Environmental Monitoring Report

The Sixth Semi-annual Monitoring Report (May 2017 - December 2017)
Project Number: 44013
January 2018

PRC: Shanxi Energy Efficiency and Environment Improvement Project

Prepared by Shanxi Energy Efficiency and Environment Improvement Project Management Office for the Shanxi Provincial Government and the Asian Development Bank

Asian Development Bank

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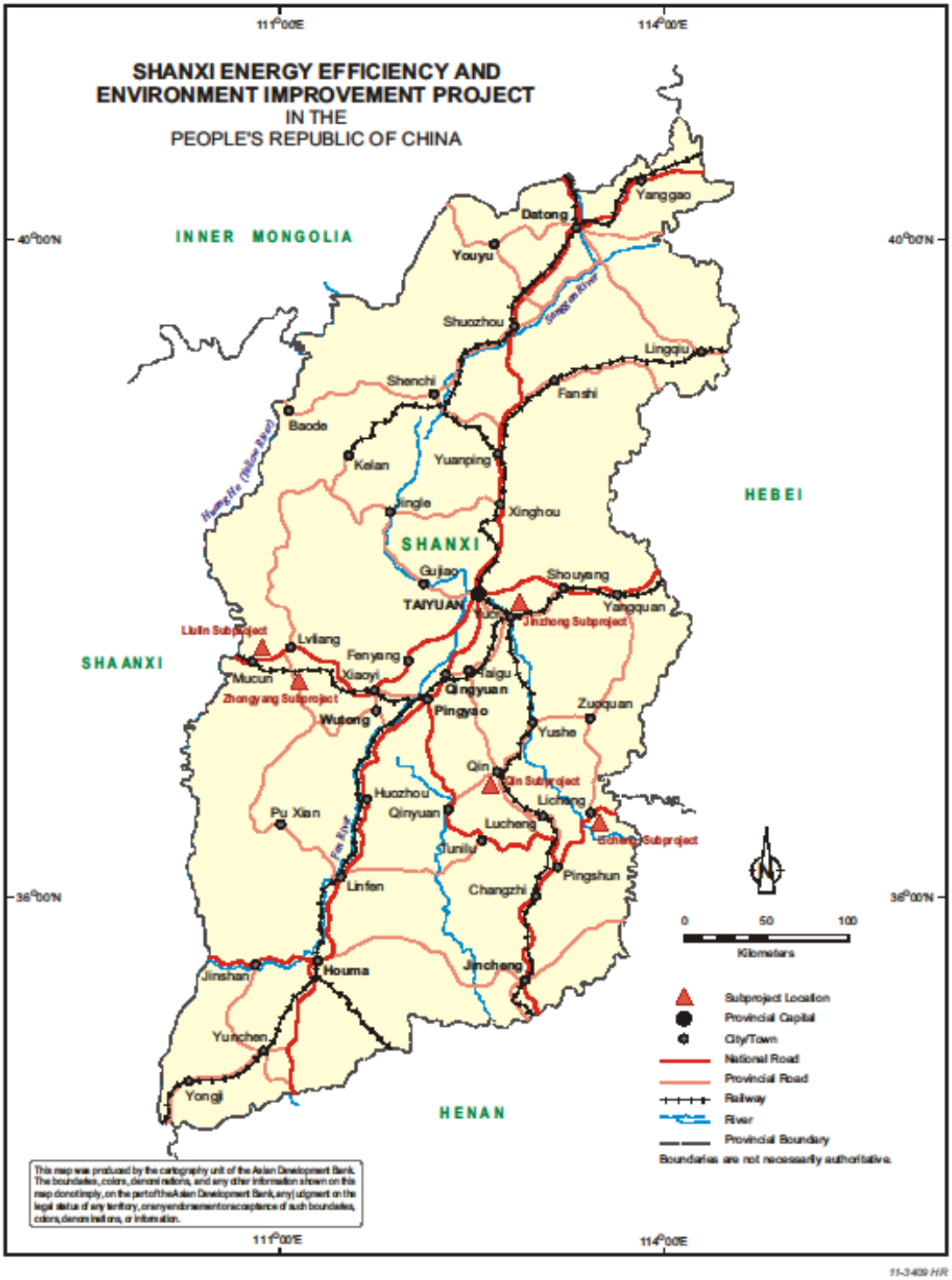
The borrower/client is required to prepare semi-annual environment monitoring and progress reports that describe progress with implementation of the project EMP and compliance issues and corrective actions.

BASIC PROJECT INFORMATION

ADB Loan No.	Loan –2885: PRC
Project Title	Shanxi Energy Efficiency and Environment Improvement Project
Borrower	People's Republic of China
Executing Agency	Shanxi Provincial Government
Implementing Agencies	Jinzhong Ruiyang CHP Heat Supply Company; Licheng County Wantong Heat Supply Company; Qin County Huayang Heat Supply Company; Zhongyang Heating and Gas Supply Center; and Liulin County Gasification Company.
Total Estimated Cost	$166.12 million ($100.00 million from ADB's ordinary capital resources and $66.12 million equity contributions from the PIAs)
ADB Loan	$100 million from ADB's ordinary capital resources
Counterpart Financing	$66.12 million
Loan Approval Date	31 August 2012
Loan Agreement Signed Date	27 March 2013
ADB Loan Effectiveness Date	24 April 2013
Original Loan Closing Date	31 December 2017
Total Number of Months for Implementation	56
Elapsed Months from Loan Effectiveness Date	56
Date of Latest ADB Loan Review Mission	September 2017 (The Project was delegated to PRCM for administration on 1 June 2015.)
Type of This Report	The 7th Environmental Safeguards Monitoring (EMP Monitoring) Report
Period Covered by This Report	May 2017- December 2017



Map 1 Location of subproject sites, Shanxi Energy Efficiency and Environment Improvement Project, PRC

I. Introduction

A. Report Purpose and Rationale

1. This report is the seventh environmental monitoring report on the Shanxi Energy Efficiency and Environment Improvement Project (the Project) covering the period of 1 May 2017 to 31 December 2017. It is prepared by Shanxi Energy Efficiency and Environment Improvement Project Management Office. The report is prepared in accordance with the environmental monitoring program as part of the environmental management plan.

B. Project Objective and Components

2. The loan 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 impact will be greater energy efficiency and a cleaner environment in Shanxi province. The outcome will be better air quality and reduced greenhouse gases emission in five urban areas in Shanxi province.

3. The project comprises two main parts as described below

4. **Part A: District heating.** This consists of four district heating subprojects that will rehabilitate 2.9 million m^2 of existing heating coverage and extend district heating to another 3.9 million m^2. It will install (i) five large, efficient coal-fired[1] boilers with an aggregate capacity of 261 megawatt thermal (MWt), which will allow the closure of 232 small, inefficient coal-fired boilers with an aggregate capacity of 340 MWt and of 4,000 household heating stoves with an aggregate capacity of 60 MWt; (ii) a heat transmission and distribution network with 100 heat exchange stations and heating pipelines;[2] and (iii) supervisory control and data acquisition (SCADA) systems. **Table** 1 summarizes the project scope.

5. **Part B: Coal-mine methane gas supply and distribution.** This will construct a CMM supply and distribution system in Liulin to supply gas to 30,000 households and 120 commercial customers. It will provide heat to 1.4 million m^2 of floor area, and cold water for summer air-conditioning to 0.3 million m^2 of building area. It will specifically include construction of (i) gas supply pipelines from the extraction points at each of the three coal mines[3] to the storage station (10 kilometers [km]); (ii)a gas storage station with one storage tank of 100,000 m^3capacity; (iii) 20 pressure-regulating stations; (iv) gas distribution pipelines of low (12 km) and medium (21 km) pressure; and (v) a SCADA system. Annual CMM use will be about 88.8 million m^3, allowing to close 43 small, inefficient coal-fired boilers with an aggregate capacity of 46 MWt.

[1] In 2014, one coal-fired boiler was changed to gas-fired boiler in Zhongyang.

[2] Pipelines to be installed will not cover the pipeline system inside buildings and households. The implementing agencies will regularly coordinate with building administrators and households to ensure technical compatibility of new and existing infrastructure with project components, and to ensure safe operation of the project.

[3] Liulin County Gasification Company, the subproject implementing agency, has signed long-term contracts with three nearby mines—Shanx iLiulin Coal Mine, Liulin County Hechang Coal Mine, and Shanxi Liulin Jiajiagou Coal Mine—for the supply of CMM.

Table 1 Scope of Subprojects

Item	Jinzhong Part A	Licheng Part A	Qin Part A	Zhongyang Part A	Total Part A	Liulin Part B	Total
Existing heating area (million m^2)	0	1.6	1.0	0.4	3.0	0.3	3.3
New heating area (million m^2)	3.0	0	0.7	0.2	3.9	1.1	5.0
Total area heated (million m^2)	3.0	1.6	1.7	0.5	6.8	1.4	8.2
Pipeline[a] (kilometer)	77.2	10.1	14.9	10.8	107.1	43.1	157.2
Heat exchange stations	78	10	25	7	100	0	100
Pressure-regulating stations	0	0	0	0	0	20	20
Heat boiler capacity[b] (MWt)	0	2x58	2x58	1x29	261	0	261
SCADA	yes	yes	yes	Yes	4	yes	5
Energy management center	yes	no	no	No	1	no	1
Decommissioned small boilers[c] (number)[4]	0	121	88	23	232	43	275
Decommissioned capacity (MWt)							
Small boilers	0	172	132	36	340	46	386
Household stoves					60		60

m^2 = square meter, MWt = megawatt thermal, SCADA = supervisory control and data acquisition system.

[a] Excludes pipeline system inside buildings and households.

[b] The heat source for Jinzhong subproject is a newly constructed 195 MWt unit of combined heat and power plant; for Luilin, it will be 140 MWt of new gas boilers.

[c] Boiler owners will implement it in coordination with the implementing agencies, which will be supervised and verified by local environmental protection bureaus and local government units.

Sources: Feasibility study reports of the subproject companies.

C. Project Implementation Progress

6. All subproject implementations are proceeding in order in line with the planned schedule. As of 13 September 2017, cumulative contract awards and disbursements are $94.5 million (94.5% of total loan amount) and $96.3 million (96.3% of total loan amount). The overall project implementation is currently rated *On Track*. Four central heating subprojects (Jinzhong, Qin, Licheng and Zhongyang) started trial or partial operation from 2014 to 2016. Liulin subproject are under construction and will be put into operation in 2018.

7. Table 2 below summarizes current status of project implementation for Part A and Part B. Except for the proposed changes in CMM station location at Liulin subproject and the boiler type at Zhongyang subproject; other subprojects have been implemented as original design. By December 2017, six environmental monitoring reports have been prepared and disclosed at the ADB website, which describe the implementation status of the project environmental management plan (EMP) in details. This is the seventh environmental monitoring report.

[4] For detailed progress please see the below **paragraph 7**. More details will be indicated in the project completion report to be submitted in March 2018.

Table 2 Project implementation Progress (by 30 November 2017)

Subproject	Project components	*Implementation Status*
Jinzhong	(i) Installation of 151 km of pre-insulated bonded pipeline; (ii)Building 58 HESs to provide heating services to 3 million m2 of new buildings in the northern urban development area of Yuci District; (iii)Installation of a water treatment facility to produce additional water for refilling both the primary and secondary pipeline networks; (iv)Installation of a SCADA and EMC to monitor and regulate the whole district heating system.	*Partially completed and under commissioning.* *(i) Installation of 179.8 km of pre-insulated bonded pipeline;* *(ii)Building 92 HESs to provide heating services to 4.27 million m2 of buildings in the urban area of Yuci District; newly adding a heating pressure station;* *(iii)Installation of a water treatment facility to produce additional water for refilling both the primary and secondary pipeline networks;* *(iv)Installation of a SCADA and EMC to monitor and regulate the whole district heating system.*
Licheng	(i)Building of an HGS containing 2 high-efficiency 58 MW PC boilers; (ii)Decommissioning 121 small boilers; (iii)Installation of a SCADA system, a water supply and sanitation system, heating and venting systems, and a fire suppression system; (iv)Installation of 10.15 km of pre-insulated bonded pipeline; (v)Building 10 HESs to provide heating services to 1.6 million m2 of building area.	*Completed and under commissioning.* (i)Building of an HGS containing 2 high-efficiency 58 MW PC boilers; (ii)Decommissioning 105 small boilers; (iii)Installation of a SCADA system, a water supply and sanitation system, heating and venting systems, and a fire suppression system; (iv)Installation of 10.15 km of pre-insulated bonded pipeline; (v)Building 10 HESs to provide heating services to 1.6 million m2 of building area.
Liulin	(i)Constructing gas supply pipelines from the extraction points at each of the three coal mines[5] to the storage station (10 kilometers [km]) (ii)Constructing a gas storage station with one storage tank of 100,000 m^3capacity; (iii)Constructing 20 pressure-regulating stations; (iv)Constructing gas distribution pipelines of low (12 km) and medium (21km) pressure; (v)Installing a SCADA system.	*Partially completed and under commissioning.* *The gas storage tank and pipelines have been relocated due to the depressed coal market, where the pipelines in Dongshan New District have been relocated to the north main urban area. The overall progress of this subproject was behind the original time schedule caused by the delay of approval for the preliminary design due to the changes of construction plan. The construction of one gas storage tank with the capacity of 50,000 m3 has been completed. Gas supply and distribution pipelines, 20 pressure regulating stations, and a SCADA system are under construction. It is anticipated that CMM gas supply and distribution facilities will be put into operation by the end 2017.* *Detailed progress includes:* ● Constructing gas supply pipelines from the extraction points at each of the three coal mines to the storage station (10 km) ● *The construction of one gas storage tank with the capacity of 50,000m3 has been completed; under commission and to put into operation by end 2017;*

[5] See the **Footnote 3** in the page 4.

Subproject	Project components	*Implementation Status*
		● Constructing 20 pressure-regulating stations; ● Constructing gas distribution pipelines of low (12 km) and medium (21km) pressure; ● Decommissioning 150 small boilers.
Qin	(i)Building a HGS containing two high-efficiency pulverized coal boilers, each 58 MW in size with dual alkali FGD scrubber and filter baghouse emission control systems; (ii)De-commissioning 88 small boilers; (iii) Installation of a SCADA system, a water supply and sanitation system, heating and venting system, and a fire suppression system; (iv) Installation of 14.88 km of pre-insulated bonded pipeline; (v) Building 25 HESs to provide heating services to 1.68 million m2 of building area.	*Completed and under commissioning.* (i)Building a HGS containing two high-efficiency pulverized coal boilers, each 58 MW in size with dual alkali FGD scrubber and filter baghouse emission control systems; (ii)De-commissioning 188 small boilers; (iii) Installation of a SCADA system, a water supply and sanitation system, heating and venting system, and a fire suppression system; (iv) Installation of 14.88 km of pre-insulated bonded pipeline; (v) Building 25 HESs to provide heating services to 1.68 million m2 of building area.
Zhongyang	(i)Build one high-efficiency 29 MW CGS boiler with utilize dual alkali FGD scrubber and filter baghouse emission control systems; (ii)Decommissioning of 23 existing small boilers; (iii)Installation of a SCADA system, a water supply and sanitation system, heating and venting system, and a fire suppression system; (iv)Installing 10.8 km of pre-insulated bonded pipeline; (v)Building 7 HESs to provide heating services to 0.52 million m2 of new construction	*The start of this subproject implementation was not in line with the original schedule set at appraisal and delayed by one year from 2013 to 2014. The physical construction and installation activities have been progressively implemented starting from 2015. As of 31 December 2016, the overall progress of this subproject was estimated at 89.5%. Detailed progress includes:* ● *The gas-fired boiler with the capacity of 29MW have been installed and will be put into commission in 2018;* ● *The SCADA has been installed;* ● *Heat supply network pipelines with total length of 10.8km have been laid out;* ● *7 HESs has been installed and put into commission;* ● *By Oct 2017, all boilers with capacities under 10t/h (or 7MW) were demolished.*

Progress of de-commissioning small boilers.

Table 3 Progress of De-commissioning Small Boilers (by 30 November 2017)

Item	Licheng Part A	Qin Part A	Zhongyang Part A	Total Part A	Liulin Part B	Total
1.Total area heated (million m^2) , planned at appraisal in 2012	1.6	1.7	0.5	6.8	1.4	8.2
2.Decommissioned small boilers[c] (number), planned	121	88	23	232	43	275
3.Decommissioned capacity (MWt) , planned 3.1Small boilers 3.2Household stoves	172	132	36	340 60	46	386 60
4.Subtotal of decommissioned small boilers (service area) through 2014~2017, actual =6+8+10+12	n/a	n/a	n/a	n/a	n/a	n/a
5.Subtotal of decommissioned small boilers (number) through 2014~2017, actual =7+9+11+13	105	188	By Oct 2017, all boilers under 10t/h (or 7MW) were demolished[6].	n/a	150	n/a
6.Service area (million m^2) in 2014	0.29	n/a	n/a	n/a	n/a	n/a
7.Decommissioned small boilers (number) in 2014	20 boiler houses	n/a	n/a	n/a	n/a	n/a
8.Service area (million m^2) in 2015	0.28	n/a	n/a	n/a	n/a	n/a
9.Decommissioned small boilers (number) in 2015	20 boiler houses	n/a	n/a	n/a	n/a	n/a
10.Service area (million m^2) in 2016	0.30	n/a	n/a	n/a	n/a	n/a
11.Decommissioned small boilers (number) in 2016	23 boiler houses	n/a	n/a	n/a	n/a	n/a
12.Service area (million m^2) in 2017	n/a	n/a	n/a	n/a	n/a	n/a
13.Decommissioned small boilers (number) in 2017	n/a	84 boiler houses	n/a	n/a	By Oct 2017, all boilers under 10t/h (or 7MW) were demolished[7]	n/a

Source: Unless specified, all were from the IAs in Nov/Dec 2017. Some information might be inconsistent, and will be checked and confirmed in the project completion report scheduled in March 2018.

[6] Zhongyang County Government website: http://www.sxzhongyang.gov.cn/info/1444/16479.htm

[7] Liuling County Government website:http://www.liulin.gov.cn/zwgk/xianzhengfuban/tongzhigonggaogongshi/20170612082623188196.html

II. Institutional Setup and Responsibilities for EMP Implementation and Supervision

A. Institutional responsibilities for environmental management

8. The **Table 4** below summarizes the project's institutional arrangement to implement environmental management plan and its current status during this reporting period.

Table 4 Institutional Arrangement for the EMP and Implementation Status

Project Stakeholders	Management Roles and Responsibilities	*Implementation Status*
Shanxi provincial government (SPG) (the executing agency)	(i) Provide overall guidance during preparation and implementation (ii) Ensure counterpart contributions are provided for project implementation on time (iii) Hold final responsibility to ensure the project to comply with environmental and social safeguards	*Complied with.* *The Shanxi provincial government (SPG) practiced its responsibility in compliance with the management roles and responsibilities as defined in the Loan Agreement, Project Agreement and the relevant documents.*
Project Management Office	(i) Is responsible for overseeing the implementation of the EMP on behalf of SPG by coordinating subprojects (ii) Ensure the implementation of EMP through a nominated environment officer (iii) Prepare and submit environmental safeguards monitoring (EMP monitoring) reports to Asian Development Bank (iv) Hiring loan implementation consultant	*(i) Complied with.* *(ii) Mr. Lv Zhuyuan(Mobile Phone Number: +86 13038082620) was nominated as the environmental officer in the PMO.* *(iii) Six EMRs were submitted respectively, and disclosed on ADB's websites in Dec 2014, Sep 2015, Apr and Nov 2016, May 2017. This is the seventh EMR.* *(iv) Designated by domestic counterpart funds.*
Implementing Agencies	(i) Hold direct responsibility of the implementation of the EMP (ii) Form an environment, health, and safety unit (iii) Ensure environmental safeguards monitoring (EMP monitoring) through hiring environmental monitoring contractors and the loan implementing consultant (iv) Prepare monthly environmental reports and submit them to the PMO (v) Inform any change that implies EMP	*(i) Complied with.* *(ii) Complied with. For details see **Paragraph 9**.* *(iii) Complied with. Five subprojects were under construction or commission, and the IAs hired qualified environmental agencies[8] to conduct the seventh environmental monitoring in Nov to Dec 2017. Loan implementation consulting service was designated by domestic counterpart funds.* *(iv) Complied with. Five subprojects' IAs submitted the semi-annual monitoring reports to the PMO.* *(v)Complied with. Currently two changes (location change of Liuling CMM storage station and Zhongyang boiler type change were identified and informed of*

[8] Jinzhong subproject hired Shanxi Hongche Environmental Engineering Design and Consulting Co., Ltd. in November 2017. Licheng subpojrct hired Shanxi Zeqingyuan environmental monitoring company in November 2017. Liuling subproject hired Shanxi Huapu Testing Technology Co., Ltd. in November 2017. Qin subproject hired Xiangheng County EMS in November 2017. Zhongyang subproject hired Zhongyang County EMS in November 2017.

Project Stakeholders	Management Roles and Responsibilities	*Implementation Status*
		ADB). For details see paragraphs 7 to 8 of the fourth EMR (dated Apr 2016).
Environment, health, and safety units (under Implementing agencies)	(i) Is responsible for EMP implementation, including mitigation measures and health and safety plans (ii) Coordinate with PIC EHS Specialists and EPB staff as they conduct environmental monitoring (iii) Review/approve construction and operation phase community and occupational health and safety plans (iv) Prepare monthly semi-annual subproject environmental monitoring reports (v) Address any environmental issues as they arise.	*(i) Complied with.* *(ii) Complied with. (Loan implementation consulting service was designated by domestic counterpart funds.)* *(iii)Complied with.* *(iv) Internal monitoring reports (period covering the starting date to date, please see **Table 5** below) for partial subprojects were submitted. Monthly internal monitoring report is suggested to be enhanced in future* *(v)Not applicable so far.*
Contractors (construction)	(i) Develop construction and operation phase community and occupational health and safety plans (ii) Ensure all construction activities to comply with the EMP requirements (iii) Prepare monthly environmental reports and submit them to the IAs	*(i) Complied with.* *(ii) Complied with.* *(iii) Internal monitoring reports (period covering the starting date to date, please see **Table 5** below) were submitted.*
Environment Monitoring Contractors (EMCs)	(i) Conduct environmental safeguards monitoring (EMP monitoring) during the project implementation (ii) Provide monitoring results to the IAs	*(i)The IAs of five subprojects appointed qualified environmental agencies (see the **Footnote 8** of page 9) to conduct the seventh environmental monitoring in Nov to Dec 2017.* *(ii) Complied with.*
Project implementation consultant Environment, health, and safety specialists (PIC EHS specialists)	(i) Developing templates for contractor monthly environmental compliance reports and for Project environmental monitoring reports to be submitted to ADB (ii) Provide training on construction and operation phase EMP implementation, including mitigation implementation, environmental monitoring and reporting (including use of the reporting templates), and health and safety issues (contractors, IAs and the local EPBs will be invited to participate in this training) (iii) Evaluate conducting environmental safeguards monitoring (EMP monitoring) in conjunction with PMO environmental staff (iv) Review construction and operation phase community and occupational health and safety	*Loan implementation environmental consultant(s) was designated by domestic counterpart funds.* *(i) The template internal monitoring report was developed by the PMO; and EMR template was provided by ADB in 2013;* *(ii) Some onsite EMP training were provided by the IAs/CSCs/contractors. More details see **Paragraph 27** in **Chapter VII**.* *(iii) The evaluation was undertaken by the ADB/PMO/IAs.* *(iv) Construction phase community and occupational health and safety plans were submitted and trained. More details see **Table 5** below **and Paragraph 27** in **Chapter VII.*** *(v) Complied with by the PMO/IAs.* *(vi) Not applicable so far. No unanticipated environmental issues or complaints were incurred so far.*

Project Stakeholders	Management Roles and Responsibilities	*Implementation Status*
	plans, and providing training on their implementation (v) Preparing semi-annual and annual environmental safeguards monitoring (EMP monitoring) reports with assistance from the PMO environmental staff to prepare semiannual environmental monitoring reports (vi) Assisting IA EHS units and PMO environmental staff to respond to any environmental issues that may arise, including complaints received through the GRM.	
Municipal Environment Protection Bureau (EPB)	(i) Ensure the project to comply with all the relevant PRC laws and regulations (ii) May direct the PMO and implementing agencies to address any subproject deficiencies, If necessary and/or appropriate	*(i) Complied with.* *(ii)Not applicable by far.*

Table 5 Submission Status of Environmental Protection Operation and Supervision Plan/Manuals and Internal Environmental Monitoring Reports (by December 2017)

Civil Works Contract Package No.	Constructor/supplier	Supervisor	Environmental Protection/Flood Prevention/Construction Safety Operation And Supervision Plan/Manuals	Internal Environmental Monitoring Report	
				Submission Date	Note
Jinzhong Subproject					
	Xinpu Construction Co., Ltd.		Construction Scheme (dated on 18 May 2012), including Environment/Civilized construction /Safety/Fire prevention implementation plan		
		Shanxi Yutong Construction Management Co., Ltd. (the 18th supervision department)	Monthly supervision report (Sep 2013)		
Licheng Subproject					
	Shanxi Zeqingyuan environmental monitoring company	IA	Draft domestic environmental check and acceptance of project completion	January 2017	
		Licheng county EPB	Approval on the domestic environmental check and acceptance of project completion	9 June 2017	
		Licheng county EPB	Site inspection records on 1 Mar, 14 Aug and 17 Aug 2017		
Liuling Subproject					
	Jiangsu Heping Constuction Group Co., Ltd.		Construction Scheme (dated on 15 June 2015), including Environment/Civilized construction /Safety implementation plan/training plan		
	Taiyuan Installation Co., Ltd. for CMM storage station/ Liyang Zhengyang Gas Burning Equipments Manufacturing Co., Ltd.		Construction Scheme (dated on 1 Nov 2014), including Environment/Civilized construction /Safety/Fire prevention implementation plan/training plan		
		Shanxi Xiaoyi Fangchao Costing Consulting Co.	Monthly supervision report (Aug 2015)		

Civil Works Contract Package No.	Constructor/supplier	Supervisor	Environmental Protection/Flood Prevention/Construction Safety Operation And Supervision Plan/Manuals	Internal Environmental Monitoring Report	
				Submission Date	Note
Qin Subproject					
	Shanxi Construction Group **(Constructor)**		(i)Environment/Health/Safety targets, indicators and implementation plan (ii)Implementation plan for building standardized safe construction site in Shanxi province (iii)Safe training materials on administrative staffs (iv)Environmental management system establishment and implementation measures (v)Guidelines of onsite environmental protection (vi)Implementation progress report (vii)Disease prevention training record (28 Oct. 2014) (viii)Emergency preparedness plan (ix)Occupational disease prevention training materials on administrative staffs		
	Shanghai Guoda Construction Group**(supplier)**		(i)Environment/Health/Safety implementation plan (ii)Guidelines of onsite solid waste management (iii)Implementation progress reports (1st quarter and 2nd quarter of 2015) (ix)Dangerous materials management regulations (v)Emergency preparedness plan on safety accidents (vi)Occupational and health emergency preparedness plan on safety accidents (vii)Environmental emergency preparedness plan on safety accidents		
		Shanxi Tiandiheng Project Management Co., Ltd.	(i) Training plan on Environment/Health/Safety (ii) Monthly supervision report (submitted on 30 Sep 2014, 31 Oct 2014, 30 Nov 2014, 31 Mar 2015, 30 Apr 2015, 31 May 2015, 30 Jun 2015, 31 Jul 2015)	Internal monitoring report (Aug 2014 to Jun 2015) submitted in Aug 2015	
		Qin county EPB	Site inspection records on 4 Jan, 24 Feb, 21 Mar, 7 Apr, 16 May and 26 May 2017		
		Qin county environmental protection committee	Implementation plan of small boilers decommissioning in the urban area of Qin county	15 July 2017	

9. **Table 6** below provides contact details of staff at PMO and each IA's environment, health, and safety (EHS) units.

Table 6 Details contact information of staff at Environment, health and safety units (by December 2017)

PMO/ Subproject	Name	Position	Telephone	Email
PMO	Mr. Lv Zhuyuan	Director	+86 13038082620	sxpmo@163.com
Jinzhong (under partial operation)	Miss Wang XiaoXue	Director, Jinzhong Ruiyang Heating Supply Company (IA)	+86 15034688016	jzryrdgs@126.com
	Miss Zhao Xiaoli	EHS officer(also Department Director, Jinzhong Ruiyang Heating Supply Company (IA))	+86 18635408629	
	Miss Wang Jing	EHS officer, Jinzhong Ruiyang Heating Supply Company (IA)	+86 18636099163	
	Mr. Jin Xingan/Mr. Zhang Ke	Project manager/EHS engineer, Shanxi First Construction Group(the constructor)	+86 15536362914	
	Mr. Zhao Jianhua/Mr. Zhang Jie	Project manager/EHS engineer, Shanxi Construction Supervision Company(the construction supervisor)	+86 18935405855	
Licheng (under partial operation)	Mr. Chang Gaoyue	Deputy director/EHS officer, Wantong Heat Supply Company, Ltd. (IA)	+86 17735517086	2517786602@qq.com
Liulin	Mr. Li Yaping	Deputy general manager, Liuling coal gasification company(IA)	+86 13935896006	sxlllxb@163.com
	Mr. Hu Xiaorong	Chief engineer on site, Liuling coal gasification company(IA)	+86 13453830262	
	Mr. Wei Shuanzhu	EHS officer, Liuling coal gasification company(IA)	+86 15935842010	
	The CMM civil works contract package			
	The CMM equipment installation contract package			
Qin(under partial operation)	Mr. Wang Qiang	Manager, Qin County Huayang Heat Supply Company, Ltd. (IA)	+86 13934053925	qxhygr@163.com
	Mr. Liang Jian	Offier, Qin County Huayang Heat Supply Company, Ltd. (IA)	+86 13835577643 /0355-7020698	
	Mr. Yao Shaoguang	EHS officer, Qin County Huayang Heat	+86 13935568694	

PMO/ Subproject	Name	Position	Telephone	Email
		Supply Company, Ltd. (IA)		
	The heating civil works contract package	Contractor: Shanxi Construction Group Responsible person of the company: Mr. Bian Leilei (for main plant building);	+86 15103470344	378443262@qq.com
		Mr. Wang Pengfei(for office building)	+86 18734867716	1249038685@qq.com
		EHS Engineer: Mr.Zhang Xiaobin (for quality)	+86 18335996904	23637586@qq.com
		EHS Engineer: Mr. Li Guofei (for quality)	+86 13015345441	1578855109@qq.com
		EHS Engineer: Mr. Shi Yijie (for safety/environment)	+86 13934112344	824585018@qq.com
	The heating pipeline installation contract package	Contractor 1: Shanghai Guoda Construction Group Responsible person of the company: Liu Xiaolong	13778132022	799775704@qq.com
		EHS Engineer: Mr. You Yimin	13764003212	23861267904@qq.com
		Contractor 2: Shanxi Lantian Environmental Protection Equipments Co., Ltd. Responsible person of the company: Mr. Wang Yipeng	13581899048	wangyipeng@sxlantian.com
		EHS Engineer: Mr. Song Guoqing	13803458176	359507401@qq.com
	Constuctdion supervisor	Shanxi Tiandiheng Project Management Co., Ltd. Responsible person of the company: Zhao Baoguo	0351-4605024	tiandiheng@sohu.com
		EHS Engineer: Zhang Jizheng	0351-4605024	tiandiheng@sohu.com
Zhongyang	Mr. Wang Xiao	EHS officer of the heating company(IA)	15803588166	124185792@qq.com

B. Incorporation of Environmental Requirements into Project Contractual Arrangements

10. During the reporting period, five subprojects are under construction/partial-operation. The articles for environmental protection and liability included in the construction contacts are summarized as follows:

6.3环境保护：承包人应在施工组织设计中列明环境保护的具体措施。在合同履行期间，承包人应采取合理措施保护施工现场环境。对施工作业过程中可能引起的大气、水、噪音以及固体废物污染采取具体可行的防范措施。

承包人应当承担因其原因引起的环境污染侵权损害赔偿责任，因上述环境污染引起纠纷而导致暂停施工的，由此增加的费用和（或）延误的工期由承包人承担。

Article 6.3: The contractors shall specify the measures for environmental protection in the project design and take such measures in physical construction process. The contractors shall properly take the environmental protection measures in the construction site, especially the pollutions controls on air emission, water discharge, noise abatement and solid waste disposal.

The contractors shall be liable for the compensation caused by environmental contamination, and shall assume the increased expenses in case of the suspension of the physical construction due to environmental pollution.

III. Compliance with environment related project covenants

11. **Table 7** below presents all the environmental related loan covenants for the project and summarizes the compliance status during this reporting period.

Table 7 Environment related loan covenants and compliance status

Environment related loan covenants	*Implementation Status*
Environment The SPG shall ensure, and cause the Project Implementing Agencies to ensure, that the preparation, design, construction, implementation, operation and decommissioning of the Project and all Project facilities comply with (a) all applicable laws and regulations of the Borrower relating to environment, health and safety; (b) the Environmental Safeguards; and (c) all measures and requirements set forth in the IEE, the EMP and any corrective or preventative actions that may subsequently be agreed upon with ADB.	*In compliance.*
Human and Financial Resources to Implement Safeguards Requirements The SPG shall make available, and cause the Project Implementing Agencies to make available, necessary budgetary and human resources to fully implement the EMP and the RP.	*In compliance.*
Safeguards-Related Provisions in Bidding Documents and Works Contracts 8. The SPG shall ensure, and cause the Project Implementing Agencies to ensure, that all bidding documents and contracts for Works contain provisions that require contractors to: (a) comply with the measures relevant to the contractor set forth in the IEE, the EMP and the RP, and any corrective or preventative actions set forth in a Safeguards Monitoring Report; (b) make available a budget for all such environmental and social measures; and (c) provide the SPG, through the Project Implementing Agencies, with a written notice of any unanticipated environmental or resettlement risks or impacts that arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP and the RP.	*In compliance. See the Paragraph 10 in Chapter II.*
Safeguards Monitoring and Reporting 9. The SPG shall do, and cause the Project Implementing Agencies to do, the following: (a) submit (i) semiannual Safeguards Monitoring Reports during construction, and (ii) annual Safeguard Monitoring Reports during operation of Project facilities, to ADB for	*(a) In compliance.*

Environment related loan covenants	*Implementation Status*
review and disclose relevant information from such reports to the Affected Persons promptly upon submission*;* (b) if any unanticipated environmental and/or social risks and impacts arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP and the RP, promptly inform ADB of the occurrence of such risks or impacts, with detailed description of the event and proposed corrective action plan; and c) report any actual or potential breach of compliance with the measures and requirements set forth in the EMP and the RP promptly after becoming aware of the breach.	*(b) In compliance.The location changed for the Liulin gas station and change of Zhongyang boiler type have unanticipated environmental implication. Due diligence was conducted in January 2015 and the EMP was updated correspondingly.* *(c) Not applicable.*

12. The follow-up status on the MOU of ADB mission in September 2017 is shown as following:

Table 8 Follow Up to the MOU of ADB Review Missions in September 2017

Requirements in the MOU	*Compliance Status*
(i) **Paragraph 15. Environmental monitoring and reporting.** Monitoring and reporting arrangement was required and defined in the project agreement, Project Administration Manual (PAM) and EMP. The 6th semi-annual environmental monitoring was submitted to ADB in May 2017 and disclosed at ADB website. It was agreed that the 7th revised first semi-annual environmental monitoring and progress report should be submitted to ADB not later than 31 October 2017.	*Complied with.* *During this (the 7th) reporting period covering May to Dec 2017, the subprojects IAs respectively hired five local qualified environmental monitoring agencies to conduct external environmental monitoring.* *This is the 7th EMR. In the first two years (2018~2019) during project operation stage, the intervals of EMRs submission are expected to be on an annual basis according to the EMP.*

IV. Environmental Mitigations and Compensation Measures Implemented in the reporting period

13. The EMP indicates pollution control and mitigation measures specifically developed for the project, which are designed in different project phases, including pre-construction, construction and operation phases. **Table 9** below presents the EMP and the summary of actions taken by the applicable subproject during construction.

Table 9 The Project environmental management plan and implementation status

Project Phase/ Aspect	Potential Environmental Impacts	Proposed Mitigation Measures	Timeframe	Responsibility	*Implementation status and compliance with EMP*
Environmental Issues Associated with Preconstruction Phase					
Subproject Siting	Land acquisition	i) Land Acquisition Plan (LAP) developed and implemented in accordance with PRC applicable laws and ADB requirements. 17 affected persons to receive a total of 465,000 CNY in compensation.	Prior to any physical works	PMO	*Not applicable.* *Due to the location change for the gas station under Liulin subproject, there is no need for LAP. However, re-assessment of environmental impacts and revision of EMP is necessary. Due diligence review were conducted and the EMP were updated correspondingly. The Environment and Social Due Diligence Report was disclosed on ADB website in Jan 2015.*
Environmental Issues Associated with Construction Phase (all subprojects, excluding Licheng subproject, are applicable during this reporting period)					

Air Quality	Nuisance and human health impacts from dust, odor, and vehicle exhaust.	i) ii) iii) iv) v) vi) vii) viii)	Water trucks will be used to wet the construction sites and routes where fugitive dust is being generated as required taking into consideration weather conditions and site location (e.g. increased spraying during dry and windy days and near residential or commercial areas). Materials will be covered during transportation to avoid spillage or dust generation. Material piles will be stored in appropriate places and covered, seeded or sprayed to minimize fugitive dust. Any planned paving or vegetating of areas will be done as soon as possible after the surface materials are removed, to stabilize the soil. Aggregate preparation and storage areas, concrete mixing plants and asphalt plants will be located at least 200 m downwind, based on the prevailing wind direction, from the nearest residential areas. Dust suppression equipment will be installed in concrete-batching plants. Vehicles and construction machinery will be properly maintained and will comply with relevant PRC emission standards. Upon completion of construction, disturbed sites will be re-vegetated or otherwise rehabilitated to stabilize the soil.	During construction	Contractor	*Complied with.* *(i)Civilized construction was implemented.* *(ii)The contractors provided full coverage of granular and powder materials during materials transportation and on the construction sites. Cement or other powder materials were stored in bags. The constructors strengthened field management, delimitated stacking area in accordance with types of construction materials, and erected material identification cards. The IAs designated full-time staffs on site for supervision and inspection. The in-situ dust was controlled with water spray (at least twice per day for access roads) and timely cleaning up or sweeping.* *(iii)No concrete batching plant was on the construction site, to which the ready-for-use concrete was transported.* *(iv)All the automobile and equipment emissions complied with the national standards.* *(v)Pavement or re-vegetation was done in a timely manner after the construction activities. In pipeline route, the removed vegetation was all common species including some poplar trees. The vegetation reclamation was done after the construction was completed.*

Project Phase/ Aspect	Potential Environmental Impacts	ProposedMitigationMeasures	Timeframe	Responsibility	*Implementation status and compliance with EMP*
Noise	Noise impacts from construction machinery operation, transport activities.	i) Equipment and machinery will be properly maintained and equipped with silencers so as to conform to the PRC standard GB12523-90. ii) Operation of machinery generating high levels of noise and the movement of heavy vehicles along urban roads will be restricted to between 6:00 am and 10:00 pm in accordance with PRC regulations. iii) Noise reduction barriers will be used around high noise construction or transportation activities within 200 m of sensitive receptors (schools, hospitals and residential areas). iv) If noise standards are exceeded, equipment conditions will be checked, and mitigation measures will be implemented to rectify the situation, such as additional sound barriers, moving noise sources away from the sensitive receptor, etc	During construction	Contractor	*Complied with.* *The noise impacts from those* equipment and machineries were mitigated with sound insulation vibration damping, noise reduction measures. Personal earmuffs were equipped with.
Wastewater	Surface and groundwater contamination from construction wastewater, domestic wastewater.	i) Construction site and equipment wash-down runoff will be directed to sedimentation basins, and wastewater will be reused if possible such as for dust control. Solid waste residue in the basins will be cleared as required and transported to designated landfills. ii) For areas with oily wastewater discharges, oil-water separators will be installed before the sedimentation basin. iii) Appropriate temporary sanitation and waste collection facilities will be provided for workers, either using septic disposal systems or portable toilets. – Effluent from portable toilets will be collected and treated by an appropriately licensed company in accordance with relevant regulations. – Toilet facilities will be regularly cleaned and disinfected so as to avoid breeding of flies and mosquitoes. – Workers will be provided with access to clean water sources.	During construction	*Contractor*	*Complied with.* *Construction site and equipment wash-down runoff were directed to sedimentation basins, and wastewater was reused if possible such as for dust control.* *In the construction sites construction workers generated small amount of domestic sewage, which was collected in the septic tanks then discharged to the municipal sewage system. Otherwise, aqua privies were built. A small amount of domestic sewage was used for irrigation or suppressing dust. And clean water was connected and available to all workers from municipal water supply pipeline network.*
Erosion	Water pollution, localized land degradation.	i) Contractors will be required to develop site erosion plans, including the use of vegetation and soil stabilization measures and structural erosion control measures.	During construction	Contractor	*Complied with.* *The contractors of the five subprojects submitted the construction plan including site erosion prevention*

Project Phase/ Aspect	Potential Environmental Impacts	Proposed Mitigation Measures	Timeframe	Responsibility	*Implementation status and compliance with EMP*
					plan to the IAs prior to construction activities. The erosion prevention plans include vegetation and soil stabilization measures and structural erosion control measures.
Solid Waste	Soil and surface and groundwater contamination from construction and domestic wastes.	Domestic waste bins will be provided. i) Construction wastes such as spoil and various building materials such as steel, timbers, etc., are utilized on site to the extent possible. ii) All wastes which cannot be used will be routinely collected by an appropriately licensed company for recycling (e.g. waste oil/grease, oily clothing rags, metals, salvageable wood and building materials, etc.) and/or final disposal in a licensed waste facility (e.g. for non-recyclable materials). Surplus spoil will be transported to suitable spoil disposal sites approved by the local EPB. i) No on-site landfills will be permitted at any construction site. ii) No burning of wastes will be permitted at any construction site. iii) Waste management will be undertaken in consultation with local authorities.	During construction	Contractor	*Complied with.* *The reusable materials were separated and re-utilized.* *The construction waste was transported to the designated and authorized dumping sites.* *The domestic waste were collected in the dustbins on the construction sites then transported to the designated and authorized dumping sites for disposal.*
Hazardous Materials	Soil and water pollution and risks to human health from hazardous materials.	i) For storage of fuels, oils, solvents and other hazardous materials: – All toxic, hazardous, or harmful construction materials including petroleum products must be transported in spill proof tanks with filling hoses and nozzles in working order, and stored in designated areas with impermeable surfaces and protective berms such that spillage or leakage will be contained from affecting surface water or groundwater systems. – Chemical safety data sheets (CSDSs) will be posted for all hazardous materials. – Oil absorbents will be readily accessible in marked containers. – Good housekeeping procedures will be established to avoid the risk of spills in the first place. – Spills will be dealt with immediately, and personnel will be trained and tasked with this responsibility.	During construction	Contractor	*Complied with.* *No toxic, hazardous, or harmful materials were used in the construction process. Five cities/counties EPBs conducted regularly check in this issue. No accident was recorded.*
	Soil and water pollution and risks to human health from hazardous waste.	i) Hazardous wastes should: – Be handled by workers who have received training in handling and storage of hazardous wastes and have the requisite PPE. – Be temporarily stored in closed containers away from direct	During construction	Contractor	*Complied with.* *No toxic, hazardous, or harmful materials were used in the construction process.*

Project Phase/ Aspect	Potential Environmental Impacts	Proposed Mitigation Measures	Timeframe	Responsibility	*Implementation status and compliance with EMP*
		sunlight, wind, water/moisture(?) and rain in secure designated areas with impermeable surfaces and protective berms such that spillage or leakage will be contained from affecting surface water or groundwater systems. – Be collected and disposed by licensed contractors on an as needed basis.			
Flora and Fauna	Vegetationcover removal.	i) Trees and shrubs will only be removed if they impinge directly on the permanent works or approved necessary temporary works. ii) Temporary sites will be rehabilitated and replanted with appropriate native vegetation; iii) Roadside pipeline routes will be re-vegetated with a mix of native vegetation species similar to the mix and composition found locally. iv) Stream crossings will be subsurface utilizing directional drilling techniques.	During construction	Contractor	*Complied with. Only temporary land occupation was involved with, and the vegetation recovery was timely done after construction was completed.*
Physical Cultural Resources	Disturbance during construction.	Chance find procedure: i) All works at the find site will be halted and the relevant local heritage authority and the PMO will be notified. ii) The find will be assessed by a competent expert. iii) Procedures to avoid, minimize or mitigate impacts to the physical cultural resources will be developed by the expert in cooperation with the relevant local heritage authority. iv) Construction will resume only after thorough investigation and with the permission of the relevant local heritage authority.	During construction	Contractor	*Not applicable. No historical heritage sites are involved in the project area.*
Public Inconvenience	Traffic congestion, interruptions in municipal services and utilities.	i) Subproject traffic control and operation plans will be prepared by the contractor and will be approved by the local traffic management administration before construction. The plans will include provisions for diverting or scheduling construction traffic to avoid morning and afternoon peak traffic hours, regulating traffic at road crossings, and selecting transport routes to reduce disturbance to regular traffic. ii) During detailed design construction activities will be planned so as to minimize disturbances to utility services. Notice will, be provided to the public as to planned service interruptions. iii) Consultation will be undertaken with relevant municipal authorities to determine the location of underground services prior to the start of work.	During construction	Contractor	*Being complied with. The traffic control plans were prepared by the constructors and approved by local traffic bureaus. A notice board was provided. The public inconvenience was kept minimal and no complaint was received.*
Occupational Health and Safety	Risk of injury to workers.	Development and implementation of subproject specific Occupational Health and Safety Plans (OHSPs) which will: i) Identify and minimize, so far as reasonably practicable, the causes of potential hazards to workers. ii) Provide preventive and protective measures, including modification, substitution, or elimination of hazardous conditions. iii) Provide for the provision of appropriate personal protective equipment (PPE) to minimize risks, including ear protection, hard	At least 1 month prior to start of physical works	PIC EHS Specialists to develop; Contractor to implement	*Complied with. The workplace safety regulations were in place and implemented in construction process. The personal protective apparatus were all provided, such as the*

Project Phase/ Aspect	Potential Environmental Impacts	ProposedMitigationMeasures	Timeframe	Responsibility	*Implementation status and compliance with EMP*
		hats and safety boots. iv) Provide for appropriately stocked first aid kits and first aid stations. v) Provide procedures to protect workers from the potential health hazards emanating from the handling, transport and disposal of asbestos or asbestos contaminated materials. vi) Provide for adequate safety protection equipment including firefighting systems. vii) Provide adequate signage in risk areas. viii) Provide procedures for limiting exposure to high noise or heat working environments in compliance with PRC noise standards for construction sites (GB12523-1990) and relevant international guidelines. ix) Provide procedures to protect workers from the potential health hazards emanating from the handling, transport and disposal of asbestos or asbestos contaminated materials. x) Provide training for workers, and establish appropriate incentives to use and comply with health and safety procedures and utilize PPE. xi) Provide training for workers on the storage, handling and disposal of hazardous wastes. xii) Provide procedures for documenting and reporting occupational accidents, diseases, and incidents. xiii) Provide emergency prevention, preparedness, and response arrangements.			*gloves, goggles, working clothes and helmets, etc. The first aid kits were available. No asbestos were used. The fire prevention measure and control equipment were all in place. The workers were trained for workplace safety, first aid, and self-protection techniques. No accidents happened.* *The IAs strictly required all the site construction workers wearing helmets, otherwise.* *The Liuling IA hired local electricity specialists to carry out inspection on the status of electricity and set up a dedicated construction transformer.*
	Social Risks	Contractors will be required to disseminate information (in local languages) on the risks of sexually-transmitted infections, including HIV/AIDS, in health and safety programs to those employed during Project implementation. Specific provisions to this effect will be included in bidding documents and Works contracts.	Prior to start of physical works	Contractor	*Complied with.*
	CMM Risks	The Liulin OHSP should pay specific attention to: i) Mine ventilation and air source for underground workers ii) Emergency evacuation procedures and provision of refuge bays iii) Dust control. iv) Fire and explosion prevention and control strategies, including: – conducting fire hazard assessments on a recurrent basis; – identifying fire hazard areas using warning signs, and prohibiting all persons from smoking, using open flame lamps, matches or other types of ignition sources in the designated fire hazard areas, unless under strict protocols (e.g. welding protocol); – appropriate storage of flammable materials; – installation of a fire detection and extinguishing system.	At least 1 month prior to start of physical works	PIC EHS Specialist to develop; Contractor to implement	*Complied with.*
Community Health and	Risk of injury to local community	Development and implementation of subproject specific Community Health and Safety Plans(CHSPs) which will include:	Prior to start of physical	PIC EHS Specialist	*Complied with.* *A construction plan*

Project Phase/ Aspect	Potential Environmental Impacts	ProposedMitigationMeasures	Timeframe	Responsibility	*Implementation status and compliance with EMP*
Safety	members.	i) Safety signage procedures to keep the public away from active works sites and hazardous areas. ii) Site speed limit signage and the requirements for all project vehicles to comply with PRC traffic regulations. iii) Community emergency response procedures. iv) Emergency contacts and communication systems / protocols. v) Procedures for interaction with local and regional emergency and health authorities.	works	to develop; Contractor to implement	*including CHSP was prepared before construction. Safety and health requirements, and emergency preparedness response plan were all covered.*
Environmental Issues Associated with Operation Phase (five subprojects which were fully or partially commissioning) are applicable during this reporting period)					
Air Quality	Emissions from boiler stacks may result in significant localized air pollution during the heating season.	i) The SPG through the PMO and the IAs shall ensure that the boilers are designed, constructed, and operated in accordance with relevant PRC national and local government environmental laws, regulations, procedures, and guidelines. ii) Only PC or CGS (in the case of Zhongyang) boiler technology will be utilized. iii) Boilers will be equipped with dual alkali flue gas desulfurization (FGD) scrubbers and filter baghouse emission control systems to reduce design emission levels to well within emissions standards stipulated in Emission Standard of Air Pollutants for Coal-burning, Oil-burning, Gas-fired Boilers (GB 13217-2001) and in the World Bank Environmental, Health, and Safety Guidelines for Thermal Power Plants. iv) Boiler house design stack height will meet PRC standards and international good practice. v) Only low sulfur coal will be utilized (< 1% sulfur content).	Design of PC/CGS boilers and emission control systems during design phase. Operation of systems during operation.	Design consultants with oversight from PMO and IAs IAs	*Complied with in Nov-Dec 2017 heating season. (Jingzhong subproject sourced heating from an existing CHP and a local power plant funded by domestic counterpart funds previously)*
	Fugitive coal dust may result in localized air pollution.	i) Coal truck loads will be covered. ii) Dust suppression systems (e.g. water spraying, coverings) will be installed at all coal handling and transfer points and in coal handling yards. iii) Ash will be stored on a temporary basis only in impervious storage tanks, and dust generation from ash tanks will be prevented by maintaining a layer of water over the surface and/or keeping ash covered prior to sale to the building industry.	During operation.	IAs	*Complied with in Nov-Dec 2017 heating season.*
Noise	Noise impacts from operation of HGSs and CMM storage units.	i) The HGSs and CMM storage units will be designed such that PRC industrial boundary noise standards (GB12348-2008) are complied with (Class II for HGSs; Class III for the Liulin CMM works). This will include but not be limited to the following: – Layout will be designed such that high noise locations are situated as far as possible from sensitive receptors, and/or	Design ofnoise control measures during design	Design consultants with oversight from PMO and IAs	*Complied with in Nov-Dec 2017 heating season.*

Project Phase/ Aspect	Potential Environmental Impacts	Proposed Mitigation Measures	Timeframe	Responsibility	*Implementation status and compliance with EMP*
		noise barriers such as berms and vegetation are used to limit ambient noise at the boundary where sensitive noise receptors are present. – The use of noise control techniques including, but not limited to acoustic machine enclosures; selecting structures and building materials according to their noise isolation effect to envelop the building; using mufflers or silencers in intake and exhaust channels; using sound absorptive materials in walls and ceilings; using vibration isolators and flexible connections (e.g., helical steel springs and rubber elements); and applying a carefully detailed design to prevent possible noise leakage through openings or to minimize pressure variations in piping. ii) If noise standards are exceeded, equipment conditions will be checked, and mitigation measures will be implemented to rectify the situation, such as additional sound barriers, moving noise sources away from the sensitive receptor, etc.	phase. Operation of systems during operation.	IAs	
	Noise impacts from HESs and PRSs.	i) HESs and PRSs will have a buffer distance of at least 10 m from the nearest household or other sensitive receptors. ii) Noise control techniques will be utilized, including, but not limited to: – acoustic machine enclosures; – selecting structures according to their noise isolation effect to envelop the building, and using sound absorptive materials in walls and ceilings; – using low-noise water pumps with noise levels controlled to within 55 dB(A) at a distance of 1 m from the pump house.	Design of noise control measures during design phase. Operation of systems during operation.	Design consultants with oversight from PMO and IAs IAs	*Complied with in Nov-Dec 2017 heating season.*
Wastewater	Surface and groundwater contamination from domestic wastewater, site drainage, wastewater from scrubbers and fly-ash storage, and wastewater from coal dust suppression spraying.	i) All subproject sanitation facilities will discharge to septic systems that meet relevant PRC standards. ii) Site runoff will be directed to sedimentation basins, and wastewater will be reused if possible such as for dust control. Solid waste residue in the basins will be cleared as required and transported to designated landfills. iii) Wet fly-ash and FGD byproducts will be directed to impervious storage tanks with a sufficient design capacity. iv) Wastewater from wet fly-ash storage and coal spraying will be recycled to the extent possible to conserve water, and wastewater will be directed to sedimentation basins. v) For areas with oily wastewater discharges, oil-water separators will be installed before the sedimentation basins.	Design of treatment systems during design phase. Operation of systems during operation.	Design consultants with oversight from PMO and IAs IAs	*Complied with in Nov-Dec 2017 heating season.*
Solid Wastes	Domestic and	i) Domestic and industrial waste bins will be provided.	Design of	Design	*Complied with in Nov-Dec*

Project Phase/ Aspect	Potential Environmental Impacts	ProposedMitigationMeasures	Timeframe	Responsibility	*Implementation status and compliance with EMP*
	industrial wastes could affect soil, air and water quality if not managed properly.	ii) All wastes will be routinely collected by an appropriately licensed company for recycling (e.g. waste oil/grease, oily clothing rags, metals, salvageable wood and building materials, etc.) and/or final disposal in a licensed waste facility (e.g. for non-recyclable materials). iii) No on-site landfills will be permitted at any construction site. iv) No burning of wastes will be permitted at any construction site. v) Waste management will be undertaken in consultation with local authorities.	waste systems during design phase. Operation of systems during operation.	consultants with oversight from PMO and IAs IAs	*2017 heating season.*
	Fly ash and slag could affect soil, air and water quality if not managed properly.	i) All fly-ash and slag will be temporarily stored on site in impervious storage tanks and sold to the local construction industry as a raw building material and to be used as material for road construction. ii) No permanent on site ash disposal will be allowed.	Design of waste systems during design phase. Operation of systems during operation.	Design consultants with oversight from PMO and IAs IAs	*Complied with in Nov-Dec 2017 heating season.*
	Boiler decommissioning could affect soil, air and water quality if not managed properly.	i) Boiler decommissioning will be undertaken by the IAs under the authority of the local county/district governments in coordination with the boiler owners, and will be overseen by the relevant local city EPBs. ii) All demolition wastes will be routinely collected by appropriately licensed waste management companies for reuse, recycling (e.g. equipment; steel, iron and other metals; salvageable wood and building materials; etc.) or final disposal in a licensed waste facility (e.g. for non-recyclable materials). Waste management will be undertaken in consultation with local authorities. iii) No on-site landfills will be permitted at any demolition site. iv) No burning of wastes will be permitted at any demolition site. v) It is understood that household stoves will be retained by owners to act as a backup in case of temporary failure of the district heating systems. However, if they so desire, homeowners who choose to decommission their stoves should be given access to the services of the waste management companies noted above. vi) As part of the Project Stakeholder Communication Strategy, Project information will be provided to beneficiaries at regular intervals during the planning and design phase, including information on the health hazards of using coal heating and cooking stoves and advantages of adopting district heating.	To be completed within two years of the start of the de-commissioning process.	IAs, EPBs	*Being complied with. For detailed progress please see the below* ***paragraph 7****. More details will be indicated in the project completion report to be submitted in March 2018.*

	In case of asbestos impact during demolishing small boilers could affect soil, air and water quality if not handled, transported, and disposed properly.	To avoid the unexpected risk from asbestos, the following mitigation measures will be conducted during the demolition works. (i) Asbestos risk assessment for asbestos and asbestos contaminated materials (ACM) will be conducted by the project city EPB under the supervision of Shanxi Hazardous Wastes Disposal Center (SHWDC), The assessment will identify the presence, absence and amount of asbestos and ACM in each of the small boilers, and define an action plan for all small boilers, including labeling requirements, control mechanism (from elimination, removal or isolation to safe working practices), health and safety requirements, as well as a plan of action and procedures for disposal of the asbestos and ACM. The plan will be based on the World Bank EHS standards (April 2007) and the Good Practice Note "Asbestos: Occupational and Community Health Issues (May 2009)". The risk assessment will be shared with the local EPBs, the Provincial PMO and ADB; (ii) SHWDC will be responsible for the removal, transport and disposal of the asbestos and ACM. SHWDC shall identify, properly label and pack asbestos as well as demolition debris contaminated with asbestos during the deconstruction. Asbestos and ACM will be transported by SHWDC in sealed vehicles to a designated hazardous waste landfill. The associated costs to handle, remove, transport, and dispose asbestos and ACM will be included in the Project. (iii) Asbestos and ACM will be monitored after deconstruction of small boilers where asbestos has been identified during the risk assessment. The monitoring will consist of a visual inspection to confirm that all identified ACM have been removed, and a clearance monitoring of airborne asbestos to confirm safe working environment. SHWDC will conduct the visual inspection; a licensed laboratory will be identified to conduct the clearance monitoring. The inspection and monitoring program for the asbestos and ACM has been included in the monitoring program of the EMP. (iv) A site contamination investigation will be undertaken in consultation with the local city EPB, and if necessary site specific plans taking into account the World Bank's Group General EHS Guidelines on Construction and Decommissioning will be developed to address any site contamination. The plans will be reviewed by the local EPB and ADB. Contaminated spoil will be transported to suitable spoil disposal sites approved by the local EPB, and clean fill provided. The site will be rehabilitated to a level suitable for its proposed future use; the local EPB will approve the rehabilitation, and will require additional rehabilitation actions if necessary.	During operation	IAs	*Not applicable for all subprojects. No asbestos was involved with.*
Hazardous	Inappropriate	i) For storage of fuels, oils, solvents and other hazardous materials:	During	IAs	*Complied with in Nov-Dec*

Project Phase/ Aspect	Potential Environmental Impacts	Proposed Mitigation Measures	Timeframe	Responsibility	*Implementation status and compliance with EMP*
Materials and Wastes	storage of hazardous materials can lead to soil and water pollution and risks to human health.	– All toxic, hazardous, or harmful construction materials including petroleum products must be transported in spill proof tanks with filling hoses and nozzles in working order, and stored in designated areas with impermeable surfaces and protective berms such that spillage or leakage will be contained from affecting surface water or groundwater systems. – CSDSs will be posted for all hazardous materials. – Oil absorbents will be readily accessible in marked containers. – Good housekeeping procedures will be established to avoid the risk of spills in the first place. – Spills will be dealt with immediately, and personnel will be trained and tasked with this responsibility. ii) Hazardous wastes should: – Be handled by workers who have received training in handling and storage of hazardous wastes and have the requisite PPE. – Be temporarily stored in closed containers away from direct sunlight, wind, water/moisture and rain in secure designated areas with impermeable surfaces and protective berms such that spillage or leakage will be contained from affecting surface water or groundwater systems. – Be collected and disposed by licensed contractors on an as needed basis.	operation		*2017 heating season.*
Occupational Health and Safety	The operation of district heating HGSs, distribution pipelines and HESs pose a risk of injury to workers from accidents, fires and other emergencies, and hazardous working environments.	Subproject specific operation-phase Occupational Health and Safety Plans (OHSPs) to be developed and implemented. OHSPs should: i) Identify and minimize, so far as reasonably practicable, the causes of potential hazards to workers. ii) Provide preventive and protective measures, including modification, substitution, or elimination of hazardous conditions. iii) Provide for the provision of appropriate personal protective equipment (PPE) to minimize risks, including ear protection, hard hats and safety boots. iv) Provide for adequate safety protection equipment including firefighting systems. v) Provide adequate signage in risk areas. vi) Provide procedures for limiting exposure to high noise or heat working environments in compliance with relevant PRC noise standards for construction sites (GB12523-1990), occupational and health standards (GBZ 2.1-2007 *Occupational exposure limits for hazardous agents in the workplace*) and relevant international guidelines.	At least 1 month prior to start of operation.	PIC EHS Specialist to develop; IAs to implement	*Complied with in Nov-Dec 2017 heating season.*

Project Phase/ Aspect	Potential Environmental Impacts	ProposedMitigationMeasures	Timeframe	Responsibility	*Implementation status and compliance with EMP*
		vii) Provide training for workers, and establish appropriate incentives to use and comply with health and safety procedures and utilize PPE. viii) Provide training for workers on the storage, handling and management of hazardous wastes. ix) Provide procedures for documenting and reporting occupational accidents, diseases, and incidents. x) Provide emergency prevention, preparedness, and response arrangements.			
	Additional risks posed by working with CMM.	In addition to the above requirements, the Liulin OHSP should pay specific attention to: i) Mine ventilation and air source for underground workers. ii) Emergency evacuation procedures and provision of refugee bays iii) Dust control. iv) Fire and explosion prevention and control strategies, including: – conducting fire hazard assessments on a recurrent basis; – identifying fire hazard areas using warning signs, and prohibiting all persons from smoking, using open flame lamps, matches or other types of ignition sources in the designated fire hazard areas, unless under strict protocols (e.g. welding protocol); – avoiding use of oil filled transformers underground; – appropriate storage of flammable materials; – installation of a fire detection and extinguishing system. v) Working in a CMM Environment, including: – preventing ignitions by installing automatic gas detectors and alarms where electrically powered equipment is used and restricting items made of, or containing, aluminum, magnesium, titanium, or light metal alloy unless there is no possibility of friction or impact, or they are adequately coated with non-sparking material; – hand-held tools should be placed in a non-sparking storage and appropriate permits obtained before use; – use of fire resistant hydraulic fluids in all underground equipment; – management of CMM in working areas; when 1 percent of methane is present, all electrical and mechanical equipment should be switched off. When 1.5 percent of methane is present everyone except for those equipped, trained, and required for normalizing the situation should be evacuated and all potential sources of ignition should be deactivated and disconnected at the power source; – Installing and using fire doors.	Prior to start of operation.	PIC EHS Specialist to develop; IAs to implement	*Not yet due, mainly for Liuling subproject.*
Community	Project operation	Subproject specific Community Health and Safety Plans (CHSPs) will be	Prior to start	PIC EHS	*Complied with in Nov-Dec*

Project Phase/ Aspect	Potential Environmental Impacts	ProposedMitigationMeasures	Timeframe	Responsibility	*Implementation status and compliance with EMP*
Health and Safety	poses potential community health and safety impacts resulting from hazardous activities, heavy equipment traffic including coal transport, inappropriate storage and handling of hazardous materials.	developed. The CHSPs will include: i) Safety signage procedures to keep the public away from active works sites and hazardous areas; ii) Site speed limit signage, and the requirements for all project vehicles to comply with PRC traffic regulations; iii) Community emergency response procedures; iv) Emergency contacts and communication systems / protocols. v) Procedures for interaction with local and regional emergency and health authorities.	of operation.	Specialist to develop; IAs to implement	*2017 heating season.*
	Additional risks posed by working with CMM.	vi) For the Liulin subproject there are additional risks posed by working with CMM, and the Liulin operation-phase CHSP should pay specific attention to ensuring community safety around subproject works.	Prior to start of operation.	PIC EHS Specialist to develop; IAs to implement	*Not yet due, mainly for Liuling subproject.*
Boiler De-commissioning	Economic displacement	i) Labor Retrenchment Plan (LRP) developed and implemented in accordance with PRC applicable laws and ADB requirements, including re-employment of 80 full-time workers, re-employment of casual workers where possible, and training for new and seasonal workers on technical aspects of the new district heating systems.	During de-commissioning	PMO	*Complied with in Nov-Dec 2017 heating season.* *For detailed progress please see the below **paragraph 7**. More details will be indicated in the project completion report to be submitted in March 2018.* *For social impacts and mitigation, please see the project progress reports.*

V. Summary of Environmental Monitoring

A. Monitoring plan and responsibilities

14. **Table 10** below summarizes the project's environmental monitoring plan and implementation status during this reporting period.

Table 10 Environmental monitoring plan and summary of implementation status

Project Phase/ Aspect	Potential Environmental Impacts	Aspects to be Monitored	Location	Frequency	Responsibility	Implementation Status
Preconstruction Phase (During this reporting period, all five subprojects are applicable)						
Land acquisition	Loss of Land	– Development and implementation of LAP	– Liulin sites	– Prior to commencement of physical works.	– PMO Social Safeguard Specialists, PIC EHS specialists	*N/A for this reporting period*
Economic Displacement	Loss of livelihoods	– Development and implementation of LRP	– All sites with boiler decommissioning	– Prior to decommissioning.	– PMO Social Safeguard Specialists, , PIC EHS specialists	*For detailed progress please see the below **paragraph 7**. More details will be indicated in the project completion report to be submitted in March 2018.* *For social impacts and mitigation, please see the project progress reports.*
Construction Phase (During this reporting period, all five subprojects are applicable)						

Project Phase/ Aspect	Potential Environmental Impacts	Aspects to be Monitored	Location	Frequency	Responsibility	Implementation Status
Air Quality	Decline in air quality	– Subproject specific air quality – 24-hour average TSP, PM_{10}, SO_2, NO_2	4 sites per subproject as identified by the PIC EHS Specialists, with one site being the closest sensitive receptor. Additional monitoring may be undertaken when necessary (e.g., if complaints are made by local communities).	– Monthly	– IAs, EMCs, PIC EHS specialist –	*The air quality monitoring was conducted regularly by five qualified environmental monitoring agencies in accordance with the parameters, locations and frequency as described in the EMoP, after consulting with local EPBs.*
		– Dust control mitigations – Erosion control mitigations	– All construction sites	– Monthly	– IAs, EMCs, PIC EHS specialist	*The site specific air quality monitoring was conducted by five qualified environmental monitoring agencies in accordance with the parameters, locations and frequency as described in the EMoP, after consulting with local EPBs.* *The monitoring on dust and erosion control mitigations was conducted by the EHS engineers of constructors and CSCs every day.*
Noise	Noise impacts from construction and transportation.	– Noise mitigations	– HGSs, CMM storage units, HESs and PRSs –	– At start of operation and then weekly –	– IAs, EMCs, PIC EHS specialist	*The monitoring on noise control mitigations was conducted by the EHS engineers of constructors and CSCs every day.*
		– Noise levels	– 6 sites per subproject	– Weekly – 1 hour dB(A) Day and Night	– IAs, EMCs, PIC EHS specialist	*The site specific ambient noise monitoring was conducted by five qualified environmental monitoring agencies in accordance with the parameters, locations and frequency as described in the EMoP, after consulting with local EPBs.*

Project Phase/ Aspect	Potential Environmental Impacts	Aspects to be Monitored	Location	Frequency	Responsibility	Implementation Status
Wastewater	Surface and groundwater contamination	– Site runoff and equipment wash-down systems – Worker sanitation systems	– All construction sites	– Monthly	– IAs, EMCs, PIC EHS specialist	*The monitoring on wastewater control mitigations, mainly site inspection, was conducted by the EHS engineers of constructors and CSCs every day. The details of mitigation measures taken please see the relevant part in **Table 9** of Chapter IV.*
Solid Waste	Soil and surface and groundwater contamination	– Waste collection, storage, recycling and disposal systems	– All construction sites	– Monthly	– IAs, EMCs, PIC EHS specialist	*The monitoring was conducted daily by the EHS engineers of the constructors and CSCs. The details of mitigation measures taken please see the relevant part in **Table 9** of Chapter IV.*
Hazardous Materials	Soil and water pollution and risks to human health from hazardous materials	– Handling, storage and disposal of fuels, oils, solvents and other hazardous materialsHazardous waste management – Spill response	– All construction sites	– Monthly	– IAs, EMCs, PIC EHS specialist	*The constructors fulfilled and the monitoring was conducted daily by the EHS engineers of the constructors and CSCs. The details of mitigation measures taken please see the relevant part in **Table 9** of Chapter IV.*
Flora and Fauna	Unnecessary impacts	– Vegetation removal minimized – Rehabilitation of temporary sites and pipeline routes	– All construction sites	– Monthly	– IAs, EMCs, PIC EHS specialist	*The monitoring was conducted daily by the EHS engineers of the constructors and CSCs. The details of mitigation measures taken please see the relevant part in **Table 9** of Chapter IV.*
Physical Cultural Resources	Disturbance during construction.	– Chance find procedure	– All construction sites	– Monthly	– IAs, EMCs, PIC EHS specialist	*No historical heritage sites are involved in the subproject area.*

Project Phase/ Aspect	Potential Environmental Impacts	Aspects to be Monitored	Location	Frequency	Responsibility	Implementation Status
Public Inconvenience	Traffic congestion, interruptions in municipal services and utilities.	– Subproject traffic control and operation plans	– All construction sites	– Monthly	– IAs, EMCs, PIC EHS specialist	*The monitoring was conducted daily by the EHS engineers of the constructors and CSCs.*
Occupational Health and Safety	Risk of injury to workers.	– Development and implementation of subproject construction phase OHSPs	– All construction sites	– Monthly	– IAs, EMCs, PIC EHS specialist	*The monitoring was conducted daily by the EHS engineers of the constructors and CSCs.*
Community Health and Safety	Risk of injury to local community members.	– Development and implementation of subproject construction CHSPs	– All construction sites	– Prior to start of construction, and then monthly	– IAs, EMCs, PIC EHS specialist	*The monitoring was conducted daily by the EHS engineers of the constructors and CSCs.*
Operation Phase (Jinzhong/Licheng/Qin subprojects are applicable during this reporting period, the other two subprojects are not yet due)						
Air Quality	Air pollution during the heating season from boiler emissions	– Emission systems – Fugitive dust control systems	– Boilers	– Prior to start of operation, and then monthly	– IAs, EMCs, PIC EHS specialist	– *Fulfilled*
		– Subproject air quality – 24-hour average TSP, PM_{10}, SO_2, NO_2	– At 4 sites per subproject: the sites of the two highest GLCs predicted by AERMOD in the domestic subproject EIAs; the nearest sensitive receptor; and the highest source of fugitive emissions (e.g. coal storage and handling), the latter two as identified by the PIC EHS specialists.	– Twice during heating season	– IAs, EMCs, PIC EHS specialist	– *Fulfilled*
Noise	Noise impacts from operation of HGSs and CMM storage units, HESs and PRSs.	– Noise mitigations	– HGSs, CMM storage units, HESs and PRSs	– At start of operation and then monthly	– IAs, EMCs, PIC EHS specialist	– *Fulfilled*

Project Phase/ Aspect	Potential Environmental Impacts	Aspects to be Monitored	Location	Frequency	Responsibility	Implementation Status
		– Noise levels	– 6 sites per subproject	– Twice during heating season – 1 hour dB(A) Day and Night	– IAs, EMCs, PIC EHS specialist	– *Fulfilled*
Wastewater	Surface and groundwater contamination.	– Septic systems – Wastewater systems, including oil-water separators	– HGSs	– At start of operation and then monthly	– IAs, EMCs, PIC EHS specialist	– *Fulfilled*
Solid Wastes	Soil, air and water contamination	– Waste collection, storage, recycling and disposal systems	– All subprojects	– At start of operation and then monthly	– IAs, EMCs, PIC EHS specialist	– *Fulfilled*
		– Fly ash storage and sale	– All subprojects	– At start of operation and then monthly	– IAs, EMCs, PIC EHS specialist	– *Fulfilled*
		– Boiler decommissioning	– All decommissioned boilers	– At least twice during each decommissioning	– IAs, EMCs, PIC EHS specialist	– *Fulfilled*
Hazardous Materials and Wastes	Soil and water pollution and risks to human health.	– Handling, storage and disposal of fuels, oils, solvents and other hazardous materials – Hazardous waste management – Spill response	– All subprojects	– At start of operation and then monthly	– IAs, EMCs, PIC EHS specialist	– *Fulfilled*
Occupational Health and Safety	Risk of injury to workers.	– Development and implementation of subproject operation phase OHSPs	– All subprojects	– At start of operation and then quarterly	– IAs, EMCs, PIC EHS specialist	– *Fulfilled*

Project Phase/ Aspect	Potential Environmental Impacts	Aspects to be Monitored	Location	Frequency	Responsibility	Implementation Status
Community Health and Safety	Risk of injury to local community members.	– Development and implementation of subproject operation phase CHSPs	– All subprojects	– At start of operation and then quarterly	– IAs, EMCs, PIC EHS specialist	– *Fulfilled*

CHSP = Community Health and Safety Plan, CMM = coal mine methane, EMC = environmental monitoring contractors, EIA = environmental impact assessment, EMP = environmental management plan, EPB = environment protection bureau, GLC = ground level concentration, HES = heat exchange station, HGS = heat generating station, IA = implementing agency, km = kilometer, LAP = land Acquisition Plan, LRP= labor Retrenchment Plan, NO_2 = nitrogen dioxide, OHSP = Occupational Health and Safety Plan, PC = pulverized coal, PHO = petition handling office, PIC EHS specialist = Project implementation Consultant Environment, Health, and safety specialist, PM_{10} = particulates matter smaller than 10 micrometers, PMO = project management office, PPE = personal protective equipment, PRS = pressure regulation station ,SHWDC = Shangxi hazardous wastes disposal center, SO_2 = sulfur dioxide, SPG = Shanxi provincial government, TSP= total suspended particulates,

Notes: i) For the purposes of the EMoP "operation phase" refers to the first two years of operation, which is the period during which ADB will have a hands-on monitoring and supervision role.

ii) The cost of the compliance monitoring is included within the cost of providing the PIC EHS specialists, estimated at a total of $147,000. It is understood that the ambient data from the EPB permanent monitoring stations will be provided at no cost; however, the site specific ambient air quality and noise monitoring cost is estimated at $225,000.

B. Environmental quality targets, sampling and analytical methods

15. The implementation status of the impact indicators in the DMF closely relating to environment are shown in the below table.

Table 11 Implementation Status of Environmental Indicators in the Project Design and Monitoring Framework (by Dec 2017)

Month/ Year	Annual coal consumption for district heating	CO2	SO_2	NO_2	TSP/PM_{10}	Days in meeting class II air quality during heating season
Targets in DMF	By 2018, district heating in the five urban areas reduces aggregate annual coal consumption by 53,493 t, thereby avoiding annual emissions of 133,358 t of CO2, 2,677 t of SO_2, 802 t of NOx, 10,534 t of TSP, compared with 2012. By 2018, the CMM distribution system in Liulin city reduces annual coal consumption by 31,897 t,thereby avoiding annual emissions of 121,021 t of CO2, 1,444 t of SO_2, 1,140 t of NOx, and 5,700 t of TSP, compared with 2012.					By 2018, the five urban areas improve their record, by at least 20%, in meeting class II air quality standards (2012 baseline – days standards are met during heating season[9] : Jinzhong- 69, Licheng- 68, Qin- 73, Zhongyang- 70, Liulin- 70)
Achievements by 2016/2017 heating season (estimated by the LIEC[10])	By 2017, district heating in the five urban areas reduces aggregate annual coal consumption by 33,613 t, thereby avoiding annual emissions of 83,797 t of CO2, 1,711 t of SO_2, 504 t of NOx, 6,732 t of TSP, compared with 2012.					As shown below for all five subprojects
class II of GB3095-2012			0.15	0.08	0.30-TSP 0.15- PM_{10}	
Jinzhong Subproject (Yuci district, urban area of Jinzhong City)						
2016/2017 heating season			AQI[2] ranged from 45~345			1 day of Class I and 22 days of Class II air quality standards during heating season (121 monitoring days in total from 15 Nov 2016 to 15 Mar 2017)
2017/2018 heating season			AQI ranged from 49~208			1 day of Class I and 24 days of Class II air quality standards during heating season (47 monitoring days in total from 15 Nov to 31 Dec 2017)[11]
Licheng Subproject (urban area of Licheng County)[12]						
2015/2016 coal consumption for heating	20,000 tons/year(data source: the IA)					
3rd operational year-2016/2017 heating season (partially) from					CO in Nov 2016, and $PM_{2.5}$ in Dec	70 days in meeting class II air quality standards (out of 150 days in total)

[9] Assumed from 1 November to 31 March every year. There might be some difference in the days meeting class II air quality standards due to different statistical methods applied.

[10] More detailed estimates will be reported in the project completion report scheduled in the March 2018.

[11] Data source: http://www.mep.gov.cn

[12] Data source: 2015/2016/2017 monthly/annual monitoring data provided by Licheng County Environmental Monitoring Station

Month/ Year	Annual coal consumption for district heating	CO2	SO_2	NO_2	TSP/PM_{10}	Days in meeting class II air quality during heating season
1 Nov 2016 to 31 Mar 2017)					2016 as the main pollutants	
4th operational year-2017/2018 heating season (partially) from 1 to 30 Nov 2017)						20 days in meeting class II air quality standards (out of 30 days in total)
Liuling Subproject (urban area of Liuling County)						
2016/2017 heating season			AQI ranged from 57~235			0 day of Class I and 39 days of Class II air quality standards during heating season (out of 148 monitoring days in total from 1 Nov 2016 to 31 Mar 2017)[13]
2017/2018 heating season (partially)			AQI ranged from 78~244			0 day of Class I and 5 days of Class II air quality standards during heating season (out of 60 monitoring days in total from 1 Nov to 31 Dec 2017)
Qin Subproject (urban area of Qin County)[14]						
2016/2017 heating season			0.092	0.039	0.079(PM_{10})	106 days of Class II air quality standards during heating season (out of 151 monitoring days in total from 1 Nov 2016 to 31 Mar 2017)
1st operational year-2017/2018 heating season (partially) from 1 to 30 Nov 2017)						24 days in meeting class II air quality standards (out of 30 days in total)
Zhongyang Subproject (urban area of Zhongyang County)						
2016/2017 heating season			AQI ranged from 56~333			0 day of Class I and 56 days of Class II air quality standards during heating season (out of 150 monitoring days in total from 1 Nov 2016 to 31 Mar 2017)[15]
2017/2018 heating season (partially)			AQI ranged from 58~134			0 day of Class I and 30 days of Class II air quality standards during heating season (out of 60 monitoring days in total from 1 Nov to 31 Dec 2017)

Note: (1) The Air Pollution Index (API) is a simple and generalized way to describe the air quality, which is used in Malaysia. It is calculated from several sets of air pollution data. It was formerly used in mainland China and Hong Kong. In mainland China the API was replaced by an updated Air Quality Index (AQI as shown below) in early 2012 and on 30 December 2013 Hong Kong moved to a health based index. The API level is based on the level of 6 atmospheric pollutants,

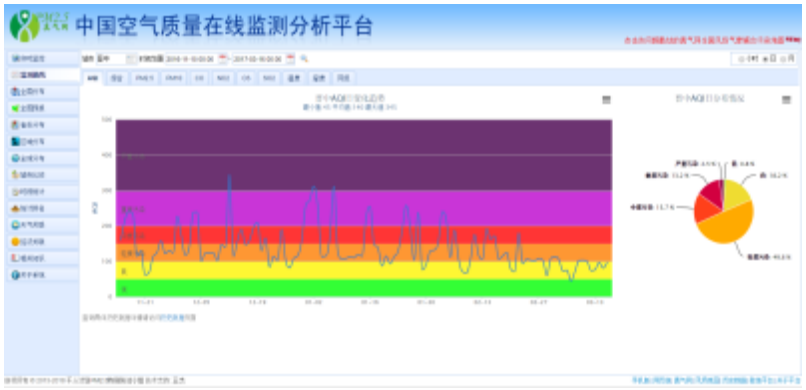
[13] Data source: http://www.llhuanbao.gov.cn/app/Main/index.action
[14] Data source: Qin County Environmental Monitoring Station.
[15] Data source: http://www.llhuanbao.gov.cn/app/Main/index.action

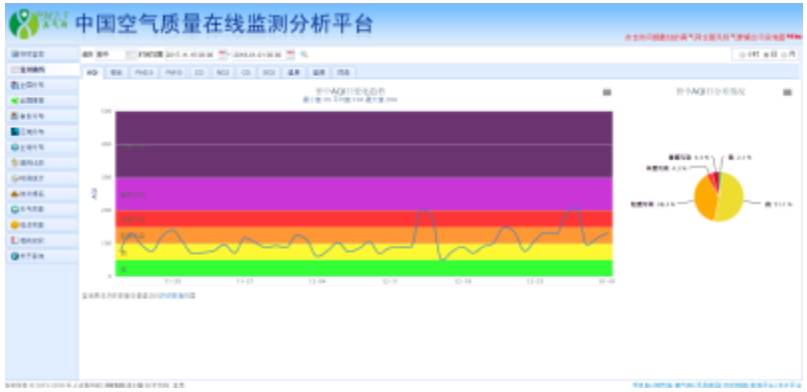
namely sulfur dioxide (SO_2), nitrogen dioxide (NO_2), suspended particulates smaller than 10 μm in aerodynamic diameter (PM_{10}), suspended particulates smaller than 2.5 μm in aerodynamic diameter ($PM_{2.5}$), carbon monoxide (CO), and ozone (O3). An individual score (IAPI) is assigned to the level of each pollutant and the final API is the sum up of those 6 scores. .

(2) As the new standard of measurement for air quality, AQI is a quantitative description of the air quality index. The major pollutants involved in the analysis including fine particulate matter ($PM_{2.5}$), inhalable particles (PM_{10}), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O3), carbon monoxide (CO). According to "Technical Regulation on Ambient Air Quality Index (on trial)" (HJ633-2012), AQI is divided into six levels in total, with Level one being the best and Level six being the worst.

AQI	Air Quality	Health Implications
0–50	Excellent	No air pollution.
51–100	Good	Few hypersensitive individuals should reduce the time for outdoor activities.
101–150	Minor pollution	Slight irritations may occur, children, and those who with breathing or heart problems should reduce outdoor exercise.

(3) The air quality (PM_{10}) monitoring data during 15 Nov 2016 to 15 Mar 2017 (the left chart, covering whole 2016/2017 heating season) and 15 Nov 2017 to 31 Dec 2017 (the right chart, covering 2017/2018 heating season, partially)





16. The environmental criterion applicable to the subprojects are as follows:

(i) Air quality : Grade II in the “Ambient air quality standard”(GB 3095-2012)

(ii) Air Emission: the Grade II in the “Emission standard of air pollutants for coal-burning oil-burning gas-fired boiler” (GB13271--2014) and the “Comprehensive emission standard of air pollutants”(GB16297-1996);

(iii) Noise: Grade 2 in the “Environmental quality standard for noise”(GB 3096-2008); and Emission standard of environment noise for boundary of construction site (GB 12523 - 2011); and

17. **Environmental Monitoring Sampling Arrangements**. According to the environmental protection targets for sensitive receivers and possible major environmental impacts by construction specified in the domestic EIAs and IEE for different Subprojects under the project, along with the actual project progress, field survey and environmental monitoring for all the five subprojects have been conducted respectively by the IAs’ environmental specialists, construction supervisors and five qualified environmental monitoring agencies. The work scope for the environment monitoring of the project includes: the locations and time of monitoring is determined according to the actual construction progress, activities and routes.

Table 12 Environmental Monitoring Sampling Arrangements under Construction and Operation (commission)

Subject	Parameter	Location	Time &Frequency
Air quality	TSP, PM_{10},SO_2, NO_2	Chosen sites as identified by the PIC EHS Specialists. Additional monitoring may be undertaken when necessary (e.g., if complaints are made by local communities).	Monthly
Operational gaseous emission	Boiler exhaust and ash storage room pollutants-particulate matter, SO_2, NO_X	Boiler and ash storage room	Once in November 2016 and online continuous environmental monitoring through Jan to Dec 2017 (for Licheng subproject)
	Fugitive dust	Heating plant boundaries-8 sites	
Acoustic environment	Leq(dB(A))	Chosen sites as identified by the PIC EHS Specialists	Monthly ,once during daytime, once during nighttime.

18. The environmental standards applicable to the subproject are as follows:

Table 13 Standard Monitoring Analytical Methods of Ambient Air, Noise and Water

Media	Monitoring Parameter	Method (Standard No.)	Detection Limit	Standard Limit
Air	TSP (mg/m3)	Gravimetric (GB/T15432-1995)	0.001	0.30
	PM_{10} (mg/m3)	Determination of atmospheric articles PM_{10} and $PM_{2.5}$ in ambient air by gravimetric method (HJ 618-2011)	0.001	0.15
	SO_2 (mg/m3)	Ambient air—Determination of sulfur dioxide —Formaldehyde absorbing-pararosaniline spectrophotometry (HJ 482 - 2009)	0.004 (daily) /0.007 (hourly)	0.15

Media	Monitoring Parameter	Method (Standard No.)	Detection Limit	Standard Limit
	NO_2 (mg/m3)	Ambient air - Determination of nitrogen oxides-N-(1-naphthyl)ethylene diaminedihydrochloride spectrophotometric method (HJ 479 - 2009)	0.006 (daily) /0.015 (hourly)	0.08
	Particulate matter(mg/m3)	GB 5468-1991 Measuring method for smoke and dust of boiler emission GB/T 16157 Determination of particulates and sampling methods of gaseous pollutants emitted from exhaust gas of stationary source		50 for boiler; 120 for outlet
	SO_2 (mg/m3)	HJ 629 Stationary source emission-determination of sulphur dioxide -Non-dispersive infrared absorption metho		300
	NO_X(mg/m3)	HJ 692-2014 Stationary source emission-Determination of nitrogen oxides-Non-dispersive infrared absorption method		300
	Fugitive dust	Technical guidelines for fugitive emission monitoring of air pollutants (HJ/T 55-2000)		1 for boundary
Noise	L_{10},L_{50},L_{90},equivalent Continuous A Sound (Leq)	Emission standard for industrial enterprises noise at boundary (GB12345-2008)	0.5	60 (day)/ 50 (night)

C. Monitoring Results

a. Results

19. Shanxi PMO/five IAs and the CSCs regularly and irregularly inspected the environmental status on the construction sites. The five cities/counties Environmental Supervision Team, the subordinate of local city/county EPBs, also periodically conducted site inspection to check compliance status, including wastewater discharge and treatment. Internal environmental monitoring was carried out by the IAs, contractors/CSCs. The site visit notes see the **Appendix 1**.

20. The air and noise monitoring results monitored by respectively by five qualified environmental monitoring agencies are shown as below.

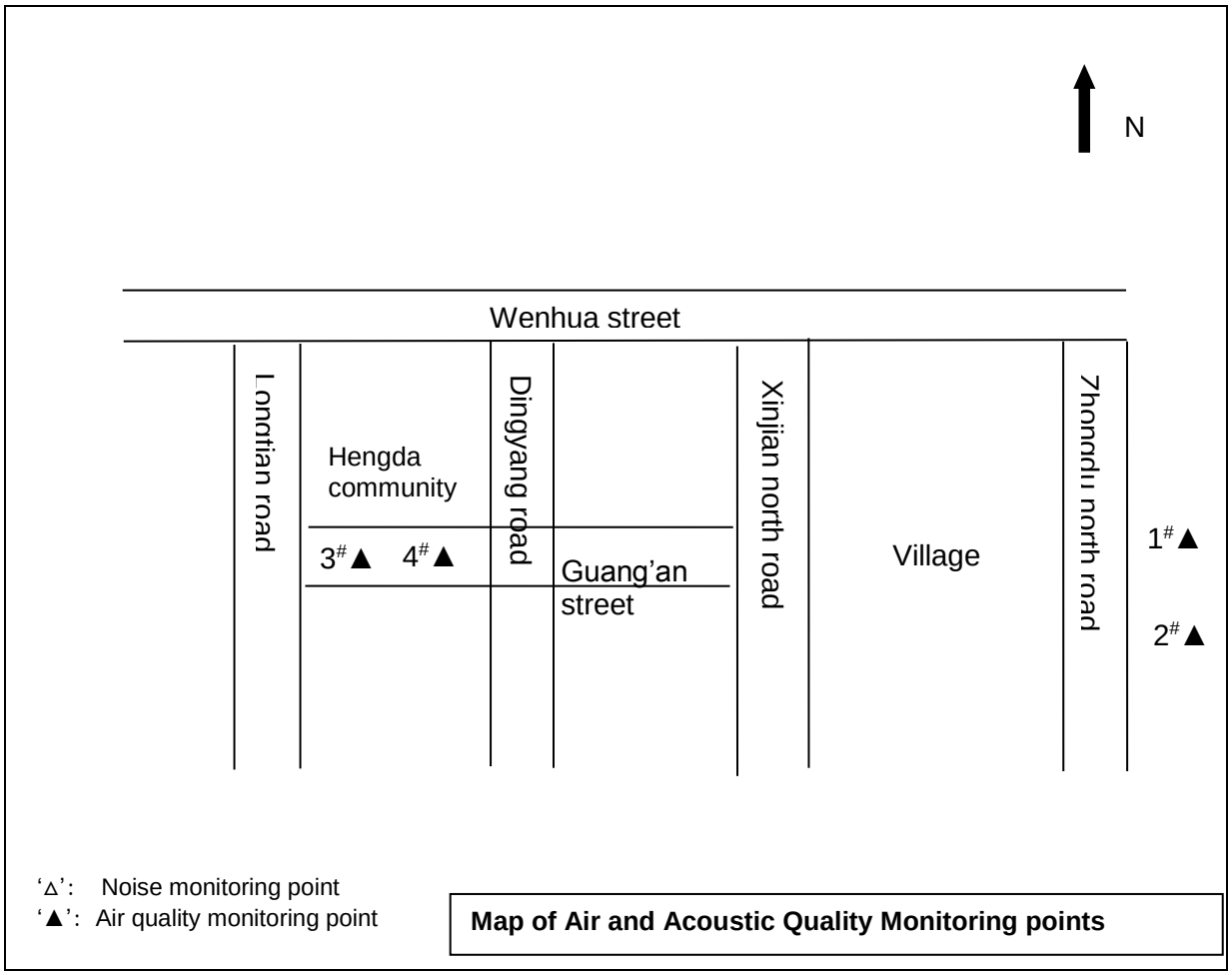
(i) Atmosphere Monitoring Items: TSP, PM_{10}, SO_2, and NO_2, particulate matter, fugitive dust[16];
Monitoring time: sampling time of TSP, particulate matter, fugitive dust for 24 hours per day, PM_{10}, SO_2, and NO_2 for at least 20 hours per day.

(ii) Noise Monitoring Items: Leq(dB, A)
Monitoring time: twice per day, once in the daytime and once in the nighttime.

[16] During this reporting period, the denitrification system of Qin subproject was newly installed and being commissioning. As a result, the continuous environmental monitoring system (CEMS) was calibrated, correspondingly, no reliable data is available.

Table 14 The Air Quality Monitoring Results under the Jinzhong Subproject in the reporting period (Environment Ambient Air Quality Standard (GB3095—2012) Grade II) Unit: mg/m^3

Monitoring site	Monitoring Date	TSP	PM_{10}	SO_2	NO_2
1# Zhongdu north road heating piping (Wenhua street~Longyang street)	**9 December , 2017**	0.363	0.190	0.067	0.050
	10 December , 2017	0.388	0.266	0.050	0.055
	11 December , 2017	0.366	0.162	0.041	0.057
3# Guang'an street heating piping (Hengda residential community)	**9 December , 2017**	0.340	0.165	0.038	0.023
	10 December , 2017	0.400	0.195	0.043	0.028
	11 December , 2017	0.415	0.191	0.036	0.025
Standard limit		**0.30**	**0.15**	**0.15**	**0.08**
Complied with?		Not complied with in this reporting period	Not complied with in this reporting period	Complied with in this reporting period	Complied with in this reporting period



Map of Air and Acoustic Quality Monitoring points

Table 15 The heating boiler (QXS58-1.6/130/70-AⅢ) exhaust pollutant emissions under the Licheng Subproject in the reporting period (Emission standard of air pollutant for boiler , GB13271—2014)

No.	Monitoring site and time	Particulate matter（mg/Nm3）	SO_2（mg/Nm3）	NO_X（mg/Nm3）
1	#7 (Nov 23, 2016)	24～29	81～99	239～288
2	#7 (Nov 24, 2016)	26～30	85～110	284～295
Compliance status		Compliance with	Compliance with	Compliance with
Standard limits （mg/Nm3）		50	300	300

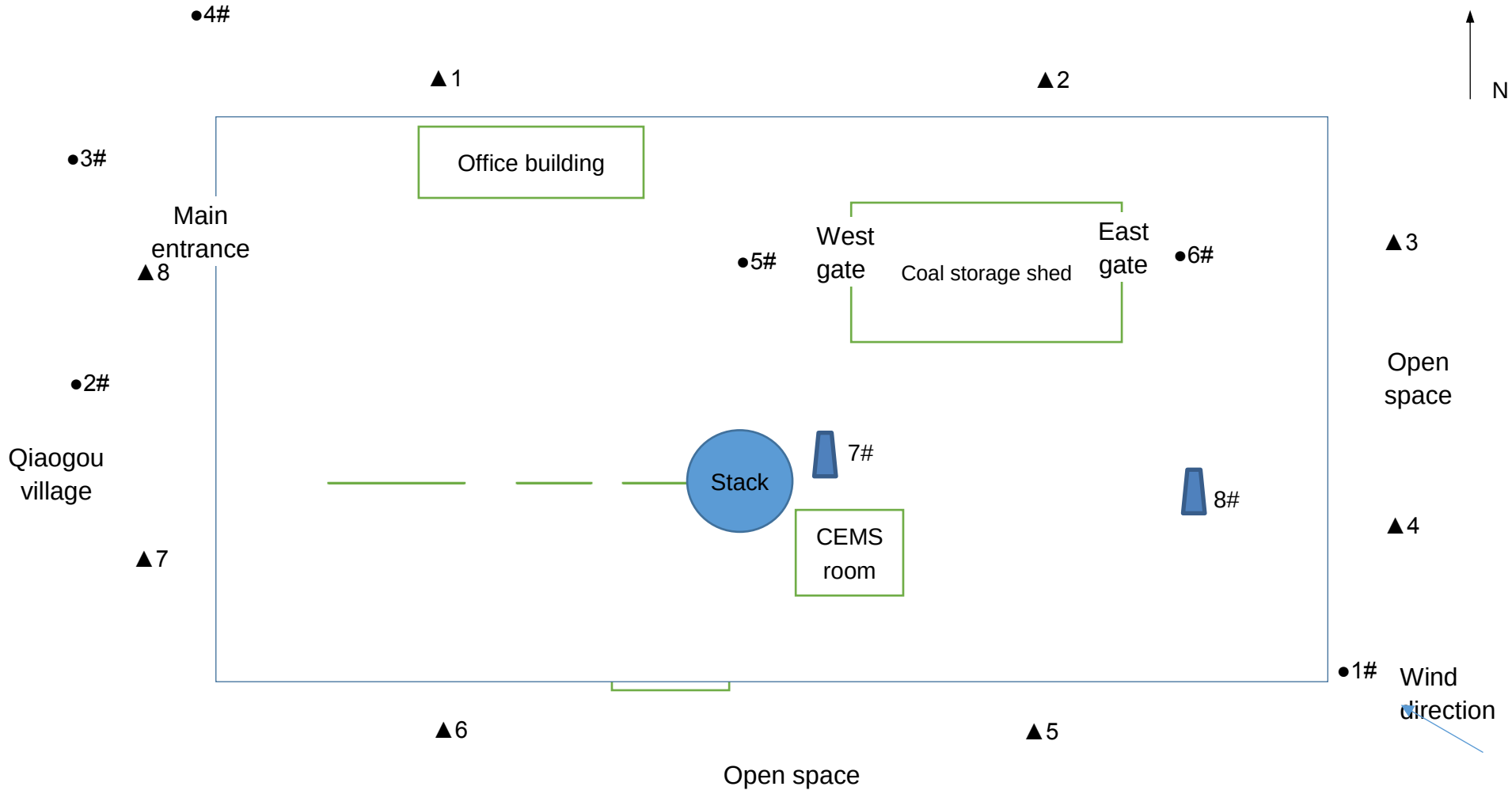
Note: During this reporting period, the denitrification system was newly installed and being commissioning. As a result, the continuous environmental monitoring system (CEMS) was calibrated, correspondingly, no reliable data is available.

Table 16 Particulate matter of ash storage room under the Licheng Subproject in the reporting period (Integrated emission standard of air pollutants (GB3095—2012))

No.	Monitoring site and time	Particulate matter（mg/m3）
1	#8(Nov 23, 2016)	12～15
2	#8 (Nov 24, 2016)	11～19
Standard limits （mg/m3）		120
Compliance status		Compliance with

Table 17 Fugitive Particulate matter of plant boundaries under under the Licheng Subproject in the reporting period (Integrated emission standard of air pollutants (GB3095—2012))

No.	Monitoring site and time	Fugitive dust（mg/m3）
1	#1 (Nov 23~24, 2016)	0.293
2	#2 (Nov 23~24, 2016)	0.506
3	#3 (Nov 23~24, 2016))	0.764
4	#4 (Nov 23~24, 2016)	0.631
5	#5 (Nov 23~24, 2016)	0.542
6	#6 (Nov 23~24, 2016)	0.428
Standard limits （mg/m3）		1
Compliance status		Compliance with



Legend ▲ noise monitoring points (8); exhaust emission monitoring points (2); ●fugitive dust monitoring points (6);

Table 18 Daily average of air quality under the Liuling Subproject in the reporting period (Environment Ambient Air Quality Standard (GB3095—2012) Grade II)

Monitoring location	Monitoring date	Concentration (mg/Nm3）			
		TSP	PM_{10}	SO_2	NO_2
1#(plant area)	29 Nov, 2017	0.239	0.107	0.088	0.055
	30 Nov, 2017	0.215	0.128	0.092	0.049
	1 Dec, 2017	0.228	0.133	0.101	0.068
2#(heating source plant)	29 Nov, 2017	0.244	0.116	0.086	0.045
	30 Nov, 2017	0.251	0.103	0.079	0.036
	1 Dec, 2017	0.209	0.137	0.090	0.052
3#(Xinjianliang village)	29 Nov, 2017	0.226	0.114	0.103	0.063
	30 Nov, 2017	0.264	0.131	0.085	0.057
	1 Dec, 2017	0.213	0.120	0.076	0.042
4#(Maojia Village)	29 Nov, 2017	0.277	0.124	0.111	0.064
	30 Nov, 2017	0.258	0.140	0.089	0.055
	1 Dec, 2017	0.294	0.134	0.102	0.070
Standard limit		**0.30**	**0.15**	**0.15**	**0.08**
Complied with?		Yes	Yes	Yes	Yes

Note: Both Xinjianliang village and Maojia Village are residential areas.

Table 19 Daily average of air quality under Zhongyang Subproject in the reporting period (Environment Ambient Air Quality Standard (GB3095—2012) Grade II)

Monitoring site	Monitoring Date	TSP	PM_{10}	SO_2	NO_2
1# Huweigou (nearby Heating Pipes under Erlangping Ave.)	4 Dec, 2017	0.239	0.124	0.109	0.062
	5 Dec, 2017	0.225	0.121	0.112	0.058
	6 Dec, 2017	0.243	0.134	0.115	0.059
2# Maternal and Children Hospital (nearby a HES completed)	4 Dec, 2017	0.245	0.129	0.104	0.060
	5 Dec, 2017	0.237	0.124	0.111	0.059
	6 Dec, 2017	0.231	0.120	0.119	0.061
3# Feiruyuan community	4 Dec, 2017	0.224	0.127	0.107	0.062
	5 Dec, 2017	0.238	0.121	0.125	0.060
	6 Dec, 2017	0.229	0.118	0.116	0.058
Standard limit		**0.30**	**0.15**	**0.15**	**0.08**
Complied with?		**Yes**	**Yes**	**Yes**	**Yes**

Table 20 The daily average of noise level under the Jinzhong Subproject in the reporting period (Environmental Quality Standard for Noise (GB3096-2008), Class II)

Monitoring location	Monitoring date	Daytime					Nighttime				
		Leq	L_{90}	L_{50}	L_{10}	SD	Leq	L_{90}	L_{50}	L_{10}	SD
1# Zhongdu north road heating piping (Wenhua street~Longyang street), north point	9 Dec , 2017	68.4	50.1	64.3	72.5	9.6	48.7	35.3	44.6	50.3	7.1
2# Zhongdu north road heating piping (Wenhua street~Longyang street),south point	9 Dec , 2017	65.4	54.8	64.9	71.0	5.4	46.5	36.1	45.2	49.7	6.5
3# Guang'an street heating piping (Hengda residential community),west point	9 Dec , 2017	55.2	39.8	50.0	55.0	6.0	45.8	34.8	43.6	48.5	6.4
3# Guang'an street heating piping (Hengda residential community),east point	9 Dec , 2017	53.6	42.1	48.4	57.0	5.6	46.1	35.6	44.5	50.6	7.0
Standard limit		70					55				
Complied with during this reporting period?		Complied with					Complied with				

Table 21 The daily average of noise level under the Licheng Subproject in the reporting period (Environmental Quality Standard for Noise (GB3096-2008), Class II)

Time period	Monitoring site and time	Equivalent sound level		Criteria	Comparison with the standard limit
		Day 1	Day 2		
Daytime	1#(Nov 23~24, 2016)	51.5	51.7	60	Within the limit
	2#(Nov 23~24, 2016)	50.2	51.1		Within the limit
	3#(Nov 23~24, 2016)	52.4	51.9		Within the limit
	4#(Nov 23~24, 2016)	51.7	51.4		Within the limit
	5#(Nov 23~24, 2016)	53.3	53.8		Within the limit
	6#(Nov 23~24, 2016)	53.3	54.8		Within the limit
	7#(Nov 23~24, 2016)	52.6	52.5		Within the limit
	8#(Nov 23~24, 2016)	51.8	52.5		Within the limit
	Thirteen HESs[17] (Feb 24~25, 2016	48.2~57.0	47.7~58.8		
Night	1#(Nov 23~24, 2016)	42.4	41.2	50	Within the limit
	2#(Nov 23~24, 2016)	41.6	40.6		Within the limit
	3#(Nov 23~24, 2016)	41	40.5		Within the limit
	4#(Nov 23~24, 2016)	42.1	41.5		Within the limit
	5#(Nov 23~24, 2016)	44.1	44.9		Within the limit
	6#(Nov 23~24, 2016)	45.9	46.3		Within the limit
	7#(Nov 23~24, 2016)	43.8	44.2		Within the limit
	8#(Nov 23~24, 2016)	41.9	42.3		Within the limit
	Thirteen HESs[18] (Feb 24~25, 2016	39.6~49.4	30.9~48.2		

[17] Including 1# Gucheng HES; 2# HES at Hongyuan school; 3# HES of Guangshengyuan community; 4# HES of Guangxiuyuan community; 5# HES of Construction Bureau; 6# HES of Transport Bureau;7# HES at the People's Hospital; 8# HES at Huangyang community; 9# HES at the Deshengyuan community; 10# HES at Waimao community; 11# HES at the Liyuan community; 12# HES at Zhuangyuan community and 13# HES at the pump factory.

[18] Ditto.

Table 22 The daily average of noise level under the Liuling Subproject in the reporting period (Environmental Quality Standard for Noise (GB3096-2008), Class II)

Monitoring date	Monitoring location	Daytime				Night time			
		L_{eq}	L_{10}	L_{50}	L_{90}	L_{eq}	L_{10}	L_{50}	L_{90}
29 Nov, 2017	1#	56.3	57.8	54.6	53.8	46.6	47.3	45.5	44.2
	2#	55.9	56.5	53.7	53.0	48.2	48.9	46.7	45.0
	3#	54.8	55.9	54.0	52.4	47.3	48.2	45.8	43.9
	4#	56.7	57.2	54.5	52.9	48.5	49.3	47.0	45.6
	5#	55.6	56.3	53.9	53.3	46.4	47.6	45.2	44.0
	6#	54.8	56.0	54.4	52.7	47.7	48.5	45.6	43.7
Standard limit		60				50			
Complied with?		Yes				Yes			
Note		Weather condition: Daytime: sunny, wind speed: C; Daytime: sunny, wind speed: C							

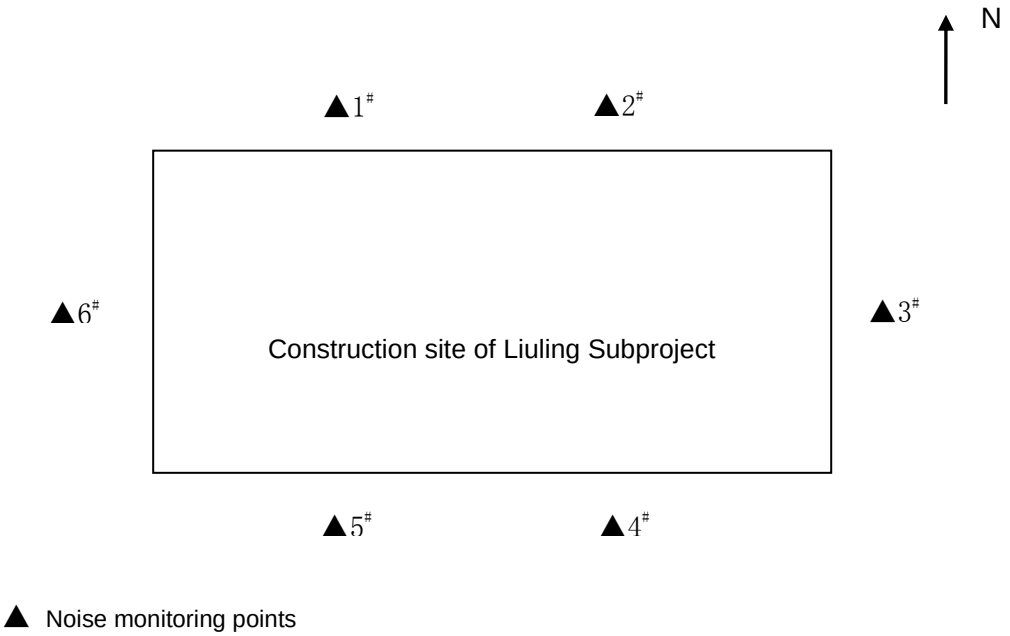
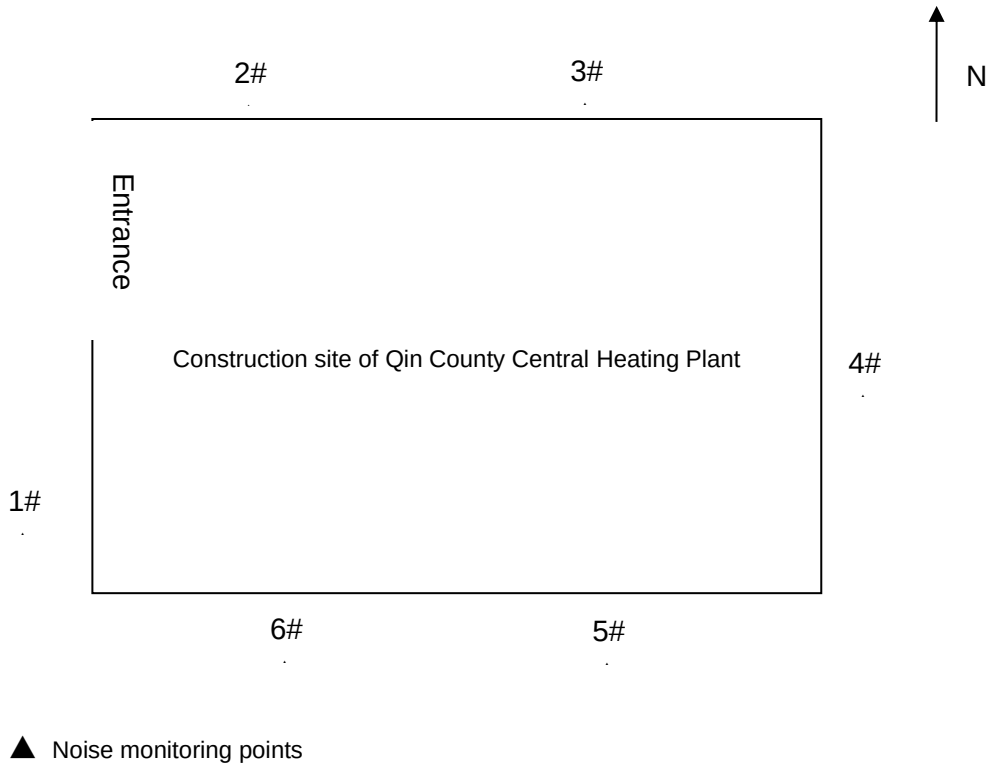


Table 23 The daily average of noise level under the Qin Subproject in the reporting period (Emission standard of environment noise for boundary of construction site (GB 12523－2011))

Time period	Monitoring site	Date and values	Comparison with the standard limits	
		20 March 2017		
Daytime	1#	55.3	60	Within the limit
	2#	55.0		Within the limit
	3#	55.2		Within the limit
	4#	53.9		Within the limit
	5#	53.7		Within the limit
	6#	55.8		Within the limit
Night	1#	46.0	50	Within the limit
	2#	45.1		Within the limit
	3#	44.9		Within the limit
	4#	43.6		Within the limit
	5#	45.6		Within the limit
	6#	46.9		Within the limit



b. Assessment

21. According to the above monitoring results, the analysis is shown as follow:

(1) During construction stage, SO_2 and NO_2 concentration levels in **Jinzhong** subproject were found within Environment Ambient Air Quality Standard (GB3095—2012) Grade II, while TSP and PM_{10} exceeded (GB3095—2012) Grade II limits by 8% to 77%. The daytime and nighttime noise levels in **Jinzhong** subproject were all found within Environmental Quality Standard for Noise (GB3096-2008), Class II. The IA and the environmental monitoring agency for field sampling explained high background dust levels during the monitoring campaign. The daily environmental reports in Jinzhong urban area (data source: http://www.jzhb.gov.cn and https://www.aqistudy.cn/) through the monitoring campaign shown below reveal high PM_{10} during 9 to 11 Dec 2017, as 46μg/m^3 to 327μg/m^3.

Date	SO_2	NO_2	PM_{10}	CO	O_3,8h	$PM_{2.5}$	AQI	Main pollutant	Grade
2017/12/9	154	62	158	2.1	34	76	104	PM_{10}	3
2017/12/10	61	46	90	1.6	68	33	70	PM_{10}	2
2017/12/11	122	62	118	1.9	39	59	86	SO_2	2

Source: Jinzhong EPB.

Source: https://www.aqistudy.cn/

(2) During operation stage, the boiler and ash storage room's particulate matter, SO_2 and NO_x, plant boundaries' fugitive dust concentration levels as well as daytime and nighttime noise levels nearby **Licheng subproject** were found within Emission standard of air pollutant for boiler (GB13271—2014) , Integrated emission standard of air pollutants (GB3095—2012) and Environmental Quality Standard for Noise (GB3096-2008), Class II .

(3) TSP, PM_{10}, SO_2 and NO_2 concentration levels in **Liuling** subproject were found within Environment Ambient Air Quality Standard (GB3095—2012) Grade II. The daytime and nighttime noise levels in **Liuling** subproject were all found within Environmental Quality Standard for Noise (GB3096-2008), Class II.

(4) No air quality monitoring was conducted **in Qin subproject**, which was under commissioning. Due to the commissioned local environmental monitoring station's relevant monitoring qualification certificate was being renewed, therefore, only noise monitoring was undertaken. The daytime and nighttime noise levels in **Qin subproject** were all found within Emission standard of environment noise for boundary of construction site (GB 12523－2011). Based on site verification by the IA, there is no any environmental sensitive receptor within a radius of 500m surrounding the construction site. Thus, the adverse noise impact during daytime construction is regarded as insignificant. And

(5) TSP, PM_{10}, SO_2 and NO_2 concentration levels in **Zhongyang** subproject were found within Environment Ambient Air Quality Standard (GB3095—2012) Grade II.

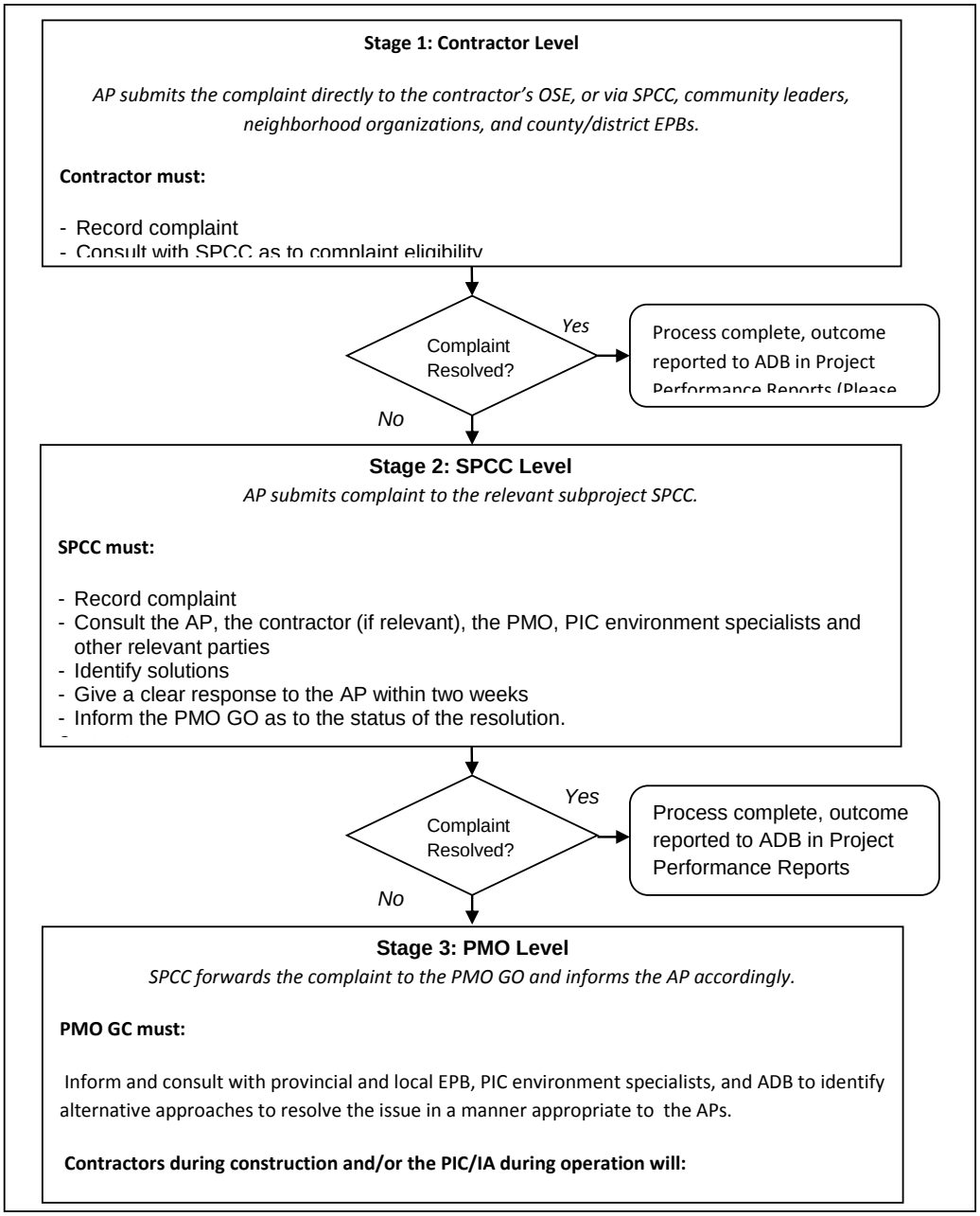
22. The summary of earth works in Jinzhou, Liuling and Qin subprojects is shown below.

Table 24 The Summary of Balance for earth works in Jinzhong, Liuling and Qin Subprojects (by 30 November 2017)

Excavation (m^3)	Fill(m^3)	Borrow(m^3)	Disposal(m^3)	Note:
Jinzhong Subproject (only the figures of heating pipes subcomponent available)				
60,000	40,000		20,000	To Nanhucun disposal site (located in Eastern Outer Ring of Jinzhong City) designated by local ESD.
Note: Temporary occupation of farmland of 234,000m^2 and existing roads of 126,880m^2.				
Liuling Subproject				
Total: 16,801.28	**19,689.64**		**3,800.72**	The designated disposal landfill located at 3km away
Qin Subproject				
Heating supply plant subcomponent				
1,817.59	1,987.53	169.94		an area of 5,000m2
440.48	9,691.93	9,251.45		an area of 10,000m2
	2,957.11	2,957.11		an area of 1,500m2
Subtotal: 2,258.07	**14,636.57**	**12,378.5**		
Heating pipes subcomponent				
34,561.48	28,255.73	1,151.86	7,457.61	
Total: 36,819.55	42,892.30	13,530.36	7,457.61	

VI. Public consultation

23. The indicative GRM proposed in the IEE is displayed as below. Currently the Project is under implementation stage. Each IA's GRM system, including the focal point, procedures, timelines for different institutions involved, and so on, have been established and will be gradually improved.



Note: OSE – On Site Engineer; SPCC – Subproject Public Complaints Center; AP – Affected Person; PMO – Project Management Office; PMO GO – Project Management Office Grievance Officer; PIC Project Implementation Consultant.

Figure 1. Indicative Project Grievance Redress Mechanism

24. The PMO and the five IAs which subprojects under construction or operation follow the procedures as presented above. Under the project, any APs eligible to file the complaints or claims are entitled to complain to the IAs, which will take every case in serious and cordial manner to make every effort toward the solution according to the above indicative GRM system. In case the problem is not solved, the complaints or claims may be further filed to the environmental protection bureau and/or the relevant government department of the five subproject counties/cities. The department staffs are responsible for making satisfactory reply and taking necessary actions toward solution.

25. The following table provides contact details of designated staff at each IA to be responsible for operating and managing GRM.

Table 25 Contact details of GRM focal personnel at subprojects and PMO

Subproject	Name	Telephone	Fax	Email
PMO	Mr. LvZhuyuan, Deputy director	+86 13038082620		sxpmo@163.com
Jinzhong	Miss Zhao Xiaoli, EHS officer(also Department Director, Jinzhong Ruiyang Heating Supply Company	18635408629		jzryrdgs@126.com
Licheng	Mr. Chang Gaoyue, EHS officer, Wantong Heat Supply Company, Ltd.	17735517086		2517786602@qq.com
Liulin	Mr. Hu Xiaorong, EHS officer, Liuling coal gasification company	15935842010		lmqllp@163.com
Qin	Ms. Yao Shaoguang, EHS officer, Qin County Huayang Heat Supply Company, Ltd.	13935568694	0355-7020698	qxhygr@163.com
Zhongyang	Mr. Wang Xiao, EHS officer of the heating company	15803588166	0358-5076399	124185792@qq.com

26. In the reporting period, no compliance or grievance was received. Limited public consultation during November 2017 also confirmed satisfaction. Two shoppers (including Mr. Zheng at 30 years old and Mr.Zhang at 55 years old) alongside the Zhongdu road heating piping works of Jinzhong Subproject acknowledged long-term environmental benefits from central heating network while expressed concerns on the relatively long construction period having caused communicating inconvenience so wished the construction could be finished as early as possible.

VII. Institutional strengthening and training

27. The implementation status of institutional strengthening and training program is shown as follow:

Table 26 Institutional Strengthening and Training Program

Training	Attendees	Contents	Times	Period (days)	Number of Person	Implementation Status and next plan
ADB's and PRC's environmental laws, regulations and policies	PMO, IAs, contractors	ADB's safeguard policy statement and other environmental regulations	4	2	30	Undertaken in Nov/Dec 2017
		Project applicable PRC's environmental laws, policies, standards and regulations				Undertaken in Nov/Dec 2017
		International environmental management practice in civil constructions				Undertaken in Nov/Dec 2017
Grievance Redress Mechanism	PMO,IAs, Local EPBs, residential communities, and Stakeholders	GRM structure, responsibilities, and timeframe	2	1	30	Undertaken once in Nov/Dec 2017
		Types of grievances and eligibility assessment				Undertaken in Nov/Dec 2017
Implementation of environment monitoring plan	PMO, IAs, contractors,	Impacts and mitigation measures during construction and operation	4	2	30	Undertaken once in Nov/Dec 2017.
		Monitoring and auditing mechanism				
		Reporting requirements				
		Corrective action of EMP				

Table 27 Record of Environmental Training by the EHS unit of CSC-Qin subproject

No.	Time	Topic
1	Q3 2014	Introduction of environmental protection objectives and procedures of environmental supervision
2	Q4 2014	Environmental laws, regulations and standards applicable to construction project
3	Q1 2015	The Eight Public Nuisance Events
4	Q2 2015	Low carbon life and environmental protection

VIII. Key Environmental Issues

A. Key Issues Identified in Last (6th) EMR

28. The last (6th) EMR reported that no major environmental issue was identified during this reporting period for all five subprojects.

B. Corrective Actions Taken in this (7th) Reporting Period

29. Not applicable.

C. Key Issues Identified in this (7th) EMR

30. No major environmental issue was identified during this reporting period for all five subprojects.

IX. CONCLUSION

A. Overall Progress of Implementation of Environmental Management Measures

31. In the reporting period, the EMP, including the environmental monitoring programs (EMoP) was well implemented. Based on the environmental monitoring of this Project, it is found that the contractors or operators of five subprojects under construction or commission have undertaken relevant environmental mitigation measures specified in the IEE and subproject domestic EIA reports, and paid sufficient attention to avoid the possible negative environmental impacts due to the project implementation.

B. Problems Identified and Actions Recommended

32. No major environmental issue was identified during this reporting period. More closely atmosphere and noise monitoring are suggested to enhance during future reporting periods. Since this whole project is expected to fully complete and put into operation by beginning of 2018, it is recommended that domestic environmental check and acceptance of project completion shall be undertaken timely for all five subprojects. Online continuous monitoring facilities shall be installed and operated on a timely manner.

APPENDIX 1
SITE VISIT NOTES IN NOVEMBER 2017

Jinzhong Subproject

Time: am of 29 Nov 2017

1. Jinzhong Ruiyang heating supply company office

2. Guang'an street, site of heating pipeline installation

Pipe well

Sprinkler

3. Zhongdu north road, heating pipelines

Public consultation (Zhongdu north road)

Licheng Subproject

Time: am of 1 Dec 2017

1. Heating supply plant

Entrance

In-plant plantation-1

In-plant plantation-2

Coal shed

Coal conveyors

Dust remover

Desulfurization

Slag storage tank

CEMS (continuous environmental monitoring system)

2. Thirteen HESs under operation

1# Gucheng HES

2# HES at Hongyuan school

3# HES of Guangshengyuan community

4# HES of Guangxiuyuan community

5# HES of Construction Bureau

6# HES of Transport Bureau

7# HES at the People's Hospital

8# HES at Huangyang community

9# HES at the Deshengyuan community

10# HES at Waimao community

11# HES at the Liyuan community

12# HES at Zhuangyuan community

13# HES at the pump factory

Liuling Subproject

Time: am of 27 Nov 2017

1.CMM gas storage tank, under commission, to put into operation by 20 Dec 2017

Janitor room at entrance

Gas storage tank

Scale

Equipment house

Pumps

In-plant Landscaping

Slope protection status

North of the gas storage tank

South of the gas storage tank

West of the gas storage tank

SCADA room

2. Residual gas (from coal mine) release station, to be used by this Subproject

Pipe from coal mine (residual gas release station) to CMM storage tank

Underground pipe (from another coal mine-Jiajiagou coal mine) to supply the CMM gas storage tank

To connect natural gas, mixed with air, then combine with the gas from the CMM gas storage tank

3. Out-plant pipe from CMM gas storage tank to pressurized station then to gas users

Qin Subproject

Time: pm of 30 Nov 2017

1. Heating supply plant


Coal shed and shredder

Conveyor

Water treatment station


2*58MW boilers under commission

Denitrification equipment, under commission

Denitrification system

Control room

Flowchart

Tank

Bag filter and stack

Slag to recycle at brick factory

2. In-plant SCADA

Monitor on 29 HESs

3. CEMS (continuous environmental monitoring system)

4. Pipeline construction site at Qin county Fire Prevention Team

5. Bayizhan community HES just finished construction,to put into operation very soon

6.Xiyuan community pipeline construction site


Another HES just completed at Xiyuan community


7. 185 small boilers demolished
Coal prohibition area to be designated for all heating area (Xiyuan community as a sample)


Zhongyang Subproject

Date: 28 Nov 2017

1. Gas boilers, at commission stage, to put into operation in 2018

WTP SCADA

2. About 50 HESs in total, remaining 2 under construction and 5 funded by ADB

3. HES at the Maternal Hospital

4. HES at Feiyuyuan community


5. HES at the county library


6.HES at Huweigou community

New one under construction

Another HES built and under operation

Heating pipes from Huweigou HES to users


7. New HES to be built at the People's Hospital

Pipeline laid down under road, nearby the People's Hospital


8. Another pipeline section built

Check well