



China, People's Republic of: Shanxi Energy Efficiency and Environment Improvement Project

Project Name	Shanxi Energy Efficiency and Environment Improvement Project	
Project Number	44013-013	
Country / Economy	China, People's Republic of	
Project Status	Closed	
Project Type / Modality of Assistance	Loan	
Source of Funding / Amount	<u>Loan 2885-PRC: Shanxi Energy Efficiency and Urban Environment Improvement Project</u> Ordinary capital resources	US\$ 100.00 million
Strategic Agendas	Environmentally sustainable growth Inclusive economic growth	
Drivers of Change	Gender Equity and Mainstreaming	
Sector / Subsector	Energy / Energy utility services	
Gender	Effective gender mainstreaming	
Description	The proposed project will improve energy efficiency and reduce emission of greenhouse gases and other pollutants in Shanxi province by introducing and expanding district heating in five urban areas and expanding the coal-mine methane (CMM) gas supply and distribution network in one of these areas. The project follows and complements two previous Asian Development Bank (ADB) projects in the province, which have been completed successfully.	

The PRC's rapid economic growth and its reliance on coal, which provided about 70% of primary energy in 2010, are causing continued rapid growth of harmful emissions. Coal combustion releases large amount of carbon dioxide (CO₂), the main greenhouse gas responsible for causing climate change. Coal combustion also emits sulfur dioxide (SO₂) and nitrogen oxides (NO_x), which are the main causes of acid rain, and total suspended particulates, which cause serious respiratory diseases. The Government of the PRC has recognized the environmental challenges posed by the rapid increase in coal consumption and has committed to achieve a reduction in carbon intensity of 40%–45% by 2020, compared with 2005, primarily by targeting reductions in energy intensity. During the Eleventh Five-Year Plan, 2006–2010, the energy intensity was reduced by 19.1% compared with a target of 20.0%. The Twelfth Five-Year Plan, 2011–2015 has set the target of reducing energy intensity by a further 16%, carbon intensity by 17%, and emissions of SO₂ by 8% and NO_x by 10%. Shanxi province has set a corresponding target of reducing energy intensity by 16%, carbon intensity by 17%, and emissions of SO₂ by 11.3% and NO_x by 13.9%.

About half of the PRC's CO₂ emissions come from the generation of electricity and heat. Demand for centralized heating (or district heating) is growing rapidly along with economic development and urbanization. In 2010, the total quantity of heat supplied in the urban areas of the PRC reached 2.9 billion gigajoules and the total area covered by district heating reached 4.4 billion square meters (m²), compared with 1.9 billion m² in 2003. Beijing and Tianjin municipalities, and 19 provinces in the PRC have adopted district heating. Despite this, district heating in the PRC still covers only 30% of the total floor area, compared with about 60% coverage in European countries. In the absence of district heating, inefficient and polluting coal-based household stoves and small neighborhood boilers continue to be widely used. The government plans to expand the coverage of district heating, which would allow to close the small, inefficient heat-only boilers, and increase the use of energy-efficient combined heat and power (CHP) plants as a heat source. District heating also allows the introduction of consumption-based billing, which enables consumers to regulate the amount of heat they consume. It avoids significant heat losses in the system, reinforcing the energy efficiency of district heating. Shanxi is an underdeveloped inland province in the PRC's north-central region. It covers an area of about 156,300 square kilometers. The heating season lasts for 5 months and temperatures can fall below 20

C. Shanxi's gross domestic product per capita in 2010 was \$4,107 equivalent, which is about 88% of the national average (\$4,686). It ranks 18th among the PRC's provinces. Shanxi is well known for its rich coal resources, estimated at about one-third of the PRC's total coal reserves. In 2011, it produced 870 million tons of coal, about one-fourth of the PRC's total coal production and an increase of 17.7% over 2010 production. It faces serious pollution and environmental problems that are closely related to the mining, use, and transport of coal.

The underground coal mines in Shanxi release large amounts of methane during operation, commonly referred to as CMM. The capture and use of CMM not only helps avoid serious mining accidents but provides large environmental and climate change mitigation benefits. ADB supported a CMM project in Jincheng, in one of the largest coal mines in the province (footnote 2). It was the first such project in the province that demonstrated the twin benefits of greater coal-mine safety by capturing methane and of utilizing the captured methane for electricity generation and as fuel for household consumption. In 2010, more than 2.8 billion cubic meters (m³) of CMM was extracted, of which the province utilized about 0.9 billion m³ (34%), mainly for residential cooking, transport, commercial and industrial use, and power generation. Its use for district heating and space cooling has been very limited. The project rectifies this by demonstrating CMM utilization for district heating and space cooling in one city. It is also the first ADB initiative to use CMM for such purposes.

Like in many other provinces, Shanxi's rapid urbanization is fuelling demand for housing and urban infrastructure. Likewise, strong economic growth, higher incomes, and the privatization of housing are driving demand for district heating. Thus, Shanxi has rapidly expanded its coverage of heat supply, from 71.1 million m² in 2003 to 287.4 million m² in 2010—an annual growth rate of 21%, much higher than the national average of 12%.

Although the high growth rate of Shanxi's heat supply provides significant opportunities for the private sector, private participation has been relatively slow because (i) initial investment costs are high and financial returns low; (ii) local commercial finance institutions are reluctant to provide debt financing, particularly in remote urban areas with small markets, because of perceived high risks; and (iii) only a handful of private companies have the required technical and managerial capacity to operate such utilities, and these tend to focus on large urban areas. While some of the reforms that will remove most of these barriers are underway, district heating as an industry is still not commercially mature and requires public investment to meet growing demand, and thus remains an essential public service in Shanxi.

Due to the abundance of locally produced coal, district heating in Shanxi relies primarily on coal as a fuel source. Many of the heating systems in urban areas are old and inefficient and lack proper emission control equipment. Environmental impacts from these systems are disproportionately high on the poor and on women. Urban pollution from small boilers worsens outdoor air quality and causes significant cumulative harm to public health. Inadequate coverage of district heating in low-income urban areas drives residents to use indoor coal stoves for heating, a major cause of respiratory diseases. Women and small children are particularly vulnerable to high indoor pollution, as they tend to spend more time indoors.

The project will help solve the issues described above by extending and expanding energy-efficient district heating to more than 270,000 residents in five highly polluted urban areas of Shanxi. It will replace small, inefficient, and polluting inner-city coal-fired boilers and coal-fired household stoves with a highly energy-efficient CHP plant and large heat boilers, and with CMM supply, thereby reducing the overall environmental footprints of district heating. Lessons from previous ADB interventions of a similar type were taken into account in the project design. The project has a strong rationale as part of the ongoing energy intensity improvement in the PRC, its Energy Conservation Law, and its Energy Conservation Ordinance for Civil Construction. The project is also in line with ADB's country partnership strategy, 2011–2015 for the PRC, and its Energy Policy, which prioritizes energy efficiency projects, including district heating, and promotes access to energy for all.

Project Rationale and
Linkage to
Country/Regional Strategy

Impact

Greater energy efficiency and cleaner environment in Shanxi province

Project Outcome

Description of Outcome	Better air quality and reduced greenhouse gases emission in five urban areas in Shanxi province
Progress Toward Outcome	Being achieved. EA's PCR is expected to be submitted by January 2018.

Implementation Progress

Description of Project Outputs	<p>Expanded CMM distribution network in Liulin</p> <p>Energy-efficient district heating in five urban areas</p> <p>Institutional strengthening and capacity building</p> <p>Currently, the procurement for Goods and Works using ADB loan proceeds was completed. The required consulting services for the remaining period of project implementation were employed by using the local counterpart fund. Original allocation of the loan proceeds for the consulting services have been reallocated. Around 181 small coal-fired boilers has been demonished in the five urban area.</p> <p>The construction work of one gas storage tank with capacity of 50,000m³ has been completed. Gas supply and distribution pipelines, 20 pressure regulating stations are under construction. The subproject will be put into operation in Nov./Dec. 2017.</p> <p>Central heating subprojects in Jinzhong, Licheng and Qin started trial operation separately from November 2015 and end of 2016. The two other subprojects (Zhongyang and Liulin) will be put into operation in November/December 2017. In jinzhong subproject, it provided heating assistance for 388 low-income households among which about 60 woman-headed households. In Qin subproject, about 200 females headed households were provided heating service in 2016. In Zhongyang subproject, free heating fee for about 30 female-headed households which are vulnerable groups. In Jinzhong subproject 12 out of 13 collectors are female. In Qin subproject, 20 collectors among which 4 persons are female. In Licheng subproject, the female collector has been 15. In Zhongyang subproject, by 2017, there will be 50% of the heating fee toll collectors for women.</p> <p>The Shanxi PMO offered trainings on ADB Procurement, Contract and Construction Management, Security (Environmental Monitoring), Financial Management and Operation and maintenance and management during 2013 - 2016.</p> <p>The Jinhzong and Qin subproject PMOs have also provided trainings on bill collection, file management and measurement to all staff including all female staff. Licheng subproject provided training for 21 female workers in 2016.</p>
Status of Implementation Progress (Outputs, Activities, and Issues)	
Geographical Location	Jinzhong Shi, Licheng Xian, Liulin Xian, Qin Xian, Shanxi Sheng, Yuci Qu, Zhongyang Xian

Safeguard Categories

Environment	B
Involuntary Resettlement	B
Indigenous Peoples	C

Summary of Environmental and Social Aspects

Environmental Aspects	<p>The project results in substantial environmental benefits by improving energy efficiency and avoiding combustion of 85,390 tons of coal per year, resulting in emission reductions of 4,121 tons of SO₂, 16,234 tons of total suspended particulates, 1,942 tons of NO_x, and 254,379 tons of CO₂. The potential adverse environmental impacts from the project include (i) during construction: noise, soil erosion, and safety risks to community members and workers, including fire and explosion risks posed by working with CMM; (ii) during operation: (a) inappropriate handling of waste when decommissioning small boilers; (b) untreated wastewater, solid and hazardous wastes; (c) noise and air pollution from boiler stacks and from coal handling, gas emissions and safety risks. The initial environmental examination (IEE) concludes that the potential adverse environmental impacts can be adequately mitigated by measures outlined in the IEE, and the project will result in environmental and socioeconomic benefits that significantly outweigh potential negative impacts. The 6th semi-annual Environmental Monitoring Report was submitted to ADB in May 2017 and has been disclosed at ADB website.</p>
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Involuntary Resettlement	<p>The gas storage site has been changed and the local government has allocated a government owned land which had not been used by the local people for past 10 years. The relocated storage and distribution station involves no house demolition, and has no livelihood or income impact on villagers, which complies with ADB's involuntary resettlement policy. The relocated pipelines will still be laid along completed roads, involving neither house demolition nor permanent land occupation, but will involve road restoration, for which the RP should be updated. It is agreed that the revised resettlement plan with land acquisition and resettlement due diligence report shall be submitted to ADB for review and disclosure on ADB website by 31 October 2016. The other sub projects do not entail any resettlement impacts. The updated Resettlement Plan is disclosed on 14 November 2016.</p>
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Indigenous Peoples	<p>No indigenous peoples will be adversely affected by the project.</p>
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Stakeholder Communication, Participation, and Consultation

During Project Design	<p>A fact finding mission of the Asian Development Bank visited Shanxi province, the People's Republic of China, to discuss the project preparatory technical assistance (PPTA) for Shanxi Energy and Environment Improvement Project with the executing agency (EA), the Shanxi Provincial Government represented by the Shanxi Provincial Development and Reform Commission (SDRC) and the Shanxi Finance Bureau (SFB), and the project implementing agencies (PIAs). The mission reached a good understanding with the EA, PIAs and the Ministry of Finance on the objectives, scope, cost estimates, financing plan, and implementation arrangements of the TA. A loan fact finding mission was also subsequently fielded after the review conducted by the PPTA consultants and agreements were reached with the stakeholders on the final scope, project cost estimates and financing plan for the proposed loan.</p>
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During Project Implementation	<p>The project team is closely coordinating with the project management office (PMO), local government at county level and sub project implementing agencies on the implementation requirements.</p>
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Business Opportunities

Consulting Services International and national consultants may be hired by the PMO or the implementing agencies through a consulting firm and/or individual selection method in accordance with ADB's Guidelines on the Use of Consultants (2010, as amended from time to time). The required positions and person-months are indicated in the Project Administration Manual (a linked document to the Report and Recommendation of the President). Disbursements will be made in accordance with ADB's Loan Disbursement Handbook (2010, as amended from time to time).

Procurement All ADB-financed procurement for the project will be conducted in accordance with ADB's Procurement Guidelines (2010, as amended from time to time). Indicative procurement packages and financing plan for all subprojects are indicated in the Project Administration Manual (a linked document to the Report and Recommendation of the President). Disbursements will be made in accordance with ADB's Loan Disbursement Handbook (2010, as amended from time to time).

Responsible ADB Officer Liu, Xinjian
 Responsible ADB Department East Asia Department
 Responsible ADB Division PRC Resident Mission (PRCM)
 Executing Agencies *Shanxi Provincial Government*

Timetable

Concept Clearance 14 Dec 2010
 Fact Finding 24 Oct 2011 to 04 Nov 2011
 MRM -
 Approval 31 Aug 2012
 Last Review Mission -
 Last PDS Update 23 Jan 2018

Loan 2885-PRC

Milestones

Approval	Signing Date	Effectivity Date	Closing		
			Original	Revised	Actual
31 Aug 2012	27 Mar 2013	24 Apr 2013	31 Dec 2017	-	08 Jun 2018

Financing Plan

Loan Utilization

	Total (Amount in US\$ million)	Date	ADB	Others	Net Percentage
Project Cost	166.10	Cumulative Contract Awards			
ADB	100.00	17 Jun 2022	100.00	0.00	100%
Counterpart	66.10	Cumulative Disbursements			
Cofinancing	0.00	17 Jun 2022	100.00	0.00	100%

Status of Covenants

Category	Sector	Safeguards	Social	Financial	Economic	Others
Rating	-	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory

Project Page <https://www.adb.org/projects/44013-013/main>

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