

**Validation Report**  
January 2022

# People's Republic of China: Heilongjiang Energy Efficient District Heating Project

Reference Number: PVR-845  
Project Number: 44011-013  
Loan Number: 2898



*Raising development impact through evaluation*

## ABBREVIATIONS

ADB	– Asian Development Bank
DMF	– design and monitoring framework
EIRR	– economic internal rate of return
FIRR	– financial internal rate of return
GAP	– gender action plan
GHG	– greenhouse gas
IED	– Independent Evaluation Department
O&M	– operation and maintenance
PCR	– project completion report
PIA	– project implementing agency
PMO	– project management office
PPMS	– project performance monitoring system
PRC	– People's Republic of China
RRP	– report and recommendation of the President
SO <sub>2</sub>	– sulfur dioxide
WACC	– weighted average cost of capital

## NOTE

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

<b>Director General</b>	Emmanuel Jimenez, Independent Evaluation Department (IED)
<b>Deputy Director General</b>	Sona Shrestha, IED
<b>Director</b>	Nathan Subramaniam, Sector and Project Division (IESP)
<b>Team Leader</b>	Arjun Guha, Evaluation Specialist, IESP

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## PROJECT BASIC DATA

Project number	44011-013	PCR circulation date	30 Sep 2021	
Loan number	2898	PCR validation date	Jan 2022	
Project name	Heilongjiang Energy Efficient District Heating Project			
Sector and subsector	Energy	Energy utility services		
Strategic agenda	Environmentally sustainable growth Inclusive economic growth			
Safeguard categories	Environment		B	
	Involuntary resettlement		C	
	Indigenous peoples		C	
Country	People's Republic of China		Approved (\$ million)	Actual (\$ million)
ADB financing (\$ million)	ADF: 0.00	Total project cost	353.00	348.82
	OCR: 150.00	Loan	150.00	132.98
		Borrower	117.00	105.15
		Beneficiaries	0.00	0.00
		Others	86.00	110.69
Cofinancier	–	Total cofinancing	0.00	0.00
Approval date	25 Sep 2012	Effectiveness date	27 May 2013	24 Apr 2013
Signing date	26 Feb 2013	Loan closing date Financial closing date	30 Jun 2018	30 Jun 2019 29 Nov 2019
Project officers	T. Oi X. Liu	Location ADB headquarters PRC Resident Mission	From Sep 2012 Mar 2014	To Mar 2014 present
IED review Director Team leader	N. Subramaniam, IESP A. Guha, IESP*			

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, PRC = People's Republic of China.

\*Team members: H. Hettige (quality reviewer), F. De Guzman (Senior Evaluation Officer), P. Choynowski and S. Price (consultants).

## I. PROJECT DESCRIPTION

### A. Rationale

1. Heilongjiang is a province in the northeastern region of the People's Republic of China (PRC) where temperatures fall below  $-40^{\circ}\text{C}$  and the heating season lasts up to 6 months.<sup>1</sup> Therefore, heating was a basic human need in the province. However, the existing district heating coverage was inadequate, particularly in low-income urban areas, resulting in households using coal stoves to supplement available heating. This was a major cause of indoor air pollution and respiratory disease, and it disproportionately affected women and children who spent most of their time indoors. Emissions from small and inefficient neighborhood boilers affected outdoor air quality and caused significant harm to public health. Heilongjiang, along with other northeastern provinces, was also a significant source of transboundary air pollution such as acid rain.

<sup>1</sup> ADB. 2012. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the People's Republic of China for the Heilongjiang Energy Efficient District Heating Project*. Manila.

2. Many existing heating systems in the province were old and inefficient. Combustion efficiency of existing small heat-only boilers of 55% was far below the 87% achieved in modern combined heat and power plants or large heat-only boilers. Cleaner and reliable district heating to households and community areas was needed to reduce respiratory disease and carbon monoxide poisoning. It would also improve living conditions, provide a better school environment during the winter, and reduce heating expenditure by switching to centralized energy-efficient heating systems. Women and vulnerable people connected to modern district heating networks were expected to enjoy a cleaner and safer living environment. Another benefit is the increased incomes through job opportunities created during construction and operation.

## **B. Expected Impact, Outcome, and Outputs**

3. The design and monitoring framework (DMF) of the report and recommendation of the President (RRP) indicated that the project's expected impact was improved energy efficiency and a cleaner environment in Heilongjiang Province. The targeted outcome was improved air quality and reduced greenhouse gas (GHG) emissions in the province's eight urban areas. Three outputs were expected: (i) expanded district heating in eight project cities without a net increase in emissions, (ii) improved energy-efficient heat generation capacity in three project cities, and (iii) enhanced private sector participation in district heating in two project cities.

## **C. Provision of Inputs**

4. The project was approved in September 2012. According to the project completion report (PCR), the project's expected effectiveness date was May 2013, and it became effective a month earlier.<sup>2</sup> The loan agreement stated that the loan closing date was in June 2018. The loan closed 1 year later with one loan extension due to Hailin subproject's construction delays.

5. The project was estimated at \$353.0 million. The government requested \$150.0 million loan from the Asian Development Bank (ADB) through ordinary capital resources to finance the project's foreign costs. The project's implementing agencies and domestic banks were to finance the balance of \$203.0 million equivalent for local currency costs. At completion, actual costs totaled \$348.8 million, of which \$133.0 million was foreign exchange costs and \$215.8 million equivalent was local currency costs. Due to a minor change in project scope and cost savings, \$17.0 million of ADB's loan was canceled. This resulted from decreases in the costs of civil works, financial charges, equipment, project management, and other engineering costs.<sup>3</sup>

6. The project had \$280,000 for 48 person-months of consulting services to assist the executing and implementing agencies in undertaking their responsibilities. The consulting firm provided 87 person-months of consulting services at completion. The PCR did not provide information on consulting services. There was no attached technical assistance.

7. The project was classified category B for environment because of the potential adverse environmental impacts such as (i) soil erosion during construction, (ii) increased noise and dust affecting residents during construction, (iii) inappropriate storage of hazardous materials and wastes during operation, (iv) safety risks to community members and workers during construction and operation, and (v) flue gas emissions during operation. Nevertheless, substantial

<sup>2</sup> ADB. 2021. *Completion Report: Heilongjiang Energy Efficient District Heating Project in the People's Republic of China*. Manila.

<sup>3</sup> ADB (PRC Resident Mission). 2017. Loan 2898-PRC: Heilongjiang Energy Efficient District Heating Project—Minor Change in Project Scope and Implementation Arrangements, and Reallocation of Loan Proceeds Memorandum. 9 October (internal). The change of scope was approved by the country director of the PRC Resident Mission.

environmental benefits resulted from replacing 470 small, old, and inefficient heating boilers and 275,166 household stoves and rehabilitating heating pipes. It was classified category C for involuntary resettlement and for indigenous peoples.

8. The project was classified effective gender mainstreaming and a gender action plan (GAP) was prepared at appraisal to maximize the project's benefits to women, safeguard poor households headed by women, increase women's participation in the district heating industry, and monitor the project impact on women.<sup>4</sup>

## **D. Implementation Arrangements**

9. The Heilongjiang Provincial Government was the executing agency responsible for project implementation and management. The project leading group, led by a provincial vice-governor, comprised provincial representatives from the Heilongjiang Development and Reform Commission, Heilongjiang Provincial Finance Department, Heilongjiang Provincial Construction Department, and Heilongjiang Provincial Environment Protection Department. A project management office (PMO), established under the Heilongjiang Development and Reform Commission, was responsible for overall project management, coordination, and supervision. Six project implementing agencies (PIAs) implemented and supervised the subprojects. Changes in the implementation arrangements were made when four subprojects were removed from the project scope and one new subproject was added. The four canceled subprojects were implemented by the local governments using their own funds. Implementation arrangements were satisfactory, effective, and consistent with the design at project appraisal.

10. The project complied with all loan covenants and counterpart funds were mobilized on time. Implementation arrangements were adequate and the ADB loan was appropriately used and disbursed. The PMO submitted the requisite reports, audited project accounts, and financial statements to ADB as required in the loan agreement. The project financial management was satisfactory. Annual project financial statements audited by the Heilongjiang Provincial Audit Office were submitted on time. The auditor issued an unqualified auditor's opinion every year.

## **II. EVALUATION OF PERFORMANCE AND RATINGS**

### **A. Relevance of Design and Formulation**

11. The PCR rated the project relevant. The project was aligned with the government's Twelfth and Thirteenth Five-Year Plans for 2011–2015 and 2016–2020,<sup>5</sup> where energy efficiency improvement and emissions reduction were prioritized, and with ADB's country partnership strategies for the PRC for 2011–2015 and 2016–2020 that emphasized resource efficiency and environmental sustainability.<sup>6</sup> The project was also consistent with ADB's urban sector strategy,

<sup>4</sup> The GAP was to have several benefits. First was the promotion of job opportunities for women as heating bill collectors. Second pertained to the provision of heating assistance to 1,300 women-headed poor households with 70% subsidy on heating tariff and waived connection fees. Third involved the launching of energy conservation awareness campaigns, targeting about 800,000 women in partnership with the women's federation. Fourth was the holding of a targeted session on women and district heating in a knowledge-sharing workshop between private and state-owned district heating companies. Fifth, pertained to the holding of a separate session on women and district heating at a regional conference on district heating.

<sup>5</sup> Government of the PRC. 2011. *People's Republic of China Twelfth Five-Year Plan (2011–2015)*. Beijing; and Government of the PRC. 2016. *People's Republic of China Thirteenth Five-Year Plan (2016–2020)*. Beijing.

<sup>6</sup> ADB. 2016. *Country Partnership Strategy: People's Republic of China, 2016–2020—Transforming Partnership: People's Republic of China and Asian Development Bank*. Manila; and ADB. 2012. *Country Partnership Strategy: People's Republic of China, 2011–2015*. Manila.

supporting infrastructure investment for economic growth, employment creation, innovation, and social services.<sup>7</sup> The project's gender measures contributed to socially inclusive and environmentally sustainable development through women's access to cleaner, safer, and reliable heating systems and capacity building activities promoting employment creation and energy conservation awareness.

12. The project design included lessons from ADB's previous projects with (i) environment-friendly circulating fluidized-bed technology, (ii) systems to control heat demand and supply, and (iii) support for two private enterprises to promote private sector participation. The results chain was sound; the indicators and targets were well considered; and the DMF was formulated and updated to monitor and capture project results. The DMF was updated when four subprojects were canceled, and a new subproject was added. The project loan modality was appropriate and contributed to smooth project implementation. This validation assesses the project relevant.

## **B. Effectiveness in Achieving Project Outcome and Outputs**

13. The PCR rated the project effective in achieving the intended outcome, outputs, and safeguard plans. The project outcome of improved air quality and reduced GHG emissions in six urban areas in Heilongjiang Province was achieved against the 2018 targets. By 2020, the project reduced annual raw coal consumption of 882,460 tons (target: 552,907 tons) and avoided annual emissions of 1,299,831 tons (target: 777,974 tons) of carbon dioxide; 5,787 tons (target: 3,529 tons) of sulfur dioxide (SO<sub>2</sub>); 98,552 tons (target: 68,928 tons) of total suspended particulates; and 11,566 tons (target: 7,751 tons) of nitrogen oxides (NO<sub>x</sub>). By 2018, the air quality in the project's targeted areas was to be improved to at least class II, and this was achieved by 2020.<sup>8</sup> The PCR did not provide details of class II standards against which the outcome target could be validated. This validation notes that the achievement of these outcome targets was delayed.

14. For outputs, 273,000 urban households (230,000 new and 43,000 existing households including 27,000 poor households and 1,100 women-headed households), covering about 34.5 million square meters of heating area, were to have access to district heating systems by 2018. This output was partially achieved by 2020 with 226,499 urban households (153,558 new and 72,941 existing households including 21,137 poor households and 1,829 women-headed households) covering about 30 million square meters had access to district heating systems. Conservation awareness campaigns organized in each subproject area covered 683,600 women by 2020 (target 680,000 women by 2018). However, the PCR did not provide details on how this number was derived and hence, could not be verified. By 2018, 406 megawatt thermal-equivalent of energy-efficient heat generation capacity was to be installed (baseline: 55% efficiency). This was successfully installed with at least 87% efficiency by 2020. By 2020, 361 small boilers were shut down (target: 359 in 2018), and 116,160 household stoves (target: 116,850 in 2018) were replaced. By 2018, (i) two private heating companies were to be supported; (ii) two knowledge-sharing sessions between private and state-owned heating companies were to be conducted; and (iii) 50% of heating bill collectors were to be women. By 2020, support was provided to private heating companies in Tongjiang and Hailin. By 2018, three knowledge-sharing sessions were conducted and a total of 90 bill collectors were recruited (93% were women).

<sup>7</sup> ADB. 1999. *Urban Sector Strategy*. Manila.

<sup>8</sup> Ambient air quality standard was categorized from class I to III, which measured pollutants of SO<sub>2</sub>, inhalable particulate matter, and NO<sub>x</sub>, as stipulated in the PRC's Ambient Air Quality Standard (GB3095-1996) and its amendments in 2000.

15. The PCR stated that project safeguard plans were adequate, updated, and disclosed on a timely basis. Implementation of the plans was monitored regularly, and disclosure of monitoring reports was timely. There were no outstanding safeguard-related issues and complaints. However, there was no assessment made on whether the plans and safeguard measures complied with ADB and country safeguard policies and/or laws pertaining to the environment. The GAP achieved planned impacts for women in the project areas. For GAP, the project completed six out of seven activities, and achieved seven out of eight quantitative targets. The DMF's gender-related outcome, outputs, targets, and indicators were successfully achieved. This validation assesses the project effective.

### **C. Efficiency of Resource Use**

16. The PCR rated the project less than efficient because of limited economic viability. The economic internal rates of return (EIRRs) of the individual subprojects at completion ranged from 7.5% to 54.7% with environmental benefits included. The consolidated EIRR for the whole project, including environmental benefits, was 28.2%, compared to 21.1% estimated at appraisal.<sup>9</sup> All other subprojects, except for the Hailin subproject, were economically viable. The sensitivity analysis tested the robustness of the economic viability of the subprojects and whole project, using three scenarios: a 10% benefit decline, a 10% operation and maintenance (O&M) cost increase, and a combination of both. The analysis showed that the EIRRs for the overall project and the Jiamusi, Qitaihe, and Tongjiang subprojects were still higher than the 12% benchmark. However, the other three subprojects were sensitive to changes and would not be economically viable, indicating limited robustness. Project implementation was less than efficient because of slow progress with changes in project scope, especially the delayed achievement of Hailin subproject's full capacity until the 2021–2022 heating season.

17. This validation notes that the EIRR calculation did not follow an appropriate methodology. First, the source of the coal price was not clear or whether the analysis considered coal tradable or non-tradable. Since coal is imported to the PRC from several countries, it should have been a tradable and shadow-priced accordingly. On the economic benefits side, incremental benefits were excluded, even though these were included in the EIRR calculation at appraisal, because of an absence of reliable information.<sup>10</sup> This was a major shortcoming of the economic analysis. The PCR should have estimated how much incremental heating would have been consumed by comparing households with district heating with those without. The price paid for space heating by households, without district heating, should also have been calculated. This data would have provided a rudimentary estimate of the household demand curve for space heating and therefore, an estimate of willingness-to-pay. The assumption that all project space heating is non-incremental introduces a major bias into the EIRR calculation. Moreover, incremental space heating results in an increase in GHG and pollution, thus increasing economic costs, rather than a net decrease, as assumed in the PCR. There was also an error in the presentation of data in Table A14.2 of the PCR's Appendix 14. The last four columns contained the same numbers by year, even though these measured different quantities. Given these methodological issues and limited economic viability, this validation assesses the project less than efficient.

<sup>9</sup> Without environmental benefits, the EIRR was –16.5%.

<sup>10</sup> The PCR stated that a project performance monitoring system to monitor and evaluate project impact, outcome, and outputs was developed. This should have provided the required information for the economic analysis.

## **D. Preliminary Assessment of Sustainability**

18. The PCR rated the project likely sustainable and noted that the PIAs, responsible for the district heating systems' O&M, possessed the institutional capability and expertise required to manage and operate the facilities. It also noted that project operations had no adverse environmental or social impacts.

19. The financial internal rates of return (FIRRs) of the six subprojects at completion ranged from 5% to 19.5%. The overall project's FIRR was 10.9%, against the 9.5% estimated at appraisal, and higher than the weighted average cost of capital (WACC) of 3.2%. The PCR did not provide detailed information on how WACC was calculated. A sensitivity analysis tested the robustness of the six subprojects' financial viability, using three scenarios: a 10% revenue decline, a 10% O&M cost increase, and a combination of both. The results showed that the overall project's FIRR would be higher than WACC under the scenario of 10% higher O&M costs. However, it would not be financially viable under the remaining two scenarios. Only the Harbin subproject could remain financially viable in any scenario.

20. This validation notes several inconsistencies in the FIRR calculation. The PCR stated that the project costs were expressed in the prices of the year that these were actually incurred, and the costs and revenues after project completion were expressed in constant 2020 prices.<sup>11</sup> Project costs should also have been expressed in constant 2020 prices. This may also be an issue with the project costs in the economic analysis. The equipment's replacement cost was the same in both the economic and financial analyses. If shadow pricing was done correctly, the two replacement cost streams should be different. The RRP indicated that "small heating boilers owned by the implementing agencies will be decommissioned after heating networks are connected to the new heat sources."<sup>12</sup> However, the FIRR calculation did not take into account the O&M cost savings of these decommissioned small heating boilers. The assessment of sustainability should have included a brief overview of the project implementing agencies' financial position since they were also the operating agencies. Nevertheless, this validation assesses the project likely sustainable as the inconsistencies were not substantial impediments for its sustainability.

## **III. OTHER PERFORMANCE ASSESSMENTS**

### **A. Preliminary Assessment of Development Impact**

21. The PCR rated the project's development impact satisfactory. Based on the DMF, energy intensity improved by 29.6% in 2019, compared with 20.0% target. By 2020, SO<sub>2</sub> emission was reduced by 20.7% (target: 2.0%) and NO<sub>x</sub> by 28.4% (target: 3.0%). Therefore, the project's intended impact of improved energy efficiency and cleaner environment in Heilongjiang was achieved.

22. The PCR rated the project's environmental impact successful. By 2020, it improved the district heating systems' energy efficiency, resulting in an estimated saving of 882,460 tons of raw coal per year and reduced emissions of carbon dioxide, SO<sub>2</sub>, NO<sub>x</sub>, and total suspended particulates. The PCR rated the project's social impact satisfactory because of significant economic, environment, and social impacts generated. A total of 1.21 million urban residents of the project areas, including 683,600 women; 55,246 people from poor families; 109,794 children

<sup>11</sup> Footnote 2, Appendix 15, para. 2(iii).

<sup>12</sup> Footnote 1, para. 16.



and 14,020 teachers; 43,947 hospital patients; and 9,994 medical staff benefited from energy efficiency improvements and cleaner environments. The project helped improve living conditions, increased participation in regional economic cooperation and integration, and enhanced project cities' capacities to manage sustainable energy-efficient heating systems and meet long-term urban development needs. It also helped reduce cases of respiratory diseases, lower heating expenditure by switching to centralized energy-efficient heating systems, and provide a better schooling environment during the winter. The upgraded district heating systems created a more comfortable and conducive environment for residents in the project areas, particularly during the coronavirus disease pandemic, when most residents had to spend a major portion of their daily lives indoors. This validation assesses the project's development impact satisfactory.

## **B. Performance of the Borrower and Executing Agency**

23. The PCR rated the performance of the borrower and executing agency satisfactory. The Ministry of Finance, as the borrower, signed the loan agreement and submitted official requests to ADB for the change of project scope, extension of loan closing date, reallocation of ADB loan proceeds, and increase of ADB disbursement percentage for some civil works contracts to maximize use of the loan proceeds. The executing agency, the PMO, and the PIAs had strong ownership and commitment to the project. The project leading group held periodic meetings to review implementation progress and provided policy guidance during implementation. The provincial government and PIAs provided counterpart funds in a timely manner. The PMO played a critical role in coordinating with government agencies and ADB. The Heilongjiang Provincial Finance Department managed the advance account and processed fund withdrawal and reimbursement applications in a timely and effective manner. Internal coordination among government agencies was effective and efficient. This validation assesses the performance of the borrower and executing agency satisfactory.

## **C. Performance of the Asian Development Bank**

24. ADB conducted technical due diligence, economic and financial analyses, environment impact assessment review, procurement capacity assessment, procurement and financing plan development, social and poverty analysis, land acquisition impact assessment, and project risk assessment of the project components. Extensive stakeholder participation and consultations were undertaken during project design.

25. ADB conducted nine review missions during implementation and provided hands-on training in procurement and contract management during these missions. The missions addressed project implementation requirements, such as procurement, disbursements, project management, changes to project scope, partial cancelation of loan proceeds, loan reallocations, and loan extension. ADB processed procurement-related reviews and withdrawal applications efficiently. The project team provided clear and detailed guidance to the project, and fully complied with all safeguard covenants and other requirements. This validation assesses ADB's performance satisfactory.

# **IV. OVERALL ASSESSMENT, LESSONS, AND RECOMMENDATIONS**

## **A. Overall Assessment and Ratings**

26. The PCR rated the project successful based on ratings for the four core evaluation criteria. The project was relevant to the government's development strategy and ADB's policies in the PRC. It was effective in achieving its envisaged outcome and outputs. The project was less than

efficient because of the change in project scope, lower EIRRs for two subprojects, an extended implementation period, and Hailin subproject's underachievement of full capacity until the coming 2021–2022 heating season. It was likely sustainable because of high FIRRs and adequate capacity to operate the project facilities. This validation assesses the project relevant, effective, less than efficient, and likely sustainable. Overall, the project is assessed 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	
<b>Overall assessment</b>	<b>Successful</b>	<b>Successful</b>	
Preliminary assessment of impact	Satisfactory	Satisfactory	
Borrower and executing agency	Satisfactory	Satisfactory	
Performance of ADB	Satisfactory	Satisfactory	
Quality of PCR		Less than satisfactory	Para. 31.

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

## B. Lessons

27. The PCR identified three lessons. First, the importance of limiting the number of subprojects to avoid cancelation. Second, because the PIAs were not experienced with ADB procurement procedures and requirements, the late start of the consulting service affected the project implementation schedule. Recruitment of consultants as early as possible would expedite project implementation. Third, a well-managed procurement process is critical to obtaining favorable bid prices. Proactive project management for equipment procurement and construction saves capital costs and ensures the quality of construction and equipment supply.

28. This validation suggests two other lessons. First, providing support for capacity building of executing and implementing agencies is of paramount importance to help strengthen their technical and institutional capabilities. These helps improve quality-at-entry and implementation. Enhanced skills and competence of these agencies facilitate implementation of project and the delivery of its expected results, especially for energy efficiency projects. Technical and institutional challenges often constrain these types of projects. As part of preparatory and start-up activities, conduct of pertinent trainings on procurement and contract management, supervision of project consultants, financial reporting, among other aspects, also help ease possible implementation bottlenecks. Second, it is imperative that socioeconomic data, required in the conduct of economic analyses at appraisal and at completion especially for energy projects, are carefully collected and readily available. Data insufficiency leads to unreliable estimates on a project's economic viability. Assessment of a project's economic efficiency relies on the soundness of data, parameters, and methodology used to appropriately assess the project's economic cost and benefits. A well-designed project performance monitoring system (PPMS) can facilitate collecting these specific project data and monitor the benefits.

### **C. Recommendations for Follow-Up**

29. The PCR suggested five recommendations. First, monitor the emission of pollutants during the project's operating period to ensure that emissions meet standards and air quality is improved. Second, follow up on the increase in heating area in Jiamusi, full heating capacity in Hailin, and closure of the remaining nine small boilers. Third, due to the long winter, resulting in shorter construction season in Heilongjiang, future infrastructure projects in northern PRC provinces require a more realistic project implementation schedule. Fourth, counterpart funding must be available on time. Each subproject must be carefully reviewed for the availability of counterpart funds during project formulation and arrangements made for obtaining such financing. Fifth, the PIAs' staff should be adequately trained during project preparation and appraisal. This validation has no additional recommendations to offer.

## **V. OTHER CONSIDERATIONS AND FOLLOW-UP**

### **A. Monitoring and Reporting**

30. The project design required the PMO and the PIAs to use a PPMS to monitor and evaluate project impact, outcome, and outputs. With the project implementation consultant's assistance, the PPMS was established, and performance was monitored and reported. However, the PCR did not discuss the design, implementation, and the quality of the PPMS.

### **B. Comments on Project Completion Report Quality**

31. The PCR adequately described project implementation and assessed the core evaluation criteria succinctly. However, the methodologies used for the economic and financial analyses had shortcomings. The economic benefits in the EIRR calculation were not appropriately identified, quantified, or valued, and omitted incremental economic benefits. There were also shortcomings in the FIRR calculation. Savings benefits were omitted, and the capital cost seemed to be in nominal terms, rather than real as required. The PCR did not provide detailed information on how WACC was calculated, including an assessment of the financial performance of the project operating entities. This validation assesses the quality of the PCR less than satisfactory.

### **C. Data Sources for Validation**

32. Data sources included the RRP, PCR, and mission reports.

### **D. Recommendation for Independent Evaluation Department Follow-Up**

33. The PCR suggested that a project performance review be conducted in 2024 or later. By that time, all subprojects should have been in operation for more than 4 years. In validation's view, the project performance evaluation report could be prepared as soon as possible to assess the economic and environmental impacts of coal-based district heating and consequently for ADB's energy policy regarding coal.