

Not for Quotation: Work-in-Progress

Subject: **Project Performance Evaluation Report on Loan 1715-PRC: Shanxi Environment Improvement Project—Evaluation Approach Paper**

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A. Background

1. The People's Republic of China (PRC) has made great progress since the economic liberalization and reform efforts began in 1978. Since then, the economy has grown faster than any other in the world, averaging more than 9% annually. In 2008, PRC's real GDP registered a growth of 9%, in spite of softening external demand and policy tightening measures; and as per Asian Development Bank's (ADB) 2008 Update, real GDP growth is projected at some 9.5% in 2009.¹ However, as per the International Monetary Fund (IMF), real GDP growth in 2009 is expected to be significantly lower at 6.7%, although 8% may not be out of range, as PRC tries to shift from an export-led growth strategy to domestic-led growth.²

2. One of the consequences of the PRC's rapid economic growth has been pollution and environmental degradation—a key cause being the country's heavy reliance on coal. PRC is the world's second largest energy consumer, and has the highest dependence on coal among the world's top ten energy consuming nations.³ Reducing energy intensity and improving the environment are among the PRC's greatest challenges, and because they require structural changes in the economy, progress is likely to be slow. ADB's strategy (for 2008 to 2010) therefore is to partner with the PRC to help it achieve key 11th five-year plan (2006–2010) goals and targets in areas such as: (i) providing clean and renewable energy; (ii) reducing energy intensity; (iii) reducing pollutants and emissions; (iv) promoting best practices, knowledge and innovation; and (v) promoting good governance.⁴

3. ADB's Operational Strategy for PRC during the time of Project's approval,⁵ although different owing to the broader objective of supporting power generation, transmission infrastructure to reduce power shortages, also included similar aims—in particular, regarding the development of cleaner energy sources such as gas, hydropower, and clean-coal technology in power generation.

¹ ADB. 2008. *Asian Development Bank Update*. Available: <http://www.adb.org/Documents/Books/ADO/2008/Update/Part03-PRC.pdf>

² IMF. 2009. *Transcript of a Briefing of Asia Press by International Monetary Fund Managing Director Dominique Strauss-Kahn*, Washington, DC, 2 February. Available: <http://www.imf.org/external/np/tr/2009/tr020209.htm>

³ Naughton, Barry. 2007. *The Chinese Economy: Transition and Growth*. Cambridge: MIT Press (pp. 334–336), as quoted in ADB 2008. *Country Partnership Strategy for the People's Republic of China*. Manila.

⁴ ADB. 2008. *Country Partnership Strategy for the People's Republic of China*. Manila. Available: <http://www.adb.org/Documents/CPSs/PRC/2008/CPS-PRC-2008-2010.pdf>

⁵ ADB. 1997. *Country Operational Strategy Study: People's Republic of China*. Manila.

4. The Shanxi Environment Improvement Project (Loan 1715-PRC) is located in Shanxi province where environmental degradation was more acute. Shanxi is one of the country's major coal-producing areas, producing about one-third of PRC's coal, and is also a major coal consumer.⁶ Its capital, Taiyuan, had the worst air quality in PRC in 1999, and ranked among the 10 most polluted cities in the world. Two other cities in Shanxi—Datong and Yangquan—were also among the cities with the worst air quality in PRC and in the world. The levels of harmful emissions from heavy industries, as well as household stoves, boilers, and commercial furnaces that burn coal were 2–3 times the national standards. The release of coal bed methane into the atmosphere as a greenhouse gas, instead of using it as an energy source, compounded the problem in Yangquan. As the producer of about one third of PRC's coal, Shanxi also uses coal as its primary energy

5. The Project was the sixth ADB-funded project to support the Government's environmental protection efforts. [For a complete list of ADB loans and technical assistance (TAs) that support environmental improvement efforts, refer to Appendix 1]. The loan of \$102 million was approved on 07 December 1999. The project was prepared through a project preparatory TA, followed by loan fact-finding and appraisal missions. The executing agency was the Shanxi Provincial Government (SPG). A project completion report was prepared and circulated to the Board in September 2006.

B. Objectives and Scope of the Project

6. The main objective of the Project was to improve the ambient air quality of three main cities in Shanxi Province—Taiyuan, Datong and Yangquan—by (i) supporting market-oriented price reforms, (ii) strengthening environmental protection agencies' capabilities in sustainable environmental management and enforcement of compliance with national environmental standards, and (iii) financing part of the investments required to expand district heating and gas distribution systems to reduce direct coal burning and improve energy efficiency. The project scope covered (i) a coal gasification and gas distribution system in Taiyuan, (ii) a district heating system in Datong, (iii) a coal bed methane gas storage and distribution system in Yangquan, and (iv) capacity building for concerned agencies.

7. As envisaged, the Project's components were as follows:

- (i) **Taiyuan Coal Gasification Plant (TCGP).** This component involved the construction of a new coke oven gas manufacturing plant with a capacity of 504,000 cubic meters (m³) of coal gas per day (175 million m³ per year) and 930,000 metric tons (t) of coke per year, and the associated storage and distribution network. The gas was to replace coal for industrial, commercial, and residential uses.
- (ii) **Datong District Heating Plant (DDHP).** This component involved the construction of two peak load boilers with capacities of 80 t per hour and 120 t per hour (and thus replace 446 small inefficient boilers currently used for space heating), and the associated district heating transmission network. The plant was to supply 3.4 million gigajoules of heat to 5.1 million square meters of residential and commercial floor space.
- (iii) **Yangquan Gas Distribution Plant (YGDP).** This entailed the installation of a system for recovering 272,000 m³ of methane gas daily (94 million m³ per year)

⁶ World Bank. 1997. *Clear Water Blue Skies: China's Environment in the New Century* in ADB. 2006. *Project Completion Report on the Shanxi Environment Improvement Project in the People's Republic of China*. Manila.

from a coal mine, and construction of the associated storage and distribution network. It was to replace coal for industrial, commercial, and residential use.

- (iv) **Institutional Development and Project Management.** This component involved investments to support and strengthen the capabilities of the provincial executing organizations, project implementing agencies (PIAs), and related bureaus in project, institutional, and financial management; procurement and construction supervision; and environmental policy making and monitoring capabilities.

C. Key Issues raised during Loan Processing

8. As per the Management Review Meeting on 20 May 1999, the Staff Review Committee meeting on 11 August 1999, and the Board Meeting on 7 December 1999, the main concerns raised were: (i) tariffs adjustments, which should take into consideration the long term sustainability of the Project and commercial viability of the PIAs as well as the affordability and willingness-to-pay of the consumers, especially the poor⁷; (ii) feasibility of introducing market-based instruments (e.g., air pollution trading system) rather than modifying the widely accepted pollution-levy system to overcome its shortcomings⁸; (iii) extent of possible private sector participation⁹; and (iv) depth of institutional reforms to be carried out by implementing agencies in terms of improving operational efficiency and ensuring long-term financial viability. In particular, the Board recognized that the Project's accomplishments—in the overall context of improving air quality in the cities of Shanxi province—would at best be modest; and that the solid commitment of SPG is a good start.

D. Major Findings of the Project Completion Report

9. The project completion report (PCR), which was finalized in September 2006, rated the Project as "successful"¹⁰, based on a review of its relevance, effectiveness, efficiency, and sustainability. The Project has had a strong and positive environmental and developmental impact. It was assessed as highly relevant, being consistent with the priorities of ADB and the Government at the time of appraisal, as also helping to improve the environment in Shanxi province. It was also rated highly effective in achieving its outcome. The Project achieved its objective of improving the environment in Taiyuan, Datong, and Yangquan by helping the cities meet part of their energy requirements through desirable and safe environmental investments and practices.

10. According to the PCR, the Project was efficient in achieving its outcome and outputs. The three subprojects were implemented efficiently, without any major cost overruns and within the construction schedule. The recalculated economic internal rates of return (EIRR) were

⁷ Due largely to (i) some 50,000 urban poor households are expected to be the direct beneficiaries of the Project; and (ii) the very high price elasticity for gas and district heat, given abundant availability of cheap coal in the vicinity of the expected beneficiaries.

⁸ Basically, the pollution levy system, formally adopted in 1982, was created to fund the provincial Environmental Protection Bureaus and to help finance a mechanism for financing a portion of the pollution control—not to enforce pollution standards. Although the Government began increasing pollution levies five-fold (albeit on a pilot basis in nine cities) in 1993 and changed the basis for calculating the levy to total emissions by 2000, the increased levy remained no more than half of the marginal abatement cost in most cases. The low rate, combined with the historical 80% recycling back to enterprises for pollution abatement, provided little incentive to reduce emissions.

⁹ Taking into account moves towards commercialization of the PIAs, the need for gradual (rather than quantum) increases in tariffs, private sector priority for short payback periods for investment, the demonstration effects of the three subprojects as well as general aspects such as private sector's role in Shanxi province in general and private sector's interest in investment in environmental technologies through BOT type projects or management contracts.

¹⁰ Project rating is on the border of "highly successful."

14.5% for TCGP, compared with 23.9% at appraisal; 19.0% for DDHP, compared with 14.1% at appraisal; and 16.1% for YGDP, compared with 26.6% at appraisal. The recalculated EIRRs exceeded ADB's 12.0% hurdle rate for economic opportunity cost of capital. The recalculated EIRRs varied from appraisal estimates due to: (i) lower-than-anticipated coal gas tariff for TCGP, (ii) higher efficiency of heat source and expanded project scope for DDHP, and (iii) lower gas tariff for YGDP.

11. The PCR indicates that the PIAs possess institutional capability and expertise required to manage and operate the facilities effectively and efficiently. As per the PCR, the Project is likely to be sustainable, as evident from: (i) For Taiyuan Coal Gas Company (TCGC), which implemented the TCGP, the demand and price of coke rose for 3 years to 2006¹¹; (ii) The incremental financial benefit from capture of methane gas effectively has been channeled to the coal mine company, thus providing an incentive for SPG to undertake similar environmental projects in other parts of Shanxi province—even though operations of the Yangquan City Gas Company, Pingding Gas Company, and Jiaoku Gas Company continue to be subsidized and adequate gas tariff increases were not approved and implemented as of 2006; and (iii) For the Datong District Heating Company (DDHC), which implemented the DDHP, and for which the need to establish a heating tariff that is sufficient to allow full cost recovery needs to be addressed for DDHP, the ADB supported a TA¹². In spite of concerns over adequate gas and heating tariffs, the projected net revenue flows for each subproject remain positive and actual financial internal rates of return (FIRRs) remain above the weighted average cost of capital.

12. The PCR drew the following lessons: (i) strong commitment of the project proponents was a key factor in the success of the Project; (ii) adequate planning and preparation contribute to smooth and timely implementation of a project; (iii) responsiveness to significant changes in prevailing parameters could improve project design and benefits; and (iv) a properly administered bidding process, supported by detailed technical design and bid specifications, can generate advantageous bids.

E. Rationale and Objectives of the Proposed PPER

13. The growing importance of addressing climate change concerns, ADB's recent initiatives that focus attention on climate change mitigation¹³ and the stated commitment of the PRC to addressing climate change mitigation concerns¹⁴ are among the reasons for proposing a project performance evaluation report (PPER) for the Shanxi Environment Improvement Project. The greenhouse gas (GHG) implications of the Project (so clearly evident from the Project scope outlined in Section B) and the ongoing special evaluation study (SES) on "GHG Efficiency of ADB's Energy Sector Operations", coupled to the fact that no project of a similar scope supported by ADB in the PRC has been evaluated thus far, reinforce the interest in the proposed PPER.

14. The proposed PPER will assess various aspects of project formulation, design, implementation and sustainability, as well as the Project's socioeconomic, environmental and

¹¹ Whether or not coke prices have increased since 2006 will be ascertained during the independent evaluation mission. It is clear nonetheless, that price increases until 2006 would contribute to the commercial viability of the coke oven plant, and to that extent, have reduced the need to increase gas prices.

¹² ADB. 2005. *Technical Assistance Completion Report on Pro-Poor Urban Heating Tariff Reforms in the People's Republic of China* (TA 3673-PRC, 24 June). Manila.

¹³ For instance, ADB's own Carbon Market Initiative and Energy Efficiency Initiative, as also ADB's participation in the Climate Investment Funds.

¹⁴ Refer to: National Development and Reform Commission, PRC, 2007; *China's National Climate Change Programme*, Beijing, June.

institutional impacts. The proposed PPER will review the PCRs findings and assess the Project's relevance, effectiveness, efficiency in achieving its outputs and purposes, as well as sustainability of outcomes and impact. The proposed PPER will also verify key learnings for ADB operations as well as identify key issues. The PPER scope is detailed in section F.

F. Key Issues to be Addressed in the PPER

15. The PPER will focus on the following major issues (in addition to issues that come up during the course of the evaluation work):

16. **Performance of the PIAs.** An assessment of the performance of the project management office (PMO) that is housed in the SPG and the three corporations (the PIAs) in Taiyuan (TCGC), Datong (DDHC) and Yangquan (SYGC) with particular emphasis on sustainability impacts on the Project. This will include (among others) the following:

- (i) Whether and how the management functions of the three PIAs have been actually separated from the ownership rights of the municipal governments of the three cities.
- (ii) Whether and how managerial autonomy of the three PIAs (from the local municipal governments in the three cities) has enhanced or evolved since project completion in 2005–2006.
- (iii) Whether and to what extent has the objective of divesting the PIAs of their social welfare functions and obligations been accomplished in practice (for instance, being able to increase tariffs, recover costs, etc.), particularly since project completion in 2005–2006.
- (iv) Whether and how technical, operational and managerial capabilities as well as environmental consciousness have helped in retaining and possibly enhancing the Project outcomes since project completion in 2005–2006.
- (v) Whether, and if so, what type of capacity building measures are required to enhance and sustain the functioning of the three PIAs.

17. **Progress on Tariff Adjustments.** From the viewpoint of cost recovery and financial sustainability of the three subprojects, an assessment of the adequacy (or lack thereof) in implementing tariff adjustments since Project completion in 2005–2006. To the extent tariff adjustments have remained below levels to achieve a reasonable financial rate of return, the key issues that impede appropriate and timely tariff adjustments will be identified and assessed.

18. **Use of Market-Based Instruments.** An assessment of the present working of the sulfur dioxide (SO₂) emission trading scheme, and identification of issues that need to be addressed upfront before it is widely accepted by enterprises that have trading permits.

19. **Private Sector Participation.** An examination of policy related constraints and other factors that affect private sector involvement, so as to strengthen the evaluation.

20. **Design Issues.** An assessment of deficiencies in Project design (if any), along with rationale of changes in the design of subproject post-appraisal.

21. **Social Aspects.** An assessment of the social impact of the Project and its subprojects with the viewpoint of assessing long term sustainability. Among the various issues that will be addressed include: (i) likelihood of increase in gas and heating tariff (to full cost recovery levels) and implications on the poor; and (ii) employment generation/loss of jobs and resettlement issues.

22. **Environmental Aspects.** An assessment of the following environmental emissions and monitoring related issues: (i) the decrease in SO₂, nitrogen dioxide (NO₂), and total suspended particulates (TSP) emissions that can be attributed to the Project in the three cities each year since Project completion; (ii) coal use reduction that can be attributed to the Project in the three cities each year since Project completion; (iii) ambient air quality levels in the three cities vis-à-vis Class I/II/III levels (perhaps against the backdrop of energy consumption growth and number of energy users in the three cities) and ; (iv) improvements in the air quality monitoring systems in the three cities since project completion. On this basis, the long term environmental impact of the Project will be assessed.

23. **GHG Aspects.** An understanding of the institutional arrangements in place (involving the PIAs and other organizations) to compile data that help to estimate GHG emissions reductions that are attributable to the subprojects. Also compiling necessary information related to GHG emission reductions as a result of the subprojects.

24. **Economic Analysis Reevaluation.** A review of the economic analyses of the three subprojects as presented in the PCR, and updating of the various inputs and assumptions in to the economic models on the basis of the recent information available and compiled. Where necessary, the technical and other inputs and assumptions will be suitably updated and EIRRs reworked.

25. **Financial Analysis Reevaluation.** A review of the financial analyses of the three subprojects as presented in the PCR, and updating of the various inputs and assumptions in to the financial models on the basis of the recent information available and compiled. Where necessary, the various inputs and assumptions will be suitably updated and FIRRs reworked.

26. **Other Aspects.** Deficiencies in project design, and key lessons learned from the Project will be highlighted. Evaluation ratings as given in the PCR will be examined. Where the self-evaluation ratings given in the PCR are to be retained, the rationale for doing so will be provided; and where the recommendations on changing the self-evaluation ratings are made, the rationale for doing so will also be provided.

G. PPER Approach and Schedule

27. The Independent Evaluation Mission (IEM) has reviewed the pertinent project files from which discussion on issues associated with the Project's formulation and implementation has been based. The IEM is also associated closely with the ongoing SES on GHG Efficiency of ADB's Energy Sector Operations.

28. It is envisaged that the consulting services of an international consultant will be needed for up to 15 person-days. He should have has experience in policy, institutional as well as pricing/tariff regimes related to the energy sector. The domestic consultant who will be part of the IEM, is a qualified national environmental engineer who has worked on environmental impact assessments, environmental compliance audits, evaluation and monitoring, and has considerable experience in environment related sustainability issues¹⁵. Terms of reference both

¹⁵ This complies with the recommendation made in the Biennial Thematic Report on Environment 2006–2007, that on site visit missions for projects that support environmental sustainability, the IED should consider including environment specialists.

are attached in Appendix 2. A tentative list of individuals/agencies to be consulted during the field visits is in Appendix 3.

In addition to work normally associated with a PPER, the domestic consultant will also work towards obtaining and analyzing information on GHG related issues for the three subprojects in Shanxi province's three cities (Taiyuan, Datong, and Yangquan). The findings from this GHG related work would be useful inputs for Phase 2 of the ongoing SES. With this additional work load, it is anticipated that the level of effort required from the domestic consultant would be up to 55 person-days.

29. It is proposed that the IEM be undertaken for approximately 2 weeks in July 2009. The following proposed schedule is subject to Government clearance of the mission and availability of suitable staff consultants:

Evaluation Mission	:	I–II Jul
Report Preparation	:	IV Aug
Director's 1 st Review and Peer Review	:	I Sep
Interdepartmental Circulation	:	III Sep
Director's 2 nd Review	:	IV Sep
Editing	:	III Oct
Submission to DG	:	IV Oct