



1. Project Data

Project ID
P120664

Project Name
CN-Urumqi District Heating

Country
China

Practice Area(Lead)
Energy & Extractives

L/C/TF Number(s)
IBRD-80460

Closing Date (Original)
31-Dec-2015

Total Project Cost (USD)
343,200,000.00

Bank Approval Date
17-May-2011

Closing Date (Actual)
31-Dec-2015

	IBRD/IDA (USD)	Grants (USD)
Original Commitment	100,000,000.00	0.00
Revised Commitment	99,144,150.75	0.00
Actual	99,144,150.75	0.00

Sector(s)

Other Energy and Extractives(99%):Public Administration - Energy and Extractives(1%)

Theme(s)

Pollution management and environmental health(34%):City-wide Infrastructure and Service Delivery(33%):Climate change(33%)

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2. Project Objectives and Components

a. Objectives

According to the Loan Agreement, the project development objective is to connect consumers in selected districts of Urumqi to district heating services with improved energy efficiency and environmental performance.

b. Were the project objectives/key associated outcome targets revised during implementation?

No



c. Components

Part A: Shuimogou District Urumqi Combined Heat and Power (CHP) Plant District Heating Network (Estimate at appraisal: US\$196.8 million; actual cost US\$158.9 million).

Construction of district heating networks with associated ancillary equipment, substations (including building level substations), control, monitoring and dispatch systems and control centers, meters, and maintenance vehicles, and associated civil and installation works and recovery of public infrastructure damaged by installation in Urumqi's Shuimogou District.

Part B: Shayibake District CHP Heating Network (Estimate at appraisal: US\$145.0 million; actual cost US\$126.5 million)

Construction of district heating networks with associated ancillary equipment, substations (including building level substations), control, monitoring and dispatch systems and control centers, meters, and maintenance vehicles, and associated civil and installation works and recovery of public infrastructure damaged by installation in Urumqi's Shayibake District and Tianshan District.

Part C: Institutional Development and Project Management (Estimate at appraisal: US\$1.27 million; actual cost US\$2.1 million).

Strengthening the capacity of Urumqi District Heating Company (UDHC) and Urumqi city in project management, monitoring, and evaluation; and supporting UDHC's and the city's institutional development through the provision of technical assistance, training, study tours, and operational support.

d. Comments on Project Cost, Financing, Borrower Contribution, and Dates

Project Costs: Total costs at appraisal were estimated at US\$343.1 million. Total actual cost was US\$468.8 million. Actual cost of the three original project parts amounted to US\$287.6 million, a saving of US\$55.4 million compared to appraisal estimates. These savings were due mainly to cancellation of some planned investments in the context of the coal-to-gas program and changes to the urban master plan, as well as from competitive bidding for project contracts. This saving contributed to the purchase of additional meters and valves for temperature control and to establish an energy management system. The total cost of these additional activities amounted to US\$137.37 million. Financing charges of US\$42.01 million (appraisal estimate US\$6.20 million), a front-end fee of US\$0.25 million, and initial working capital of US\$1.57 million, brought the total project cost to US\$468.8 million. The project team explained that the considerable increase in financing charges over the appraisal estimate was partly caused by depreciation of the US dollar against the Chinese yuan. However, according to the ICR (page 46), total depreciation of the dollar against the yuan during implementation was 9.3 percent compared to a 678 percent increase in financial charges over the appraisal estimate.

Financing: The IBRD loan of US\$ 100 million was almost fully disbursed. There were no other external sources of financing.

Borrower Contribution: The Government and Urumqi Municipality were expected to contribute US\$ 243.3 million at appraisal; their actual contribution was US\$ 369.7 million.

Date: The project closed on schedule on December 31, 2015.

3. Relevance of Objectives & Design

a. Relevance of Objectives

The PDO remains relevant to both Government and World Bank Group (WBG) strategy as set out in the China Country Partnership Strategy (CPS) for FY2013-2016. China's Five-Year Plans for 2016-2020 target the reduction of the economy's energy and carbon intensities and of air pollution. This focus was reflected in Theme 1 of the CPS: supporting greener growth. Despite air quality improvements resulting from the project and other measures, Urumqi remained vulnerable to air pollution due to the continued use of coal in industry, increases in vehicle emissions, and unfavorable geo-meteorological conditions, and was China's most polluted city in the first quarter of 2016. Clean and efficient energy for heating remains highly relevant to ensure that it does not contribute to Urumqi's continuing air quality concerns.

Rating



High

b. Relevance of Design

The framing of the objectives and their ambitiousness were adequate. The quality of the results framework was sufficient and straightforward. The PDO was clear and linked to intermediate and final outcomes. The causal chain between funding and outcomes is clear and convincing. Components A and B aimed to meet the objective by extending and upgrading the district heating network to connect customers to pre-existing CHP plants. This would be a cleaner and more efficient alternative to the small coal-fired heat-only boilers prevalent in Urumqi in 2011. Component C was designed to support the implementing agencies' efforts to improve the efficiency and environmental performance of the district heating sector and pave the way for broader sectoral reform and development. The choice of lending instrument of investment project financing (IPF) including the technical assistance (TA) on capacity building was appropriate. There were, however, some significant shortcomings. There was insufficient consideration of the possible impact on project outcomes of factors such as efficiency improvement measures in power plants and buildings, and demand-side efficiency enhancements, which would not be financed by the project. Most importantly, design did not take account of the possibility of a large scale switch from coal-fired to natural gas-fired heating, which was in fact officially announced shortly after Board approval, and which would likely have a significant impact on the level of air pollution. This was followed by the launching, in March 2012, of a city-wide coal-to-gas program. This program was implemented with impressive speed, and some 9 gigawatt (GW) of coal-fired heat-only boilers (HOB) were replaced by natural gas-fired boilers for over 75 percent of Urumqi's heated floor area. Unintended impacts on potential curtailment of renewable energy could also have been discussed, although these had not yet materialized at project closure.

Rating
Modest

4. Achievement of Objectives (Efficacy)

Objective 1

Objective

Connect consumers in selected districts of Urumqi to district heating services with improved energy efficiency

Rationale

Outputs

1. In the Shuimogou District Heating Network (UHN), the project connected a heated area of 9.7 million square meters (m²), a 66 percent achievement of the target of 14.7 million m², due to lower than originally expected demand for heat from coal, following the implementation of Urumqi's coal-to-gas program.
2. A UHN pipeline of 48.3 kilometers (km) was installed, some 12 percent lower than the targeted length of 54.9 km due to less demand for heating service from UHN than originally expected.
3. One new pressure-regulating substation for UHN was constructed.
4. 72 UHN substations were constructed or rehabilitated (compared with the target of 90).
5. In the Shayibake District Heating Network (SHN), the project connected a heated area of 10.8 million m², including 5.9 million m² that independent distribution companies heated solely with gas, but which could still in the future be heated with CHP plant heat using project-financed pipeline connections. This was 73 percent of the target of 14.7 million m².
6. A pipeline of 37.96 km, including 5.9 million m² that independent distribution companies heated solely with gas, but which could still in the future be heated with CHP plant heat using project-financed pipeline connections, was installed in the SHN.
7. One new pressure-regulating substation for SHN was constructed.
8. 58 SHN substations were constructed or rehabilitated.
9. The billing and accounting system of Urumqi District Heating Company (UDHC) was strengthened to enable implementation of consumption-based billing as a means of improving the economic efficiency of district heating.
10. Technical assistance was provided to UDHC and a study completed of how to optimize multi-heat source operation, management and monitoring. The study identified numerous technical measures that could significantly improve the efficient performance of UDHC's



systems. The Borrower's ICR (ICR, page 43) noted that this study proposed "relevant recommendations."

11. 20 domestic and two international study tours did not take place since a Government order restricted travel by public-sector employees. However, over 700 person-days of training for project staff were implemented.

Outcomes

1 The standard coal consumption for heating per connected floor area was reduced from the baseline of 31.99 metric tons of coal per thousand square meters (tce/km²), by 8.15 tce/km², 120 percent of the target reduction of 6.80 tce/km².

2 The connected floor area per unit of heat generation increased by 122.31 square meters per terajoule (m²/TJ) from a baseline of 1,504.97 m²/TJ, exceeding the target of 36.80 m²/TJ by 332 percent.

These outcomes are estimated by the ICR to be those attributable to the project. The original energy efficiency targets set out in the PAD could no longer be used because they were significantly affected by factors exogenous to the project, particularly the coal-to-gas program. The ICR therefore adopted a modified methodology for calculating energy efficiency outcomes. By separating heat generation data from coal-fired CHP plants, coal heat-only boilers and gas heat-only boilers, the ICR attempted to identify and isolate those energy efficiency impacts that could be attributed to the project-financed CHP plants. The revised methodology, set out in Section 3.2 (and in more detail in Annex 9) of the ICR, is generally convincing. However, while addressing the principal issue of the coal-to-gas program, the methodology does not take into consideration other efficiency-enhancing factors such as demand side changes, enhanced building efficiency, weather, and the quality of coal.

Notwithstanding the large scale conversion to gas, the costs of heat production from CHP plants (¥11.5/Giga Joule [GJ]) are less than a quarter of those from gas (¥56/GJ). Although the Regional Government decided in 2013 to reduce coal use by closing one CHP plant in Urumqi, it did not close the project-supported CHP plants for Shayibake (Saybagh) District Heating Network (SHN) and Shuimogou District Heating Network (UHN). The multi-source optimization study, financed by the project, recommended maximization of heat production from the CHP plants. Had the Authorities closed down all CHP plants, the increased cost of energy would have had a significantly deleterious effect on UDHC's financial performance, thereby calling for increased subsidies.

Rating

Substantial

Objective 2

Objective

Connect consumers in selected districts of Urumqi to district heating services with improved environmental performance

Rationale

Outputs are the same as in Objective 1 above.

Outcomes

1 Annual boiler plant dust emissions per connected floor area were reduced by 48.24 metric tons per million m² from a baseline of 189.32 t / million m², thereby exceeding the target reduction of 40.22 t / million m² by 120 percent.

2 Annual boiler plant SO₂ emissions per connected floor area were reduced by 94.94 metric tons SO₂ per million m² (from a baseline of 372.62 t / million m², thereby exceeding the target reduction of 79.17 t / million m² by 120 percent.

3 Annual boiler plant CO₂ emissions per connected floor area were reduced by 22.59 metric tons of CO₂ per thousand m² from a baseline of 88.67 metric tons per thousand m², thereby exceeding the target reduction of 18.84 metric tons per thousand m² by 120 percent.

As with the gains in efficiency, application of the original methodology used in the PAD shows high achievement rates for environmental impact – reductions of 148 percent, 142 percent and 233 percent of the target for dust, SO₂ and CO₂ respectively. The improvements were confirmed by a four-year study of Urumqi, covering the period January 2011-January 2014, which found a significant decline in fine inhalable particles (known as PM 2.5) in January of 2013 and 2014 compared with the same period in 2011 and 2012. These achievements, however, reflect the impact not only of the project, but also of exogenous factors, primarily the coal-to-gas program. Using the same approach as for the efficiency gains, the ICR estimates that the above achievement rates of 120 percent of the target are attributable to the project when the supply of heat from CHP plants is identified and isolated. The achievement rate for each outcome is



identical (120 percent of target), because the calculations of dust, SO₂ and CO₂ emissions use coal consumption data with fixed emissions factors. The ICR (page 12) argues that “this is appropriate for attribution purposes because any difference between the expected and actual emissions factors would be due to the performance of boiler emissions controls, which are outside the scope of the Project. Actual, monitored emissions at the CHP plants show that SO₂ and dust emissions (per unit of coal consumed) were on a par with expected values, which confirms the positive environmental performance outcome.”

While the project and other measures improved the air quality, Urumqi was still China’s most polluted city in the first quarter of 2016 due to the continued use of coal in industry, increases in vehicle emissions, and unfavorable geo-meteorological conditions. Without the project under review, the severity of the pollution would likely have been even worse.

Rating
Substantial

5. Efficiency

Economic Analysis

The ex-ante analysis, covering 90 percent of project costs, estimated the following benefits: (a) fuel efficiency improvements generated by replacing local, inefficient coal-fired boilers by heat supply from CHPs; (b) reduced heat losses through modernization and automation of existing sub-stations; (c) reductions in operating, repairs and maintenance costs; and (d) environmental benefits of reductions in dust, SO₂ and CO₂ emissions. The economic internal rate of return (EIRR) of the project was estimated at 21.3 percent. Without including the economic values of emission reduction, the EIRR was estimated at 11.5 percent. The opportunity cost of capital was assessed at 6 percent. The ex-post analysis covered 61 percent of the actual project costs. The lower coverage at completion is because of the additional activities partly financed with loan savings. These activities were related to system management rather than connection of floor areas, and are therefore not covered by the economic or financial analysis. The ex-post analysis differed from that at appraisal in three respects. First, it took account of the actual floor area connected to different fuel sources. Second, it valued CO₂, SO₂ and dust emission reductions higher than at appraisal, in line with updated World Bank guidelines. Third, it examined two scenarios: (1) the Government continues with the current policy of using primarily gas-fired boilers for supply of the incremental heat requirements; and (2) the Government acts on the recommendations of the project-financed study to maximize use of heat from the CHP plants. The EIRR was 13.1 percent under the first scenario and 16.4 percent under the second. Without including emission reduction values, the EIRR was negative (minus 6.3 percent) for the first scenario; the equivalent rate was not calculated for the second scenario. The ICR did not clearly explain the valuations of coal and natural gas, or the methodology used.

The financial rates of return were 8 percent ex ante and minus 6.8 percent ex post. The low FRRs resulted from under-utilization of the project-financed CHP-related primary and secondary networks due to the coal to gas program, and no increases in tariffs during implementation.

There were few operational and administrative inefficiencies, and the project was completed on schedule.

Efficiency Rating
Substantial

a. If available, enter the Economic Rate of Return (ERR) and/or Financial Rate of Return (FRR) at appraisal and the re-estimated value at evaluation:

	Rate Available?	Point value (%)	*Coverage/Scope (%)
Appraisal	✓	21.30	90.00 <input type="checkbox"/> Not Applicable
ICR Estimate	✓	13.10	61.00 <input type="checkbox"/> Not Applicable

* Refers to percent of total project cost for which ERR/FRR was calculated.



6. Outcome

Relevance of objectives remains high (Urumqi was China's most polluted city in the first quarter of 2016). The relevance of design is rated modest, since insufficient account was taken of exogenous factors, notably the introduction of the coal to gas program. Efficacy is rated substantial reflecting the ICCR's generally convincing attribution of notable efficiency improvements and air pollution reductions to the project-supported CHP connections and enhancements of associated infrastructure and software systems. Efficiency is rated substantial due to positive EIRR's given the economic valuations of air pollution, and few operational or administrative inefficiencies.

- a. Outcome Rating
Satisfactory

7. Rationale for Risk to Development Outcome Rating

The technical risk is low because the project did not involve complex or innovative technology and systems.

There is a financial risk because of the under-utilization of the project-financed CHP-related primary and secondary networks, and the fact that there were no increases in UDHC's average heat sales tariffs during the implementation period. If this continues, it would impact negatively on UDHC's financial situation and hence upon investments, operation and maintenance and the quality of heating services.

Economic risk at country and global levels is low because the demand for heat is relatively inelastic.

Social risk in terms of the strength of stakeholder support is moderate. Customers may appreciate the reduced air pollution from CHP but may prefer more marked pollution reductions from gas heating.

An environmental risk would materialize if some heat supply were to shift from gas to coal-fired CHP plants as the system is optimized and as heat demand rises over time. CO2 emissions from the heat sector could increase relative to the current situation in which there is a high share of natural gas. Another risk is that growth in demand for heat from CHP plants may curtail the use of renewable energy. Technical and policy measures are needed to mitigate this risk.

Although the government has thus far demonstrated ownership and commitment to the project, it could decide to close down the project-financed coal fired CHP network.

There is a moderate risk of exposure to natural disasters, but no assessment of resilience and preparedness of the CHP and associated project-financed infrastructure is available.

- a. Risk to Development Outcome Rating
Substantial

8. Assessment of Bank Performance

- a. Quality-at-Entry

The Bank's strategic relevance and approach were appropriate and the PDO were highly relevant to Bank and Borrower strategies. The proposed infrastructure investment responded directly to Urumqi's circumstances at that time. Project preparation was facilitated by the strong relationship that Bank staff cultivated with the municipal government through prior cooperation under a previous project. Bank staff successfully incorporated the design lessons from other district heating operations in China and elsewhere, including: (a) use of waste heat from CHP plants for district heating; (b) ensuring a demand-driven operation in order to respond efficiently to individual customer requirements, saving on pumping and energy costs; (c) metering across the heating supply chain, enabling best practice control and optimization, and providing data for calculating two part heat tariffs; and (d) piloting building level substations to demonstrate energy efficiency and heating quality benefits associated with linking substations to fewer buildings. Technical assistance activities supported the implementing agencies' efforts to address long-term systemic challenges for the district heating sector. Safeguards policy compliance, and fiduciary and policy institutional arrangements were strong. The Bank team helped Urumqi apply a sophisticated clean development mechanism (CDM) methodology to measure emissions reductions as part of the monitoring and evaluation arrangements (M&E).

Technical solutions were based on well tested experience, and equipment reflected mature technologies. Detailed feasibility studies prepared for the two district heating areas defined the technical solutions, pipeline routes and locations for the pressure isolation stations, as well as investment costs for all sub-components and expected benefits. Because no account was taken of the potential shift to natural gas, the



financial and economic assessment turned out to be optimistic, and M&E indicators were not fully attributable to the project.

A project social analysis identified the stakeholders (citizens, religious communities, shop keepers, schools, hospitals, local markets, mosques, heating company employees, municipal departments in charge of traffic management, and the Project Management Office). Public consultations, interviews, focus group discussions, and substantial data gathering and analysis made it possible to conclude that all groups fully supported the project and that their concerns were incorporated in design.

Bank inputs and processes were appropriate. The concept stage to approval of this project was 11.1 months, shorter than the average of 19 months for Bank projects in China.

There was one moderate shortcoming. The Bank team considered but ruled out the potential use of gas as an alternative to coal given the municipal government's concerns at that time. Less than one year after the project approval in May 2011, the municipal government implemented the coal-to-gas program beginning in March 2012, with impressive speed.

Quality-at-Entry Rating
Moderately Satisfactory

b. Quality of supervision

The Bank team proactively identified and resolved threats to the achievement of relevant outcomes. Supervision was underpinned by the technical expertise of the task team and the continuity of team membership from design to the final six months of implementation. However, the Borrower expressed frustration over delays in obtaining non-objections.

The team leader, and fiduciary and safeguard staff were based in Beijing, which allowed visits to Urumqi two to three times per year. During field visits, the team monitored and verified social and environmental impacts, and met relevant authorities to address issues as they arose. Procurement was supervised efficiently and satisfactorily, and most implementation problems were resolved by completion. The candor and quality of performance reporting was adequate.

The Bank's role in ensuring appropriate transition arrangements for regular operation of supported activities after loan closing was supported by a separate District Heating Pricing Technical Assistance (TA) Project, begun in 2014 and scheduled to conclude in late 2016.

Quality of Supervision Rating
Satisfactory

Overall Bank Performance Rating
Moderately Satisfactory

9. Assessment of Borrower Performance

a. Government Performance

Government ownership and commitment to achieving the PDO was strong, but their view on how they might be achieved had changed less than one year after project approval when the coal-to gas program was adopted. Government support for the project investments was nonetheless maintained, and the CHP plants financed by the project remained open, although another one was closed.

Support to improve air quality in Urumqi has been strong from the Central, Regional and Municipal Authorities. Swift and comprehensive closure of all coal-fired heat-only boilers, without compromising city-wide supply of reliable and affordable heating, reflects a high level of political will, dedicated resources, and institutional capacity (under both the project and the coal to-gas program).

Government support included higher than expected funding from the local government (¥473 million, 112 percent of the original budget), and subsidies that allowed UDHC to comply with financial covenants.

However, the rapid pace of change in the heat sector nevertheless poses a challenge for the efficient use of existing and project-supported heating infrastructure, and to the sustainability of current tariffs. A comprehensive approach to potential tariff reform, energy efficiency and social protection measures would improve the financial and environmental sustainability of heating in Urumqi, while also protecting low-income households. Optimal use of CHP plants in the context of existing and potential new infrastructure and related social, economic and environmental policies would require improved planning.

Government Performance Rating
Moderately Satisfactory



b. Implementing Agency Performance

Urumqi Municipality was the implementing agency. The Urumqi International Technical Cooperation Project Office (UPMO or PMO) was established in the Urumqi Municipality Government Construction Commission. The PMO was to be responsible for the overall management and oversight of project implementation. Day-to-day implementation was the responsibility of UDHC, to which the municipality relented the proceeds of the IBRD Loan. UDHC established two project implementation units (PIUs), one each for Shuimogou and Shayibake district heating networks. Commitment to achieving the PDO by the PMO and UDHC was apparent, and they complied fully with covenants and agreements. Delays occurred initially due to lack of experience with Bank projects, but implementation improved quickly. The PMO rapidly absorbed the assistance provided by project-supported consultants. Procurement staff from the PMO and UDHC were invited to a joint procurement, financial management, and disbursement workshop organized by the Ministry of Finance and the World Bank Beijing Office. The introduction of advanced management practices – including an energy management system, modern project management, international bidding and contracting, construction supervision, and performance measurement – underpinned implementation. However, the utilization of some technical assistance related to institutional reform was slow. Physical execution of contracts was efficient, but there were some delays in signature. Payments to contractors suffered more serious delays, but these did not affect progress on physical infrastructure or technical assistance. According to the ICR, these problems had been fully resolved by closure, and no extension of the closing date was necessary. Safeguards compliance was adequate. There were some problems in implementing the results framework and in timely submission of the data requested by the Bank on energy efficiency and environmental performance. Adequacy of beneficiary/stakeholder consultations and involvement and relationships and coordination with partners/stakeholders could not be assessed due to lack of information.

Implementing Agency Performance Rating
Moderately Satisfactory

Overall Borrower Performance Rating
Moderately Satisfactory

10. M&E Design, Implementation, & Utilization

a. M&E Design

The indicators reflected the PDO but full attribution was difficult given factors such as the switch to natural gas, emission controls and demand side and building energy efficiency measures. CO₂ emissions reductions estimates were based on a clean development mechanism (CDM) methodology defined in Article 12 of the Kyoto Protocol that UDHC had used in neighboring Tianshan (Southern) District. PDO-level Indicators 2 and 3 (for SO₂ and dust respectively) were to be calculated using actual emissions data measured at the boilers. The indicators were measurable in terms of values, timing, and location. Baselines were available in the PAD. Nonetheless, M&E design presented two main issues. First, as the ICR (page 7) acknowledges, the indicators did not control for the possibility that heat would be generated from sources other than coal (a circumstance that was not expected at appraisal, but occurred in practice). Second, as the ICR also points out, measuring SO₂ and dust emissions using actual boiler-level data is useful to confirm that boilers perform as expected. However, any difference between expected and actual emissions would be due to boiler emission controls, which are outside the scope of the project. M&E design was largely project-specific and not well-embedded institutionally (most of the indicators were project specific and thus unlikely to be sustained after closure).

b. M&E Implementation

UDHC, which was responsible for M&E, did not always supply necessary data in a timely manner. Design weaknesses, including indicator specification to improve attributions, were not addressed during implementation although they were in the ICR, which used a revised methodology (see Section 4 above). Following the mid-term review in January 2013, the project team proposed an updated methodology to adjust the baseline to eliminate the coal consumption reductions that were attributable to the shift to the natural gas heating. This proposal would have led to new target values requiring a project restructuring, an option that was not pursued. Supervision visits between 2013 and 2015 raised queries about reported information and data gaps, and the implementation of an agreed methodology for PDO-level indicators related to coal consumptions (energy efficiency and environmental performance) remained outstanding at closure. Little information is presented in the project documents concerning independence of analysis and data quality control. There was no evidence regarding reliability and quality of data, that a sound methodology was adopted and maintained, or that the project assured independence of analysts and quality control.



c. M&E Utilization

The implementing agencies and Bank team used the indicators to monitor physical progress and make appropriate adjustments to contracts and plans to account for the coal-to-gas program.

M&E Quality Rating
Modest

11. Other Issues

a. Safeguards

The project was classified as Category "A" for the purposes of environmental assessment. As well as Environmental Assessment (OP 4.01), Involuntary Settlement (OP 4.12) was triggered.

Environment

The project was expected to contribute to a net reduction of coal consumption and associated emissions. Temporary environmental impacts were foreseen during the construction phase, such as noise, dust, solid waste disposal, worker safety, social and traffic disturbance, and chance finds of cultural relics. Standard measures to mitigate the environmental impact of these were described in the Environmental Assessment (EA) and in the Environment Management Plan (EMP), which, according to the PAD, were carried out prior to appraisal. The EMP included a traffic management plan and appropriate mitigation measures identified during the social analysis process. The PAD reports that, in accordance with OP 4.01 and relevant domestic regulations, an EA was prepared for each of the two project district heating networks. An executive summary of each EA was also prepared. The ICR (page 8) reports that the project performed well with respect to environmental safeguards, and that the EMP was well implemented. The Bank safeguards team prepared bi-annual monitoring reports from field visits and a summary report (Chinese and English language translations). The ICR did not report on the findings of any independent review of environmental safeguards implementation or monitoring reports. Overall safeguards and EA ratings were reported as satisfactory throughout implementation.

Social Safeguards

Although OP 4.12 was triggered, design avoided land acquisition and involuntary resettlement. Therefore, no resettlement action plan or indigenous people's development plan was prepared. The ICR reports that a resettlement policy framework was prepared to address the land acquisition and resettlement impacts of any changes to the project design, but that no resettlement issues arose.

b. Fiduciary Compliance

Financial management

Out of the four financial covenants, three were complied with and the other was partially complied with according to the last Implementation Status Report (ISR). Virtually all the loan was disbursed. The project's financial management (FM) was rated satisfactory in the last ISR, though most of the previous ratings were moderately satisfactory. The ICR reports that the project's financial management system provided accurate, timely information, and that there was reasonable assurance that the implementing agencies had used the Loan for the intended purposes. Accounting and financial reporting aligned with Ministry of Finance and Loan Agreement requirements. The withdrawal procedure and funds flow arrangements were described as appropriate. All project financial management reports received unqualified audit opinions. During implementation no significant financial management issues arose, and the Bank and auditors raised only minor concerns. However, disbursement consistently lagged the physical progress of contract work. This resulted in moderately satisfactory ratings during implementation. The implementing agencies were able to resolve these concerns by completion. The ICR did not report any corruption or misuse of funds.

Procurement

All works, goods and consultant services were procured satisfactorily, in accordance with legal covenants and Bank procurement policy and procedural requirements. At the beginning of project implementation, there were some delays in procurement due to the PMO and UDHC being unfamiliar with Bank policies and procedures. The ICR reports that procurement improved significantly after the mobilization of project management consulting services in October 2012, and periodic training from Bank staff. All PIUs stated that the Bank's procurement policies and procedures helped achieve transparency and fairness in the bidding process by providing a high standard of guidance. The project provided training to municipal officials for procurement. UDHC has replicated their experience with these rules and procedures in subsequent business. There were no reported cases of misprocurement.



c. Unintended impacts (Positive or Negative)

Not applicable.

d. Other

Not applicable.

12. Ratings

Ratings	ICR	IEG	Reason for Disagreements/Comment
Outcome	Satisfactory	Satisfactory	---
Risk to Development Outcome	Modest	Substantial	The increasing use of gas-fired heating and the underutilization of the project financed CHP network could undermine project achievements.
Bank Performance	Moderately Satisfactory	Moderately Satisfactory	---
Borrower Performance	Moderately Satisfactory	Moderately Satisfactory	---
Quality of ICR		Substantial	---

Note

When insufficient information is provided by the Bank for IEG to arrive at a clear rating, IEG will downgrade the relevant ratings as warranted beginning July 1, 2006.

The "Reason for Disagreement/Comments" column could cross-reference other sections of the ICR Review, as appropriate.

13. Lessons

The first three of the following lessons are taken from the ICR with some adaptation of language. The fourth is drawn by IEG.

1. Careful planning and a well-developed communication strategy can help to avoid the risk of over-investing in under-utilized assets and to optimize resource use while being consistent with environmental objectives. Prior analysis can help to reveal the sensitivity of 'least-cost' options to different scenarios and thereby inform policy dialogue and investment decisions. Ultimately government leadership is essential to navigate any conflict of objectives, such as between 'affordable' and 'clean' heating.

2. Local political leadership and policy directions may change during implementation. Design needs to be sufficiently flexible to take this into account.

3. Infrastructure and technical assistance projects can help create favorable conditions for sector reforms. The project expanded metering, building-level substations, variable flow operation across a vast network, integrated billing and accounting, and installed systems to manage energy and information. This can provide a strong basis for city-wide heating system reforms.

4. Careful and thorough consultation and analysis at the preparation stage can assist in the identification of risks of exogenous factors that would have a major impact on the project. In this case, a new policy concerning conversion from coal to gas-fired heating began to be implemented less than a year after Board approval. This risk was not taken into account based on the municipal Government's rejection of the widespread use of gas during appraisal. Wider and more in-depth consultation with National and Regional Authorities and other interested parties may have enabled a more accurate assessment of the likelihood of the policy change and the design of appropriate mitigating measures.



14. Assessment Recommended?

No

15. Comments on Quality of ICR

This ICR is well thought out and candid, but sometimes lacks clarity. For example, an explanation as to why the project team did not pursue a restructuring in order to revise the M&E framework would have been useful. It is not stated which of the two scenarios used in the economic analysis was used for the financial analysis. More detail on the implementation problems that remained unresolved at closure would have been helpful. The consequences of not taking Bank advice on the procurement of pre-insulated pipelines is discussed first in the Lessons and not earlier in the text. There are also some more minor shortcomings (e.g., some inconsistencies in project component costs, no EIRR without environmental benefits in scenario 2.) but these did not affect the overall storyline.

- a. Quality of ICR Rating
Substantial