

Environmental and Social Impact Assessment

Executive Summary

For

HEBEI CLEAN HEATING PROJECT

**Foreign Debt Management Center of Hebei Provincial
Government**

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1. INTRODUCTION

1.1 Project Background

Hebei Province is facing a major challenge in mitigating the environmental impacts of its economic growth. Hebei Province is a key center for manufacturing, including energy intensive heavy industry, and is a key source for fine particulates which have major impacts on public health. It is located in the airshed including major provinces of Beijing, Tianjin and Hebei, known collectively as the Jing-Jin-Ji region. Hebei accounts for about 80 percent of total primary fine Particulate Matter (PM2.5) in the region.

In order to improve air quality in the Jing-Jin-Ji Region, particularly Hebei Province, the central government of China has adopted the Air Pollution Prevention and Control Action Plan, which mandates the Jing-Jin-Ji region to reduce their annual average PM2.5 concentration by 25% from 2012 to 2017 through a combination of series of actions in energy efficiency, air pollution abatement, clean and renewable energy, institutional capacity building, etc. The Provincial Government of Hebei has proposed initiatives for clean air in the province under the context of the central government's action plan. The Urban Heating Plan (the "Plan" hereafter) is one of the action plans among the initiatives, which calls for promoting expanded use of CHPs and larger district heating networks to replace those smaller heating networks. This project is an integral part of the Plan and has been proposed by Hebei Provincial Government for partial financing from the World Bank.

Although no significant adverse environmental impacts will be caused by the small scale construction of heating networks, this project has been classified into Category A taking into account potential linked facilities (heating sources), displacement of workers and potential operating safety risks during the operation phase, which requires EIA and EMP, collectively known as the EA documentation. An Environment Assessment (EA) was conducted by the Foreign Debt Management and Service Center of Hebei Provincial Government. Social Impact Assessments (SIA) have been prepared by Shanxi Social and Science Academy and Hehai University for this project with main findings and conclusions incorporated into the EA documentation. This document is a summary of the EA documentation and the SIA document.

1.2 Environmental Policies, Laws and Regulations

1.2.1 Laws and Regulations

The basis of the EIA Reports includes national and local environmental laws, regulations, policies, and the World Bank's environmental and social safeguard policies. The main applicable laws and regulations include:

Environmental Protection law of the People's Republic of China, promulgated by the National People's Congress in 1989 and amended in 2014. It stipulates that units constructing project that cause pollution to the environment must observe the state provisions concerning environmental protection for such construction projects. The environmental impact statement on a construction must assess the pollution the project is likely to produce and its impact on the environment and stipulate the preventive and mitigation measures. The EIA statement shall, after initial examination by the authorities in charge of construction project, be submitted by specified procedures to the competent department of environmental protection administration for approval. The department of planning shall not ratify the design plan description of the construction project until after the environmental impact statement on the construction project is approved.

Environmental Impact Assessment Law: This Law is formulated in order to implement the strategy of sustainable development, prevent the adverse impact on

environment brought about by the implementation of plans and construction projects, and promote the harmonized development of economy, society and environment. Environmental impact assessment should be carried out in accordance with this Law for construction of the projects that produce impact on environment within the territory of the People's Republic of China and all other sea areas under the jurisdiction of the People's Republic of China. The State encourages relevant units, experts and the public to participate in environmental impact assessment in an appropriate way.

The Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution, amended in 2000, presenting overall requirements for air pollutant emission control of polluting sources and total load control.

The Law of the People's Republic of China on Prevention and Control of Water Pollution, amended in 2008, stipulating requirements for point source and non-point source discharges to water body.

The Law of the People's Republic of China on Prevention and Control of Pollution From Environmental Noise, issued in 1996, including overall requirements for control of construction, traffic and other activities that generate noise.

The Law of the People's Republic of China on Environmental Impact Assessment, promulgated in 2003, specifying requirements for projection and assessment of potential environmental impacts to be introduced by construction activities, development of mitigation measures for adverse impact, approval procedure, as well as requirements for public consultations.

Technical Specifications for Environmental Impact Assessment; and various applicable standards for air, water, and noise. These particular technical specifications define scope and depth of environmental impact assessment based on nature of the construction activities.

1.2.2 Applicable Standards

The most important assessment criteria and environmental quality standards are the Ambient Air Quality Standard (GB3095-2012) which classifies the air quality into two classes for areas zoned for different functions, as follows:

Class I: applicable to natural reserves, scenery spots or other sites requiring special protection; and

Class II: applicable to residential areas, composite areas for residential and commercial activities, normal industrial and rural areas.

The Ambient Air Quality Standard is listed in Table 1-1 where the EHS of the WBG has been compared.

Table 1-1 Ambient Air Quality Standard

Unit: $\mu\text{g}/\text{m}^3$

Pollutant	Ambient Air Quality Standard (GB3095-2012)			EHS of WBG	
	Averaging period	Class I	Class II	Averaging period	Guideline value
SO ₂	Annual	20	60	24 hour	20
	Daily	50	150		
	Hourly	150	500	10 minutes	500

PM₁₀	Annual	40	70	Annual	20
	Daily	50	150	24 hour	50
NO₂	Annual	40	40	Annual	40
	Daily	80	80		
	Hourly	200	200	1 hour	200
PM_{2.5}	Annual	15	35	Annual	10
	Daily	35	75	24 hour	25
TSP	Annual	80	200	-	-
	Daily	120	300		
Ozone	8 hour daily Max.	100	160	8 hour daily Max.	100
	Hourly	160	200		

It is clear that there are no significant difference between the Chinese standard and the EHS of the WBG for the ambient air quality management.

The emission standard for flue gas from the gas-fired boilers has been compared between the China's and the EHS-Thermal Power Plants of WBG, as follows:

Table 1-2 Flue Gas Emission Standard mg/Nm³

Pollutants for natural gas fired boilers, >50 MWth, <600 MWth (dry gas, excess O₂ content 3%)	Standard for Air Pollutants Emission for Thermal Power Plants(GB 13223-2011)	EHS guideline for Thermal Power Plants
PMs	5	N/A
SO₂	35	N/A
NO_x	100	240

It is known that the standard of China's for flue gas emission from gas-fired boilers is much stringent than that of the EHS Thermal Power Plants of the WBG. Thus the domestic standard of China is adopted for the EA.

Other applicable standards are included in Table 1-3.

Table 1-3 Applicable Standards

Category	Ref.	Name of standard
Environment quality standard	1	Surface Water Quality Standard (GB3838-2002)
	2	Acoustic Environment Quality Standard (GB3096-2008)
Pollutant discharge standard	3	Discharge Standard for Municipal Wastewater (CJ 3082-1996)
	4	Noise Limits on Boundaries of Construction Sites (GB12523-90)

	5	Noise Standard on Boundaries of Enterprises (GB12348-2008)
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1.2.3 Safeguard Policies and EHS of the WBG

The safeguard policies triggered for this proposed project include:

OP 4.01 Environmental Assessment: Category A and full assessment.

OP 4.37 Safety of Dams: the heating source for Xingtai Component involves the Yangwowan Reservoir. The Dam safety expert of the WBG has reviewed the relevant document on the dam safety for this reservoir during the site visit and confirmed the safety of the dam.

OP 4.12 Involuntary Resettlement: The policy was triggered during the early phase of project preparation when more components with land acquisition were still part of the Project, and alignments of heating pipelines had not been determined. An abbreviated resettlement plan (ARAP) was prepared by each subproject to address potential land acquisition impacts. The ARAPs include compensation policies and due diligence review of related facilities. In the end, those components with potential land acquisition were dropped, and alignments of pipeline construction were selected to avoid any potential occupation of farmland. However, OP 4.12 is still triggered to include due diligence review of land acquisition that has recently taken place. In addition, the ARAPs include measures to mitigate impacts of social impacts covered by OP 4.01 in relation to loss of employment and affordability.

The reasons for not triggering other SG policies are:

OP 4.11 Physical Cultural Resources: the site survey and information obtained during consultation with relevant government department indicate that there are no physical cultural resource in or near the proposed project;

OP 4.04 Natural Habitats: the proposed project is located within urban areas where the urban eco-system dominates, and neither natural habitats and nature reserves, nor rivers will be involved by the proposed project;

OP 4.36 Forests: the proposed project will not finance commercial logging;

OP 4.10 Indigenous People: the proposed project does not involve the ethnic minority concentrated areas.

The EHS of the WBG considered in the preparation of the EA include the EHS General, EHS Thermal Power Plants. The applicable standards of the EHS have been considered and compared with that of China and the good practice of the EHS have been adopted in the EA and ESMP.

1.3 Assessment Scope, Period and Key Issues

The scope and key objects of environmental assessment are shown in Table 1-3.

Table 1-3 Assessment Scope

No.	Environmental Factor	Assessment Scope	Protected Objects
1	Ambient air	<ul style="list-style-type: none"> The surrounding areas of heating pipeline network, and sub-stations 	<ul style="list-style-type: none"> The residential, education and working areas, e.g., government agencies, research and education institutions, schools, hospitals,

			sanitarium, resorts and office buildings, etc.
2	Surface water environment	<ul style="list-style-type: none"> sections 100m upstream and 500m downstream of river crossing heating pipeline 	<ul style="list-style-type: none"> Surface waters.
3	Acoustic environment	<ul style="list-style-type: none"> Areas 200m away from heating pipelines Areas in 100 m radius of pressure-isolation and heat exchange substations 	<ul style="list-style-type: none"> The residential, education and working areas, e.g., government agencies, research and education institutions, schools, hospitals, sanitarium, resorts and office buildings, etc.
4	Ecological environment	<ul style="list-style-type: none"> Areas 200 m from heating pipelines 	<ul style="list-style-type: none"> Natural and artificial greens, parks, attractions, and orchards.
5	Social issues	<ul style="list-style-type: none"> Area 100 m from the heating pipelines Areas in 100 m radius of pressure isolation and heat exchange substations 	<ul style="list-style-type: none"> Social and economic zones in affected areas, e.g. institutes, enterprises, residential areas, cultural sites and education areas, hospitals and commercial areas.

2. PROJECT DESCRIPTION

2.1 Project Composition

The proposed project development objective (PDO) is to improve the efficiency and environmental performance of heating services in project areas of selected municipalities of Hebei Province. The subprojects of the project are listed in Table 2-1 below and location map is shown in Figure 1.

Table 2-1 Project Description

Subproject	Description	Service Scope	Cost Estimate
Chengde Subproject: Chengde City District Heating Networks	<ul style="list-style-type: none"> Construction of 4.764 km of primary networks; Rehabilitation of 2.743 km primary networks and 56.792 km secondary networks; Construction of 20 conventional heating substations; Construction of 114 units of building-level heating exchange equipment. 	Increase of heating service area by 2,462,300 m ² .	USD 35.70 million with USD 20 million to be financed by the IBRD

<p>Pingshan Subproject: Pingshan County Heating Networks</p>	<ul style="list-style-type: none"> • Construction of 4.011 km of primary networks; • Construction of 2.272 km pipelines connecting primary networks and heating substations; • Rehabilitation of 3.193 km existing primary networks; • Construction of 36 new heating substations; • Expansion of 5 existing heating substations to 8 substations; • Rehabilitation of 46 existing heating substations; • Installation of heat metering devices for 16,934 households (heating area 1,923,600m²) and 108 institutions; and • Construction of one control center. 	<p>Increase of heating service area by 3,031,200m².</p>	<p>USD 25.18 million with USD 12 million to be financed by the IBRD</p>
<p>Xingtai Subproject: Xingtai City heating networks</p>	<p>Phase 1:</p> <ul style="list-style-type: none"> • 9.7 km circulating water pipelines from primary cooler to primary exchange station; • 1 km steam pipelines from China Coal RISUN to primary exchange station; and 2 km condensate pipelines; • one plate exchange system chamber, 1 comprehensive command building, one warehouse and repair workshop, and one garage, within primary station; • 24.326 km primary heat pipelines; and • 27 heating substations. <p>Phase 2:</p> <ul style="list-style-type: none"> • 1.9 km circulating water pipeline from CDQ waste heat boiler electricity station to the primary station in the plant area; • 550m circulation water pipeline from o-phthalic anhydride facility to primary station; • 2 km steam pipeline from the plant area to the 	<p>Increase of heating service area by 8,016,300m².</p>	<p>USD 113.21 million with USD 33.5 million to be financed by the IBRD</p>

	<ul style="list-style-type: none"> • primary station; • two primary station heat pump rooms; • 27.86 km primary networks; • 117 heating substations, including 14 building-level substations. 		
Zhangjiakou Subproject: Zhangjiakou City heating networks	<ul style="list-style-type: none"> • One 2,016 m² pressure isolation heat exchange station (including the control center); • Construction of Level 0 and Level 1 high-temperature hot water pipelines with a trench length of 20.5km; • Construction and rehabilitation of 58 heating substations; • construction of 17 building-level heating substations ; and • Installation of heat meters for existing 1,340 residential buildings. 	Increase of heating service area by 3,880,000m ² .	USD 74.22 million with USD 33.5 million to be financed by the IBRD

2.2 Heating Sources

Heating sources of the four subprojects are given in Table 2-2.

Table 2-2 Heating Sources

Subproject	Base Heat Load	Peak Load	Small Boilers to be Replaced
Chengde	Cooling water residual heat of Luanhe Power Plant (coal-firing)	Northeast Suburb Heat Source Plant (coal-firing)	4 boiler plants (6 boilers)
Pingshan	Cooling water residual heat of Xibaipo Power Plant (coal-firing)	-	-
Xingtai	Residual heat of primary cooler cooling water and cooling water of coke dry quenching of China Coal Risun Company	Circulating water residual heat of o-phthalic anhydride facility of Xingtai Risun Chemical	22 boiler plants (40 boilers)
Zhangjiakou	Cooling water residual heat of Zhangjiakou Power Plant (coal-firing)	Two 70MW gas-fired boilers of Dongyuan Heating Company	99 boiler plants (158 boilers)

A Due Diligence Review was carried out for these heating sources during the EA preparation and the review shows that these facilities are compliant with national

emission standards as well as with those of the WB/IFC Environmental Health and Safety (EHS) guidelines, except Xibaipo Power plant, which fails to meet national emission standard in terms of SO₂ and renovation is ongoing.

3. ENVIRONMENTAL BASELINE

3.1 General Setting

Hebei Province is located in the north of the Huabei Plain with a footprint of 0.19 million km², the home of 74 million people. Hebei Province is bordered by the Bohai Sea to the east and by Taihang Mountains to the west. It slopes from the northwest to southeast with the average elevation less than 100 m. The northwestern part of the province is distributed with hills and plateau, valley and small basins, the middle and the southeastern parts are vast plain. The project cities, Chengde is in the northeast, Zhangjiakou in the northwest, Pinshan in the southwest and Xingtai in the south of the province of Hebei respectively.

3.2 Climate

Hebei Province is in the temperate zone where the continental monsoon climate dominates. The climate is characterized with distinct seasons, **spring is dry and windy, summer is hot with rainfall, autumn is mild and cool, and winter is cold with snow**. The annual average temperature ranges between 4°C to 13°C, the annual average precipitation between 300 mm to 800 mm, and the annual frost free days average 120 to 200.

3.3 Air Pollution and Ambient Air Quality

Hebei accounts for about 80 percent of total primary fine Particulate Matter (PM_{2.5}) in the region of Jing-Jin-Ji which shares the same airshed. In 2010, the region emitted a total of 1.6 million tons of primary PM_{2.5}, with 1.3 million tons from Hebei Province only. Industrial processes and the residential sector are the main sources of primary PM_{2.5} in the region, accounting for 54% and 29% of the pollution, respectively.

Moreover, the power sector, heating, industrial boiler and the transportation sector represent the other 4%, 3%, 6% and 4% of the primary PM_{2.5} emissions. Sulfur dioxide (SO₂) and nitrogen oxide (NO_x) are also major atmospheric emissions. Industrial boilers, industrial processes, the power sector, the residential sector, and the heating sector contribute 39%, 19%, 17%, 15%, and 8% of SO₂ emissions, respectively. The transportation sector, industrial boilers, the power sector, heating and industrial processes are the main sources of NO_x emissions, accounting for 28%, 27%, 24%, 10% and 7%, respectively.

The ambient air is seriously polluted in the four project city of Hebei Province particularly during the winter when the space heating demand appears, with the air pollutants of primary concern being SO₂, NO_x, PM₁₀ and PM_{2.5}. The routine air quality monitoring data in 2014 indicate that the results on annual average basis in the four cities exceed the Class II of the Ambient Air Quality Standard except for Zhangjiakou where the wind is frequently strong.

3.4 Acoustic Environment

The data obtained from the local environmental monitoring stations show that the acoustic environment quality in the four cities are good so that meets the respective standard. There are three points exceeding the standard in Zhangjiakou due to the traffic noise and boiler noise near the points.

3.5 Ecology

The proposed project is located within the urban area of the four cities, where the

urban eco-system dominates. There are no natural forests, nature reserves, or endangered species and large wild animals within the project area.

3.5 Current Status of Heating Service

There is a limited coverage of district heating service in the four cities. Large part of the space heating demand in the four cities is satisfied by smaller district heating serviced by scattered small coal-fired boilers and small coal-fired stoves. Those smaller district heating networks are not hydraulically connected each other, hence a very low energy efficiency and poor economy for effective flue gas control.

3.6 Social and Economic Status

Hebei Province covers eleven cities and 108 counties. In 2013, the total GDP of Hebei Province is USD 460.19 billion, and the GDP per capita is USD 6,284. It ranks the sixth in term of GDP in China. The GDP increased by 6.5% in 2014, the agricultural sector, industrial sector and the service sector contributed USD 56.06 billion, USD 244.23 billion and USD 178.11 billion respectively. The industrial sector is centered on the steel and iron, equipment, petrochemical, food, pharmacy, construction materials and textile, with the production of steel/iron and equipment exceeding USD 160 billion respectively.

The four cities are in different areas of the province of Hebei. In general, the variation of the economic development in the four cities is small. The summary of the socio-economy of the four cities are as follows:

Chengde: covers 3 districts and 8 counties. The urban area is 708 km² and the urban population in 2012 is 0.58 million. The GDP in 2013 is USD 20.68 billion with the GDP per capita being USD 4,782. The personal income of urban residents is USD 3,161;

Pingshan: covers 23 towns, and the population is 0.46 million, with 0.43 million rural residents. In 2013 the GDP is USD 3.34 billion;

Xingtai: covers 19 towns, and the population is 0.34 million. The GDP in 2013 is USD 26.09 billion;

Zhangjiakou: covers 4 districts and 13 counties. The population is 4.67 million, with 3.10 rural residents. In 2013 the GDP is USD 21.41 billion.

4. ENVIRONMENTAL IMPACT ASSESSMENT

4.1 Impact Assessment in Construction Phase

Potential adverse impacts of the project in the construction phase are summarized as below.

Air Pollution: the air pollution primarily caused by the air-borne dust generated during the trench excavation and material transportation, vehicular emission and smoke from pipeline welding. The air-borne dust is of the most concern, about 60% of the air-borne dust is contributed by the movement of transport vehicles. Typically the area of influence of air-borne dusts is limited to 50 m outside the boundary of the construction site, or 150 m leeward. However the impact of air-borne dust can be easily mitigated by water spray and careful management of construction site including fencing, prohibition of excavation in strong windy days. The vehicular emission and welding smoke may pose minor impact. Therefore, the impact on air quality during the construction is not severe and will disappear once after the construction is completed.

Noise: Construction and transport vehicles would have potential impacts on acoustic environment, especially hospitals and schools. The operating equipment will generate the high level noise affecting the area within 100 m from the construction

sites. Although the construction will be banned in night, the sensitive receptors near the construction sites will be heavily affected by the noise. However the noise impact can be effectively mitigated by adoption of low noise equipment and good maintenance of equipment, installation of tall noise barriers near the sensitive receptors, and slow-down of transport vehicles. The noise in construction thus will not cause significant impact and is temporary.

Water Pollution: the proposed project will not cross surface waters. The water pollutants will come from the domestic wastewater of workers and the small amount of wastewater from the testing procedure of the pipelines. As the project will be constructed in urban area where the municipal sewers are easily accessible, the wastewater from the construction can be discharged into the sewers, thus the impact of water pollution is minor.

Solid waste: Pipeline trench excavation and backfill would cause residual soil, construction wastes and domestic wastes etc. it is expected that the amount of solid waste is small and will be collected and transported in timely manner. Totally 125 boiler houses will be demolished involving dismantle of 204 small boilers under the project. Due diligence review for the activity has been carried out by the EA team and found that there are no hazardous or toxic materials, such as asbestos, in the boiler houses and boilers. The solid waste produced during the demolition of the boiler houses will be collected and transported to the landfill for construction wastes. However the management of hazardous materials will be a topic for training program in the ESMP for the staff of the contractors to demolish the boiler houses, so as to mitigate the potential concern on the occupation health once hazardous materials are present. The dismantled small boilers will be recycled by the resource recycling companies. A management plan for small boilers dismantle activity has been prepared as an annex of the ESMP.

Ecology: the vegetation along the roads will be affected by the construction. However the vegetation can be replanted or restored after the construction is completed. Thus the impact on vegetation is minor.

4.2 Impact Assessment in Operation Phase

4.2.1 Positive Impacts

The project will bring primary benefits after the project becomes operational. The main positive impacts include saving of coal, reduction of air pollution loads in the project area.

Operation of the project will achieve coal saving and reduction of air pollution loads to be emitted into the air, as shown in Table 4-1 below.

Table 4-1 Reduction of Coal Consumption and Air Pollutants after the Project

Unit: ton/a

Coal saving	Reduced SO ₂	Reduced PM	Reduced NO _x
242,800	78.76	25.68	1692.64

4.2.2 Negative Impacts

Potential adverse environmental impacts during the operation phase of the project mainly come from substations.

Air pollution: the operation of the pipeline and sub-stations will not generate air pollution. The primary source for air pollution is from the flue gas emission in Zhangjiakou, where two 70 MW coal-fired boilers will be innovated to gas-fired boilers. The air pollutant of primary concern is NO_x to be generated by the gas-fired

boilers. The low-NO_x burner will be adopted to ensure the compliance of NO_x with the standard for of Air Pollutants Emission from Thermal Power Plants (GB 13223-2011) where the NO_x concentration limited to less than 100 mg/Nm³. the height of the stack is 40 m, calculated in line with the Standard for Air Pollutant Emission from Boilers (GB13271-2014). The max. ground concentration of NO_x from the stacks has been estimated by the model recommended by the Technical Specifications for EIA-Atmosphere. The modeling results show that the max. ground concentration of NO_x will occur 1362 m leeward of the stacks at 0.03894 mg/m³, only 19.47% of the standard value. Thus the impact on the air quality by the two gas-fired boilers is minimal.

Noise: the major course for noise in operation phase is the operation of pumps in sub-stations. The sub-stations either will be located in the communities or in the residential buildings (building sub-stations have much less capacity), the model recommended by the Technical Guideline for EIA-Acoustic Environment has been used to estimate the noise level on the boundary of the sub-stations. It is projected that the noise level outside the wall of the sub-stations will be less than 50 dB(A) which is in compliance with the standard of Noise Emission for Boundary of Enterprises (GB 12348-2008).

The same model is also used to estimate the noise level on the sensitive receptors for Xingtai and Zhangjiakou. Under Xingtai, an initial sub-station will be constructed 320 m from a village; the modeling result shows that the acoustic environment quality of the village will not be degraded. Under Zhangjiakou, a pressure isolation sub-station will be constructed near residential buildings; the modeling result indicates the very minor impact on the acoustic environment quality of the residential buildings. Under Zhangjiakou, the nearest sensitive receptors to the gas-fired boiler houses are 120 m and 180 m away respectively; the modeling results indicate that the noise from the boiler house will have very minor impact on the sensitive receptors.

Wastewater: during the operation period, the wastewater consists of wastewater from the water softening process to reduce the hardness in the sub-stations. The substations will be connected with municipal sewers which will receive the wastewater and convey it to the WWTP. Thus the wastewater will have little impact on environment.

Solid waste: there will not be solid waste to be generated during the operation stage.

4.2.3 Environmental Risks

The risks associated with the project include leakage or break of the heat pipeline, leakage of the gas pipeline and the explosion of the gas-fired boilers. It is also identified that there is no significant source for danger or hazard. The accidents will cause the damage of the operational staff or interruption of the heating service. The mitigation measures include the stringent quality control of the pipeline and boilers, design specifications comply with the relevant requirements for safety and health, careful inspection of the pipeline, valves and boilers, etc. The preparedness plan has been developed, including the institutional arrangement, procedure, training and drills, equipment and material preparation, medical aid, filing and public education.

4.3 Social Impacts

4.3.1 Social Impacts in Construction Phase

Social impacts in the construction stage are diversified, specifically including:

Impacts on local traffic: During pipeline construction, pavement excavation will occur. In the course of excavation, it is necessary to enclose the road sections around the construction area and reduce the number of lanes, thus affecting local traffic. In the

same time, traffic will increase due to the additional construction vehicles. However, since there are not many such additional vehicles, the impacts on traffic flow along the roads should be very minor. This impact can be mitigated by the careful coordination with traffic department to develop the measure for adjust or divert the traffic flow and enhance the traffic management.

Impacts on municipal facilities and railway and highway: Pipeline construction may interrupt the existing underground pipelines and cables. In addition, pipeline crossing construction may also produce impacts on normal operation of railway and highway and, when serious, may impact traffic safety. Pingshan and Xingtai will involve the crossing of existing railway and expressway. Before the commence of the construction, the underground pipelines and cables will be identified together with the associated management departments, and the construction plan will be prepared by the contractors to submit to the supervisor for approval. The construction plan will be prepared by the contractor for review of the management of the railway and expressway.

Impacts business activities: construction of pipeline and sub-stations will produce certain adverse impacts on business activities along the roads by blocking of accessibility, and noise and dust. However, the adverse impacts will be temporary and will disappear when the construction completed. The access roads will be provided to the roadside commercial businesses, and water spray will be intensified on the road sections near the businesses, so that the impact on roadside businesses can be mitigated effectively.

Impacts on tourism: Construction on the roads toward tourism sites may also bring certain impacts on tourists' routes. This impact only exists in Chengde City. Xiayingfang Section of Guangren Street (West Street) in Chengde is one of the key routes to Chengde Summer Resort. Construction on this road section will affect tourist vehicles and increase the pressure on the other access roads or reduce the number of tourists. As Xiayingfang Section of Guangren Street (West Street) in Chengde is not the only route to Chengde Summer Resort, the degree of such impacts is not significant and such impact will disappear immediately as the construction completed.

4.3.2 Social Impacts in Operation Phase

The proposed project will achieve tremendous positive social impacts upon the operation of the Project, the following social impacts are expected to:

increase the district heating area provided by the heating enterprise and facilitate improvement of local air environment and realization of energy conservation and emission reduction objectives;

enable the heating enterprises to cut heating cost and increase market competitiveness;

improve heating conditions and living quality of local residents;

improve heating stability and help decreasing disease occurrences and improve the level of residents' health protection and disease prevention;

take full account of the actual needs of the aged, disabled, children, and low-income households and provide supports to vulnerable groups;

help increasing employment;

help reducing housework and heating expenditure of local residents and drive women development; and

facilitate the improvement of urban infrastructure and services.

4.3.3 Induced Impacts

The induced negative impact of primary concern is expected to be the loss of employment of the operating staff of the small boiler houses to be replaced by the project. The SA team has made site survey to identify the detailed information about the operating staff to be affected by dismantling of small boilers under the proposed project. Based on consultations, detailed reemployment plans have been developed during social assessments, and included in the ARAPs for three subprojects. The summary of the SA report on the affected operating staff and the mitigation measures has been included in the EA. Following is the summary information on the affected staff and the mitigation measures:

Chengde: totally 19 staff affected, they are all part-time employees. The heating company has made commitment to employ these 19 staff in the coal convey and residue removal process;

Xingtai: 8 staff are the full-time employees of the community management company who operate the boilers during the heating season. These 8 staff will continue being employed by the community management company; 73 staff are part-time employees and will be employed by the heating company to do maintenance, guard and pipeline inspection after trainings according to the commitment of the heating company;

Zhangjiakou: totally 259 staff affected, they are all part-time employees. The heating company has made commitment to employ them to do the maintenance of pipelines and office cleaning after trainings.

Pingshan: this sub-project will not involve dismantle or demolition of boiler houses.

The local governments and communities also expressed willingness to provide trainings or information on better-payment jobs to the affected staff. Through the consultation, all of these affected staff and the heating companies are supportive of the project.

Other induced impacts due to the proposed projects include:

The residences will be connected to the district heating network, affordability might be a concern for those residents in certain communities where improvement of the secondary heat network is required. However the governments will adopt measures to reduce the share of the secondary heat network improvement cost by residents, and provide subsidies to low income families so as to mitigate the impact on vulnerable families.

The proposed project will induce the urbanization and attract more people into the project due to improved living conditions. Thus the impact on the infrastructures of the project area becomes another concern. The proposed project is an integral part of the urban development planning which supplemented by the sectoral planning for sanitation and transportation which have already taken into account the increase population and the associated demand for infrastructure service in the development planning.

The proposed project will help promote local business and trade and economic growth, as a result of increased population into the project area.

4.4 Cumulative Impact

The methodology for the cumulative impact assessment defined in the Good Practice Handbook-Cumulative Impact Assessment of IFC has been adopted.

Possible VECs considered based on the nature, location, scale and magnitude of the proposed project include public health, air quality, air pollutant emission and displacement of small boiler workers.

Hebei Province has been suffering from severe air pollution for over a decade and has paid continuous effort to reduce the air pollution loads into the air. Given the topographical and meteorological features of Huabei Plain where Hebei Province is located, there are several provinces are within the same airshed. Thus it is difficult to assess the air quality improvement due to air pollution reduction actions in Hebei Province alone. The VECs to be assessed is therefore limited to the air pollution load reduction rather than the air quality improvement, and among the other factors the social cumulative impacts in terms of displacement of small boiler workers and affordability of heating tariff for poor households that are of primary concern.

The matrix method is employed to assess the cumulative impacts of the proposed project. In the context of Hebei provincial action plan for air pollution control which defines the targets for air pollution loads reduction by the time frame of 2013 to 2017, the relevant projects in air pollution control in Hebei Province in the past, present and future within the time frame have been identified and considered. The air pollutants of primary concern in the province are NO_x, SO₂ and PMs, which place the reasonable basis for assessment of the cumulative impacts in quantitative term. The result of the cumulative impact assessment indicate that these relevant project plus the proposed project will play an important role in the provincial action plan by reducing the loads into the air by SO₂ 40%, NO_x 25% and PMs 25%.

Between 2013 and 2017, 359 seasonal workers in the small boiler houses to be closed during the implementation of the Project will lose their jobs. They account for a very small percentage of workers who have lost their jobs. The record of labor market in these cities shows that the demand for labor in the market is strong so that the unemployment rate is very low in these cities. The local labor bureau and NGOs provided technical training to unemployed workers and the re-employment rate of the workers is very high. In addition, for those affected under the project, detailed reemployment plans have been prepared for the affected workers, and all three cities and heating companies have committed to provide similar employment to the affected workers, so that their income and livelihood will be restored and improved.

5. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

5.1 Public Consultation

In accordance with the requirements of the China's EA Law and Method for Public Participation, as well as the World Bank safeguard policies, two rounds of public consultation were conducted by the EIA team. The first round focused on environmental screening to define public concerns, to assist identification of key environmental issues and to draw public response and comments on the initially developed mitigation measures for the potential adverse impacts identified before EA TOR finalization. The second round was designed to ensure public awareness of the EA effort and final project definition and mitigation of the adverse impacts by presenting a draft EA report to the public through access to information procedures. Details of the two rounds of public consultation undertaken are presented in Table 5-1.

Table 5-1 Implementation of the Public Consultation

Subproject	Round	Timing	Participants	Form	Organizer
Chengde	1	Feb 2 –	Local residents	Interview	Chengde Heating

		Feb. 15, 2015	and concerned agencies	and public meeting	Company (the IA), Chengde Shengyuan Environmental Service Company (EIA Institute)
	2	March – April 6, 2015	Affected local residents, concerned agencies	Questionnaires, interview	
Pingshan	1	Oct. 27 – Dec 21, 2014	Local residents affected and of interest, concerned agencies	Questionnaires, interview and public meeting	Pingshan County Heating Company (the IA), Guohuan Hongbo Energy Conservation and Environment Protection Company (EIA Institute)
	2	Jan. 4 – Apr. 10, 2015	Affected residents, concerned agencies	Questionnaires, interview	
Xingtai	1	Feb 5 – Feb 17, 2015	Affected residents, sensitive receptors, concerned agencies	Interview	Xingtai Risun Anneng Heating Company (the IA), Hebei Zhonglian Energy Conservation and Environment Protection Company (EIA Institute)
	2	Mar 19 – May, 2015	Affected residents, sensitive receptors, concerned agencies	Questionnaires, interview and public meeting	
Zhangjiakou	1	Jan 28 – Feb 16, 2015	Affected residents, concerned agencies	Questionnaires, interview and public meeting	Zhangjiakou Dongyuan Heating Company (the IA), Zhangjiakou Research Institute of Environmental Science (EIA Institute)
	2	Mar 19 – Apr 24, 2015	Affected residents, concerned agencies	Questionnaires, interview and public meeting	

Through the consultation, it is understood that the public strongly support the project as they think it would be an effective approach to improving their living condition and the air quality. It is also understood that major concerns of the public include the impact of traffic blocking and safety issues, and noise and dust suspension caused by construction activities. In response, the mitigation measures have been developed in the draft EA and the public expressed that the proposed mitigation measures are acceptable.

5.2 Information Disclosure

Information on each of the sub-project has been disclosed to the public during the public consultation. During the first-round consultation, the project information has been disclosed, and during the second round of consultation, the draft sub-EA has been placed in the EA institute and the Implementing Agencies. Advertisements have been posted in the affected communities and on the IA and/or EIA institutes' websites during the first round and second round consultation, to inform the public of

project details and potential impacts, invite them to express their concerns and to inform the public the place to access to relevant information and draft EIA report.

The consolidated EA has been placed in the website of the provincial PMO at:

http://110.249.165.62:8080/pub/root17/zfxx/201508/t20150824_257737.html

6. ANALYSIS OF ALTERNATIVES

6.1 Introduction

During project development, various alternatives have been compared from technical, economic and environmental regards. In terms of the environmental assessment of alternatives, the primary objective was to identify and adopt options with the least adverse environmental impacts at reasonable cost. The evaluation and comparison has included the following options:

- **The scenario of with and without the project;**
- **Heat technologies;**
- **Siting of sub-stations and alignment of pipelines; and**
- **Pipe material**

The following criteria formed the basis of identifying the most appropriate options for the project:

- **Complying with the required standard;**
- **Being appropriate in respect of local conditions;**
- **Being proven in operation at or close to the scale proposed;**
- **Representing the least cost option.**

6.2 Alternatives of Heating Technologies

For each of the four subprojects, district heating by using residual heat from power plant or coking facility and decentralized heating (by coal or gas firing boilers) options were compared in terms of technical, economic and environmental performance. District heating was considered as the preferred option for being energy efficient, cost effective, better environmental performance and operation stability.

6.3 Alternatives of Heating Substation and Pipeline Layout

Two options of heating substations and network layout were compared for each of the four subprojects, with focuses on siting of heating substations (location, ground or underground), type of heating substations (conventional or building-level), number of heating substations, as well as heating pipeline alignment, respectively. The options with the least cost and environmental impacts are identified and recommended as preferred options.

6.4 Alternatives of Pipe Material

Two options of pipe protection material were compared for all the four subprojects. Option 1 uses polyurethane foam prefabricated insulated pipe with high-density polyethylene outer jacket, and option 2 uses rock wool for insulation and glass wool cloth for protection. Option 1 was selected, with lower cost, better technical and environmental performance.

7. Due Diligence Review

During the preparation of the EA, due diligence review has been carried out to 1) ascertain the presence of hazardous materials in the small boiler houses to be dismantled under the project; 2) the environmental performance of the heating sources. It is found that the hazardous materials, such as asbestos, were not used for insulation in these boiler houses as the local governments prohibited the use of such hazardous materials before the establishment of these boiler houses. However

a training session on dealing with the hazardous materials is to be part of the environmental training plan for the staff dismantling the boiler houses, so as to alleviate the concern on occupational health by such materials.

The occupational safety risk is a major concern for the heating sources that will provide heating to the proposed project. The safety risks are identified to be: The workers may be injured by the exposure to steam from recovery of surplus heat or co-generation; The workers may be injured by the exposure to the electric devices that may cause electric shock in co-generation. The due diligence review show that the industrial enterprises have established the system for occupation health and safety management in accordance with the relevant laws and regulations, i.e. safety operation law. The performance of such system is satisfactory.

The environmental performance of the heating sources for the proposed project has been reviewed. It is found that these heating sources are established in compliance with the legal procedure, including the environmental management procedure, i.e. EIA and environmental examination and acceptance. The environmental monitoring data for the operational performance of the heating sources have been obtained during the due diligence review. It is found that the environmental performance of the heating sources are in compliance with the respective standards, except for the Xibaipo Thermal Power Plant in Pingshan County to provide residual heat to the proposed project which fails to meet the flue gas emission standard in terms of SO₂. Flue gas treatment equipment upgrading of the Xibaipo Thermal Power Plant is in progress and will be completed by the end of 2015. For flue gas emission, continuous online monitoring is in place for the power plants, and external monitoring report by local EPB will be provided to the IA, Hebei Provincial PMO and the World Bank every quarter, which is included in the environmental monitoring plan of the EMP.

8 ENVIRONMENTAL and SOCIAL MANAGEMENT PLAN

8.1 Institutional Arrangement

The institutional arrangement and responsibilities of relevant agencies and organizations for environmental management are as follows:

- **The subproject IA will take the ultimate responsibility for environmental protection and management, with the responsibility for engaging environmental supervisors and monitoring agencies;**
- **Environmental Supervisors, to be engaged by the IA, will be responsible for day to day environmental management during the construction phase. Their responsibilities will include response to environmental monitoring reports and the taking of appropriate mitigation actions. They will also handle any environmental events which may occur during construction and operation;**
- **Provincial and city/county PMOs will be responsible for supervising overall implementation of the EMP;**
- **Local EPBs will be responsible for enforcement of environmental regulations and standards and review of environmental monitoring reports;**
- **Monitoring Stations, to be engaged by the IA, will undertake environmental monitoring of air quality, noise, water quality, and other impacts on the environment in the project construction and operation;**
- **Contractors will be responsible for implementing the mitigation measures in implementation phase; and**
- **Heat source facility will be responsible for provision of emission monitoring report conducted by local EPB.**

A training program will be undertaken during project implementation for management and technical staff from the above organizations. Training course contents will include environmental regulations, environmental monitoring, mitigation measures, safety practice for small boiler demolition, and handling and responses to environmental incidents.

8.2 Mitigation Measures

Mitigation measures for the potential impacts in the design, construction and operation phases are summarized in Annex 1.

8.3 Environmental Supervision

ESMP implementation will be managed by Hebei PMO. An environmental and social management unit will be established in the PMO with dedicated safeguards staff. Civil work contractors and supervision companies will be required to assign qualified environmental staff to their team to ensure effective implementation of the ESMP. PMO, under assistance of on-site environmental supervisors, local EPB and external monitoring institution, will supervise the implementation of ESMP. To improve local capacity, the ESMP proposes capacity training activities for civil work contractors, PMO, environmental supervisors, and monitoring institutions etc.. The ESMP also specifies monitoring plan, and budget for the ESMP implementation. A set of environmental compliance checklists for the contractors and supervisors have been developed for construction period including checking the implementation of all of the mitigation measures, and correction of environmental practice and environmental acceptance for checking the implementation of the monitoring plan, mitigation measures and reporting system.

8.4 Reporting and Public Grievance Mechanism

The requirements for environmental supervision and monitoring, as well as the reporting system has been clearly specified. The public grievance mechanism will be established and maintained throughout the project to deal with any public concerns in environmental management.

8.5 Training Plan

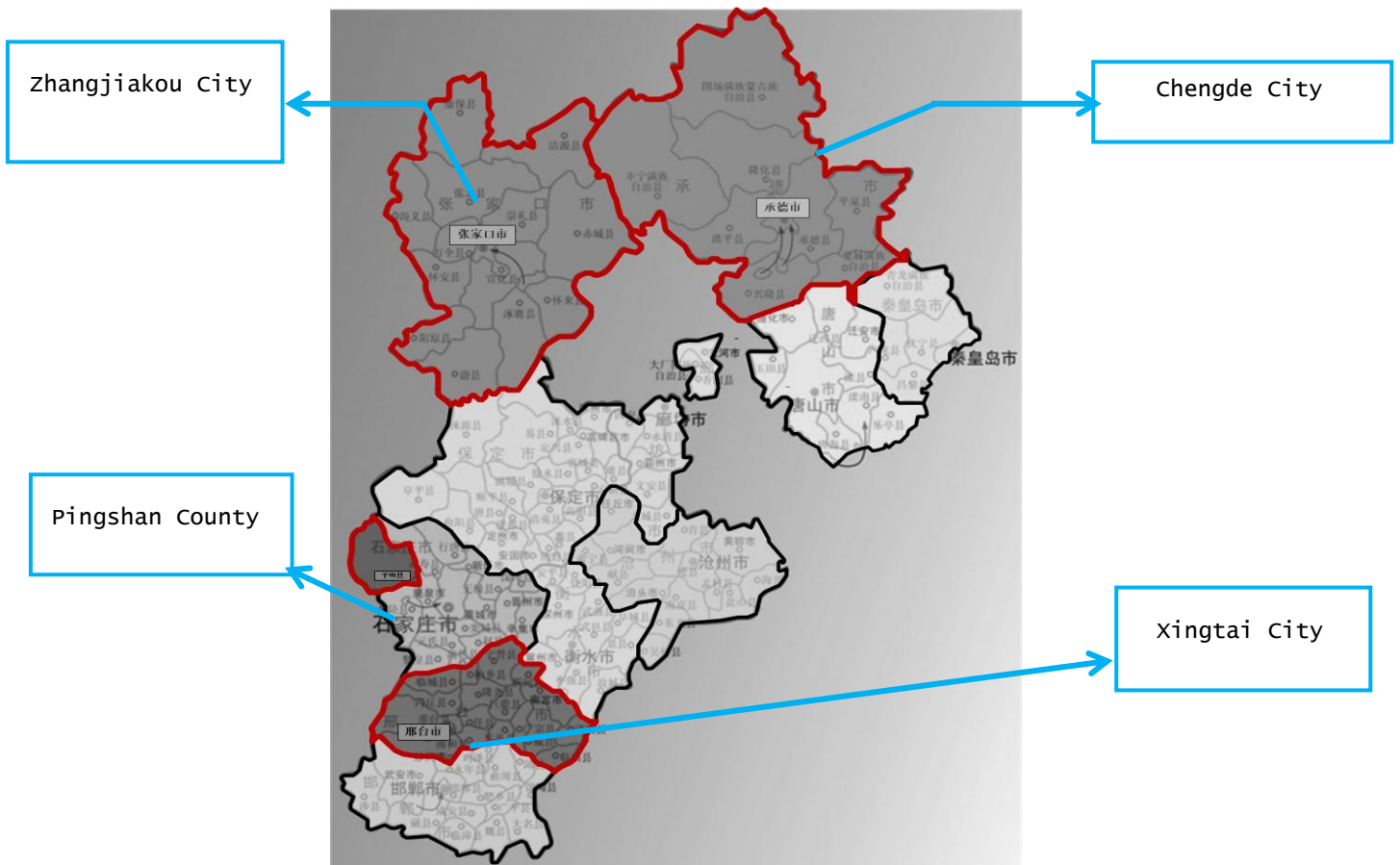
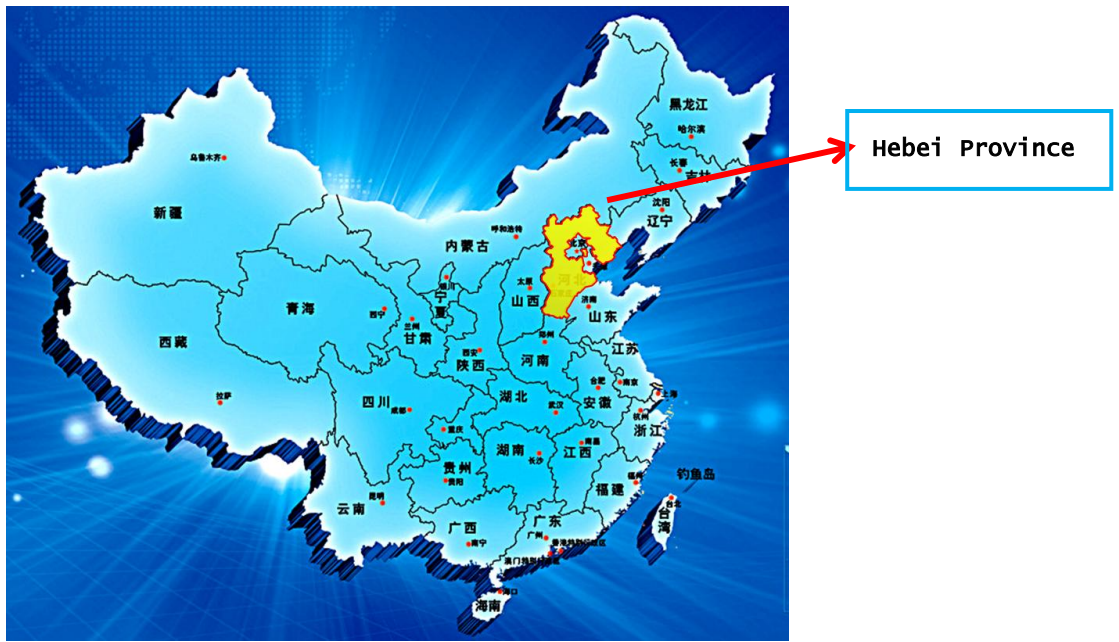
A training program has been developed for the PMO staff, environmental supervisors, contractors and environmental monitoring units with the contents focusing on the responsibilities of the relevant organizations, environmental regulations, mitigation measures, supervision, reporting system and public grievance.

8.6 Environmental Monitoring Plan and Cost Estimate

An environmental monitoring plan has been developed for the construction and operation phases and incorporated into the ESMP, which includes the monitoring location, monitoring parameters, methods, frequency and cost estimate.

The total cost estimate for the environmental monitoring is USD 85,365.

Figure 1 Project Location



Annex 1. MITIGATION MEASURES

No.	Generic Issues	Mitigation Measures	Implemented by	Supervised by
Design Stage				
1	Emission	<ul style="list-style-type: none"> • Energy-efficient and less-polluting heat source should be selected. 	The design institute (DI)	The Implementing Agency (IA)
2	Interference with Other Pipelines	<ul style="list-style-type: none"> • Thorough investigation should be done to avoid interference with other underground pipelines and possible damage. 	The DI	The IA
3	Noise	<ul style="list-style-type: none"> • Low-noise equipment should be selected. 	The DI	The IA
Construction phase				
1	Air-borne Dust	<ul style="list-style-type: none"> • Water spray is required on the construction sites. It shall be conducted twice to three times per day in order to reduce impacts of dust suspension; • Powder construction materials, like cement, should be covered or bagged. It should be covered with tarp when stored or transported; • Construction shall be well managed. The machinery should be maintained, repaired and operated properly to reduce air pollutant emission during construction; and • Fences should be installed when construction site is near residential area. 	Contractors	The IA, Local EPB
2	Noise	<ul style="list-style-type: none"> • Low-noise equipment or noise reduction and isolation device shall be used; • Temporary noise isolation structure or sound barriers are needed at the construction sites where key sensitive noise receptors are identified; 	Contractors	The IA, Local EPB

No.	Generic Issues	Mitigation Measures	Implemented by	Supervised by
		<ul style="list-style-type: none"> • Construction shall be well managed. The machinery should be maintained, repaired and operated properly to reduce noise during the construction; • Construction should be stopped at night (12:00am – 14:00; 10 pm– 6 am); • The construction at sections near schools is forbidden during examinations; • Transportation route should be well planned to avoid sensitive residential area and sensitive time period; and • Workers should be provided with personal protective equipment, e.g. helmet and earplug, etc. 		
3	Waste water	<ul style="list-style-type: none"> • Wastewater should not be discharged into the surface water. • Temporary mobile toilets should be set on construction site. • Sedimentation tank should be built for treatment of muddy construction wastewater. 	Contractors	The IA, Local EPB
4	Solid waste	<ul style="list-style-type: none"> • Spoil shall be transported to the designated site for backfilling. • The construction waste shall be hauled to the designated disposal site. • The domestic solid waste shall be piled at designated sites and collected through municipal sanitation services. • Dismantled small boiler waste including heat insulation material should be transported to the designated sites following requirements for general industrial solid waste disposal. 	Contractors	The IA, Local EPB
5	Damage to Vegetation	<ul style="list-style-type: none"> • Vegetation should be restored immediately after the works on the section is completed. • Unplanned temporary construction access road should not be 	Contractors	The IA, Local Urban Administrati

No.	Generic Issues	Mitigation Measures	Implemented by	Supervised by
		allowed.		on Authority
6	Cultural Heritage	<ul style="list-style-type: none"> • The construction should be stopped immediately once any physical cultural heritages are discovered and the local cultural department and specialist should be reported; • The site should be protected by the contractor and should not construct until the local cultural department issued a permit. 	Contractors	The IA, Local Cultural Heritage Authority
7	Social Impacts	<ul style="list-style-type: none"> • Full preparation and coordination with concerned agencies before the construction; • Properly arranging construction schedule to avoid rush hour, and construction schedule should be disclosed through public media; • Good safety measures at the construction sites. Warning signs and traffic guiding signs should be adequately set around or along construction sites. • Trainings and reemployment opportunities should be provided to the laid-off small boiler workers. 	Contractors	The IA
8	Risk Prevention	<ul style="list-style-type: none"> • Welding operations should be strictly managed. 	Contractors	The IA
No.	Sensitive Receptors	Mitigation Measures	Implemented by	Supervised by

No.	Generic Issues	Mitigation Measures	Implemented by	Supervised by
1	Noise	<ul style="list-style-type: none"> • The height of sound barriers should be not less than 3 m, and enclosure should be adopted where necessary. • For construction activities near school, construction should be strictly scheduled to arrange construction activities during weekend and after school as much as possible. • Construction schedule should be posted in sensitive residential communities. • Construction activities should be stopped when monitoring shows applicable standard cannot be met. 	Contractors	The IA
2	Air	<ul style="list-style-type: none"> • More frequent water spraying should be adopted to reduce impact of dust suspension. • Higher fence should be used around construction site, no less than 2.5m. • Construction material storage should be far away from the sensitive receptors. • Covering measures should be adopted for temporary storage. • Construction should be stopped in windy time. 	Contractors	The IA
3	Social	<ul style="list-style-type: none"> • Temporary access road should be built for schools, hospitals and other sensitive receptors. Traffic diversion and management should be strengthened. • Communication should be well conducted with concerned agencies to avoid interference with or damage of other pipelines. • Road and railway agencies should be consulted to develop safe construction plan for construction crossing road and railway. 	Contractors	The IA
Operation Phase				

No.	Generic Issues	Mitigation Measures	Implemented by	Supervised by
1	Noise	<ul style="list-style-type: none">• High-quality low-noise imported pumps shall be used.• Vibration reduction for base and shock absorber shall be installed. Pump inlet and outlet shall be connected with rubber hose. Vibration reduction should be installed between the base and the floor or walls to eliminate impacts of low-frequency noise due to the structure.• The equipment should be well maintained.	The IA	Local EPB
2	Safety	<ul style="list-style-type: none">• Pipeline inspection should be done regularly, and should be strengthened for road and railway-crossing area.	The IA	Local Safety Authority