

Validation Report
December 2018

People's Republic of China: Inner Mongolia Autonomous Region Environment Improvement Project

Reference Number: PVR-578
Project Number: 39019-013
Loan Number: 2260



Raising development impact through evaluation

ABBREVIATIONS

ADB	–	Asian Development Bank
CO ₂	–	carbon dioxide
EIRR	–	economic internal rate of return
EMP	–	environmental management plan
EMR	–	environmental monitoring report
FIRR	–	financial internal rate of return
IEE	–	initial environmental examination
IMAR	–	Inner Mongolia Autonomous Region
km	–	kilometers
OHS	–	occupational health and safety
PCR	–	project completion report
PMO	–	project management office
PRC	–	People's Republic of China
RRP	–	report and recommendation of the President
SO ₂	–	sulphur dioxide
SRP	–	Short Resettlement Plan

NOTE

In this report, "\$" refers to United States dollars.

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PROJECT BASIC DATA

Project Number	39019-013	PCR Circulation Date	11 Sep 2017	
Loan Number	2260	PCR Validation Date	Dec 2018	
Project Name	Inner Mongolia Autonomous Region Environment Improvement Project			
Sector and subsector	Energy	Energy efficiency and conservation		
Strategic agenda	Environment sustainable growth Inclusive economic growth			
Safeguard categories	Environment		B	
	Involuntary resettlement		B	
	Indigenous peoples		C	
Country	People’s Republic of China		Approved (\$ million)	Actual (\$ million)
ADB Financing (\$ million)	ADF: 0.00	Total Project Costs	330.40	340.97
	OCR: 120.00	Loan	120.00	117.84
		Borrower	175.43	164.78
		Beneficiaries	0.00	0.00
		Others ^a	34.97	58.35
Cofinancier		Total Cofinancing	0.00	0.00
Approval Date	29 Sep 2006	Effectiveness Date	14 Aug 2007	24 Sep 2007
Signing Date	16 May 2007	Closing Date	31 Dec 2011	21 Jul 2016
Project Officers		Location	From	To
	A. Bhargava	ADB headquarters	Jan 2011	Jul 2011
	M. Pajarillo	ADB headquarters	Jul 2011	Apr 2012
	A. Seiler	ADB headquarters	Apr 2012	Oct 2013
	W. Lee	ADB headquarters	Oct 2013	Nov 2013
	A. Seiler	ADB headquarters	Nov 2013	May 2017
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ADB = Asian Development Bank, ADF = Asian Development Fund, IED = Independent Evaluation Department, IESP = Sector and Project Division, OCR = ordinary capital resources, PCR = project completion report.

^a Others is comprised of domestic borrowings from local banks (ADB. 2017. *Completion Report: Inner Mongolia Autonomous Region Environmental Improvement Project*. Manila.).

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I. PROJECT DESCRIPTION

A. Rationale

1. According to the report and recommendation of the President (RRP),¹ the People's Republic of China (PRC) suffered from severe environmental problems caused by rapid economic growth, heavy reliance on coal as the primary fuel, and use of obsolete technology. It had been estimated that pollution resulted in a loss of about 4% of the gross domestic product since the

¹ ADB. 2006. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the People's Republic of China for the Inner Mongolia Autonomous Region Environmental Improvement Project*. Manila.

early 1990s, with air pollution accounting for 59%, water pollution 36%, and solid waste 5%. The Inner Mongolia Autonomous Region (IMAR) was a province with severe air pollution due to its heavy reliance on coal as the primary fuel for industry and residential consumption. In 2004, only 7 of 21 areas in IMAR met the national air quality standards.

2. Municipal wastewater was a major contributor to the pollution of the PRC's rivers and lakes. Mixtures of raw municipal wastewater and partially treated industrial wastewater were discharged directly to the nearest body of water in the absence of wastewater treatment plants. In 2004, about 65% of the country's 46 billion cubic meters (m³) of wastewater was from municipal sources and the rest was from industries. Also, 44% of wastewater was treated but the rest was discharged untreated, mainly into the Yellow River and Wuliangsuhai Lake.

3. The IMAR had a population of about 24 million and its economic development was relatively slow. Of its 101 counties, 31 were under the national poverty line and 29 were under the provincial poverty line. The rapid economic growth (12% annually from 1996 to 2004) led to a worsening of environmental pollution and ecosystem degradation, particularly air and water quality in all major areas. Water shortages had become a constraint to the IMAR's economic development. Increased urban housing construction led to gas, heating, and water demand outpacing supply, or caused the facilities for these utilities to not function well. These utilities were absent in the city's poorer sections.

B. Expected Impacts, Outcomes, and Outputs

4. According to the design and monitoring framework, the project's intended impact was environmental improvement by reducing atmospheric and water pollution. The performance indicators were: (i) a reduction of annual emissions of 787,243 tons of carbon dioxide (CO₂), 15,105 tons of sulphur dioxide (SO₂), 2,272 tons of nitrogen oxides, and 19,136 tons of total suspended particulates in the project area; (ii) a reduction of annual discharge of 14,126 tons of chemical oxygen demand, 5,738 tons of biological oxygen demand, 7,600 tons of suspended solids, 898 tons of ammonia-nitrogen, 1,234 tons of total nitrogen, and 88 tons of total phosphorus in the project area; and (iii) about 30,000 poor households benefiting from the gas and central heating supply connection and tariff discounts from 2010.

5. The project's targeted outcome was efficient, safe, and reliable gas and heating supply and wastewater treatment systems that conserved energy and water resources in the project areas. The planned project outputs in the project areas were: (i) improved central heating systems, (ii) provision of gas transmission and distribution systems in the project areas, (iii) enhanced wastewater treatment capacity in the project areas, and (iv) institutional strengthening and capacity building.

C. Provision of Inputs

6. According to the project completion report (PCR)² the project was approved in September 2006 and was expected to become effective in August 2007. The effectiveness date was delayed by 6 weeks owing to delays in formalizing onlending agreements between various levels of government. The loan was closed in July 2016, 4 years and 7 months later than the expected closing date; three extensions of the loan closing date were required because of project start-up delays and scope changes. Due to the long, harsh winter season in the IMAR, local governments

² ADB. 2017. *Completion Report: Inner Mongolia Autonomous Region Environment Improvement Project in the People's Republic of China*. Manila.

prioritized district heating projects and advanced the implementation of five of the eight subprojects without utilizing the Asian Development Bank (ADB) loan. One wastewater subproject was similarly implemented without utilizing the ADB loan to meet the discharge reduction requirement of the local environment protection bureau. Another wastewater subproject became redundant because the local environment protection bureau forced the wastewater source to stop operating. The project scope was also changed in 2010 to accommodate the expansion of the Linhe district heating subproject, which increased the estimated total project cost to \$376.3 million. This increased cost resulted from the: (i) expanded Linhe district heating subproject, including 270 megawatts of new thermal heating capacity; and (ii) additional length of main and secondary natural gas transmission pipelines.

7. The project was estimated to cost \$330.4 million, including contingencies of \$34.4 million and \$37.6 million in financing charges. The government requested for a loan of \$120 million from ADB's ordinary capital resources to finance 36.3% of the project cost. The remaining project cost was to be financed through equity contributions (53.1%) and domestic bank loans (10.6%). Local banks were to have a repayment period of 5 to 10 years, including a grace period of 1 to 2 years and an interest rate of 6.5%. For the ADB loan, the Government of the PRC was to be the borrower and was to make the proceeds of the loan available to the government of IMAR, which in turn was to onlend on the same terms and conditions to the municipalities of Bayannur and Wuhai; the counties of Linhe, Dengkou, Hangjinhouqi, Wuyuan, Wulatehouqi, Wulateqianqi, and Wulatezhongqi; and then to the project implementation agencies. The implementation agencies were to assume the foreign exchange and interest risks of the loan.

8. The actual project cost was \$341 million, a 9.3% decrease compared to the estimate with the major change in scope in 2010, but a 3.1% increase from appraisal in 2005. The actual project cost comprised \$117.8 million in foreign exchange cost (34.5% of the total) and \$223.1 million in local currency cost (65.4%) comprising \$164.8 million (48.3%) in equity contributions and \$58.4 million (17.1%) in domestic borrowing. The change in scope resulted in \$49.9 million of ADB loan savings. Because of the rapid rise in demand for district heating, in February 2010 the executing agency requested approval to use the loan savings to expand the district heating system in Linhe, which ADB approved in June 2010. The change in scope also resulted in the revision of the financing plan, toward increased equity contributions and domestic borrowings.

9. For project implementation supervision, about 12 person-months of international and 76 person-months of national consulting services³ were to be engaged to assist the executing agency and the implementing agencies with (i) project design and engineering, (ii) procurement, (iii) construction supervision related to equipment and materials procured under ADB financing, (iv) project management, and (v) impact monitoring and assistance to prepare the required reports to ADB and the executing agency. International and national consultants were also to be recruited for the institutional reform and the corporate governance improvement subcomponent, which included related training. An additional 9 person-months of international consulting services and 53 person-months of national consulting services were also expected. Some national consultants were also to be engaged by the project management office (PMO) and the implementing agencies for site supervision and various tasks relating to project implementation.

10. An international consulting firm was engaged with 21 person-months of international consultant inputs and 129 person-months of national consultant inputs. The firm was recruited in September 2008 and consultants were immediately mobilized after the contract was awarded in

³ About 20 person-months of national consulting services under the implementation supervision were to be provided to develop benchmarks and indicators for the economic, social, and environmental impact of the project.

2008. The consultants assisted with (i) institutional strengthening and training, with a primary focus on heat tariff reform and tariff collection improvement; (ii) heating tariff reform and corporate governance improvement; and (iii) development of options for private sector participation.

11. The project was classified as environment category B in accordance with ADB's environmental classification criteria under the 2002 Environment Policy.⁴ The project had substantial environmental benefits from energy efficiency improvements, reduction in emissions from coal burning, reduction of pollutant discharge; and the potential adverse impacts assessed during project preparation were temporary and localized during construction. The project was classified as category B for involuntary resettlement and category C for impacts on Indigenous Peoples. The project involved permanent land acquisition and temporary land occupation. There were no ethnic minority groups in the project area.

D. Implementation Arrangements

12. The government of IMAR was to be the executing agency and the implementing agencies were to implement the project components. The PMO was to be responsible for managing, coordinating, and supervising implementation of all components. Each implementation agency was to establish a project implementation office to design, construct, and operate subprojects. The project was generally implemented as envisaged at appraisal. The executing agency was guided by the project leading group, comprising the IMAR vice governor, the IMAR Development Reform and Commission, the Finance Bureau, and the Environment Protection Bureau. A PMO was established in 2006 under the Development and Reform Commission, which was responsible for overall project management, coordination, and supervision. Components related to the heating system, natural gas transmission and distribution, and wastewater treatment were implemented by the implementing agencies, while the component for institutional reform and corporate governance improvement was implemented by the PMO. Due to the changes in scope, the Bayannur Yangguang Energy Group became the implementing agency for the expanded district heating subproject in Linhe.

13. The loan agreement contained 38 covenants. The PCR stated that all covenants were complied with. The financial performance covenant required that all project implementing agencies maintain in each fiscal year commencing from 2007 (i) a debt service coverage ratio of at least 1.4, (ii) a debt–equity ratio not greater than 70:30, and (iii) a current ratio of greater than 1:1 by 2010 and thereafter. Although the PCR indicated project compliance to this requirement, no evidence was presented to verify this.

II. EVALUATION OF PERFORMANCE AND RATINGS

A. Relevance of Design and Formulation

14. The PCR rated the project relevant because it was aligned with the 11th and 12th Five-Year plans of the Government of the PRC,⁵ where energy conservation and environmental improvement were priorities of the development agenda. It was consistent with ADB's country strategy and sector priorities. The project was also in line with the government of IMAR's environmental strategy.⁶ The project was consistent with the sector strategies of the ADB in the

⁴ ADB. 2002. *Environment Policy of the Asian Development Bank*. Manila.

⁵ Government of the PRC. 2006. *People's Republic of China Eleventh Five-Year Plan (2006–2010)*. Beijing.

⁶ It focused on (i) strengthening pollution control with regulations and water standards and improving monitoring and enforcement; (ii) improving air quality by substituting coal with gas and closing small boilers; and (iii) increasing the use of efficient technologies and management.

PRC,⁷ particularly in the energy⁸ and water sectors.⁹ Regarding the environment, ADB's strategy was to ensure the sustainable utilization of natural resources and promoting market-based pricing and encouraging cost recovery and better environmental information disclosure.

15. According to the PCR, the project modality should have been built upon the medium- and long-term urban development plans, which were closely integrated with the development of the district heating system. The project supported the government of IMAR's heating reform initiatives to make the heating subsector more sustainable, open to private sector investment, reduce energy losses, and improve corporate management. The project preparatory technical assistance helped finalize the project design for a year from August 2005, addressing technical due diligence and social and environment safeguards; and undertaking financial and economic analyses, procurement package planning, and institutional and policy analyses.

16. The PCR stated that project design changes (para. 6) resulted from (a 6-week) delay in achieving loan effectiveness, and some subprojects earmarked to be implemented with ADB support were actually implemented without using the ADB loan. Additional subprojects were identified in keeping with the needs of the project area (especially for Linhe county in the IMAR). A wastewater treatment plant was not implemented because the source of the wastewater discharge (a paper mill) was closed down. Based on the discussion, this validation rates the project relevant.

B. Effectiveness in Achieving Project Outcomes and Outputs

17. The PCR rated the project effective. According to the RRP, outcome indicators to be achieved by 2009 and 2010 pertain to: (i) reliable gas services to about one million urban population; (ii) reliable central heating services to about one million urban population; (iii) closure of small inefficient coal-fired boilers and an average 20% heating efficiency improvement; (iv) more than 85% of the household coal-fired stoves substituted by central heating and/or gas supply; (v) reemployment of workers affected by the closure of small boilers; (vi) land acquired permanently or occupied temporarily that affected people; (vii) increase in daily wastewater treatment capacity in Wulateqianqi and Wulatehouqi; (viii) treated water meeting the national discharge standard and treated grey water recycled annually; and (ix) energy efficiency of gas and heat supply and wastewater treatment plants improved from 58% to 80% and conserving 540,000 tons of standard coal equivalent annually. After the change in scope, achievement dates were postponed to 2011 and 2013, with the quantity targets the same or more. The project achieved its outcome of efficient, safe, and reliable gas and heating supply and wastewater treatment systems that conserve energy and water resources in the project areas generally by 2015, which is later than the initial target date.

18. Output indicators at appraisal were the achievement of the following by 2010: (i) a well-functioning central heating supply system and closure of small coal-fired boilers; (ii) construction of gas transmission trunk pipeline from Changqing to Linhe, including transmission and valve stations and urban gas distribution pipeline in eight project areas including

⁷ ADB. 2005. *Country Strategy and Program Update: People's Republic of China, 2006–2008*. Manila; and ADB. 2008. *Country Partnership Strategy: People's Republic of China, 2008–2010*. Manila.

⁸ It aimed to (i) develop cleaner energy sources, (ii) renovate and retrofit existing facilities, (iii) promote corporatization and commercialization of energy utilities, and (iv) support tariff reforms.

⁹ ADB's strategy focused on (i) improving wastewater treatment and water supply services through investment in physical infrastructure, (ii) promoting improved corporate governance and commercial management to enhance the potential for future private sector involvement, (iii) improving cost recovery, and (iv) ensuring water resource conservation and environmental protection by supporting new legislative and regulatory provisions.

one compressed natural gas primary supply station; (iii) construction of two wastewater treatment plants, sewer transmission pipeline, and five pumping stations; (iv) developing and implementing an institutional reform and corporate governance plan and improving bill collections; and (v) ensuring the profitability of implementing agencies with a current ratio of at least 1:1, debt-to-equity ratio of not more than 70:30, and debt-service ratio of 1.4.

19. The project exceeded most of the intended project outputs by 2015, which was later than the revised dates after the change of scope. The project provided (i) 451 million m³ of natural gas supply and 25 million m³ of compressed natural gas supply, via 426 kilometers (km) of main and 386 km of secondary natural gas transmission pipelines to 1.2 million urban residents and for commercial use; (ii) 773 megawatts of heating supply capacity, 224 units of heat exchange stations, and 396 km of heating pipelines with 37 million square meters of heating area for 1.6 million urban residents; (iii) closure of 431 small, old, and inefficient coal-fired boilers, which affected 800 boiler workers; and (iv) improved energy efficiency from 55% to 80%. Without ADB support, wastewater treatment capacity was increased by 6,000 tons per day, and 80,000 tons wastewater per day was avoided as the wastewater source (a paper mill) was shut down. Each implementing agency arranged the reemployment of the affected boiler workers; 280 workers were retained in the implementing agencies and 520 were reemployed without changes in the level of their wages and benefits. The project had 685 *mu* of permanent land acquisition and 1,155 *mu* of temporary land occupation without resettlement and house demolition. The permanent land acquisition affected 161 people (21% more than envisaged), and temporary land occupation affected another 324 (83% more than estimated).

20. The institutional reforms and corporate governance component was also implemented as intended and aided the government of IMAR to initiate heating reforms, which led to improving (i) the tariff collection rate (from 70% in 2004 to 96% in 2015), and (ii) the financial performance of the district heating supply companies.

21. The project safeguard performance is rated satisfactory for environment.¹⁰ The project was correctly classified as category B for environment and was in material compliance with standards set by ADB and with host country laws and regulations at approval. The Initial Environmental Examination (IEE) 2010 identified in accordance with the ADB Safeguard Policy Statement (2009) relevant regulatory requirements and potential direct, indirect, cumulative and induced environmental impacts in consultation with stakeholders and affected people.¹¹ The IEE included an adequate Environmental Impacts and Mitigation Matrix and Monitoring Plan for environmental impacts and mitigation activities during construction and operation, responsibilities, location, and schedule. However, occupational health and safety (OHS) aspects were not addressed in the IEE, but the loan covenants included some requirements for health and social risks, and labor and employment.

22. The Environmental Management Plan (EMP) was adequately implemented and the environmental impacts were mitigated as planned (footnote 10). The borrower carried out adequate consultations with affected people and other concerned stakeholders, including civil society, and facilitated their informed participation. The environmental monitoring reports (EMRs) did not report on any grievances during the project lifetime. Biodiversity Conservation and Sustainable Natural Resource Management materially met ADB safeguard requirements. The project was within the urban areas and did not significantly impact flora and fauna.

¹⁰ ADB (Independent Evaluation Department). 2018. Project Safeguard Assessment in People's Republic of China: Inner Mongolia Autonomous Region Environment Improvement Project. 4 May (internal).

¹¹ ADB. 2009. *Safeguard Policy Statement*. Manila.

The EMRs 2011–2016 stated that all mitigation measures in the EMP were appropriately implemented. This validation notes that the project was correctly classified as category B for involuntary resettlement, but since the relevant information to establish material compliance, or lack thereof, could not be obtained, the project safeguard performance for involuntary resettlement is not rated. While a 2006 Short Resettlement Plan (SRP) was available and considered adequate, the evaluation of SRP implementation (including compensation, assistance, and benefits for affected persons; consultation and participation; grievances; and monitoring), was not possible. Resettlement information disclosure did not meet ADB requirements. Project documentation did not include the final Resettlement Plan (2010), Resettlement/Social Monitoring Reports and an evaluation report of the resettlement 1 year after completion as stipulated in the loan covenants. The project was correctly classified to category C for Indigenous Peoples as it was confined within the urban areas.

23. Pollution prevention and abatement also materially met ADB safeguard requirements in regard to air emissions, ambient air quality, effluents, and waste management and its performance is deemed overall highly satisfactory. Key environmental impacts (including soil erosion and contamination, wastewater disposal, and dust generation during construction) were addressed in accordance with mitigation measures in the EMP. Mitigation measures in the EMP, such as for dry sludge disposal, compliance with the boiler emission standard, and natural gas leakage detection, were also addressed. The project performed satisfactorily or close to highly satisfactorily, for reduction of about 1.1 million tons of CO₂ emissions and highly satisfactory for resource conservation and energy efficiency. Labor and OHS aspects were not monitored, thus, occupational accidents, diseases, and incidents were missing in the EMRs. The project materially met ADB's community health and safety requirements. The most important project outcome on public health was improved indoor air quality by replacing household coal-fired stoves with district heating systems, and improved outdoor air quality by replacing 431 old, small, and polluting boilers with a modern district heating network connected to boilers that emitted less dust, SO₂, and nitrogen dioxide.

24. The project also benefited women through fuel switching and changes in heating system, which reduced indoor air pollution; giving preference to employing women during construction; ensuring equal pay for equal work type; and encouraging women in project areas to participate in planning and implementing project activities. Based on the discussion in this section, this validation rates the project effective.

C. Efficiency of Resource Use

25. The PCR rated the project less than efficient given the delay in achieving the overall project outcome and outputs. It noted that the project comprised multiple components in various locations with a multi-layered project administration structure, including onlending and counter-guarantee arrangements across implementing agencies and local governments. This posed an inherent challenge to project management, required significant coordination, and made project implementation difficult. It resulted in advanced implementation of five district heating subprojects and one wastewater treatment subproject without ADB financing. The PCR also noted that the lack of coordination between the development of the district heating system and urban development plan was a major cause of implementation delays, especially in Hangjinhouqi and Wuhai.

26. The recalculated economic internal rates of return (EIRR) for the entire project was 15.8% without environmental benefits (compared to 17.6% at appraisal) and 23.5% with environmental benefits (compared to 21.7% at appraisal), and although it exceeded the

12% economic opportunity cost of capital, it was lower than expected. Only in extreme circumstances (when capital cost and operation and maintenance costs exceed base case levels by 10% each, and benefits reduce by 10% from base case levels) does the EIRR fall below the 12% threshold. This validation notes that implementation delays are implicitly included in the EIRR calculation and should not be double-counted by referring to delays outside the EIRR calculation.

27. Nonetheless, this validation has several other concerns about the economic analysis and rates the project less than efficient. It questions the valuation of the project's economic benefits using willingness to pay,¹² and notes several statements in the RRP.¹³ First, "the urban central heating supply will replace the existing small inefficient boilers." The PCR did not provide evidence that incremental heating was used and also did not indicate reasons why there would be incremental consumption of heating. Economic benefits of the heating supply component should have been deemed non-incremental and valued in terms of resource cost savings. Second, "the project will supply natural gas to replace liquefied petroleum gas and coal for residential use, and a small portion of industrial consumption." All economic benefits of the natural gas transmission and distribution component should be non-incremental, that is, resource cost savings in terms of coal and liquefied petroleum gas, unless there was evidence that incremental natural gas was used. Third, "water is in short supply and the demand for treated water under the project is larger than supply." This implies that the economic benefit of the wastewater treatment component is non-incremental and should have been valued in terms of resource cost savings, that is, the cost of water that would have been used in the "without project" scenario. Given the concerns about the EIRR calculation, this validation rates the project less than efficient. Paragraph 4 of Appendix 8 in the PCR discussed the valuation of the environmental benefits of the project. However, it did not mention the environmental costs, specifically, the cost of incremental CO₂ emitted as a result of the natural gas transmission and distribution component. This cost should have been included in the EIRR recalculation.

D. Preliminary Assessment of Sustainability

28. The PCR provided a recalculated financial internal rates of return (FIRR) in the efficiency section. FIRRs are a measure of sustainability and should have been discussed in the sustainability section. The PCR rated the project likely sustainable. It stated that all subprojects were operating well and achieved their performance parameters and the increasing demand and improved policies would support sustainable operations. Reforms in heating policy built a foundation for sustainable district heating subsector and the ongoing implementation of reforms helped ensure a continuous supply of reliable heating services by district heating subprojects.

29. The recalculated FIRRs were 9.1% for the urban central heating system component, 14.4% for the natural gas transmission and distribution component, and 4.8% for the city wastewater treatment component. The FIRRs for individual subprojects ranged from 4.8% to 16.9%. The recalculated FIRR for the whole project was 10.5%, higher than 7.7% at appraisal. The FIRRs for the individual subcomponents and the entire project were also higher than the weighted average cost of capital of 3.3%. The PCR did not assess the financial performance of the implementing agencies that were responsible for the operation of the subprojects. Nevertheless, this validation rates that the project is likely sustainable.

¹² Footnote 2, Appendix 8, para. 4.

¹³ Footnote 1, Appendix 7, para.1.

III. OTHER PERFORMANCE ASSESSMENTS

A. Preliminary Assessment of Development Impact

30. The PCR rated the project satisfactory for development impact. Performance indicators in the design and monitoring framework in the RRP were: (i) a reduction of annual emissions by 787,243 tons of CO₂, 15,105 tons of SO₂, 2,272 tons of nitrogen oxides, and 19,136 tons of total suspended particulates in the project area; (ii) a reduction of annual discharge of 14,126 tons of chemical oxygen demand, 5,738 tons of biological oxygen demand, 7,600 tons of suspended solids, 898 tons of ammonia-nitrogen, 1,234 tons of total nitrogen, and 88 tons of total phosphorus in the project area; and (iii) about 30,000 poor households benefiting from the gas and central heating supply connection, and tariff discounts starting in 2010. The project achieved these targets.

31. The project also benefited about 2.8 million urban inhabitants, including 46,129 poor households, through clean district heating and natural gas supply. It supported the IMAR government to prepare and implement heating reforms, including a pro-poor tariff and an assistance program providing free heating connection. The impact performance targets for emission reduction, connection of poor households to the gas and heating systems, and tariff discounts for poor households were met or exceeded. However, the targets for the discharge reduction of chemical oxygen demand, biological oxygen demand, suspended solids, ammonia-nitrogen, total nitrogen, and total phosphorus were not met. Nevertheless, based on the net positive impacts, this validation rates the development impact satisfactory.

B. Performance of the Borrower and Executing Agency

32. The PCR rated the performance of the Ministry of Finance as borrower satisfactory. It provided timely guidance and approvals to smooth project implementation. The performance of the government of IMAR as the executing agency was also generally satisfactory, despite the challenges resulting from (i) multiple project components with widely dispersed subprojects and implementing agencies; (ii) multi-layered project administration across counties, cities, and provincial governments; and (iii) coordination among several provincial and local government agencies. Notwithstanding the change in scope, lengthened implementation schedule, and enhanced outputs, the executing agency adequately managed the project and guided the implementing agencies, including complying with covenants and ADB guidelines; mobilizing additional counterpart funding; and initiating institutional reforms and corporate governance improvements. The performance of the implementing agencies was satisfactory as they delivered on the outputs. This validation rates the borrower performance satisfactory.

C. Performance of the Asian Development Bank

33. The PCR rated ADB's performance satisfactory. It is unusual that a delay in effectiveness of 6 weeks would lead five subprojects to divert to other funding sources. ADB should have been able to gauge the commitment and urgency of the subprojects that were implemented with non-ADB resources. ADB provided strong support and closely cooperated with the executing agency and the implementing agencies. ADB staff spent time reviewing physical progress and resolving issues with the PMO and implementing agency staff during implementation. It adhered to timely approvals of bidding documents and bid evaluation reports and promptly approved contracts and disbursements. It also approved the requested changes in project scope, implementation arrangements, and loan closing dates in a timely manner.

34. ADB's safeguard work quality at approval was satisfactory (footnote 10). In compliance with ADB's Environment Policy (2002) and Environmental Assessment Guidelines (2003), a fact-finding visit and environmental and social appraisal were carried out with the detailed back-to-office reports. They included quantified information on energy efficiency improvements and expected reductions in stack and CO₂ emissions and effluents and resettlement aspects. The Summary Initial Environmental Examination (2006) and updated IEE 2010, and 2006 SRP were adequate although had insufficient OHS data. The project was also correctly categorized for environment, involuntary resettlement, and Indigenous Peoples. ADB's safeguard work quality at supervision in regard to environment was adequate and kept itself sufficiently informed. However, resettlement monitoring reports were not available for this validation. The key loan covenants were compliant with ADB's Environment Policy (2002), Involuntary Resettlement (1995), Resettlement Plan, and applicable laws and regulations of the PRC. Additional covenants addressed health and social risks, labor and employment, and resettlement plan implementation. The quality of the environmental assessment and EMP in the IEE and public consultation meetings at project sites were adequate. This validation rates ADB performance satisfactory.

IV. OVERALL ASSESSMENT, LESSONS, AND RECOMMENDATIONS

A. Overall Assessment and Ratings

35. The PCR rated the project successful. The project start-up delays led to a major change in scope and loose integration of the district heating investment planning and urban development plan, which in turn caused delays in achieving the outcome and outputs. However, the project remained relevant, was effective in achieving its main outcomes and outputs, but less than efficient. It is likely sustainable given the continued priority to energy conservation and environmental improvement. Heating tariff reform also created a foundation for sustainability. This validation rates the project successful.

Overall Ratings

Validation Criteria	PCR	IED Review	Reason for Disagreement and/or Comments
Relevance	Relevant	Relevant	
Effectiveness	Effective	Effective	
Efficiency	Less than efficient	Less than efficient	
Sustainability	Likely sustainable	Likely sustainable	
Overall assessment	Successful	Successful	
Preliminary assessment of impact	Satisfactory	Satisfactory	
Borrower and executing agency	Satisfactory	Satisfactory	
Performance of ADB	Satisfactory	Satisfactory	
Quality of PCR		Less than satisfactory	Para. 41.

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

B. Lessons

36. The PCR identified three **project-level lessons**. The choice of project modality, scope, and implementation arrangements need to be carefully considered at project preparation to avoid multiple subcomponents scattered across many locations, resulting in a multi-layered project administrative structure. Urban development plans have to be thoroughly assessed to identify

potential risks at project preparation and thereby minimize subsequent changes to scope and implementation delays. A strong project steering committee with close coordination across relevant local government agencies is essential for smooth project implementation. This validation concurs with these lessons.

37. This validation provides two other **project-level lessons**. Since capacity building components of projects are rarely on the critical path to project completion, such as the institutional reform and corporate governance improvement component of this project, capacity building could be undertaken as a stand-alone technical assistance to avoid implementation delays caused by other components of the project. ADB staff need to be trained in economic analysis, specifically the identification, quantification, and valuation of economic benefits. This would improve the credibility of EIRR calculations.

C. Recommendations for Follow-Up

38. The PCR suggested four recommendations. The government of IMAR should continue to monitor the operational status of subprojects and the implementation status of heating reform. These could provide lessons for the two ADB-financed district heating projects currently ongoing in the IMAR. A heating subsector-specific evaluation that builds on the outcome, outputs, and lessons from this and the two ongoing ADB projects were recommended to identify measures to enhance subsector sustainability and reduce emissions while meeting the demand for heating. Project modality and scope should be carefully considered during project preparation. A stand-alone project loan modality is less manageable when implementing a multi-component project that involves a wide range of subsectors and project components, unless the executing agency has strong project management capacity. Urban development plans should be carefully assessed in preparation of any district heating project. The relevance and effectiveness of the district heating project depend on urban zoning, which is linked to commercial and public building planning, industrial complex development, and population growth projections. This validation concurs with these recommendations.

39. This validation suggests one other recommendation. Given that countries in northern climates, particularly in North America and northern Europe, do not rely on district heating for the heating of homes and buildings, ADB should study the relative economics of district heating with approaches used elsewhere.

V. OTHER CONSIDERATIONS AND FOLLOW-UP

A. Monitoring and Reporting

40. Loan covenants required that the government of IMAR monitor and evaluate project impacts as specified in the project performance management system developed for the project. It was to collect data on indicators during project implementation, at completion, and biennially for 5 years thereafter and submit the reports summarizing the key findings to ADB. The indicators were to cover environmental, social, and poverty impacts. According to the PCR, the covenant regarding project performance management system was complied with, but it did not provide an assessment of the project monitoring and evaluation system or its outcomes.

B. Comments on Project Completion Report Quality

41. The PCR was succinct and assessed all the evaluation criteria. A major shortcoming was in the identification and valuation of economic benefits of the project. The PCR failed to provide

evidence of incremental project output, should have valued all outputs in terms of resource cost saving, and not double-counted the effects of implementation delays. It also erroneously considered the FIRR as an efficiency measure when it should have been discussed under sustainability. The PCR did not assess the financial performance of the project implementation agencies that are responsible for the operation of the subprojects. Some of the financial indicators were covenanted, but the PCR did not demonstrate how they were complied with. There was no assessment of the project performance monitoring and evaluation system. This validation rates the quality of the PCR less than satisfactory.

C. Data Sources for Validation

42. Data sources included the RRP, PCR, mission reports, national and ADB strategies, and detailed assessment of the safeguard performance of the project.

D. Recommendation for Independent Evaluation Department Follow-Up

43. The PCR did not recommend the preparation of a project performance evaluation report for the project. This validation concurs with this recommendation.