republic of Viet Nam for the Irrigation and Flood Protection Rehabilitation Project*. Manila.

MARD counterparts. The core group was also used to evaluate the overall program for water users in 1997. The training received strong support from MARD and participants but was not institutionalized into ongoing training programs.

Equipment. The TA provided two four-wheel drive vehicles, one sedan car, five computers, and various other pieces of office and audiovisual equipment for the training program. Equipment was also provided for field surveys and testing. The equipment was appropriate for TA activities. Water measurement equipment should also have been included.

Overall Assessment and Rating

The TA introduced water users cooperatives (WUCs), helped establish better financial management within IMCs, introduced the concept of water allocations, determined water users fees at a level commensurate with O&M costs, and structured IMCs along hydraulic boundaries. The TA introduced new perspectives regarding organizing water users for O&M and demonstrated how they could bring about substantial increases in water use efficiency, particularly in times of water shortage. The gains, while limited, are significant achievements that contributed to follow-on institutional reforms in the water sector (e.g., through TA 2869-VIE).[3] Loan 1855-VIE(SF)[4] and Loan 2025-VIE(SF)[5] incorporated many of the TA's lessons. Many project outputs were not mainstreamed into MARD's policy framework and, as a result, are not extended and institutionalized beyond the pilot areas. Overall, the TA is rated successful.

Major Lessons Learned

Policy reform and development processes in Viet Nam were not well understood when the TA was being prepared. In addition, the Ministry of Water Resources and MARD had little, if any, experience in formulating programs for capacity building at provincial and lower levels. Total reliance on MARD was inappropriate, because financial and resource allocation issues are often linked more closely to the provincial people's committees communes than to MARD. Other relevant institutions should also have been represented in the planning and implementation processes. A greater understanding of the roles, rights, responsibilities, and relationships among water resource and administrative agencies is critical.

More time should be built into TAs aiming to have direct impacts on policies, and much more time is needed to consolidate gains made in pilot areas. Proper evaluation of the results also demands a longer TA consultant presence in the field.

WUCs were formed and have provided initial benefits in terms of reduced operating costs, improved water control and management, improved equity, higher crop yields, and fewer social conflicts based on water. However, the sustainability of WUCs requires greater financial security and more certainty over their empowerment. Again, considerably more time is needed to consolidate the changes and achieve lasting benefits.

Scheduling TA inputs in accordance with the annual irrigation shutdown period was not successful, because the various processes being introduced require continuous inputs.

Recommendations and Follow-Up Actions

(i) The policy reform process must be accelerated by MARD, to ensure more efficient use of resources in irrigation schemes and for future externally funded projects.

(ii) Greater emphasis must be given to IMCs and their capacity to reform and become more responsive to water users' needs.

(iii) MARD should establish a committee to review the technical and policy-related outputs of this and other similar TAs, to decide how their findings may be internalized into the organization, including in training programs at national, provincial, and lower levels.

Prepared by: Ian B. Fox Designation: Principal Project Specialist

[3] ADB. 1997. *Technical Assistance to the Socialist Republic of Viet Nam for the Operation and Maintenance Development in the Irrigation Sector*. Manila.

[4] ADB. 2001. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the Socialist Republic of Viet Nam for the Second Red River Basin Sector Project*. Manila.

[5] ADB. 2003. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the Socialist Republic of Viet Nam for the Phuoc Hoa Water Resources Project*. Manila.

ECONOMIC REEVALUATION

A. Introduction

1. The reevaluation uses the appraisal methodology with minor modifications. Project economic performance was estimated from cost information provided by the Central Project Office (CPO), and from the project benefit monitoring and evaluation (BME) system supported by data from site visits and official statistics.

2. The Project's objective was to reduce the vulnerability of the lives, assets, property, and sources of livelihood for local communities in three project areas. Increased certainty was to be provided through strengthening the infrastructure associated with flood protection (Hanoi dike) and irrigation schemes (Song Chu and North Nghe An). For flood protection, benefits were expected to flow directly from flood risk reduction. For the irrigation schemes, benefits were expected from the reduced likelihood of headwork failure and increased effectiveness of water distribution, leading to increased irrigation intensity and higher yields. Reduction in the risk level could not be recalculated, because risk of failure was assessed against a set of criteria not explicit in the documentation.[1]

3. Cost savings amounting to $15.9 million derived mainly from lower-than-expected costs for the Hanoi dike and Song Chu subprojects.[2] Of this, $6.0 million was reallocated in 2000 for flood damage repairs at four sites outside the original project area. These additional works were not included in the appraisal economic evaluation, and no economic evaluation was undertaken at the time of their inclusion in the Project—they have not therefore been reevaluated (para. 38).

B. Methodology and Assumptions

4. Project investment was taken from CPO cost data and ADB loan disbursement records. Project costs are listed (Basic Data, Table C.1).

5. The reevaluation was done in 2002 constant values. Foreign investment costs were converted to 2002 constant dollar values using the average annual exchange rate and adjusting by the manufacturing unit value index, as published by the World Bank. The 2002 constant dollar values were then converted to 2002 Vietnamese dong, by dividing by the average 2002 exchange rate. Local costs were converted to 2002 values using Viet Nam's gross domestic product deflator, as provided by the General Statistics Office (GSO). The economic farm gate prices of agricultural output (soybean, maize, and rice) and fertilizer were derived from World Bank commodity price projections. Locally traded goods were included at financial prices, in accordance with other ADB assessments in the sector and the economic reevaluation for Loan 1344-VIE(SF).[3]

6. Project costs include the financial costs of resettlement and land compensation, which were, according to the BME and consultants engaged on TA 3064-VIE,[4] fair market values. Following appraisal methodology, the opportunity cost of land taken out of production during construction or for Hanoi dike's right-of-way was not priced in the evaluation.

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[1] Given that the major infrastructure was designed to withstand a flood whose average recurrence interval is 100 years, the risk of failure is now assumed to be nil.

[2] Costs for the North Nghe An subproject were higher than those estimated at appraisal.

[3] ADB. 2002. *Project Completion Report on the Red River Delta Water Resources Sector Project*. Manila.

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

7. Operation and maintenance (O&M) costs were provided by subproject offices (SPOs) and irrigation (and drainage) management companies (IMCs). Major repairs and maintenance were included in the cash flow, as a 5% charge on capital every 5 years from project completion.

8. The estimation of benefits includes damage avoided due to reduced risk of dike and irrigation canal regulator failure and associated increases in agricultural productivity. The estimation of risk reduction is based on the product of the probability of a flood or storm and the probability of a structural failure. The joint probability is used to develop an expected value of losses or damage avoided. The probability cannot be reassessed ex post in a meaningful way, and the appraisal estimates were therefore used for the reevaluation. Estimates of damage were reevaluated, where possible, using data from project records, secondary data, and BME findings. An accurate estimate for Hanoi dike would require the development of an inundation model, backed up by surveyed data on businesses and households within the affected areas. This was not possible, and the appraisal models were used.

9. Appraisal and BME data were used to derive irrigated and irrigable areas. Difficulties arise from the variety of classes recorded, including command areas; gross areas; irrigable areas (which can be fully irrigated, partially irrigated, or not irrigated); and cropped areas. Project investments were limited to headworks and primary canals and short sections of secondary canals. Large parts of the secondary and tertiary canals and related structures were excluded. The Project also excluded pumping stations and water repumping, increasing the difficulty of establishing the extent of project benefits and costs. BME did not distinguish the within scheme distribution of costs and benefits with any rigor. Hence, appraisal assumptions were used.[5]

10. The cropping areas reflect the total summer, winter, and spring crop areas. The cropping intensity is the ratio between the irrigated and irrigable area. Crops other than rice include corn, potatoes, sweet potatoes, other vegetables, and winter crops (mainly groundnuts).

11. Cropped areas were derived from BME reports and are based on the average cropping intensity within each area, segregated by irrigation service type. Where any discrepancy existed between the recording of changed irrigation status (i.e., areas that changed from not irrigated to partly irrigated), a midpoint estimate was applied. Since BME commenced well after project implementation, the appraisal estimates were adopted as the before project situation. The evaluation and assessment reports for the Project adopt a before and after assessment framework, rather than a with and without approach. Hence, the after scenario recorded in the BME report and CPO project completion report (PCR) does not separate any external factors (such as changing crop varieties, technological advances, and policy reforms effects) whose impacts on Viet Nam's agricultural productivity were significant during the project implementation period. Key policy reforms occurred immediately prior to project appraisal, including *doi moi* (the market reforms program) and the 1993 land law reforms, which placed increasing land use rights with rural households. The effect of these was to double economic growth rates during the decade following project appraisal.

12. The effect of using a before and after impact model for benefit assessment therefore inflates the estimated agricultural productivity gains and overestimates the Project's impact. The

[5] For example, a plot classified as fully irrigated may be subject to social or economic constraints that limit the utility of the water supply provided under the Project.

BME reports provided extensive information on project sites but made no use of secondary data to triangulate areas and yield data or to interpret the findings.

13. For the reevaluation, a with and without project framework was applied. To obtain without project estimates (of areas and yields), secondary data at the commune level were obtained from the districts adjacent to project areas. Data from outside project-impacted areas were used to discern the extent of other influences on agricultural productivity, especially cropped areas and yields. Commune-level data were disaggregated into with and without project data sets that represent averages for cropped areas and crop yields (summer, winter, and third crops). From these sets, annual yield growth rates were derived for the with and without project cases, and these were compared with the yields estimated at appraisal (Table A6.1).

Table A6.1: With and Without Project Yields using Commune-Level Data

Song Chu Irrigation Scheme Yields (tons per hectare)

Item	1997	1998	1999	2000	2001	Change 1997–2001 (%)
With Project						
Spring Paddy	5.3	5.0	5.3	5.5	5.6	5
Autumn Paddy	3.4	3.4	4.0	4.2	4.3	25
Without Project						
Spring Paddy	3.6	3.4	3.6	3.8	3.8	5
Autumn Paddy	2.0	2.3	2.4	2.5	2.6	30

Sources: Central Project Office and subproject offices.

North Nghe An Irrigation Scheme Yields (tons per hectare)

Item	1997	1998	1999	2000	2001	Change 1997–2001 (%)
With Project						
Spring Paddy	5.7	5.59	5.41	5.6	5.7	0
Autumn Paddy	4.6	4.4	4.2	4.2	4.1	(1)
Without Project						
Spring Paddy	5.1	4.84	4.89	5.1	4.9	(5)
Autumn Paddy	4.1	4.29	3.99	4.0	3.9	(5)

Sources: Central Project Office and subproject offices.

14. Yields were derived by combining General Statistics Office, commune, and BME data to eliminate, as far as possible, the effects of externalities. Commune boundaries were used because project areas do not always encompass whole administrative districts. The data indicate that spring and autumn paddy yields have followed similar trends for with and without project cases. These data confirm the provincial trends that show that project impacts on yield

were relatively small. This differs from the BME and Central Project Office completion report findings, which refer to yield responses of up to 20% following project investment. At appraisal, a more modest increase of 9% in spring yield and 14% in autumn yield was estimated.

15. The costs of major inputs, for with and without cases, were based on BME data, which sampled 10% of communes (30 communes) and 3 households.[6] The net economic value of production was derived from areas, yields, prices, and input costs. The difference between the two was adopted as the change in economic value of production resulting from the Project. Although underemployment exists in the project area, labor was not shadow-priced, reflecting the approach adopted at appraisal. This is considered realistic, because labor increasingly migrates on a seasonal basis, to take on casual work. Nonetheless, a shadow wage rate of 75% of the assumed average rate of D13,000 per day was tested.

16. The economic price of unhusked rice (paddy) was based on the published value of Thai rice shipped from Bangkok. Corn price was based on the import parity price for corn from United States gulf ports. Economic prices were estimated for urea, triple superphosphate, and muriate of potash based on import parity price. Time series data for rice and corn, as well as for fertilizers, were taken from published World Bank data.

17. The price of paddy rice, in economic terms, fell substantially since appraisal, at which time the price was estimated at D1,408 per kilogram (kg), or about D2,400 per kg, adjusted to 2002. The implications of a rice price that remained stable at the appraisal level are shown in paras. 37 and 38.

18. The economic internal rate of return (EIRR) was calculated over 30 years (1994–2024) with no residual value, based on the expected life of major project investments.

C. Subproject Economic Performance

1. Hanoi Dike Rehabilitation

19. The Hanoi dike rehabilitation subproject consisted of engineering works, to overcome structural and hydraulic weaknesses and reverse encroachment of human activity. The subproject benefits 42,000 hectares (ha) of Hanoi city where 2.00 million people (1.75 million at appraisal) live and work, and protects 19,000 ha of agricultural land from flood risk. The significant risk of dike collapse, as reported at appraisal, was reduced, but the anticipated level of benefit due to reduced O&M cost may not have been realized.

20. To maintain consistency with the appraisal methodology, the economic reevaluation for this subproject was carried out on the basis of the original scope of work, without the downstream extension.[7] The benefiting area is under the direct protection of the Hanoi dike and, even if the downstream dike were to break, the study area would be largely unaffected.[8] Works included (i) riverbank protection structures (11.10 kilometers [km]); (ii) dike strengthening (30.90 km); (iii) wave protection and retaining walls (27.14 km); (iv) clay slurry grouting (12.30 km); and (v) dike foundation strengthening, including impervious blankets (0.60 km), pond filling (1.70 km), road resurfacing (16.00 km), and relief wells (223). The inclusion of relief wells was an adjustment made during the design phase. Achieving a high standard for the relief wells proved

[6] BME data were collected in 1995, 1997, and 2000.

[7] Nevertheless, the cost of the Hanoi dike extension was included in the economic reevaluation for the total Project.

[8] As noted at appraisal, the extension downstream (to the south) of Hanoi does not reduce flood risk for Hanoi.

to be difficult, and the Ministry of Agriculture and Rural Development curtailed the program toward the Project's end. Additional costs were incurred, due to significantly higher-than-expected resettlement and land compensation programs.

21. The Project's expected achievements were realized, and the dike is now capable of withstanding major flood events, as shown in 1996 and 1999. BME surveys indicate that local communities perceive significant improvements in their lives as a result of the subproject. Data on resettlement and land compensation proved hard to compile and were not available in some instances. The PCR Mission found that resettlement was completed to a satisfactory standard, given the Executing Agency's previous lack of experience in such matters.

22. The benefits (or damage avoided) arising from the Project were not reassessed by the BME report. The basic appraisal data set is the only one on which to estimate likely benefits. The BME report, nevertheless, reviewed the appraisal assumptions and found the possible damage to have been overstated. The PCR Mission also concluded that little observable evidence exists of the scale of losses claimed at appraisal. Discussions during the PCR Mission showed that local communities developed adaptive strategies to reduce or minimize the disadvantages of floods. Housing, industry, and infrastructure continue to be developed and flourish on the dike's river (unprotected) side, where the prices of houses are only marginally lower than those on the dike's protected side. This would tend to indicate that the disadvantages of floods are offset by the advantages of close proximity to the city's center. Conversely, for agricultural land, a threefold difference exists in capital value between the dike's protected and unprotected sides, indicating that flooding has significant negative impacts on agricultural production. The PCR Mission concluded that the appraisal estimates of potential damage may have been overstated, and the more conservative estimates of damage made by the BME report was therefore adopted for the economic reevaluation.[9]

23. The base EIRR for Hanoi dike rehabilitation was estimated to be more than 62%, compared with 54% at appraisal (Table A6.9). The subproject cost saving of 35% of the appraisal estimate more than offset the lower damage estimate. Under any set of assumptions, the Hanoi dike rehabilitation has a high EIRR.

2. Song Chu Irrigation Scheme Rehabilitation

24. Rehabilitation of the Song Chu irrigation scheme aimed to achieve full irrigation of the command area and reduce the risk of structural failure. The Song Chu irrigation system covers a gross area of 70,000 ha, of which 57,555 ha are cultivated. The area supported an estimated 200,000 rural households, at appraisal. Thanh Hoa City, with a population of 130,000, also draws its water supply from the irrigation system. Song Chu irrigation scheme was designed in the 1920s to irrigate 50,000 ha, against an appraisal estimate of 50,933 ha.

25. The works were completed successfully in June 2001, using international competitive bidding (ICB) and local competitive bidding (LCB). The scope included (i) weir and headworks rehabilitation; (ii) main canal resectioning and lining (16.2 km) and related structures; (iii) north and south canal resectioning and lining (80.0 km); and (iv) secondary canal resectioning and lining (17 canals, amounting to 220.0 km). Only 15–20% of the secondary canal system—equivalent to 1.0 km on each canal—was rehabilitated. Despite cost savings, complete rehabilitation was not attempted. Funds amounting to $6 million were reallocated to the irrigation

[9] The average annual damage was estimated at appraisal to be D678,147 billion, although a lower value (D489,196 billion, or 72% of the estimate) was used in calculating the appraisal EIRR.

extension subprojects. Rehabilitation of about 191.0 km of tertiary and quaternary canals was done concurrently by beneficiaries, with local government support.

26. Table A6.2 shows the levels of achievement of the irrigation target (100% fully irrigated, equivalent to a conversion of 21,717 ha to fully irrigated status) at appraisal, midterm review, and completion. By the time of the PCR Mission, the increase was only 4,737 ha, representing 22% of the target. BME data show that the rain fed area was completely transformed during the Project, but commune-level data indicate that the rain fed area declined from 3,676 ha in 1997 to 3,399 ha in 2001, while the area of winter crops increased from 14,300 ha to 15,300 ha. The economic reevaluation used the appraisal and BME data for changes in yields and cropping intensity in the with project case and commune-level data for changes in without project yields and cropping intensities.[10]

Table A6.2: Status of Irrigation Service in the Song Chu Irrigation Scheme

Irrigation Status	Appraisal	Midterm Review (1997)	Completion (2000)	Increase as Percentage of Target
Fully Irrigated	29,716	32,877	34,453	22%
Partially Irrigated	17,884	17,556	16,480	
Rain Fed	3,333	500	0	
Total	**50,933**	**50,933**	**50,933**	
Cropping Intensity at Appraisal (%)	192		209	
Cropping Intensity from BME (%)	173		218	
Cropping Intensity from PCR (%)	188		210	

BME = benefit monitoring and evaluation; PCR = project completion report.
Sources: benefit monitoring and evaluation and appraisal reports.

27. The limited increase in fully irrigated area can be attributed to a number of factors. The irrigation system was designed to convey only 1 liter per second for each hectare of service area, which is low in the months of April and May. In addition, the water available for diversion from the Song Chu River at that time was already heavily committed. Water pumping and repumping, which increase the level of water use efficiency and contribute to achievement of fully irrigated status, were not factored into the appraisal evaluation. Areas benefiting from pumping increased from 5,449 ha in 1995 to 11,538 ha in 2000, according to BME reports.[11] The exclusion of pumping and tertiary-level components from the Project's scope raises questions as to the appropriate area for assessing impacts.

28. Drainage is a significant constraint because about 20% of the command area is waterlogged in an average year, increasing to 40% in wet years, such as 1996 and 1997. The effect of poor drainage is to delay the second crop and reduce rice yield. In some areas, poor

[10] Apart from commune data from nearby areas that were not covered by the Project, no data exist for the without project scenario, against which appraisal projections would be verified.

[11] Claims that farmers at the lower levels have reduced pumping costs as a result of the Project are difficult to separate and have not been included in the reevaluation.

drainage precludes the planting of a second crop and sometimes also a third crop (usually of vegetables).

29. At appraisal, the weir and intake structures were identified as major system weaknesses, and the risk of their failure was a large part of the justification for rehabilitation. The probability of failure during the 1998–2003 period, from flooding events similar to those experienced in 1962 and 1980, was estimated by local engineers to be 10–40%. However, the joint probability of a large flood and structural failure ranges from only 2% in year 1 to 5% in year 30. This relatively low probability of failure was not adequately considered during appraisal. For example, no assessment was made of the potential of increased preventive maintenance to manage the risk and how this could have led to restructuring the investment. Furthermore, no effort was made to understand the risk from the perspective of water users and their adaptive strategies for coping with limited water availability. The limited incremental gains and water users' high reliance on pumping and repumping indicate that the investment in rehabilitation did not address critical constraints to water use.

30. No reevaluation of the appraisal risk assessment and expected damage was made, except to update the costs to 2002 values. Given the small impact of these on the EIRR, they were not addressed further.

31. The reevaluation used a yield increase for spring and autumn crops of 6 and 3% per annum with and 5 and 2% per annum without the Project. The base-case EIRR was estimated to be 6.4% compared with 13.9% at appraisal, the major factors being low achievement of fully irrigated status; limited increase in yields; and markedly lower paddy price of D1,919 per kg, compared with D2,400 per kg (2002 equivalent) at appraisal. These effects are only partly offset by lower capital investment. The EIRR increased to 7.3%, with the inclusion of the value of risk reduction in the benefit stream. The subproject is assessed to have been less efficient.

3. North Nghe An Irrigation Scheme Rehabilitation

32. The North Nghe An scheme covers a gross area of 36,000 ha, of which 34,700 ha are cultivatable and 30,000 ha can be commanded by the irrigation system. At appraisal, only 12,000 ha were classified as fully irrigated, because of the poor condition of the intake and distribution network, including a tunnel on the main canal that is upstream of 85% of the total command area. The rehabilitation objective was to reduce the risk of structural failure, particularly of the tunnel, which was considered to be at greatest risk.[12] As for the Song Chu scheme, the joint probability of failure would be relatively low (in the range 3–5% in years 1 through 10, increasing to 33% for years 20 through 30).[13]

33. The Ministry of Agriculture and Rural Development successfully implemented the works using ICB and LCB procurement, with construction running from 1996 to 2001. The works included (i) Do Luong weir and headworks; (ii) main canal resectioning and partial lining (56 km), existing tunnel rehabilitation, and new tunnel construction (500 meters); (iii) secondary canals resectioning and partial lining (89 km), together with related structures; (iv) Vach Bac drain improvements (13 km); and (v) weir and enlarged drain (4 km) construction for the Bau Ru sluice. The works reduced the risk of structural failure, although the additional tunnel is of limited value, due to water shortages in the dry season.

[12] Although a detailed survey of the condition of the tunnel was not undertaken, the risk of a tunnel failure during a typhoon (3-year average recurrence interval) was assessed at appraisal to be 10–20% during the first 3 years, rising to 90% at 10 years. The tunnel was only partially rehabilitated and continues to operate.

[13] Assuming that the risk of structural failure is assessed without bias.

34. The expected outcome from the provision of improved infrastructure was to achieve fully irrigated and double-cropped status for the entire command area of 30,000 ha.[14] Table A6.3 shows the levels of achievement of the irrigation target (100% fully irrigated, equivalent to a conversion of 17,764 ha to fully irrigated status) at appraisal, midterm review, and completion. By the time of the PCR Mission, the increase was only 6,977 ha, representing 39% of the target. The low level of achievement was compensated for, to an extent, by a larger-than-expected use of winter vegetable crops, giving a higher cropping intensity than anticipated at appraisal. The extent to which vegetable production would have increased without the Project is unknown. As for the Song Chu scheme, the economic reevaluation used appraisal and BME data for changes in yields and cropping intensity in the with project case and commune-level data for changes in without project yields and cropping intensities. In contrast with BME data, commune data indicate that rain fed areas have not declined (8,827 ha in 2001, compared with 8,692 ha in 1997). The commune data also indicate limited gains since 1997 in the fully irrigated area (1.5%, or about 200 ha).

Table A6.3: Status of Irrigation Service in the North Nghe An Irrigation Scheme

Irrigation Status	**Appraisal**	**Midterm Review** (1997)	**Completion** (2000)	**Increase as Percentage of Target**
Fully Irrigated	11,786	13,571	18,763	39%
Partially Irrigated	10,133	10,523	11,287	
Rain Fed	6,731	5,956	0	
Total	**28,650**	**30,050**	**30,050**	
Cropping Intensity at Appraisal (%)	186		200	
Cropping Intensity from BME (%)	179		224	
Cropping intensity from PCR (%)	176		211	

BME = benefit monitoring and evaluation; PCR = project completion report.
Sources: Benefit monitoring and evaluation and appraisal reports.

35. The limited increase in fully irrigated area can be attributed to a number of factors. Only part of the total scheme was rehabilitated, limiting the ability to supply adequate water throughout the command area. As for the Song Chu scheme, water pumping and repumping were not considered,[15] and some known drainage problems were not addressed.[16] In addition, an expected reduction in sedimentation at the weir intake, following weir improvements, did not eventuate, suggesting that additional investment will be needed to ensure adequate diversions to the main canal. Crop yield response was impressive for the with and without project cases, and the reevaluation applied yield increases for spring and paddy rice, as shown in Table A6.4.

36. The base-case EIRR was estimated to be 8.4%, compared with 22.0% at appraisal. The EIRR increased to 9.5%, with the inclusion of the value of risk reduction in the benefit stream.

[14] The command area is stated to be 29,000 ha by CPO and SPO staff.

[15] About 19% of the total irrigated area depends on pumping, to a greater or lesser extent.

[16] About 20%, on average, of the total area is waterlogged, increasing to 72% in wet years.

The largest impact on EIRR derived from the amount of labor included in the farm production models. The subproject is assessed to have been less efficient.

Table A6.4: Yield Responses for North Nghe An

Crop	Annual Increase in Crop Yield by Period (%)		
	1993–1997	1997–2000	2000–2002
Spring Paddy Rice (with)	9.0	4.5	4.0
Spring Paddy Rice (without)	9.0	4.0	4.0
Autumn Paddy Rice (with)	11.0	3.0	3.0
Autumn Paddy Rice (without)	10.0	2.5	2.5

Source: Central Project Office, subproject offices, and benefit monitoring evaluation reports.

D. Overall Economic Performance

37. The Project comprised two separate types of investment, the first being highly efficient rehabilitation of the Hanoi dike, to provide improved flood protection, and the other being the less efficient investment in irrigation rehabilitation. The overall Project, including overhead expenses and management costs but excluding the irrigation extension subprojects, has an estimated EIRR of 36.8%. The Project is assessed to be efficient. The sensitivity estimates for each subproject and the overall Project are in Table A6.5.

Table A6.5: Sensitivity Analysis of Economic Internal Rate of Return

Subproject	Base Case	SCF 0.9	Appraisal[a]	Shadow Wage Rate	With Risk Reduction
Hanoi Dike	62.6	65.2	—	—	—
Song Chu	6.4	7.1	11.4	11.7	7.3
North Nghe An	8.4	9.2	14.5	14.2	9.5
Total Project	**36.8**	**41.5**	**—**	**—**	**37.4**

— = data not available.
EIRR = economic internal rate of return; SCF = standard conversion factor.
[a] Using a paddy price of D1,919 per kilogram, compared with the appraisal price of D2,400 per kilogram (2002 equivalent).
Source: Staff estimates.

38. The efficiency of investment in flood damage repairs in the irrigation extension subprojects is difficult to assess, due to a lack of adequate prior feasibility assessments. Indicative impact data suggest that the investment was inefficient, due mostly to the inclusion of works not strictly related to flood damage.

Table A6.6: Project Investment Costs, Crop Areas, and Incremental Benefits

Item	Unit	1994	1995	1996	1997	1998	1999	2000	2001	2002
Investment Costs										
Total Foreign Cost	D bil	10.4	6.7	17.1	28.3	44.1	47.4	40.3	17.3	—
Total Local Cost	**D bil**	**20.5**	**16.0**	**53.5**	**79.9**	**133.0**	**160.0**	**112.7**	**55.5**	—
Total Investment Cost	D bil	30.9	22.7	70.5	108.2	177.1	207.4	153.0	72.8	—
US Dollar Equivalent	$ mil	2.8	2.1	6.4	9.5	13.3	14.9	10.8	4.9	—
Total O&M	**D bil**	**0.4**	**0.6**	**7.1**	**10.8**	**13.8**	**18.4**	**19.8**	**19.9**	—
Total Cost	**D bil**	**31.3**	**23.3**	**77.6**	**119.0**	**190.9**	**225.8**	**172.8**	**92.7**	—
Economic Costs										
Foreign Cost (2002 D)	D bil	16.7	11.1	24.9	40.0	53.3	57.7	44.3	17.3	—
Local Cost (2002 D)	D bil	35.0	23.4	71.9	100.8	154.0	175.3	116.4	56.5	—
Total Investment Cost	**D bil**	**52.4**	**45.8**	**114.6**	**151.3**	**218.0**	**243.2**	**168.4**	**82.8**	—
Equivalent Cost (2002 $)	$ mil	3.4	3.0	7.4	9.8	14.1	15.7	10.9	5.3	—
Incremental O&M Costs	D bil	0.6	1.0	6.0	10.1	13.9	19.0	21.2	21.4	—
		1994	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Land Use—Without Project										
Irrigated Area Song Chu	'000 ha	44.5	44.5	44.5	44.5	44.5	44.5	44.5	44.5	44.5
Irrigated Area North Nghe An	'000 ha	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7
Nonirrigated Area Song Chu	'000 ha	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Nonirrigated Area North Nghe An	'000 ha	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Cropped Area	'000 ha	148.8	153.1	158.0	156.3	156.3	156.3	156.3	156.3	156.3
Cropping Intensity	%	174%	179 %	184%	182%	182%	182%	182%	182%	182%
Land Use—With Project										
Irrigated Area Song Chu	'000 ha	44.5	45.6	46.6	47.6	48.4	49.3	50.1	50.9	50.9
Irrigated Area North Nghe An	'000 ha	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7
Nonirrigated Area Song Chu	'000 ha	6.4	5.4	4.4	3.3	2.5	1.7	0.8		
Nonirrigated Area North Nghe An	'000 ha	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Cropped Area	'000 ha	148.8	153.1	159.3	158.6	161.5	165.0	171.4	171.4	171.4
Cropping Intensity	%	174%	179 %	186%	185%	188%	193%	200%	200%	200%
Cropped Area—Without Project										
Spring Rice Song Chu	'000 ha	44.5	44.6	44.7	44.5	44.5	44.5	44.5	44.5	44.5
Spring Rice North Nghe An	'000 ha	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4
Summer Rice Song Chu	'000 ha	39.6	40.4	41.2	39.6	39.6	39.6	39.6	39.6	39.6
Summer Rice North Nghe An	'000 ha	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2
Other	'000 ha	19.0	22.5	26.4	26.4	26.4	26.4	26.4	26.4	26.4
Total	**'000 ha**	**148.8**	**153.1**	**158.0**	**156.3**	**156.3**	**156.3**	**156.3**	**156.3**	**156.3**
Cropped Area—With Project										
Spring Rice Song Chu	'000 ha	44.5	44.6	44.7	44.8	45.3	45.8	46.9	46.9	46.9
Spring Rice North Nghe An	'000 ha	24.8	23.4	23.4	23.4	23.8	24.7	24.8	24.8	24.8
Summer Rice Song Chu	'000 ha	39.6	40.4	41.2	39.6	40.4	41.2	44.3	44.3	44.3
Summer Rice North Nghe An	'000 ha	24.8	22.2	22.2	22.2	22.7	23.2	24.8	24.8	24.8
Vegetables	'000 ha	15.1	22.5	27.8	28.5	29.3	30.0	30.7	30.7	30.7
Total	**'000 ha**	**148.8**	**153.1**	**159.3**	**158.6**	**161.5**	**165.0**	**171.4**	**171.4**	**171.4**
Crop Yields—Without Project										
Spring Rice Song Chu	t/ha	4.0	4.2	4.4	4.6	4.9	5.1	5.4	5.4	5.4
Spring Rice North Nghe An	t/ha	3.1	3.4	3.7	4.1	4.2	4.4	4.6	4.8	5.0
Summer Rice Song Chu	t/ha	3.3	3.4	3.4	3.5	3.6	3.6	3.7	3.7	3.7
Summer Rice North Nghe An	t/ha	2.6	2.8	3.2	3.5	3.6	3.7	3.8	3.9	4.0

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Table A6.6 - *Continued*

Item	Unit	1994	1995	1996	1997	1998	1999	2000	2001	2002
Production (t)										
Spring Rice Song Chu	'000 t	178.1	187.3	197.0	206.2	216.5	227.3	238.7	238.7	238.7
Spring Rice North Nghe An	'000 t	73.6	80.2	87.4	95.3	99.6	104.1	108.2	112.6	117.1
Summer Rice Song Chu	'000 t	130.7	136.0	141.4	138.7	141.5	144.3	147.2	147.2	147.2
Summer Rice North Nghe An	'000 t	56.9	63.2	70.1	77.9	79.8	81.8	83.8	86.2	88.6
Total Rice Output	**'000 t**	**439.3**	**466.7**	**496.0**	**518.1**	**537.4**	**557.5**	**578.0**	**584.6**	**591.6**
Total Value	D bil	937	1122	1336	1312	1413	1193	1061	944	1043
Production Costs	D bil	918	965	993	963	951	937	943	938	938
Net Value of Production	**D bil**	**19**	**157**	**342**	**350**	**462**	**257**	**119**	**6**	**104**
Crop Yields—With Project										
Spring Rice Song Chu	t/ha	4.0	4.2	4.4	4.7	5.0	5.3	5.6	5.6	5.6
Spring Rice North Nghe An	t/ha	3.5	4.0	4.4	4.8	5.0	5.2	5.5	5.7	5.9
Summer Rice Song Chu	t/ha	3.3	3.4	3.4	3.5	3.6	3.8	3.9	3.9	3.9
Summer Rice North Nghe An	t/ha	2.4	3.0	3.4	3.7	3.8	3.9	4.1	4.2	4.3
Production (t)										
Spring Rice Song Chu	'000 t	178.1	187.3	197.0	209.5	224.6	240.8	260.9	260.9	260.9
Spring Rice North Nghe An	'000 t	86.7	94.5	103.0	112.3	119.0	129.2	135.4	140.8	146.4
Summer Rice Song Chu	'000 t	130.7	136.0	141.4	140.1	147.1	154.5	171.2	171.2	171.2
Summer Rice North Nghe An	'000 t	60.5	67.1	74.5	82.7	87.1	91.7	100.6	103.7	106.8
Total Rice Production	**'000 t**	**456.0**	**484.9**	**515.9**	**544.6**	**577.9**	**616.2**	**668.2**	**676.6**	**685.3**
Total Value	D bil	968	1160	1393	1412	1554	1355	1261	1126	1240
Total Costs	**D bil**	**970**	**1029**	**1065**	**1028**	**1029**	**1029**	**1083**	**1074**	**1074**
Net Value of Production	**D bil**	**(2)**	**131**	**328**	**384**	**525**	**326**	**179**	**51**	**165**
Incremental Value	D bil	(21)	(26)	(15)	35.0	63	70	60	46	61
Additional Working Capital	D bil	8	3.0	4.0	1	5	6	11	(1)	0
Net Benefit Irrigation	D bil	(28.9)	(28.5)	(18.8)	33.1	58.5	64.0	48.7	46.2	61.3
Hanoi Dike Benefit	D bil							679.2	679.2	679.2

— = not available.
D = dong; $ = dollar.
bil = billion; ha = hectare; mil = million; t = ton.
Sources: Central Project office, subproject offices, and benefit monitoring evaluation reports.

Table A6.7: Economic Internal Rate of Return
(constant 2002 D billion)

Calendar Year	Project Year	Investment Cost	Capital Reinvest	Incr. O&M	Total Cost	Incr. Benefit	NCF	NCF (incremental risk)
1994	1	52.4		0.6	53.0	(28.9)	(81.9)	(79.3)
1995	2	45.8		1.0	46.8	(28.5)	(75.3)	(72.7)
1996	3	114.6		6.0	120.6	(18.8)	(139.4)	(136.8)
1997	4	151.3		10.1	161.4	33.1	(128.4)	(125.7)
1998	5	218.0		13.9	231.9	58.5	(173.4)	(170.8)
1999	6	243.2		19.0	262.3	64.0	(198.2)	(195.6)
2000	7	168.4	79.4	21.2	269.0	728.0	459.0	461.6
2001	8	82.8		21.4	104.2	725.4	621.2	623.8
2002	9			21.4	21.4	740.6	719.2	721.8
2003	10			21.4	21.4	740.6	719.2	721.8
2004	11			21.4	21.4	740.6	719.2	722.9
2005	12		99.5	21.4	121.0	740.6	619.6	623.4
2006	13			21.4	21.4	740.6	719.2	722.9
2007	14			21.4	21.4	740.6	719.2	722.9
2008	15			21.4	21.4	740.6	719.2	722.9
2009	16			21.4	21.4	740.6	719.2	722.9
2010	17		99.5	21.4	121.0	740.6	619.6	623.4
2011	18			21.4	21.4	740.6	719.2	722.9
2012	19			21.4	21.4	740.6	719.2	722.9
2013	20			21.4	21.4	740.6	719.2	722.9
2014	21			21.4	21.4	740.6	719.2	723.5
2015	22		99.5	21.4	121.0	740.6	619.6	624.0
2016	23			21.4	21.4	740.6	719.2	723.5
2017	24			21.4	21.4	740.6	719.2	723.5
2018	25			21.4	21.4	740.6	719.2	723.5
2019	26			9.7	9.7	740.6	730.9	735.3
2020	27		99.5	9.7	109.2	740.6	631.4	635.7
2021	28			9.7	9.7	740.6	730.9	735.3
2022	29			9.7	9.7	740.6	730.9	735.3
2023	30			9.7	9.7	740.6	730.9	735.3
						EIRR	36.8%	37.4%

D = dong.
EIRR = economic internal rate of return; NCF = net cash flow; O&M = operation and maintenance.
Sources: Central Project Office, subproject offices, and staff estimates.

Table A6.8: Hanoi Dike Project Investment Costs

Item	Unit	1994	1995	1996	1997	1998	1999	2000	2001
Investment Costs									
Total Foreign Cost	D bil	4.3	3.2	2.7	12.1	14.6	19.9	25.2	12.2
Total Local Cost	D bil	10.1	7.5	11.3	37.9	51.9	82.7	65.7	44.0
Total Investment Cost	D bil	14.4	10.7	14.0	50.0	66.5	102.6	90.9	56.2
US Dollar Equivalent	$ mil	1.3	1.0	1.3	4.4	5.0	7.4	6.4	3.8
Total O&M	D bil	0.4	0.6	1.0	2.2	3.9	6.5	8.7	10.1
Total Cost	**D bil**	**14.8**	**11.3**	**15.0**	**52.2**	**70.4**	**109.0**	**99.7**	**66.3**
Economic Costs									
Item	**Unit**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Foreign Cost (2002 D)	D bil	7.0	5.4	4.0	17.1	17.8	24.3	27.7	12.2
Local Cost (2002 D)	D bil	17.3	10.9	15.2	47.8	60.2	90.6	67.9	44.8
Total Investment Cost	**D bil**	**24.3**	**16.3**	**19.2**	**64.9**	**77.9**	**115.0**	**95.7**	**57.0**
Equivalent Cost (2002 $)	$ mil	1.6	1.1	1.2	4.2	5.0	7.4	6.2	3.7
Incremental O&M Costs	D bil	0.6	1.0	1.5	3.1	5.1	7.9	10.3	11.8

D = dong; $ = dollar.
O&M = operation and maintenance.
Sources: Central Project Office and subproject offices.

Table A6.9: Hanoi Dike Economic Internal Rate of Return
(constant 2002 D billion)

Calendar Year	Project Year	Investment Cost	Capital Reinvest	Incremental O&M	Total Cost	Incremental Benefit	Project Cash Flow
1994	1	24.3		0.6	24.9		(24.9)
1995	2	16.3		1.0	17.3		(17.3)
1996	3	19.2		1.5	20.7		(20.7)
1997	4	64.9		3.1	68.1		(68.1)
1998	5	77.9		5.1	83.0		(83.0)
1999	6	115.0		7.9	122.9		(122.9)
2000	7	95.7	79.4	10.3	185.4	679.2	493.8
2001	8	57.0		11.8	68.8	679.2	610.5
2002	9			11.8	11.8	679.2	667.5
2003	10			11.8	11.8	679.2	667.5
2004	11			11.8	11.8	679.2	667.5
2005	12		94.1	11.8	105.8	679.2	573.4
2006	13			11.8	11.8	679.2	667.5
2007	14			11.8	11.8	679.2	667.5
2008	15			11.8	11.8	679.2	667.5
2009	16			11.8	11.8	679.2	667.5
2010	17		94.1	11.8	105.8	679.2	573.4
2011	18			11.8	11.8	679.2	667.5
2012	19			11.8	11.8	679.2	667.5
2013	20			11.8	11.8	679.2	667.5
2014	21			11.8	11.8	679.2	667.5
2015	22		94.1	11.8	105.8	679.2	573.4
2016	23			11.8	11.8	679.2	667.5
2017	24			11.8	11.8	679.2	667.5
2018	25			11.8	11.8	679.2	667.5
2019	26			11.8	11.8	679.2	667.5
2020	27		94.1	11.8	105.8	679.2	573.4
2021	28			11.8	11.8	679.2	667.5
2022	29			11.8	11.8	679.2	667.5
2023	30			11.8	11.8	679.2	667.5
						EIRR	62.6%

O&M = operation and maintenance.
Sources: Central Project Office, subproject offices, and staff estimates.

Table A6.10: Project Investment Costs, Crop Areas, and Incremental Benefits

Item	Unit	1994	1995	1996	1997	1998	1999	2000	2001	2002
Investment Costs										
Total Foreign Cost	D bil	3.7	2.4	10.0	8.4	18.7	13.8	6.1	3.1	
Total Local Cost	D bil	6.5	4.5	27.8	24.1	47.3	41.4	19.7	7.0	
Total Investment Cost	D bil	10.2	6.8	37.8	32.6	66.1	55.2	25.8	10.1	
US Dollar Equivalent	$ mil	0.9	0.6	3.4	2.9	5.0	4.0	1.8	0.7	
Total O&M	D bil			6.1	7.5	8.2	9.3	7.0	5.7	
Total Cost	**D bil**	**10.2**	**6.8**	**43.9**	**40.1**	**74.2**	**64.4**	**32.9**	**15.8**	
Economic Costs										
Foreign Cost (2002 D)	D bil	5.8	3.9	14.5	11.8	22.4	16.6	6.6	3.0	
Local Cost (2002 D)	D bil	11.1	6.5	37.4	30.4	54.8	45.3	20.4	7.1	
Total Investment Cost	D bil	17.0	10.4	51.9	42.2	77.2	61.9	27.0	10.1	
Equivalent Cost (2002 $)	$ mil	1.1	0.7	3.3	2.7	5.0	4.0	1.7	0.7	
Incremental O&M Costs	D bil			4.5	6.0	7.0	8.5	6.8	5.6	
		1994	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Land Use—Without Project										
Irrigable Area	'000 ha	44.5	44.5	44.5	44.5	44.5	44.5	44.5	44.5	44.5
Nonirrigable Area	'000 ha	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Cropped Area	'000 ha	94.6	99.0	103.8	102.1	102.1	102.1	102.1	102.1	102.1
Cropping Intensity	%	186	194	204	200	200	200	200	200	200
Land Use—With Project										
Irrigable Area	'000 ha	44.5	45.6	46.6	47.6	48.4	49.3	50.1	50.9	50.9
Nonirrigable Area	'000 ha	6.4	5.4	4.4	3.3	2.5	1.7	0.8		
Cropped Area	'000 ha	94.6	99.0	103.8	101.8	102.5	103.2	106.7	106.7	106.7
Cropping Intensity	%	186	194	204	200	201	203	210	210	210
Cropped Area—Without Project										
Spring Rice	'000 ha	44.5	44.6	44.7	44.5	44.5	44.5	44.5	44.5	44.5
Summer Rice	'000 ha	39.6	40.4	41.2	39.6	39.6	39.6	39.6	39.6	39.6
OFC	'000 ha	10.5	14.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
Total	**'000 ha**	**94.6**	**99.0**	**103.8**	**102.1**	**102.1**	**102.1**	**102.1**	**102.1**	**102.1**
Cropped Area—With Project										
Spring Rice	'000 ha	44.5	44.6	44.7	44.8	45.3	45.8	46.9	46.9	46.9
Summer Rice	'000 ha	39.6	40.4	41.2	39.6	40.4	41.2	44.3	44.3	44.3
OFC	'000 ha	10.5	14.0	18.0	17.4	16.8	16.1	15.5	15.5	15.5
Total	**'000 ha**	**94.6**	**99.0**	**103.8**	**101.8**	**102.5**	**103.2**	**106.7**	**106.7**	**106.7**
Crop Yields—Without Project										
Spring Rice	t/ha	4.0	4.2	4.4	4.6	4.9	5.1	5.4	5.4	5.4
Summer Rice	t/ha	3.3	3.4	3.4	3.5	3.6	3.6	3.7	3.7	3.7
Corn	t/ha	3.0	3.0	3.0	3.1	3.1	3.2	3.2	3.2	3.2
Vegetables	t/ha	4.1	4.3	4.5	4.7	4.8	5.0	5.2	5.2	5.2
Production (t)										
Spring Rice	'000 t	178.1	187.3	197.0	206.2	216.5	227.3	238.7	238.7	238.7
Summer Rice	'000 t	130.7	136.0	141.4	138.7	141.5	144.3	147.2	147.2	147.2
Total Rice Production	'000 t	308.8	323.3	338.4	344.9	358.0	371.6	385.9	385.9	385.9
Total Value	**D bil**	**636.3**	**762.5**	**905.7**	**871.5**	**939.3**	**792.9**	**705.5**	**621.5**	**680.7**
Production Costs	D bil	629.0	664.6	692.1	670.2	664.2	656.4	660.2	657.7	657.6

Continued on next page

Table A6.10 — *Continued*

Item	Unit	1994	1995	1996	1997	1998	1999	2000	2001	2002
Net Value of Production	**D bil**	**7.4**	**97.9**	**213.6**	**201.2**	**275.1**	**136.5**	**45.3**	**(36.2)**	**23.1**
With Project - Crop yields										
Spring Rice	t/ha	4.0	4.2	4.4	4.7	5.0	5.3	5.6	5.6	5.6
Summer Rice	t/ha	3.3	3.4	3.4	3.5	3.6	3.8	3.9	3.9	3.9
Corn	t/ha	3.0	3.0	3.0	3.1	3.2	3.3	3.4	3.4	3.4
Vegetables	t/ha	4.1	4.3	4.5	7.4	7.4	7.4	7.4	7.4	7.4
Production (t)										
Spring Rice	'000 t	178.1	187.3	197.0	209.5	224.6	240.8	260.9	260.9	260.9
Summer Rice	'000 t	130.7	136.0	141.4	140.1	147.1	154.5	171.2	171.2	171.2
Total Rice Production	'000 t	308.8	323.3	338.4	349.6	371.7	395.2	432.1	432.1	432.1
Total Value	D bil	636.5	762.5	905.7	902.8	987.4	848.8	785.3	689.7	754.4
Total Costs	**D bil**	**635.6**	**682.5**	**712.4**	**680.4**	**676.9**	**669.8**	**704.1**	**698.5**	**698.5**
Net Value of Production	**D bil**	**0.9**	**80.0**	**193.3**	**222.4**	**310.5**	**178.9**	**81.1**	**(8.8)**	**55.9**
Incremental Value Production	D bil	(6.5)	(17.9)	(20.3)	21.2	35.4	42.4	35.8	27.4	32.8
Additional Working Capital	D bil	1.0	2.9	2.5	0.3	2.3	2.2	7.3	(0.5)	0.0
Total Incremental Benefit	D bil	(7.5)	(20.8)	(22.8)	20.9	33.1	40.2	28.5	27.9	32.8

$ = dollar.
bil = billion; D = dong; mil = million; t =ton.
Sources: Central Project Office, subproject offices, and benefit and monitoring evaluation reports.

Table A6.11: Financial Budgets for a Typical Farm Without and With the Project

		Without Project					With Project				
Item	**Unit**	**Spring Rice**	**Summer Rice**	**Maize**	**Vegetables**	**Farm Total**	**Spring Rice**	**Summer Rice**	**Maize**	**Vegetables**	**Farm Total**
Total Farm Area	ha					0.31					0.31
Cropping Intensity (%)		87	78	14	7	186	92	87	13	18	210
Cropped Area	ha	0.27	0.24	0.04	0.02	0.58	0.29	0.27	0.04	0.06	0.65
Farm Output	D'000	1,843	1,352	217	88	3,500	2,699	1,772	228		4,699
Farm Inputs											
Seed	D'000	105	92	4	5	206	110	103	3	13	230
Fertilizer	D'000	547	484	43	20	1,094	575	542	47	51	1,216
Agrochemicals	D'000	22	19			41	51	49			100
Other Costs	D'000	355	316			671	374	353			727
Land Preparation	D'000										
Total Inputs	**D'000**	**1,028**	**911**	**47**	**25**	**2,011**	**1,111**	**1,047**	**51**	**64**	**2,272**
Net Farm Income	D'000	815	441	170	63	1,489	1,589	725	177	(64)	2,426
Interest	D'000					113					132
Farm Income	D'000					1,375					2,295
Family Labor	pd/farm	57	50	8	4	119	60	56	7	10	133
Return per Day	D'000					11.6					17.2

D = dong.
ha = hectare.
Sources: Benefit monitoring and evaluation reports.

Table A6.12: Economic Internal Rate of Return
(constant 2002 D billion)

Calendar Year	Project Year	Investment Cost	Incremental O&M Cost	Total Cost	Incremental Benefit	NCF Production Only	NCF Risk Reduction
1994	1	17.0		17.0	(7.5)	(24.4)	(23.3)
1995	2	10.4		10.4	(20.8)	(31.3)	(30.1)
1996	3	51.9	4.5	56.4	(22.8)	(79.3)	(78.1)
1997	4	42.2	6.0	48.1	20.9	(27.3)	(26.1)
1998	5	77.2	7.0	84.3	33.1	(51.1)	(50.0)
1999	6	61.9	8.5	70.4	40.2	(30.1)	(29.0)
2000	7	27.0	6.8	33.8	28.5	(5.3)	(4.1)
2001	8	10.1	5.6	15.8	27.9	12.1	13.3
2002	9		5.6	5.6	32.8	27.2	28.4
2003	10		5.6	5.6	32.8	27.2	28.4
2004	11		5.6	5.6	32.8	27.2	29.5
2005	12	2.9	5.6	8.5	32.8	24.3	26.6
2006	13		5.6	8.5	32.8	24.3	26.6
2007	14		5.6	5.6	32.8	27.2	29.5
2008	15		5.6	5.6	32.8	27.2	29.5
2009	16		5.6	5.6	32.8	27.2	29.5
2010	17	2.9	5.6	8.5	32.8	24.3	26.6
2011	18		5.6	5.6	32.8	27.2	29.5
2012	19		5.6	5.6	32.8	27.2	29.5
2013	20		5.6	5.6	32.8	27.2	29.5
2014	21		5.6	5.6	32.8		27.2
2015	22	2.9	5.6	8.5	32.8		24.3
2016	23		5.6	5.6	32.8		27.2
2017	24		5.6	5.6	32.8		27.2
2018	25		5.6	5.6	32.8		27.2
2019	26		5.6	5.6	32.8		27.2
2020	27	2.9	5.6	8.5	32.8		24.3
2021	28		5.6	5.6	32.8		27.2
2022	29		5.6	5.6	32.8		27.2
2023	30		5.6	5.6	32.8		27.2
				EIRR			6.4%

D = dong.
NCF = net cash flow; O&M = operation and maintenance.
Sources: Central Project Office, subproject offices, and staff estimates.

Table A6.13: North Nghe An Investment Costs, Crop Areas, and Incremental Benefits

Item	Unit	1994	1995	1996	1997	1998	1999	2000	2001	2002
Investment costs										
Total Foreign Cost	D bil	2.4	1.1	4.3	7.8	10.8	13.7	9.1	2.0	
Total Local Cost	D bil	3.8	4.1	14.4	17.9	33.7	35.9	27.2	4.6	
Total Investment Cost	D bil	6.2	5.2	18.7	25.7	44.5	49.7	36.2	6.6	
Dollar Equivalent	$ mil	0.6	0.5	1.7	2.3	3.3	3.6	2.6	0.4	
Total O&M	D bil				1.0	1.7	2.6	4.0	4.0	
Total cost	**D bil**	**6.2**	**5.2**	**18.7**	**26.8**	**46.2**	**52.3**	**40.3**	**10.6**	
Economic Costs										
Foreign Cost (2002 D)	D bil	3.9	1.9	6.3	11.1	13.2	16.8	10.0	2.0	
Local Cost (2002 D)	D bil	6.6	5.9	19.3	22.6	39.0	39.4	28.1	4.6	
Total Investment Cost	D bil	10.4	7.8	25.7	33.7	52.2	56.2	38.1	6.7	
Equivalent Cost (2002 D)	$ mil	0.7	0.5	1.7	2.2	3.4	3.6	2.5	0.4	
Incremental O&M Costs	D bil				1.0	1.7	2.6	4.0	4.0	
		1994	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Land Use—Without project										
Irrigable Area	'000 ha	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7
Nonirrigable Area	'000 ha	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Cropped Area	'000 ha	54.1	54.1	54.1	54.1	54.1	54.1	54.1	54.1	54.1
Cropping Intensity	%	176	176	176	176	176	176	176	176	176
Land Use—With Project										
Irrigable Area	'000 ha	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7
Nonirrigable Area	'000 ha	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Cropped Area	'000 ha	54.1	54.1	55.5	56.8	59.0	61.8	64.7	64.7	64.7
Cropping Intensity	%	176	176	181	185	192	201	211	211	211
Cropped Area—Without Project										
Spring Rice	'000 ha	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4
Summer Rice	'000 ha	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2
Other	'000 ha	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
Total	**'000 ha**	**54.1**	**54.1**	**54.1**	**54.1**	**54.1**	**54.1**	**54.1**	**54.1**	**54.1**
Cropped Area—With Project										
Spring Rice	'000 ha	24.8	23.4	23.4	23.4	23.8	24.7	24.8	24.8	24.8
Summer rice	'000 ha	24.8	22.2	22.2	22.2	22.7	23.2	24.8	24.8	24.8
Other	'000 ha	4.6	8.5	9.8	11.2	12.5	13.9	15.2	15.2	15.2
Total	**'000 ha**	**54.1**	**54.1**	**55.5**	**56.8**	**59.0**	**61.8**	**64.7**	**64.7**	**64.7**

Continued on next page

Table A6.13 — *Continued*

Item	Unit	1994	1995	1996	1997	1998	1999	2000	2001	2002
Crop Yields—Without Project										
Spring Rice	t/ha	3.1	3.4	3.7	4.1	4.2	4.4	4.6	4.8	5.0
Summer Rice	t/ha	2.6	2.8	3.2	3.5	3.6	3.7	3.8	3.9	4.0
Corn	t/ha	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Vegetables	t/ha	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.3
Production (t)										
Spring Rice	'000 t	73.6	80.2	87.4	95.3	99.6	104.1	108.2	112.6	117.1
Summer Rice	'000 t	56.9	63.2	70.1	77.9	79.8	81.8	83.8	86.2	88.6
Total Rice Production	'000 t	130.5	143.4	157.6	173.2	179.4	185.9	192.1	198.8	205.7
Total Value	D bil	301.1	359.6	430.0	440.7	473.5	400.4	355.9	322.5	361.9
Production Costs	D bil	289.1	300.8	301.3	292.4	287.1	280.4	282.7	280.5	280.8
Net Value of Production	**D bil**	**12.0**	**58.8**	**128.7**	**148.3**	**186.4**	**120.1**	**73.2**	**42.0**	**81.1**
With Project—Crop yields										
Spring Rice	t/ha	3.7	4.0	4.4	4.8	5.0	5.2	5.5	5.7	5.9
Summer Rice	t/ha	2.7	3.0	3.4	3.7	3.8	3.9	4.1	4.2	4.3
Corn	t/ha	2.3	2.3	2.4	2.4	2.4	2.5	2.5	2.5	2.5
Vegetables	t/ha	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.3
Production (t)										
Spring Rice	'000 t	86.7	94.5	103.0	112.3	119.0	129.2	135.4	140.8	146.4
Summer Rice	'000 t	60.5	67.1	74.5	82.7	87.1	91.7	100.6	103.7	106.8
Total Rice Production	'000 t	147.2	161.7	177.6	195.0	206.2	221.0	236.0	244.5	253.2
Total Value	D bil	331.9	397.8	487.1	509.4	566.4	506.4	475.8	435.9	485.1
Total Costs	**D bil**	**334.5**	**346.6**	**352.9**	**347.7**	**352.2**	**359.1**	**378.4**	**375.7**	**375.5**
Net Value of Production	**D bil**	**(2.6)**	**51.2**	**134.2**	**161.7**	**214.3**	**147.3**	**97.4**	**60.2**	**109.6**
Incremental Value Prod	**D bil**	**(14.6)**	**(7.6)**	**5.5**	**13.4**	**27.9**	**27.2**	**24.2**	**18.2**	**28.4**
Additional Working Capital	D bil	6.8	0.1	1.5	1.2	2.5	3.4	4.0	(0.1)	(0.1)
Total Incremental Benefit	D bil	(21.4)	(7.7)	4.0	12.2	25.4	23.8	20.2	18.3	28.5

D = dong;
bil = billion; ha = hectare; mil = million; O&M = operation and maintenance; t = ton
Sources: Central Project Office, subproject offices, and benefit monitoring and evaluation reports.

Table A6.14: Financial Budgets for a Typical Farm Without and With the Project

Item	Unit	Without Project					With Project				
		Spring Rice	Summer Rice	Maize	Vege-tables	Farm Total	Spring Rice	Summer Rice	Maize	Vege-Tables	Farm Total
Total Farm Area	ha					0.31					0.31
Cropping Intensity	%	76	72	9	19	176	81	81	15	35	211
Cropped Area	ha	0.24	0.22	0.03	0.06	0.55	0.25	0.25	0.05	0.11	0.65
Farm Output	D'000	2010	1521	99	430	4059	2514	1833	185	787	5318
Farm Inputs											
Seed	D'000	75	72	2	12	161	80	80	4	21	185
Fertilizer	D'000	347	268	42	77	735	455	454	82	141	1131
Agrochemicals	D'000	19	18			37	23	23			45
Other Costs	D'000	310	302			612	328	328			655
Total inputs	**D'000**	**752**	**660**	**45**	**89**	**1545**	**884**	**884**	**86**	**162**	**2016**
Net Farm Income	D'000	1258	861	54	341	2514	1630	949	99	624	3302
Interest	D'000					77					118
Farm Income	D'000					2437					3184
Family Labor	pd/farm	47	40	5	11	103	53	50	8	19	130
Return per Day	D'000					23.6					24.5

D = dong.
ha = hectare.
Sources: Benefit monitoring and evaluation reports.

Table A6.15: North Nghe An Economic Internal Rate of Return

(constant 2002 D billion)

Calendar Year	Project Year	Investment Cost	Incremental O&M Cost	Total Cost	Incremental Benefit	NCF Production	NCF Risk Reduction
1994	1	10.4		10.4	(21.4)	(31.8)	(30.4)
1995	2	7.8		7.8	(7.7)	(15.5)	(14.0)
1996	3	25.7		25.7	4.0	(21.7)	(20.2)
1997	4	33.7	1.0	34.7	12.2	(22.6)	(21.1)
1998	5	52.2	1.7	53.9	25.4	(28.6)	(27.1)
1999	6	56.2	2.6	58.8	23.8	(35.0)	(33.6)
2000	7	38.1	4.0	42.1	20.2	(21.9)	(20.4)
2001	8	6.7	4.0	10.7	18.3	7.6	9.0
2002	9		4.0	4.0	28.5	24.5	25.9
2003	10		4.0	4.0	28.5	24.5	25.9
2004	11		4.0	4.0	28.5	24.5	25.9
2005	12	2.6	4.0	6.6	28.5	21.9	23.4
2006	13		4.0	4.0	28.5	24.5	25.9
2007	14		4.0	4.0	28.5	24.5	25.9
2008	15		4.0	4.0	28.5	24.5	25.9
2009	16		4.0	4.0	28.5	24.5	25.9
2010	17	2.6	4.0	6.6	28.5	21.9	23.4
2011	18		4.0	4.0	28.5	24.5	25.9
2012	19		4.0	4.0	28.5	24.5	25.9
2013	20		4.0	4.0	28.5	24.5	25.9
2014	21		4.0	4.0	28.5	24.5	25.9
2015	22	2.6	4.0	6.6	28.5	21.9	23.4
2016	23		4.0	4.0	28.5	24.5	25.9
2017	24		4.0	4.0	28.5	24.5	25.9
2018	25		4.0	4.0	28.5	24.5	25.9
2019	26		4.0	4.0	28.5	24.5	25.9
2020	27	2.6	4.0	6.6	28.5	21.9	23.4
2021	28		4.0	4.0	28.5	24.5	25.9
2022	29		4.0	4.0	28.5	24.5	25.9
2023	30		4.0	4.0	28.5	24.5	25.9
					EIRR	8.4%	9.5%

NCF = net cash flow; O&M = operation and maintenance.

Sources: Central Project Office, subproject offices, and benefit and monitoring evaluation reports.

SOCIAL ASSESSMENT

A. Introduction

1. The social assessment was developed from secondary data, including project appraisal documentation, benefit monitoring and evaluation (BME) data, technical assistance (TA) reports, sector studies, and field visits to Hanoi dike. The assessment was constrained by the absence of a comprehensive social assessment during project design and the quality of the limited data available on the status of project beneficiaries.

2. The irrigation subprojects are located in Thanh Hoa and Nghe An provinces. At appraisal, Thanh Hoa had a population density of 289 people per square kilometer (km^2) and Nghe An a density of only 160 people per km^2, compared with a national average of 209 people per km^2. Both provinces ranked above the national average for indicators of access to social services relating to education and health. The Song Chu subproject area included 266,000 beneficiary households and North Nghe An 106,000 households, with an average household size of 4.5 and 5.0, respectively. The population density within subproject areas is significantly higher than the provincial average at 869 people per km^2 and 525 people per km^2, with 75 to 80% of the population engaged in agriculture. In-migration occurred during the project period.

3. Land per household is low at 0.30 hectares (ha) per household for Song Chu and 0.36 ha per household for North Nghe An. Land holdings may be divided into as many as seven plots with some located more than 1.5 kilometers from the house. Land fragmentation results from an allocation system that intends to provide equitable access to land throughout the community but is a major constraint to productivity gains.

4. At appraisal, both schemes were noted to be lacking water. The social assessment for Song Chu identified the dual problems of water shortage and poor drainage as major constraints to production. The adopted cropping pattern comprises a winter-spring crop followed by a summer-autumn (early monsoon crop), in an attempt to minimize water shortage and poor drainage impacts. To make optimum use of rainwater in Nghe An, the spring crop is followed by a late monsoon crop. During the Project Completion Report (PCR) Mission, the Executing Agency's (EA's) representatives mentioned water constraints in terms of inadequate "low season flows," relative to the design capacities of primary and secondary canals. The water constraint reflects in system conveyance capacities of only 1.0–1.1 liters per second per ha, which are minimal for irrigation schemes under the prevailing conditions. Water pumping and repumping are, consequently, common means of increasing water use efficiency throughout the command areas, and BME data indicate pumps as a major household capital purchase.

5. Drainage constraints to production were also not adequately addressed in project design, possibly because most drainage problems occur in areas remote from the headworks[1] and are not directly linked to the main and secondary canal infrastructure for which the EA (Ministry of Agriculture and Rural Development [MARD]) and irrigation (and drainage) management companies (IMCs) are responsible.

6. Annual food grain production ranged from 200–478 kilograms per capita in Song Chu and 254–485 kilograms per capita in North Nghe An, correlating closely with access to water and the level of irrigation service provided. Water was short at the tail end of canals because upstream users tended to withdraw more water when the supply was increased. The delivery of

[1] Headworks is the term applied to the structure controlling the quantity of water entering a canal.

more water into the scheme and its distribution to wider areas, as envisaged by the project design, did not fully address the issue of water allocation among users. The BME showed this to be a persistent problem throughout the project implementation period.

B. Findings

1. Hanoi Dike Subproject

7. According to BME data, the subproject achieved its expected output with minimal negative impact on local communities. The dike successfully protected Hanoi from flooding during the 1996 and 1999 floods, which reached Alert Level III (close to the highest recorded flood level). For these floods, seepage was reportedly less and a significant reduction occurred in the number of sand boils. In addition, little interruption to transportation on the dike occurred during the flooding periods, and bank erosion was reduced.

8. Significant subproject impacts were resettlement and land loss for dike construction and maintenance. Although the resettlement process caused implementation delays, the outcome is considered acceptable. The majority of the 309 houses resettled in the subproject were able to improve their well-being. There remained a few outstanding grievance cases (15% of a total of 185) at project completion, but these were resolved.[2] The absence of a resettlement action plan led to a high level of uncertainty regarding timing, level of compensation, and nature of assistance to be offered to affected people.

9. Human activities that jeopardize the dike's integrity were significantly reduced as a result of the Project. Demographic pressures and the high cost of land within Hanoi are likely to place increased pressure on the dike in the future. Local communities and businesses demonstrate a lack of understanding of their responsibilities for dike management and of regulations pertaining to the dike structure's use. Institutional responsibilities are fragmented, with little coordination between agencies. This fragmentation manifested itself, immediately following the Project, in the implementation by an agency other than the EA of modifications to the dike road.

10. Beneficiaries consider dike improvements to have provided significant benefits, including improved transport; returned productive use of cultivable land; increased value of land, arising from improved flood protection; and reduced risk of sand boils. Concerns were expressed at the possibility of relaxation of right-of-way restrictions (intended to protect the dike from being built upon), cattle grazing restrictions, and garbage accumulation of garbage on the dike.

2. Song Chu and North Nghe An Subprojects

11. The BME social survey gives clear evidence of improved living standards and well-being, supported by a strong community belief that the Project delivered benefits through water supply improvement and stabilization. However, the lack of a system-wide approach is considered by water users to have been a major weakness in the Project's design and implementation. Incomplete rehabilitation of primary and secondary canals left many with inadequate or uncertain access to water. The Project may even have reinforced, and possibly increased, the prior inequities between those at the top and those at the tail end of schemes.

[2] These were linked to compensation for land where plots are larger than those covered by the national directive for compensation and where the use of land was taken temporarily for construction and maintenance.

12. The Project's effect on drainage is poorly understood, despite the BME report that indicated that large parts of the command areas were waterlogged before, during, and after the Project. Costs arising from waterlogged soil and the distribution of these costs were not examined but could be significant in limiting benefits for those affected.

13. The contributions paid by beneficiaries toward project cost do not reflect the benefits generated. The beneficiary contribution identified during project design (in-kind contributions) was realized as a financial levy on production. The limited achievement of full irrigation and payment of a levy combine to reinforce inequities, as mentioned during farmer interviews for the BME report. The use of beneficiary contributions to pay administrative costs continues to provide opportunities for inappropriate transactions.

14. Irrigation and irrigated agriculture are increasingly involving women, who provide up to 60% of total labor input. Within the institutional arrangement for decision making on water resources, women are marginalized—an outcome that was reinforced during project design and implementation. The Project's significant impacts on women include reduced input to water conveyance and less crop labor for weeding, due to increased use of herbicides, although these are largely offset by additional new labor required for a third crop. Overall, more reliable access to water has had significant benefits at the household level, through increased quality of life, reduced amounts of time spent carting water, and fewer health problems stemming from poor water quality.

15. On average, 4.7 people live in each Song Chu household, and about 50% of these people participate in the workforce, which is predominantly employed in agriculture (greater than 70%). On average, each household has five plots of land, totaling 0.36 ha, of which 0.25 ha is double-cropped. For North Nghe An, the average household size is smaller, at 4.4 people, of which 40% participate in the workforce. Each household averages seven plots, totaling 0.26 ha, of which 0.16 ha is double-cropped. Half of the plots are in the fully irrigated zone, and 30% are in the partly irrigated zone. Some 20% of households have plots in rain fed areas.

16. Most poor households in Song Chu have rain fed or partially irrigated production systems and account for 32% of the total cultivated land, suggesting that those with full irrigation have greater power and influence. Poor households in North Nghe An have partly irrigated plots, amounting to 30% of the total cultivated area, and a high prevalence of pumping. These areas also suffer from significant drainage problems, limiting the possibility of a second crop.

17. The BME report classified households into three wealth categories. During the Project, the proportion of households within the poor category declined from 32% to 12% in Song Chu and from 28% to 14% in North Nghe An. These improvements may, however, reflect the overall increase in agricultural productivity that occurred as a result of major reforms linked to the market reform program (*doi moi*) and a 1993 land law.

18. The Project's expected increase in agricultural productivity, due to increasing yields, was achieved, although similar gains were achieved in the without project situation. Yield response is similar to that of other irrigation schemes in Viet Nam during the same period.[3] Rural households in the project area and elsewhere responded to major policy reforms implemented during the early 1990s, which suggests that water supply was not the only (or even major) constraint to productivity.

[3] Sixty percent of project targets were realized prior to the completion of major rehabilitation works.

19. Other constraints were identified under TA 1968-VIE[4] and TA 2869-VIE.[5] Through participatory management involving water users cooperatives (WUCs) and commune-based agricultural service cooperatives, significant cost and water access benefits were achieved.

3. Participatory Irrigation Management

20. The Asian Development Bank's (ADB's) project preparation included a cursory assessment of stakeholder perspectives and little if any participation by affected people in formulation. Lessons from a wide range of previous ADB projects stressed the need for water user involvement at each stage of the project cycle as a critical determinant of project success. Project documentation noted the need for "…careful analysis of local conditions, including local agro-climatic [6] conditions, preferences and management capabilities of farmers, relevant pricing policies and their impact on farm income and off-farm employment opportunities." Also stated was that "…interrelated aspects of agriculture projects must be assessed to ensure that performance is not inhibited by failure of complementary activities or institutions…" and "…a participatory approach, through transfer of responsibility for the management of facilities to a local organization, contributes to satisfactory operation and maintenance." These were not adequately applied in this case, due possibly to ADB's haste in resuming operations in Viet Nam.

21. The establishment of WUCs under TA 1968-VIE was implemented with strong support from government agencies, local authorities, and concerned farmers. The process included (i) social mobilization involving commune and village meetings, awareness campaigns, and public opinion surveys and (ii) participatory assessment of the level of functioning of facilities and participatory preparation of operation and maintenance (O&M) plans, financing, and regulations. All interviewed farmers expressed satisfaction with the process.

22. Following the TA's completion in 1999, the activities of WUCs appear to have diminished in the absence of support from relevant agencies at the provincial and local levels. WUCs were not consolidated and empowered as expected, because of the limited duration of external support.

23. Interviewed officials consider the WUC system to have achieved (i) water savings, due to a combination of canal lining and improved management; (ii) improved ownership and responsibility on the part of farmers; and (iii) more reliable and predictable water scheduling. From the viewpoint of IMCs, advantages stemmed from delegation of responsibility and reduced water demand, allowing more water for downstream users. WUCs reported extensive canal degradation, due mainly to low-quality construction (attributed to inadequate construction supervision).

24. The TA's positive outcomes include (i) significant water savings and higher irrigation efficiency, allowing more water for downstream users; (ii) water conflicts reduction between head and tail end users; (iii) better canal maintenance, at reduced cost; (iv) improved water fee collection; and (v) stabilized production and improved livelihood, with less concern about water than previously.

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[4] ADB. 1993. *Technical Assistance to the Socialist Republic of Viet Nam for Operation and Maintenance Strengthening.* Manila.

[5] ADB. 1997. *Technical Assistance to the Socialist Republic of Viet Nam for the Operation and Maintenance Development in the Irrigation Sector*. Manila.

[6] The term agro-climatic refers to the relationship between crop adaptation and climate.

4. Poverty Issues

25. The Project was formulated prior to the adoption by ADB of its poverty reduction strategy, and farmers were not consulted in any systematic manner. Nevertheless, their involvement through the supporting TAs highlights the potential value of increased participation. In addition, the poor in every commune were given priority for employment as unskilled laborers during construction, providing significant temporary income. In some cases, additional income was reinvested in canal maintenance at the tertiary level.

26. BME data highlight an improvement in household wealth status during the project period. In the communes surveyed during 2003,[7] the poverty ratio declined from more than 30% before the Project to 10–15% in 2002 (under the new Ministry of Labor, War Invalids, and Social Affairs standard). While not definitive in determining the contribution of the Project (as opposed to other factors influencing productivity gains), the survey shows that the Project helped reduce poverty in subproject areas.

Table A7: Poverty Levels of Surveyed Communes in Project Areas

No.	WUC	Before Project (%)	1998–2000 (%)	2002–2003 (%)
	Thanh Hoa			
1.	B8A WUC	>30	21	15
2.	B6/9 WUC	>30	7	5
3.	Thieu Do Co-op	>30	14	12
	Nghe An			
4.	N4/B WUC	>30	22	16
5.	N6 WUC	>30	22	17
6.	Nam Thanh Co-op	>30	20	15

> = greater than.
WUC = water users' cooperative.
Source: Special evaluation study (footnote 7).

27. A major group of project beneficiaries is the 130,000 residents of Thanh Hoa city. This group receives significant benefits from the assured increased water supply provided by the Project.

5. Irrigation Extension Subprojects

28. No systematic assessment of social impacts and issues within the irrigation extension subprojects was undertaken. The PCR Mission found significant resettlement associated with the rehabilitation of the Nam Thach Han irrigation scheme in Quang Tri province, for which no resettlement action plan was prepared (despite the support for and experience gained in handling resettlement in the core subprojects). Little is known about the quality of resettlement in this subproject. The direct benefits of the irrigation extension subprojects are predicted to be limited.

[7] ADB. 2003. *Special Study on Participatory Approaches in Forest and Water Resource Operations in Selected DMCs.* Manila.

C. Lessons Learned

1. Socioeconomic Context of Irrigated Agriculture

29. A focus on irrigation infrastructure ignores the interaction of human and social capital with natural and physical capital. A direct consequence of such an approach is a decoupling of output (improved irrigation infrastructure) from project outcomes (improved well-being or livelihood). To be effective, irrigation rehabilitation needs to be considered as an input to a production system that is defined by its community of users, their aspirations, and the economic and social alternatives available to them.

30. Water users mentioned a number of constraints to water use and agricultural production that were not fully considered during project preparation (e.g., insufficient land area per household). The low achievement of this project results from the deficiencies of the process of project preparation and design: inadequate definition and understanding of the problems, limited review of alternatives, and weak participation at all stages of the project cycle. In addition, little attention was paid to the impact of hydrological limitations (i.e., water shortages) on outcomes.

2. Institutional Assessment

31. A critical aspect in defining access to capital for development is the institutional arrangements that govern access to water. The incomplete institutional assessment during project preparation severely constrained benefits. Project implementation delays were a direct result of inadequate institutional capacity at all levels of irrigation management. Within MARD, the Central Project Office was poorly prepared for implementing a project of this nature.

32. Institutional support provided through supporting TAs focused on strengthening O&M. The critical role of IMCs, active communes and cooperatives, and social institutions was not factored into project design. The rapid and positive effects arising from the creation of WUCs and their potential to address a wide range of water management issues should be expanded in future projects.

33. Increasingly, IMCs need to define themselves as water managers, rather than construction managers. Their role should be defined in terms of delivering water at the lowest possible cost and highest efficiency. IMCs need to be more accountable to water users. While current fee collection covers maintenance cost, concerns exist about financial accountability and the absence of earmarking to ensure that fees are used in the areas where they are collected. The PCR assessment that water fees meet maintenance costs is based on the weak assumption that current levels of maintenance are appropriate and sufficient. More comprehensive maintenance, with benchmarked performance indicators and monitoring, is needed to reverse the deterioration of facilities.

34. Increasing competition for limited water supplies indicates an urgent need to improve water use efficiency, but current institutional arrangements provide no incentives for this. MARD should therefore support and facilitate the change process by providing leadership and technical support to lower-level agencies, rather than focus purely on engineering projects.

3. Resettlement

35. Although the resettlement undertaken in the core subprojects may not have followed strictly ADB's guidelines, the outcomes of resettlement have been positive overall, and the

understanding of resettlement processes has developed significantly during the Project. Resettlement undertaken in the irrigation extension subprojects appears not to have benefited from the experience in the core subprojects. Lessons learned from the Hanoi dike subproject were not applied to the new subprojects.

HANOI DIKE RESETTLEMENT

1. The scale of resettlement for the Hanoi dike subproject was significantly underestimated at loan appraisal and, as a consequence, implementation was seriously delayed. The requirement for increased counterpart contribution exacerbated the delays, due to an uncertain government legislative framework and related procedures.

2. At loan appraisal, the resettlement requirement was estimated to be 66 households. In the early stages of project implementation this grew to more than 2,000 households, based on prevailing right-of-way regulations. The regulations were redefined and implementation was adapted to minimize the scale of resettlement (Table A7.1). Resettlement provisions and procedures were also redefined, assisted largely by TA 3064-VIE.[1]

Table A8: Scope of Hanoi Dike Resettlement

District	Households Affected	Households Relocated	Compensation (D million)	Outstanding Grievances[a]	Land Affected Temporarily (square meters)	Land Affected Permanently (square meters)
Ha Tay	620	46	5,219	11	4,385	74,825
Tu Liem	405	151	13,444	10	130,000	47,771
Hoan Keim	47	39	3,300	0		1,400
Thanh Tri	200	58	—	1		
Thai Ho	344	13	3,673	6		23,334
Total	1616	307	25,636	28	134,385	147,330

— = not available.
[a] All grievances remaining at project completion have since been settled.
Source: Final benefit monitoring and evaluation report.

3. The Project Completion Report (PCR) Mission interviewed resettled households, to verify their status and assess their perception of the resettlement experience. Overall, the resettled families consider the project resettlement to have been positive. The Project's land-for-land exchange was welcomed by households, due to appreciating land prices. Most resettled households now have houses that are superior to the houses they had prior to resettlement. To build these better houses, all households contributed personal savings and resources.

4. Social disruption and dislocation were minimized, because resettlement sites were within the same village or commune, thus ensuring the continuation of social services and links. A major benefit reported by resettled households was the limited disruption to children's schooling. Employment impacts were generally small, except for impacts on fishers, who were faced with greater travel distances.

5. Resettlement sites were prepared before people were moved. In some cases, however, essential infrastructure, including electricity, drainage, and water supply was completed after resettlement. This resulted in significant hardship during the first 2 years after resettlement. Most households received a 3-month allowance for food and house rent, although many were not aware of these allowances. Where households changed employment, no additional support was offered.

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

6. Affected households with residential land totaling less than 120 square meters (m^2) received a similar area of land as compensation. Households needing larger plots in the resettlement site could pay the additional cost or, if they were willing to accept smaller plots, could save some money. The land compensation price varied from place to place, depending on the assessment of the local authority. However, those households with more than 120 m^2 of residential land did not receive full residential land compensation for the whole plot. Land in excess of 120 m^2 was treated as garden or agricultural land. This created most of the 185 grievance cases and caused site clearance delays. At final benefit monitoring and evaluation, 28 grievances remained unresolved.

7. Cumbersome administration of resettlement and the gap between government and Asian Development Bank (ADB) procedures were identified as constraints to a more effective resettlement. The initial lack of capacity and experience among Central Project Office staff members, subproject office staff members, and local authority representatives also slowed implementation. The major lesson is that ADB should assure prior consensus with the Government as to how resettlement and compensation will be managed.

8. Positive outcomes of the experience are that the Government's legislation and procedures for land acquisition, compensation, and resettlement are being strengthened, and that the Central Project Office has developed good in-house capacity for handling resettlement. As awareness improved, and with the involvement of local authorities (commune leaders, police officers, and cadastral officers), the handling of resettlement improved greatly during project implementation.

COUNTRY-SPECIFIC RECOMMENDATIONS

	Recommendations	Responsible Agencies	Schedule
A.	**Project and Technical Assistance Related**		
1.	Civil works must be transferred to operating agencies as soon as possible, following completion of project construction works, and their operation and maintenance (O&M) must be integrated into the ongoing O&M programs of irrigation (and drainage) management companies (IMCs) or the Department of Dike Management and Flood Control (DDMFC), as appropriate.	MARD, CPO, DDMFC, IMCs	30 June 2004
2.	Monitoring of relief well efficiency must be maintained and be made part of ongoing monitoring and evaluation.	MARD, DDMFC	Problems to be resolved by 30 June 2004
3.	MARD must review the achievements of TA 1968-VIE[1] and TA 3064-VIE[2] and establish a time-bound action plan for incorporating recommendations into standard operating procedures (including the establishment of awareness and training programs).	MARD	30 June 2004
4.	MARD and ADB must review the experience with water users cooperatives (WUCs) and extend the role of WUCs throughout the two irrigation schemes.	MARD, ADB	30 June 2004
5.	Benefit monitoring and evaluation must be integrated into IMCs' site-specific management information systems.	MARD, IMCs	30 June 2004
6.	Benefit monitoring and evaluation must start during project design, to develop a baseline, including selection of appropriate control groups or areas, to enable subsequent with and without project impacts that must be discerned.	MARD, ADB	For all new water sector projects
B.	**Project Formulation, Design, and Implementation**		
1.	ADB should ensure that project preparatory technical assistance is always used to assess causative factors to poor performance and formulate the most appropriate combination of interventions.	ADB	To be adopted in all future projects
2.	In water resources projects, careful investigation of the hydrological characteristics of the river basin should be a prerequisite to any consideration of infrastructure development.	ADB	To be adopted in all future projects
3.	To ensure a wider, more holistic and systems-based approach to problem analysis	ADB, MARD	To be adopted in all

[1] ADB. 1993. *Technical Assistance to the Socialist Republic of Viet Nam for Operation and Maintenance Strengthening.* Manila.

[2] ADB. 1997. *Technical Assistance to the Socialist Republic of Viet Nam for the Operation and Maintenance Development in the Irrigation Sector*. Manila.

	Recommendations	Responsible Agencies	Schedule
	and identification and selection of appropriate response strategies, a systematic assessment of institutional and stakeholder perspectives should be carried out.		future projects
4.	The scope of any new project for improvement of irrigation schemes should be determined on the basis of a participatory diagnostic survey of the whole system, including main, secondary, tertiary, and on-farm levels. The survey should look into physical and nonphysical aspects that influence system performance.	ADB, MARD	To be adopted in all future projects
5.	To ensure cost-effective water delivery, the cost of water supplied should be a benchmarked performance indicator within the management information system.	ADB, MARD	To be adopted in all future projects
6.	CPO should be mainstreamed within MARD's structure and provided with appropriate levels of delegated authority. This will require further development of technical and project management skills that will only occur in a sustainable manner if good career development opportunities are assured.	MARD	30 June 2004
7.	O&M manuals (including budgetary analyses) are to be provided for all major infrastructure components and civil works systems, together with appropriate training for operations staff.	MARD, CPO, ADB	To be adopted in all future projects
C.	**Future Lending Policy**		
1.	Loan proceeds should only be used for the purposes for which a loan was approved, and attainment of a project's immediate objectives should be the main consideration in determining whether to cancel or use surplus loan proceeds.	ADB	To be adopted in all future projects
2.	ADB should be more responsive to requests for capacity building or support for assistance in project implementation, particularly in relation to social and environmental analyses. Technical assistance should be included whenever weaknesses are noticeable in such areas within an executing agency.	ADB	To be adopted in all future projects
3.	ADB should carry out a detailed study of the incentive structure in irrigated agriculture in Viet Nam (including the effects of input costs, price regulation, subsidies, alternative work opportunities, and labor availability), to prepare a strategy for improved water management, water user participation, and management responsibilities devolution.	ADB	31 December 2004

ADB = Asian Development Bank; CPO = Central Project Office; MARD = Ministry of Agriculture and Rural Development.