

# Environmental Assessment Report

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Revised Summary Initial Environmental Examination  
Project Number: 36362  
April 2007

## People's Republic of China: Liaoning Environmental Improvement Project

Prepared by Liaoning Provincial Government for the Asian Development Bank (ADB).

The revised summary initial environmental examination is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

## SUMMARY INITIAL ENVIRONMENTAL EXAMINATION

### A. Introduction

1. This paper summarizes the benefits, adverse effects, and recommended mitigation and monitoring measures related to the construction and operation of the proposed changes of scope of the Liaoning Environmental Improvement Project (the Project) in the People's Republic of China (PRC). This summary initial environmental examination (SIEE) is prepared based on individual environmental impact assessment (EIA) reports for proposed project components, which include field sampling and assessment, interviews, and analysis of secondary data. EIA reports of three proposed project components have been endorsed by concerned government agencies.<sup>1</sup> This SIEE is consistent with the original one of the Project, which was included in the Report and Recommendation of the President to Board of Directors on the Project.

### B. Summary of Scope Changes

2. The Project originally includes: (i) improved and expanded coal mine methane (CMM) and coal bed methane (CBM)<sup>2</sup> production in Fuxin city, totaling 46 million cubic meters per year (m<sup>3</sup>/y); (ii) rehabilitation and expansion of gas transmission and distribution networks in Benxi and Fushun cities; and (iii) construction and operation of central heating systems in the cities of Benxi, Liaoyang, and Yingkou to replace small coal-fired heating boilers; and (iv) institutional reforms and corporate governance improvement of the project implementation agencies (PIAs). Proposed changes comprise: (i) increased CMM and CBM production to 63 million m<sup>3</sup>/y in Fuxin city and adding four small gas-fired power plants with a total capacity of 22 MW; (ii) adding the central heating system in Benxi and Fuxin to improve heating supply efficiency and replacing additional 28 small coal-fired heating boilers and; and (iii) cancellation of the subprojects for Anshan city central heating system and Fushun gas transmission and distribution networks which are to be financed with domestic funds.

### C. Description of the Environment

3 Liaoning Province is located on the northeast coast of the Asian continent at 118°51'–125°47' E and 38°43'–43°29' N with a width of 374 kilometers (km) from east to west and 530 km from south to north. The climate is continental monsoon, with mean annual precipitation from 1,200 millimeters (mm) to 400 mm, decreasing from the southeast to northwest. The average annual temperature is 10.1°C. Natural resources include coal, iron, limestone, and petroleum. Agricultural products include oil plants, fruits, rice, corn, apples, pears, peanuts, and other cash crops. Liaohe oil field is the third largest in the PRC, with crude oil and natural gas reserves that account for 15% and 10% of the total of the PRC, respectively. Despite having significant energy resources, the project area is a net energy importer. Conventional petroleum and natural gas reserves are declining, and coal production is insufficient to meet energy demand in an environmentally acceptable manner. Liaoning is a traditional heavy industrial base of the PRC, with severe air, water, and soil pollution. Air pollution has been improving in the project area, but does not yet meet the designated ambient quality standards on a year-round

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<sup>1</sup> EIA of Fuxin Central Heating Subproject was approved by the Liaoning Provincial Environmental Protection Bureau (LPEPB) in August 2006. EIA of Fuxin CBM/CMM Subproject was approved by LPEPB in September 2006. EIA of Benxi Huaxing Central Heating Subproject was approved by LPEPB in August 2004.

<sup>2</sup> Coal mine methane (CH<sub>4</sub>) is a gas produced by in-mine drilling and drainage; coal bed methane is produced from surface wells drilled into un-mined coal seams.

basis. The ambient total suspended particulates (TSP) level exceeds PRC National Grade II standards in all the project cities; ambient sulfur dioxide (SO<sub>2</sub>) concentrations frequently exceed National Grade II standards.

4. **Benxi City.** According to the Benxi Annual Statistic Report (2005), the population of Benxi was 1.56 million, of which 67.1% was non-agricultural population. The gross domestic product (GDP) was CNY34.33 billion, and the per capita GDP was CNY21, 922. GDP grew by 15.1% in 2005. There was one nationally designated poverty county. The urban disposable per capita income was CNY8,150, and the rural poor per capita income was CNY4,022. The registered urban unemployment rate was 5.6%. About 41.2% of the total population, or 642,000 citizens, enjoyed social security benefits. The total cropping land area is 51,400 hectare (ha), 6.1% of the total land area. The forestry coverage was 72%, the highest in Liaoning Province.

5. **Fuxin City.** According to Fuxin Annual Statistic Report (2005), the population of Fuxin was 1.93 million, of which 44.7% was non-agricultural population. The GDP was CNY14.26 billion, and the per capita GDP was CNY7, 398. GDP grew by 13.5% in 2005. There were two provincially designated poverty counties. The urban disposable income per capita was CNY6,656, and the rural poor per capita income was CNY3,090. The registered urban unemployment rate was 5.6%. Totally 219,000 citizens enjoyed social security benefits. The total cropping land area is 303,000 hectare (ha), 29.4% of the total land area. The forestry coverage was 21.7%.

#### **D. Anticipated Environmental Impacts and Mitigation Measures**

6 Proposed project components aim to reduce air pollution emissions, both regional and indoor, by expanding clean energy supplies and improving energy efficiency. Project impacts, mitigation measures, monitoring requirements, and reporting responsibilities are summarized in Table 1. Gas leakage from pipeline transmission and distribution systems will be reduced, as will explosion hazards associated with coal mining and gas transmission and distribution. CMM will be produced from existing mines, and CBM will be produced from new surface wells; new mining is not required. Enhanced CMM and CBM production will reduce mine explosion hazards by reducing the amount of methane gas in the mine working space. Methane and hydrogen sulfide (H<sub>2</sub>S) are monitored by automated systems that trigger alarms when methane concentration in the air is within explosive limits and when H<sub>2</sub>S is above designated workplace safety limits. Regional air quality will improve with the closure of small, inefficient, coal-fired boilers, more efficient gas transmission and distribution systems, and reduced coal use.

7. With the proposed project components, the Project will achieve coal savings of 285,281 tons per year (t/y) and the following air emission reductions, (i) 24,545 t/y of TSP; (ii) 3,396 t/y of SO<sub>2</sub>; (iii) 2,218 t/y of nitrogen oxides (NO<sub>x</sub>); and (iv) 1,197,614 t/y of CO<sub>2</sub> equivalent<sup>3</sup>. Water and soil pollution will be indirectly reduced due to a lower rate of pollutant transfer from air to water and soil, with reduced stress on local ecosystems.

8 Construction traffic, excavation and earthmoving, and aggregate processing facilities will generate dust, which will be suppressed with routine measures (e.g., water sprays on construction sites and roads, tarpaulins to cover trucks hauling raw materials). Construction vehicles and stationary equipment for aggregate processing and concrete mixing will meet

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<sup>3</sup> The original estimated reduction in the project RRP was : (i) coal savings of 217,500 tons per year (t/y); (ii) TSP of 18,800 t/y; (iii) SO<sub>2</sub> of 2,600 t/y; (iv) nitrogen oxides (NO<sub>x</sub>) of 1,700 t/y; and (vi) greenhouse gas of CO<sub>2</sub> equivalent by 840,900 t/y.

existing PRC emissions and noise standards. Construction activity in urban areas and near sensitive receptors (schools, hospitals, etc.) will be limited to daylight hours; additional noise abatement measures such as temporary barriers will be constructed as necessary to meet national and local standards. Traffic and communications may be occasionally disrupted during construction of the pipelines and the CBM/CMM stations. The city construction companies have substantial experience in minimizing the potential for and managing the occurrence of epidemic diseases in the project area.

9. Resettlement and land acquisition requirements have been quantified and presented in the Updated Resettlement Plan. Additional 28 small boilers in Benxi will be closed. In accordance with ADB's social protection strategy, the Government of Liaoning Province and the Project Implementation Agencies will ensure that all workers affected by the closure are reemployed in a timely manner and in accordance with the reemployment action plan prepared by the PIAs, so that they will be at least as well off as they would have been in the absence of the Project (para 6 and 7, Schedule, Project Agreement). Employment opportunities for local people are estimated to be 1,940 full-time individuals.

10 **Project Alternatives.** Without the proposed components, urgent needs for residential heating supply in Benxi will be barely met to support the newly developed residential area under the government's housing development plan for citizens living in slum and subsidence areas. Fuxin will continue to rely on coal as the primary energy source for heating and residential use and suffer from deteriorated quality and reliability of the heating supply in central city area due to antiquated pipe networks. These overtime serviced heating systems have witnessed severe pipe burst and leaking in past years. Conventional natural gas reserves are insufficient to meet increasing clean energy demands. Hydropower resources are limited. Other renewable energy options have yet to be demonstrated on a commercial scale. Demand-side management measures will continue to be driven by market forces, but will be insufficient in the near-term to offset increasing energy demands. CMM and CBM are readily available alternatives, the supply of which can be expanded through improved production methods. Improved utilization of coal in modern central heating systems is the most practical method of providing space heating.

## **E. Institutional Requirements and Environmental Monitoring Plan**

11. Construction equipment must meet relevant PRC emissions and noise standards. Local environmental protection bureaus (EPBs) will be responsible for routine monitoring of construction activities, as well as conducting routine air and water monitoring at designated monitoring stations. The Liaoning provincial EPB will be responsible for oversight of local EPBs and will review data from construction contractors and local EPBs to determine if environmental requirements are being met. The project management office (PMO) will designate at least one suitably qualified professional staff member to serve as an environmental officer for the Project. The PMO will be responsible for compiling progress reports for submittal to ADB two times a year. Project impacts, mitigation measures, monitoring requirements, and reporting responsibilities are summarized in Table 1.1.

## **F. Public Consultation and Information Disclosure**

12. Environmental evaluations and assessments were prepared for each project component, and included at least one public consultation for each subcomponent, primarily via surveys in affected areas. Activities for public consultations included (i) meetings attended by members of the public and other stakeholders concerned; and (ii) a questionnaire survey of project-affected people and beneficiaries from different age groups, genders, educational backgrounds, and

occupations. The 102 questionnaires forms have been distributed and responded effectively. Information including summaries of EIA findings, proposed mitigation measures, relevant project information, and contact details were disclosed through authorized government websites. Survey results indicated strong local support for the proposed project components, in terms of improved energy services, improved air quality and local ecological conditions, and expected economic benefits (e.g., potential employment opportunities).

### **G. Findings and Recommendations**

13. The Project will improve and expand clean energy supplies, improve energy efficiency, improve regional and indoor air quality, and reduce the explosion hazards associated with methane gas production, transmission, and distribution. Proposed project components will effectively contribute the overall goal of the Project. Global environmental benefits will be realized via expanded CMM production, capture and utilization of vented methane, and improved energy efficiency, which will result in reduction of methane and CO<sub>2</sub> emissions. The anticipated impacts arise primarily from construction activities, and can be readily mitigated with good engineering practice and active environmental management. The Liaoning provincial EPB will assume a lead role in assuring that the environmental management program is fully implemented. Local EPBs in each project city will be responsible for routine monitoring and oversight.

### **H. Conclusions**

14. Proposed project activities will significantly strengthen the original goal of the Project. The environmental examinations and assessments being conducted follow similar procedures and standards as adopted originally by the Project. The Executing Agency has completed all of the environmental assessments required by the PRC Government. As referred in para. 1, EIAs of three project components have been approved by the government. The examinations and assessments have adequately evaluated the potential impacts of the proposed changes.

**Table 1.1: Project Impacts, Mitigation Measures, and Monitoring Requirements**

Types of Pollution Sources		Pollution Sources	Pollutant or Parameter	Treatment Measures	Applicable Standards	Monitoring Frequency and Responsible Party
Air Pollution	Construction Period	Dust and exhaust gases emitted by construction machinery and vehicles	TSP, NO <sub>2</sub> , SO <sub>2</sub> . Levels at construction sites and surrounding areas	Appropriate emissions controls on equipment and vehicles, water sprays	GB or local standard for construction activities	Daily/weekly by contractor with monthly reports to EPB and PMO. Quarterly inspections by EPB
	Operational Period	Emissions from boilers and gas engines	TSP, NO <sub>2</sub> , SO <sub>2</sub> .	Scrubbers and lime injection, dust removing and desulphurization facilities Smoke funnels for gas engines	GB3095-1996 Grade II or III	Continuous emissions monitoring at boilers by operator with quarterly reports to EPB and PMO
		Emissions from gas productions, gathering, and transmission systems	CH <sub>4</sub> , H <sub>2</sub> S, NO <sub>x</sub> : 20.2t/a	Engineering controls: improved CMM production technique reducing CH <sub>4</sub> content in air; rehabilitation of transmissions/distribution pipelines	GB for gas operations and safety; CH <sub>4</sub> upper and lower explosive limits; H <sub>2</sub> S >10 part per million	Monthly/quarterly monitoring on gas systems by operator with quarterly reports to EPB and PMO. Annual inspections by EPB
Solid Waste	Construction Period	Spoils from earth moving, refuse from constructions workers, and construction garbage	Non hazardous construction wastes and domestic wastes	Earthwork spoils can be used as base material for construction, or disposed at designated areas and revegetated; garbage disposed at designated treatment and disposal sites	Good engineering practice	Weekly by contractor with monthly reports to EPB and PMO. Quarterly inspections by EPB
		Refuse peeled from old pipes and waste pipes disposal	Silicate Polyurethane Steel/iron	Steel/iron wastes can be recycled Silicate and polyurethane to be disposed at designated areas	GB18599-2001. Liaoning DB21-777-94	Weekly by contractor with monthly reports to EPB and PMO. Quarterly inspections by EPB
	Operational Period	Ash and slag from boilers, domestic garbage from boilers and other fixed facilities	Ash and slag and domestic solid waste	Ash and slag to be tested for hazardous characteristics and disposed at designated facility if necessary, or used as construction fill and raw material of building material as permitted by local and provincial EPBs; garbage disposed at designated treatment and disposal sites	GB or provincial and local standards for waste characterization and treatment and disposal	Monthly by operator with quarterly reports to EPB and PMO

**Table 1.1** —Continued

Types of Pollution Sources		Pollution Sources	Pollutant or Parameter	Treatment Measures	Applicable Standards	Monitoring Frequency and Responsible Party
Wastewater	Construction Period	Domestic and industrial wastewater from construction camps	COD, BOD, and petroleum, etc.	Primary treatment if needed	Good engineering practice or GB8976-1996 Grade III standards	Monthly contractor with quarterly reports to EPB and PMO Quarterly inspections by EPB and /or Health Department
		High-density wastewater residue from heavy equipment maintenance	COD, BOD, petroleum, etc.	Primary treatment	GB8976-1996 Grade III standards	Weekly/monthly by contractor with quarterly reports to EPB and PMO. Twice yearly inspection by EPB
	Operational Period	Boilers and heating	Pollutant discharge; SS: 0.109t/y COD: 0.08t/y NH <sub>3</sub> -N: 0.003t/y BOD: 0.03 t/y	Domestic sewage held in septic tank then sent to urban sewage treatment plant	GB 8978-1996 Grade III standards	Monthly by operator with quarterly reports to EPA and PMO
		Gas production sites, storage tanks, pipelines, and compressor stations, small gas engine power plants in Fuxin	SS, COD, BOD, petroleum: 0.72t/a	Oil contaminated wastewater filtered then recycled; domestic sewage pre-treated if necessary prior to sending to municipal treatment plant	GB8978-1996 Grade III Standards	Monthly by operator with quarterly reports to EPA and PMO
Noise	Construction Period	Heavy equipment operation and maintenance	70-100dBA (30 meters)	Pre-construction equipment certification; routine maintenance; temporary noise barriers if necessary	GB 12523-1990	Daily/weekly by contractor with monthly reports to EPB and PMO. Quarterly inspections by EPB
	Operational Period	Boilers and heating	70-100dBA (30 meters)	Sound barrier wall of the plant building	GB 3096-93 Grade I or locally designated standard for functional zones	Weekly/Monthly by operator with quarterly reports to EPB and PMO. Annual inspections by EPB
		Gas engines	70-100dBA (30 meters)	Erect sounder barriers	GB12348-90 Grade I standards or locally designated standard for functional zones	Weekly/Monthly by operator with quarterly reports to EPB and PMO. Annual inspections by EPB

BOD = biochemical oxygen demand, CH<sub>4</sub> = methane, COD = chemical oxygen demand, dBA = decibel acoustic, EPB = environmental protection bureau, GB = guojia biao zhun (national standard), H<sub>2</sub>S = hydrogen sulfide, NO<sub>2</sub> = nitrogen dioxide, NO<sub>x</sub> = nitrogen oxides, PMO = project management office, SEPA = State Environmental Protection Administration, SO<sub>2</sub> = sulfur dioxide, SS = suspended solids, TSP = total suspended particles.

Source: derived from environmental assessment reports prepared by PIAs.