China, People's Republic of: Air Quality Improvement in the Greater Beijing–Tianjin–Hebei—Shandong Clean Heating and Cooling Project

Project Name	Air Quality Improvement in the Greater Beijing–Tianjin–Hebei—Shandong Clean Heating and Cooling Project
Project Number	51418-001
Country	China, People's Republic of
Project Status	Proposed
Project Type / Modality of Assistance	Loan Technical Assistance
Source of Funding / Amount	**Loan: Air Quality Improvement in the Greater Beijing-Tianjin-Hebei for Shandong** Ordinary capital resources — US$ 400.00 million
Strategic Agendas	Environmentally sustainable growth Inclusive economic growth
Drivers of Change	Governance and capacity development Knowledge solutions Partnerships
Sector / Subsector	**Energy** - Conventional energy generation - Energy efficiency and conservation - Renewable energy generation - biomass and waste - Renewable energy generation - geothermal
Gender Equity and Mainstreaming	Effective gender mainstreaming

Description	The proposed project will implement three clean heating and cooling subprojects to accelerate air pollution abatement in Shandong Province. The heating and cooling projects proposed are innovative, as they will combine renewable energy technologies and waste heat recovered from industry and power plants to reduce the energy and carbon intensity of heat production and refrigeration, and thereby reduce air pollution and greenhouse gas emissions, as well as the heat island effect in urban areas. An overview of each subproject is provided below. Subproject 1: West Jinan Waste Heat Utilization and Clean Energy Subproject.This subproject will provide heat to urban residents, industrial, and business customers. The technologies to be used on the project include: (i) Large temperature difference waste heat exchange technology is adopted for transporting waste heat from the nearby power plants to the city, which will increase the heat transport capacity by more than 50% than using the standard technology, and same time reduce electricity consumption for cycling pumps. The large temperature difference is achieved by lowering the temperature of return water to the primary pipeline. The waste heat will be used to supply heating to about 80 million m2 of buildings; (ii) Year-round heat supply needs to be provided to an industrial park with industrial and business customers located in west Jinan. A biomass-based combined heating and power plant using biomass briquette made of agriculture waste will supply heating to 1.54 million m2 buildings and will generate electricity of 133 GWh per year. A feedstock assessment showed that only 12% of the available agriculture waste will be consumed by the biomass plant; (iii) Jinan is endowed with geothermal resources. Deep-well geothermal offers an environmentally friendly alternative to the current practice of using coal-based space heating. Deep-well reinjection technology will be used to extract and exchange heat from the underground water, which will then be filtered and recharged back to the same aquifer; and (iv) For a few newly built resident communities not covered by the heating network and where geothermal resource is not available, distributed gas-fired boilers will be used. This subproject enables Jinan to fully utilize waste heat in the neighboring regions, to form a waste heat-dominated heating system, with distributed energy supply from biomass, geothermal and natural gas as supplementary. Subproject 2: Shanghe Coal-Free Clean Heating Demonstration Subproject. This subproject covers the urban area of Shanghe County, the semi-urban area of 11 towns and 80,000 rural households where coal-fired stoves or coal-fired boilers are common for space heating. The subproject will use geothermal energy as the main heat source to replace coal-fired heating. Other clean options, such as air-source heat pump, are selected as distributed heating source where the pipeline network is not available. Gas-fired boilers will be an auxiliary heat source. This subproject also plans to retrofit total 660,400 m2 of urban buildings and 30,000 rural households to improve their energy efficiency. Based on the available resources, heavily polluting coal-fired stoves in 80,000 rural households will be replaced by air-to-air heat pumps, air-to-water heat pumps, heat-storage radiators, carbon crystal plate radiators and small household gas heaters. This subproject will play an important role in, and have demonstration effect to, other counties in the northern PRC who are also facing similar air quality issues caused by the winter heating. Subproject 3: East Jinan Low-Emission Combined District Heating and Cooling Subproject. East Jinan is where the central business district located. The large amount of heating and cooling demands in this area requires a low-emission system supplying both heat and cooling. For heating supply, two options will be used: (i) Industrial waste heat through long-distance pipeline will be used to supply heat to 6.2 million m2 buildings; and (ii) Electrode boilers with heat storage will use off-peak electricity at night, and then deliver hot water to the households in the day time to heat up to 700,000 m2 area. For district cooling, two technologies will be adopted: (i) Ice storage, which uses off-peak electricity during the night and stores the cooling energy in the form of ice. During peak hours in the daytime, ice is melted to provide cooling; and (ii) When the cooling demand is large enough, lithium bromide absorption chiller driven by the waste heat from the power plant will be used to deliver cold water to the consumers through long-distance pipelines. The subproject aims to expand the area of waste heat supply, and at the same time use off-peak electricity to produce and store heating and cooling capacity to improve the waste heat utilization and shift peak load.
Project Rationale and Linkage to Country/Regional Strategy	The proposed project responds directly to the urgent national, provincial, and municipal government priorities to reduce coal consumption and improve air quality by introducing more efficient methods and advanced technology for heat production, through coal substitution and utilizing cleaner sources of energy such as natural gas and renewable energy, and reducing raw coal burning among households. The proposed project is well aligned with the priorities on managing climate change and environment in ADB's Country Partnership Strategy (2016 2020) and will support the government's priorities in realizing an ecological civilization, articulated in its 13th plan and at the 19th Party Congress for the Central Committee of the Communist Party. It will also support key strategic priorities of tackling climate change, accelerating progress in gender equality and making cities more livable of ADB's Strategy 2030.
Impact	Air pollution reduced and public health in the BTH region improved
Outcome	Emissions of pollutants and carbon dioxide in Shandong Province reduced
Outputs	Integrated renewable energy and coal-free based heating and cooling systems installed Capacity to install and maintain clean heating and cooling technologies strengthened
Geographical Location	Shandong

Safeguard Categories	
Environment	A
Involuntary Resettlement	C
Indigenous Peoples	C

Summary of Environmental and Social Aspects
Environmental Aspects
Involuntary Resettlement
Indigenous Peoples
Stakeholder Communication, Participation, and Consultation
During Project Design
During Project Implementation

Business Opportunities	
Procurement	Procurement (including consulting services) to be financed by the proposed project will follow ADB's Procurement Policy (2017, as amended from time to time) and Procurement Regulations for ADB Borrowers (2017, as amended from time to time).

Responsible ADB Officer	Lu, Lin
Responsible ADB Department	East Asia Department
Responsible ADB Division	Energy Division, EARD
Executing Agencies	*Shandong Provincial Government* *People's Republic of China*

Timetable	
Concept Clearance	06 Jun 2018
Fact Finding	21 Aug 2018 to 22 Aug 2018
MRM	27 Sep 2018
Approval	-
Last Review Mission	-
Last PDS Update	01 Oct 2018

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