Viet Nam: Development of the Northern Chu and Southern Ma Rivers Irrigation System Project
ABBREVIATIONS

ADB – Asian Development Bank
DED – detailed engineering design
DMF – design and monitoring framework
EIRR – economic internal rate of return
EMP – environmental and management plan
GAP – gender action plan
GIS – geographic information system
ha – hectare
ICMB3 – Irrigation Construction and Management Board No. 3
IMC – irrigation management company
ISF – irrigation service fees
MARD – Ministry of Agriculture and Rural Development
M&E – monitoring and evaluation
NCSMRIS – Northern Chu and Southern Ma Rivers Irrigation System
O&M – operation and maintenance
PCR – project completion report
REMDP – resettlement and ethnic minority development plan
VND – Vietnamese Dong
WUA – water user association
WUG – water user group

NOTE

In this report, “$” refers to United States dollars.

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I. PROJECT DESCRIPTION

A. Rationale

1. Since early 1990s, Viet Nam has been the leading producer of rice and one of the largest global exporters. Rice is the country’s predominant staple food and paddy is the dominant food crop, accounting for 82% of Viet Nam’s irrigated area, as of 2009. Given its annual population growth at 1.4%, rice production surplus per year of about 4 to 5 million tons was estimated to be wiped out by 2021–2022. The increase was expected to result in a 2% rise
in rice consumption, which posed a threat to national food security. To address this situation, the government planned to enhance the productivity of existing land and food security through improved irrigation and drainage.¹

2. The government’s investment program (Northern Chu and Southern Ma Rivers Irrigation System (NCSMRIS)) aimed to develop new main and distribution canals, rehabilitate existing irrigation and drainage facilities, improve institutional capacity for water management, and enhance the operation and maintenance (O&M) of the irrigation system. The program’s command area was in Thanh Hoa Province in the north–central Viet Nam. The irrigated area within the NCSMRIS command area was about 15,700 hectares (ha) and was served by about 160 pumped irrigation and redistribution schemes, with water drawing from the Chu and Ma rivers and smaller tributaries. The NCSMRIS was to expand the irrigation area to a command area of about 31,084 ha through the provision of gravity irrigation water, rehabilitation of existing facilities, and development of new facilities. Prior to the development of this project, farmers depended on pumping stations for water irrigation within the command area from the Chu and Ma rivers.

3. In response to the development constraints, the government requested the Asian Development Bank (ADB) to finance the project. The Development of the Northern Chu and Southern Ma Rivers Irrigation System Project (the project) was part of a government’s program comprising three phases. Phase 1 was to construct a new main canal (government–financed). Phase 2 was to construct a new north and south main canals and associated distribution canals systems (financed by the Asian Development Bank (ADB) and the government). Phase 3 was to extend the north and south main canals and rehabilitate the southern Ma pumped irrigation scheme and irrigation area (World Bank–financed).

B. Expected Impacts, Outcome, and Outputs

4. The project’s expected impact was improved water and land productivity of irrigated cropping systems in the Thanh Hoa province, within the command area of the NCSMRIS. The project’s targeted outcome was effective and timely irrigation services under the NCSMRIS. The project had four intended outputs. The first two were improved (i) water resources management and delivery of irrigation services and irrigation system O&M and (ii) irrigation infrastructure. The other two were improved access to and use of rural support services, agricultural inputs and information, and effective project management.

C. Provision of Inputs

5. ADB approved the loan in December 2011. The loan agreement was signed in March 2012 and became effective in July 2012. The expected loan closure was in December 2017 but was extended for a year. The extension was due to the delay in resettlement planning on a new land law that became effective in July 2014. Thus, in turn, caused a delay in the completion of resettlement, including corrective safeguard actions for on-farm canal civil works.

6. ADB was to provide a loan of $110 million from the Asian Development Fund, while the government was to contribute the balance of the total project cost at $143.05 million. The actual project cost was lower at $125.67 million due to the reassignment of two project districts to

Phases 1 and 3 and the removal of two planned demonstration sites. This included a rice demonstration site, which was moved to phase 3, and a sugarcane demonstration site, which was already developed by a private company. Consequently, actual expenditures on irrigation equipment and training services were reduced to 54% and 61% of the original fund allocation. These were noted as a minor change in the project.

7. The planned consultancy packages for project management and technical support package comprised 69 person-months of international and 205 person-months of national consulting services. The construction supervision package required 59 person-months of international and 299 person-months of national consulting services. Two international consulting firms, in association with national firms, were to be engaged for both technical support and construction supervision packages. The recruitment of national consultants experienced delays of two years because of complex terms of references that required several revisions. Notwithstanding these delays, the PCR noted that the recruitment of consultants was efficient and their performance was satisfactory.

8. The project was classified as effective gender mainstreaming. A gender action plan (GAP) was prepared in line with the government’s gender equality law and ADB’s Policy on Gender and Development (1998). Specific gender-related targets included three aspects. First, women would make up at least 40% of water user group (WUG) and water user association (WUA) representatives, trainees in project technical training courses, and participants in non-agricultural, occupational training. Second, at least 30% of central project office and provincial project management unit staff would be women. Third, gender-sensitive training would be conducted for all staff.

9. The project was supported with technical assistance (TA) of $1 million, of which 80% was from an ADB grant, and the rest from the government. It was approved in December 2009 and closed in October 2012. The TA aimed to strengthen irrigation management including O&M, improve water use efficiency, and promote agricultural production through agricultural extension and capacity building of provincial project management agencies, irrigation management companies (IMCs) and WUAs.

D. Implementation Arrangements

10. The Ministry of Agriculture and Rural Development (MARD) was the executing agency. The Central Project Office of the MARD was responsible for project management through a central project management unit. The two implementing agencies were MARD’s Irrigation Construction and Management Board No. 3 (ICMB3), which was located within Thanh Hoa province, and provincial project management unit that was established within the Department of Agriculture and Rural Development of Thanh Hoa province. In Viet Nam, at commune levels, rehabilitation and irrigation facilities are operated by IMCs, i.e., state-owned entities under Department of Agriculture and Rural Development. The IMCs’ responsibilities include planning and managing O&M of the schemes, delivery of irrigation water, collection of irrigation service fees (ISFs) and managing the schemes’ finances.

5 Fund sources from Japan Special Fund ($1 million) and the Technical Assistance Fund ($0.12 million).
6 In January 2009, the government introduced an irrigation subsidy scheme for irrigation management companies.
11. The PCR indicated that the loan agreement had 27 covenants. Of these, 25 were complied with; one partly complied with; and another one not complied with. The partly complied with covenant required that 40% of WUA and WUG representatives shall be women. This was not achieved, as there were only 41 women among 237 leaders of 43 WUGs. The covenant that was not complied with was on establishing WUAs with at least 40% comprising women.

II. EVALUATION OF PERFORMANCE AND RATINGS

A. Relevance of Design and Formulation

12. The PCR rated the project relevant. The project was in line with one of the major initiatives of the government’s Socioeconomic Development Plan 2011–2015, to accelerate agricultural and rural industrialization and modernization. It was designed to catalyze large-scale agricultural commodity production and improve food security through improved irrigation infrastructure, and improved access to and use of rural support services. It was consistent with the National Water Resources Strategy 2008–2020, which aimed to improve the delivery of irrigation services and irrigation system O&M. The project design was aligned with ADB’s Viet Nam Country Strategy and Program (CSP) 2007–2010 and was consistent with the Water Operational Plan, emphasizing support for the rehabilitation of irrigation systems and irrigation efficiency. At completion, the project was aligned with the CSP 2016–2020 to increase inclusiveness of infrastructure service delivery and improve environmental sustainability.

13. The project design was appropriate. However, more attention could have been devoted during the appraisal stage. Although there was no major change in scope, there were some minor changes that affected output 2–improved irrigation infrastructure. During implementation, detailed topographical surveys showed that two districts earmarked for the project (phase 2), Thieu Hoa District and Thuong Xuan District, which had 3,071 ha would be better reassigned to phases 1 and 3 to provide gravity irrigation to these districts more effectively. In addition, 3,584 ha of paddy fields were converted to perennial tree planting (3,156 ha) and aquaculture (428 ha). During early implementation, only the WUGs could work for the project, contrary to the project design requiring the involvement of both the WUAs and the WUGs. The WUAs were not suitable to the project, as they would involve too many farmer-participants. The mid-term review report indicated a minor change of reducing demonstration sites under the output 3. These changes were not reflected in the design and monitoring framework (DMF).

14. This validation notes that, although it had a few design issues, the project was strategically relevant to the government and ADB. As such, this validation assesses the project relevant.

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7 The covenant pertained to concerned leadership positions of women in WUGs which was partly complied with. However, 43 WUGs with 3,915 participants had 41.5% women.
12 Footnote 2 (para. 12).
B. Effectiveness in Achieving Project Outcome and Outputs

15. The PCR rated the project effective. At completion, two outcome targets were achieved, as indicated by a project completion survey. First, 100% of the 43 WUGs in 37 communes received adequate irrigation water on time and 92% received adequate quantity (target: irrigation water would be accessible by 2017 on time and in adequate quantity); and second, 44% of technical trainees were women (target: 40%).

16. There were four project outputs with 14 targets. Under output 1, four out of six targets were achieved. The measurement of irrigation flows and river discharges and monitoring agricultural production were improved using the geographic information systems (GIS)-based monitoring and evaluation (M&E) systems by the IMCs. A quarterly reporting instrument for key data in the GIS map was developed for phases 1 and 2. The WUGs developed O&M plans, and ISFs were collected from farmers for financing O&M of on-farm canals. Also, the IMCs prepared annual business plans. The project delivered the planned outputs, except for two sub-outputs on the WUAs and women representation. There was no WUA established. The WUAs were based on the boundaries of large distributary canals covering larger areas and more farmers than WUGs. The WUGs were based on administrative boundaries and were smaller. The establishment of the WUAs was not suitable from a design's point of view. Also, the target of 40% representatives of the WUGs and WUAs to be women by 2017 was not achieved. It was unrealistic given the low baseline of 18% due to the prevailing socio-cultural norms relating to gender roles.

17. For output 2, the converted irrigation area was 8,061 ha of rain-fed area (target: 8,141 ha). The second target was affected by the reassignment of two prospective project districts to phases 1 and 3 (para. 13). As a result, the irrigation area was reduced from 23,899 ha to 17,244 ha. With about 76% irrigated by gravity, 24% by pump, and less than 1% remaining rainfed leading to a partly achieved target. The third target was largely achieved with 92% of unskilled labor sourced locally (target 40%), of which 40% were women against the sub-target of 50%.

18. There were two targets for output 3. The first target was not achieved. Extension services were delivered to 5,239 farmers (56.8% female) in 37 communes (target: 60,000 farmers). In total, 104 trainers received training-of-trainer (43% female) training on the effective use of water for crops. The second target of establishing three pilot sites was not achieved. The validation notes that sprinkler irrigated maize demonstration was in operation. The three pilot sites were reduced to one during the mid-term review, but it was not reflected in the DMF.

19. The project was classified as environment category B. The government prepared an environmental impact assessment for the investment program, in accordance with its national guidelines. An initial environmental examination and an environmental and management plan (EMP) were prepared for project civil works. Overall, the project had minimal negative environmental impacts. The degraded areas within Xuan Lien nature reserve were reforested to compensate for a similar area cleared during construction (para 12).

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13 The PCR reported that there was no basis for the target of 60,000 farmers.
14 Principal issues identified in the initial environmental examination were the scale of land acquisition and displacement of affected households for main canal infrastructure, and the need to relocate 157 graves and approved by Ministry of Agriculture and Rural Development in June 2010.
15 Bidding documents included EMPs, so contractors would incorporate mitigation plans. Consultants trained relevant PMUs, contractors, and local environment officials on environment safeguard and the implementation of the EMPs.
20. On social safeguards, the project was classified as category A for both involuntary resettlement and indigenous peoples. The project acquired land assets and affected 11,755 households. Compensation was paid at replacement costs. The project provided additional cash payments, income restoration program, and vocational training courses to 179 severely affected households. All the 34 households who were given new plots received land use certificates. An external monitoring assessed that the households had restored their standard of living. A sound grievance redress mechanism was installed and all the 166 grievances received were resolved.

21. The project was category A with respect to indigenous peoples. Of the 119,495 households benefitted by the project, 11,448 households comprised Thai and Muong ethnic minorities. Broad ethnic minority community supported the project, as documented in meetings with communities during project preparation. An indigenous peoples plan (locally termed an ethnic peoples’ development plan) was prepared covering the entire NCSMRIS program. Combined resettlement and ethnic minority development plans (REMDPs) were developed and all REMDP activities were completed by December 2017.

22. GAP was developed for the project. Financial resources were provided to women’s unions to help implement the GAP. It largely achieved 22 targets including gender representation in WUA/WUG and participation in training and planning of irrigation system. The central project management unit developed and maintained a sex-disaggregated M&E database of all activities. The validation assesses the project effective, based on the above discussions.

C. Efficiency of Resource Use

23. The PCR rated the project efficient. The economic analysis at completion used the same assumptions and benefits at appraisal. The economic internal rate of return (EIRR) at completion was 13.4%, lower than the 22.4% at appraisal. The main reason for this lower EIRR was the actual irrigation area of 17,244 ha against the estimate of 23,899, due to the reassignment of the two districts and the conversion of some paddy fields to perennial tree planting areas.

24. The project analysis identified three benefits. These were changes in cropping intensity and cropping pattern, increase in yield, and pumping cost savings. The methodology was sound using the parameters of increases in cropping intensity and crop yield. Also, the PCR noted the large savings from substantial annual pumping operating costs. According to the completion survey, however, the third benefit—the pumping operating cost savings—was less than the expected amount. It indicated that the benefits were overestimated at appraisal (PCR Appendix 10, paras. 13, 21). The project also built paved canal access roads along the main canals. It would have yielded significant benefits in terms of improving inter-village connectivity and reducing travel time and transportation costs. However, the PCR did not quantify these due to insufficient traffic data. Notwithstanding these issues, the EIRR at completion is above the benchmark. As a whole, the validation assesses the project efficient.

D. Preliminary Assessment of Sustainability

25. The PCR rated the project likely sustainable. The project irrigation system was managed by the ICMB3 and the South Ma River IMC, which were both experienced in managing irrigation

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16 Annual cost of pumping was reduced from VND 25.6 billion (2011) to VND 6.3 billion (2019) (PCR, Appendix 10).
systems.\textsuperscript{17} In 2019, the management of the Cua Dat reservoir and the main canal of 16.5 km under phase 1 was transferred from Chu River IMC to ICMB3.\textsuperscript{18} Under the arrangement, ICMB3 contracts out O&M responsibilities to the South Ma River IMC to manage the main and secondary canals, for which the IMC received payment from the Government.\textsuperscript{19}

26. At project completion, the South Ma River IMC’s routine O&M budget doubled for phase 2, totalling VND 9.5 billion ($0.40 million). But, this budget was very modest in relation to the total civil works investment at VND 1,785 billion ($77.0 million). As irrigation facilities age, the budget needs to be adjusted upward. At commune levels, the WUGs managed the tertiary and on-farm canals. Farmers pay the WUGs VND 450,000/ha per crop at maximum, as desired by the government. The PCR reported that the ISFs being collected for the tertiary canal O&M are mostly on-time.

27. The validation notes that O&M budget doubled from the IMC and farmers’ willingness to pay for the tertiary and on-farm canals. However, the PCR did not indicate the adequate level of funding required annually for the O&M activities by the South Ma River IMC and WUGs. Furthermore, there is no assurance that the government will continuously revise the O&M tariff and that the government would subsidize the irrigation scheme to cover any shortfall in cases when the collected ISF is inadequate.

28. The validation also notes that GIS-based M&E was developed for phase 1 and has been used to support M&E during the implementation of this project (phase 2), and that a similar GIS-based M&E is under development for phase 3. The use of GIS-based M&E by IMCs and SCADA technologies will improve water resources and irrigation management and also infrastructure asset management. With uncertainty on the government continued commitment and the lack of information on adequate level of O&M funding requirements, the validation assesses the project less than likely sustainable.

III. OTHER PERFORMANCE ASSESSMENTS

A. Preliminary Assessment of Development Impact

29. The PCR rated the development impact of the project satisfactory. The project contributed to Country Partner Strategy Results Framework 2016–2020. It increased irrigation command area served by water efficient irrigation infrastructure by 12,040 ha, as compared to a target of 60,000 ha.\textsuperscript{20} Relating to Pillar 3 of the Operational Priority 5 (Promoting Rural Development and Food Security) of ADB’s Strategy 2030, it improved land productivity through climate-resilient irrigation infrastructure and water service delivery.\textsuperscript{21}

30. The increased yield targets were met. The project yielded 7.0 tonnes per ha in 2019 (target: 6.9 t/ha) for spring rice and achieved 6.0 t/ha in 2018 for summer rice as targeted. Water supply averaged to 26,532 cubic meters (m$^3$) ha per annum from the Cua Dat reservoir, exceeding the target of 16,415 m$^3$/ha/annum. Also, cropping intensity rose slightly

\textsuperscript{17} Most of staff in the Irrigation Construction and Management Board No. 3 (ICMB3) division managing the Cua Dat Reservoir and main canal (phase 1) formerly worked for the North Chu River irrigation management company.

\textsuperscript{18} Decision 450/QD-BNN-TCCB dated 30 January 2019 of Ministry of Agriculture and Rural Development.

\textsuperscript{19} Footnote 2 (paras. 39–40).


from 2.01 in 2011 to 2.37 in 2018 before the project was completed. These indicators are expected to increase further. The project completion survey shows that the average annual farm household incomes doubled from VND 6.26 million to VND 14.8 million between 2011 and 2019. This validation finds the development impact of the project satisfactory.

B. Performance of the Borrower and Executing Agency

31. The PCR rated the borrower’s performance satisfactory. The executing and implementing agencies demonstrated strong ownership of the project. Advance government funds helped to mobilize consultants prior to loan effectiveness and made the detailed engineering designs ready ahead of time, showing the government’s commitment to enhancing the country’s irrigation system and ensuring food security. Early mobilization of the project management consultant prevented delays in consultant recruitments, civil works procurement packages, and social safeguards implementation. The executing agency and implementing agencies actively monitored the implementation of the resettlement plans, the EMP, and the GAP. This validation rates the performance of the borrower and executing agency satisfactory.

C. Performance of the Asian Development Bank and Cofinanciers

32. The PCR rated the performance of ADB satisfactory. ADB gave adequate support including a project preparatory TA, in consultation with the MARD. ADB fielded nine loan review missions, in addition two missions prior to inception and one for PCR. There were follow-up missions on resettlement issues. Compensation payment for all affected households were addressed and completed in September 2016 and February 2017. All REMDP activities were completed by December 2017. This validation rates the performance of ADB satisfactory.

IV. OVERALL ASSESSMENT, LESSONS, AND RECOMMENDATIONS

A. Overall Assessment and Ratings

33. The PCR rated the project successful. It was relevant, as it addressed the country’s priority development needs for food security by enhancing land productivity and promoting agricultural commodity production. There were a few design issues involving the WUG and the reduced irrigation area. The project was effective as it largely achieved the DMF targets—notably the on-time delivery of water to meet crop water requirements, given the cropping intensity of 2.37, resulting in achieving targets for crop yields and coverage area. The training targets were partly achieved, with the targets related to women’s participation in training generally met. The project was efficient with an estimated EIRR of 13.5%, which was above the benchmark but lower than the EIRR at appraisal. The whole irrigation system is being managed by ICMB3 and the South Ma River IMC, which have extensive experience in managing irrigation systems. However, there is uncertainty in regard to the provision adequate government funding for required annual O&M activities. The validation rates the project successful.

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### Overall Ratings

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*ADB = Asian Development Bank, IED = Independent Evaluation Department, PCR = project completion report. Source: ADB (IED).*

### B. Lessons

34. The PCR lessons noted three lessons. Future water resources development projects could integrate appropriate irrigation infrastructure to deliver gravity irrigation and sustainable O&M backed by adequate rural extension services. Mobilization of consultants using government funds at early stage enables them to engage in engineering designs and facilitates timely implementation, including safeguards. In the case of this project, the combination of resettlement and ethnic minority plan expedited the project review and approval, allowing project preparation to work in parallel and the main canal works to be implemented first.

35. The validation adds two project-level lessons. First, adequate consultation and inclusiveness of project stakeholders and beneficiaries during preparation strengthens project design quality and facilitates implementation. The involvement of local people, such as farmers during the design stage is important to incorporate specific issues pertaining to the local context (e.g., WUG or WUA in terms of scale participant number, on-farm canals, construction works, cultural and gender roles). Also, generating local participation at the onset provides incentives to reduce risks that may possibly involve resentment and conflicts during implementation. Project achievements depend on the collective support from local communities to effectively implement and deliver livelihood restoration activities on time.

36. Second, the timely completion of topography surveys and detailed engineering design (DED) is crucial to irrigation infrastructure projects. It permits timely procurement and construction works that are critical for projects with multiple phases. Procurement for the construction of secondary and on-farm canals for phase 2 were delayed, as its DED could not commence before phase 1 DED could be finalized. This led to the implementation delays in the succeeding phases. Technically experienced contractors can help execute engineering designs efficiently and in a timely manner.
C. Recommendations for Follow-Up

37. This validation supports the PCR recommendations for follow-up. For similar projects in the future, the validation recommends that where possible, as with the construction of the Cua Dat Reservoir, governments would be well advised to consider setting up enabling conditions much earlier than when the project is implemented. On public awareness of safety around large canals, the IMCs in coordination with the respective WUGs and communities should ensure awareness by the public of the dangers inherent in large canals. These campaigns should incorporate public health related matters whereby the disposal of any waste in the canals is forbidden. On maintenance plans, the validation further recommends that the use of GIS alone is not enough to monitor infrastructure conditions, and that regular physical verification is crucial to a systematic management of irrigation infrastructure assets.

38. The validation also recommends the development of a sustainable O&M mechanism for water infrastructure projects, e.g., the net annual savings from energy costs through gravity fed water largely obviating pumping costs would be best reallocated to annual O&M budgets for canals larger than tertiary canals. On GAPs, the validation recommends that more attention be given to leadership training for administrative and technical IMC staff and that the requirement for leadership roles in WUGs be toned down in line with community norms and expectations.

V. OTHER CONSIDERATIONS AND FOLLOW-UP

A. Monitoring and Reporting

39. This validation supports the PCR that M&E be conducted regularly using funding other than future phase 3 funds as these are essential in monitoring benefits. The validation suggests that the funding be from the recurrent budget of the MARD and continue well into the future. Additionally, follow-up surveys are needed particularly to continue the tree plantation initially carried out and monitor how future phases further obviate the use of pumping stations and the continued functioning of the drainage system components to minimize salinization.

B. Comments on Project Completion Report Quality

40. The PCR presented a comprehensive analysis and an objective assessment of the outcome, outputs, and targets. The social safeguards and the environmental aspects were well analyzed and presented as well. The validation finds the PCR quality satisfactory.

C. Data Sources for Validation

41. The data sources for the validation included the report and recommendation of the President, PCR, back-to-office reports of the nine loan review supervision missions as well as the mid-term review, national planning documents, country partnership strategy, and selected external references on the internet for example to verify the actual capacity of the Cua Dat reservoir.

D. Recommendation for Independent Evaluation Department Follow-Up

42. The validation recommends that a project performance evaluation report be carried out after two to three years of normal operation of the irrigation system.